January 31, 2006 TSTF-06-01

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: TSTF-412, Revision 2, "Provide Actions for One Steam Supply to Turbine Driven AFW/EFW Pump Inoperable"

Dear Sir or Madam:

Enclosed for NRC review is Revision 2 of TSTF-412, "Provide Actions for One Steam Supply to Turbine Driven AFW/EFW Pump Inoperable." This revision incorporates NRC requested changes to the Bases. Also attached are responses to NRC questions provided on Revision 1 of TSTF-412.

Any NRC review fees associated with the review of TSTF-412, Revision 2 should be billed to the Westinghouse Owners Group.

Should you have any questions, please do not hesitate to contact us.

Wesley Sparkman (WOG/W)

Michael Crowthers (BWROG)

Brian Woods (WOG/CE)

Paul Infanger (WOG/B&W)

Enclosure

cc: Thomas H. Boyce, Technical Specifications Section, NRC
David E. Roth, Technical Specifications Section, NRC

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Administered by EXCEL Services Corporation

Response to NRC Comments on TSTF-412, Revision 1

A couple of corrections are needed in the Bases Section.

1. For Action A.1.a, the following statement is being added at the end: "and the turbine driven train is still capable of performing its specified function." This is not entirely correct in that the turbine driven train may not be able to perform its function for a MSLB or FLB that affects the remaining operable steam supply for the turbine driven AFW/EFW pump. I would suggest the following clarification: "and the turbine driven train is still capable of performing its specified function for most postulated events." (or something to this effect).

RESPONSE: Change incorporated.

2. The second item is an editorial error under Action E.1 where the proposed change states: "and the turbine driven turbine driven EFW train is...;" one of the "turbine driven" phrases needs to be eliminated.

RESPONSE: Change incorporated. The subject Bases paragraph for Action A.1 is revised to state, "For the inoperability of the turbine driven AFW pump due to one inoperable steam supply, the 7 day Completion Time is reasonable since there is a redundant steam supply line for the turbine driven pump and the turbine driven train is still capable of performing its specified function for most postulated events."

3. We [SPLB, Steve Jones] have an issue with the TS actions that apply when both motor-driven AFW trains are inoperable and the turbine driven AFW train is operable (current Condition C.) or inoperable solely because of one inoperable steam supply (proposed Condition D). In these states, the required actions are to place the plant in Mode 3 within 6 hours and then Mode 4 within 18 hours.

The Mode 4 LCO requirement is to have one motor-driven AFW train operable, and, in Mode 4, steam pressure may become inadequate to run the turbine driven AFW pump. Therefore, following the required actions could result in having no functional AFW supply. The required actions and associated bases should address these two issues up-front. I recommend including a required action for proposed Condition D to immediately restore one motor-driven pump to operable status if no motor driven pumps are operable, in addition to beginning shutdown to Mode 4. I also recommend that the required actions and associated bases address how to manage the turbine driven AFW train in Mode 4 until a motor-driven pump is operable. This could involve either minimizing cooldown to maintain steam pressure once in Mode 4 or using the turbine driven pump to gradually overfill the steam generators and use the inventory to reach RHR entry conditions. The second path is somewhat risky in that generating adequate steam to restore the turbine-driven pump may be difficult if RHR entry fails and steam generator inventory is low.

RESPONSE: If steam pressure decreases to the point that it cannot power the turbine driven AFW train, the turbine driven train could no longer perform it's safety function and would be inoperable. In that case, Condition E would apply, not Condition D. Condition E requires immediately initiating action to restore one EFW train to OPERABLE status. Since the turbine driven pump cannot be made OPERABLE with inadequate steam pressure, a motor driven pump must be restored. This accomplishes the same effect as the proposed action to restore a motor driven pump if no motor driven pump is inoperable. In should be noted that the turbine-driven pump is fully OPERABLE in

MODES 1 through 3 down to the MODE 3 to MODE 4 transition temperature of 350 degrees F. The MODE 3 to MODE 4 transition temperature is also the point at which the plant can be placed on RHR cooling. From a practical perspective, if there are no OPERABLE AFW trains, the plant is going to transition to shutdown cooling as quickly as possible to establish RCS temperature control. Taking these two items together, the change to Condition D is not needed.

The Specifications already address no required OPERABLE AFW pump in MODE 4 with Condition F. In addition, ISTS 3.4.6, RCS Loops - MODE 4, provides the requirements and Actions in MODE 4 for RCS cooling. ISTS 3.4.6 provides options for cooling the RCS that do not require an OPERABLE AFW pump (i.e., RHR). The proposed additions regarding how to operate the turbine driven AFW train are the type of detail contained in plant operating procedures and are not appropriate for Technical Specifications and Bases.

4. The LCO requires only one motor-driven train in Mode 4 when a SG is being relied upon for heat removal. Does this mean that the LCO cannot be met in Mode 4 when a SG is being relied upon for heat removal unless a motor driven train is operable?

RESPONSE: That is correct. When in MODE 4 and a SG is being relied on for heat removal, the LCO requires one AFW train, which includes a motor driven pump, to be OPERABLE. This is clearly stated in the Bases. In addition, once in MODE 4, ISTS 3.4.6 specifies the required RCS cooling. ISTS 3.4.6 includes cooling options that do not require AFW.

5. If in Condition D (3 AFW trains inoperable, but turbine driven pump available with one steam supply operable), the actions require entering Mode 4; but because no motor driven trains are operable, this puts the plant in Condition F (as long as a SG is being relied upon for heat removal). Required Action F.1 could be satisfied by restoring the second steam supply to the TD train, BUT this would NOT take the plant out of Condition F because the LCO requires a motor driven train to be operable in Mode 4; the only way to exit Condition F without restoring operability of a motor driven pump is to go on shutdown cooling for heat removal. Is the TD train adequate to ensure a safe transition to shutdown cooling?

RESPONSE: While in Condition D, the plant enters MODE 4 per Required Action D.2. Required Action F.1 <u>cannot</u> be satisfied using the turbine driven AFW pump because Required Action F.1 states "Required AFW train inoperable in MODE 4." The word "required" means "required by the LCO." The Required Action refers to the Condition. Therefore, once in MODE 4, the plant would stay in Condition F until a motor driven AFW train is restored to OPERABLE status or the SGs are no longer relied on for heat removal. The turbine driven AFW train can be used to transition to shutdown cooling. Shutdown cooling can typically be entered at RCS temperatures of approximately 350 degrees F (i.e., the MODE 3 to MODE 4 transition temperature), well above the steaming temperatures for the SGs. As stated in the Bases for Required Action F.1, "In MODE 4, either the steam generator loops or the DHR loops can be used to provide heat removal." The MODE 4 RCS cooling requirements are addressed by ISTS 3.4.6.

6. Please ensure that the Bases clearly address these points.

RESPONSE: As stated above, the Bases address these points.

Technical Specification Task Force
Improved Standard Technical Specifications Change Traveler

Provide Actions for One Steam Supply to Turbine Driven AFW/EFW Pump Inoperable

NUREGs Affected: ☑ 1430 ☑ 1431 ☑ 1432 ☐ 1433 ☐ 1434

Classification: 1) Technical Change

Recommended for CLIIP?: No

Correction or Improvement: Improvement

NRC Fee Status: Not Exempt

Benefit: Provides Longer Completion Time

Industry Contact: Wes Sparkman, (205) 992-5061, wasparkm@southernco.com

1.0 DESCRIPTION

This change is proposed to clarify the OPERABILITY of the turbine driven AFW pump with one steam supply inoperable.

The Bases for LCO 3.7.5 states in part: "The turbine driven AFW pump is required to be OPERABLE with redundant steam supplies from each of [two] main steam lines upstream of the MSIVs, ..." LCO 3.0.2 states: "Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5 and LCO 3.0.6. If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required unless otherwise stated."

The existing LCO specifies the OPERABILITY of the AFW system at the train level, and the Bases state that the turbine driven AFW pump is required to be OPERABLE with redundant steam supplies. Therefore, based on LCO 3.0.2 and associated Bases, entering Condition A implies that the LCO is not met (i.e., an inoperable steam supply means that the turbine driven AFW train is inoperable).

Based on the above logic, with one steam supply inoperable, Condition A would be entered for an inoperable steam supply. Assuming that one motor driven AFW pump were declared inoperable (at the same time a steam supply was inoperable), Condition B would be entered for an inoperable motor driven AFW train as well as entry into Condition C for two inoperable AFW trains. However, the turbine driven AFW train remains capable of performing its specified function, but with a lack of redundancy with respect to its steam supplies.

However, there are scenarios where the combination of an inoperable motor driven AFW train and the turbine driven AFW train inoperable due to an inoperable steam supply can lead to inadequate AFW flow to the SGs. Consider, for example, a four loop plant where the steam supplies for the turbine driven AFW train come from two of the SGs. The turbine driven train feeds all four SGs, and each motor driven train feeds two SGs. If one steam supply is inoperable, and the SG with the remaining steam supply becomes faulted due to a Feedline Break (FLB) or Main Steamline Break (MSLB) (whichever is limiting from the standpoint of AFW flow requirements and assuming no single failures), the turbine driven AFW train may not be able to perform its function. If the motor driven AFW train that feeds the two intact SGs is also inoperable, the remaining motor driven AFW train will be feeding only one intact SG. This may not meet safety analysis requirements. Similar scenarios are possible for three loop plants that require two motor driven AFW trains to mitigate the FLB or MSLB. New Condition C addresses these scenarios. A Completion Time of 24 or 48 hours is proposed for new Required Actions C.1 and C.2. The 24 hour Completion Time is based on the fact that the turbine driven train can still perform its function (and meet 100% flow requirements) with an inoperable steam supply, and the low probability of an event that would result in the inability to meet the 100% AFW flow requirements. However, even if a plant design will still provide 100% of the AFW flow requirements while in this condition, the level of degradation is more than one inoperable AFW train, so a Completion Time of 48 hours is proposed for plants that can still meet the 100% flow requirements even assuming the worst case scenario.

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2.0 PROPOSED CHANGE

The following changes are proposed to STS 3.7.5, "Auxiliary Feedwater (AFW) System" (for NUREG-1431 and NUREG-1432) and STS 3.7.5, "Emergency Feedwater (EFW) System" (for NUREG-1430):

1. Condition A is modified to state: "Turbine driven AFW train inoperable due to one inoperable steam supply."

2. A new Condition C is added for the turbine driven AFW train inoperable due to one inoperable steam supply and one motor driven AFW pump train inoperable. For new Condition C, Required Action C.1 requires restoration of the affected steam supply to OPERABLE status in 24 hours for plants that can no longer meet the safety analysis flow to the SGs assuming no single active failure and a feedwater line break (FLB) or main steamline break (MSLB) or 48 hours for plants that can still meet the safety analysis requirements. New Required Action C.2 is also provided that addresses restoration of the inoperable motor driven AFW train within 24 or 48 hours as explained above for Required Action C.1. A Reviewer's Note is added to the Condition C Bases to explain the applicability of the two bracketed Completion Times for Required Actions C.1 and C.2. Associated Bases changes are provided to support the addition of new Condition C.

3. The existing Condition C is revised to Condition D, and existing Condition C is revised to address the case where three trains of AFW are inoperable due to the turbine driven AFW train being inoperable solely due to one inoperable steam supply. The associated Bases are revised.

4. Existing Condition D becomes Condition E and is revised to address two motor driven AFW trains inoperable and turbine driven AFW train inoperable for reasons other than one inoperable steam supply. The existing Condition E is revised to Condition F. The associated Bases are revised.

5. The Bases of NUREG-1430 are revised to replace some inaccurate references to "AFW" with "EFW."

3.0 BACKGROUND

The Auxiliary Feedwater (AFW) (For B&W Plants, Emergency Feedwater (EFS) System automatically supplies feedwater to the steam generators to remove decay heat from the Reactor Coolant System upon the loss of normal feedwater supply. The AFW pumps take suction through separate and independent suction lines from the condensate storage tank (CST) and pump to the steam generator secondary side via separate and independent connections to the main feedwater (MFW) piping outside containment. The steam generators function 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) or atmospheric dump valves. If the main condenser is available, steam may be released via the steam bypass valves and recirculated to the CST.

For a typical Westinghouse NSSS four loop plant, the AFW System consists of two motor driven AFW pumps and one steam turbine driven pump configured into [three] trains. Each motor driven pump provides 100% of AFW flow capacity, and the turbine driven pump provides 200% of the required capacity to the steam generators, as assumed in the accident analysis. The pumps are equipped with independent recirculation lines to prevent pump operation against a closed system. Each motor driven AFW pump is powered from an independent Class 1E power supply and feeds [two] steam generators (SGs), although each pump has the capability to be realigned to feed other SGs. The steam turbine driven AFW pump receives steam from two main steam lines upstream of the main steam isolation valves. Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump. The steam turbine driven AFW pump feeds all of the SGs.

The AFW System is capable of supplying feedwater to the steam generators during normal unit startup, shutdown, and hot standby conditions.

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4.0 TECHNICAL ANALYSIS

A turbine driven AFW pump with a single OPERABLE steam supply is capable of performing its safety function in the absence of a single failure. The ITS ACTIONS in many specifications recognize that loss of single failure protection is a less degraded condition than inoperability and provide longer Completion Times for those situations.

Condition A is modified to indicate that the turbine driven AFW train is inoperable due to one steam supply inoperable. With one steam supply inoperable, the turbine driven AFW train is considered inoperable but is still capable of performing its specified function. A new Condition C is proposed that will require restoring an AFW train to OPERABLE status in 24 hours if one motor driven AFW train is inoperable and the turbine driven AFW train is inoperable due to one steam supply inoperable. This Completion Time is applicable when the condition could result in the inability of the AFW system to provide 100% of the flow required by the safety analysis for the FLB or the MSLB, whichever is most limiting, assuming no additional single failure. This Completion Time is reasonable based on the remaining OPERABLE motor driven AFW train, the remaining OPERABLE steam supply to the turbine driven AFW pump, the turbine driven AFW pump still capable of performing its specified function, and the low probability of an event that would result in the inability of the AFW system to provide 100% of the required flow. A 48 hour Completion Time is proposed for this condition when plant design still provides for 100% of the AFW flow requirements regardless of this scenario. This Completion Time is reasonable since the consequences of this configuration are less severe, but the configuration represents a higher level of degradation than one inoperable AFW train, which can exist for 72 hours per Condition B.

The proposed new Condition C addresses the ability of the AFW system to mitigate the most limiting design basis events (e.g., an FLB or MSLB), excluding a single failure, due to one inoperable steam supply to the turbine driven train and an inoperable motor driven train. For example, a typical Westinghouse three-loop design feeds all three steam generators with two motor driven AFW trains and a turbine driven train. The turbine driven AFW steam supplies are taken from two of the steam generators. If the turbine driven AFW train is inoperable due to one steam supply inoperable and a motor driven AFW train is inoperable, and the steam generator with the remaining steam supply is faulted, the remaining motor driven train will be able to feed two intact steam generators. Therefore, the design basis may be met, and the Completion Time of 48 hours is appropriate. However, if due to plant design, there are scenarios where 2 out of 3 AFW trains are required for a three loop plant, the more limiting Completion Time of new Condition C (24 hours) is appropriate. For the two loop design, there must be a remaining motor driven train capable of feeding the remaining intact steam generator.

In a typical four-loop design, each motor driven AFW train feeds two steam generators, and the turbine driven train feeds all four steam generators. As with the three-loop design, the success criteria for the AFW system require that two intact steam generators receive AFW flow. The new Condition for an inoperable turbine driven AFW train due to one steam supply inoperable and an inoperable motor driven AFW train cannot be applied unless the combination of inoperabilities allow the success criteria to still be met. Consequently, a Reviewer's Note is applied to the new Condition to distinguish between those designs which can meet design basis for all scenarios, and those which cannot.

In the case of an inoperable turbine driven AFW train due to one steam supply inoperable and two inoperable motor driven AFW trains, existing Required Action D.1 (renamed to E.1) and it's Note are not applicable because there is still a safety related means for conducting a plant cooldown. Therefore, existing Condition C, renamed to Condition D, is revised to address this configuration which will require the plant to be in MODE 3 in 6 hours and MODE 4 in 18 hours. If the steam generator with the remaining OPERABLE turbine driven AFW steam supply is faulted, the plant will be left with no AFW System capability. As such, while the one remaining steam supply is available, the unit should be placed in a condition which minimizes the potential for a faulted steam generator and which makes available another means of decay heat removal (i.e., the Residual Heat Removal System). A Completion Time of 18 hours is consistent with the existing Required Action C.2 for two AFW trains inoperable and allows reasonable time to reach the required unit conditions in an orderly manner and without challenging unit systems.

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5.0 REGULATORY ANALYSIS

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION

The TSTF has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

Standard I - Involves a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated

The Auxiliary Feedwater (AFW) System is not an initiator of any design basis accident or event, and therefore the proposed changes do not increase the probability of any accident previously evaluated. The proposed changes to address the condition of one or two motor driven AFW trains inoperable and the turbine driven AFW train inoperable due to one steam supply inoperable do not change the response of the plant to any accidents.

The proposed changes do not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, and configuration of the facility or the manner in which the plant is operated and maintained. The proposed changes do not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed changes do not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. Further, the proposed changes do not increase the types and amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposures. The proposed changes are consistent with the safety analysis assumptions and resultant consequences.

Therefore, it is concluded that the proposed change does not result in a significant increase in the probability or consequences of an accident previously evaluated.

Standard II - Create the Possibility of a New or Different Kind of Accident from any Accident Previously Evaluated

The proposed changes do not result in a change in the manner in which the AFW System provides plant protection. The AFW System will continue to supply water to the steam generators to remove decay heat and other residual heat by delivering at least the minimum required flow rate to the steam generators. There are no design changes associated with the proposed changes. The changes to the Conditions and Required Actions do not change any existing accident scenarios, nor create any new or different accident scenarios.

The changes do not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. In addition, the changes do not impose any new or different requirements or eliminate any existing requirements. The changes do not alter assumptions made in the safety analysis. The proposed changes are consistent with the safety analysis assumptions and current plant operating practice.

Therefore, it is concluded that the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Standard III - Involve a Significant Reduction in a Margin of Safety

The proposed changes do not alter the manner in which safety limits, limiting safety system settings or limiting conditions for operation are determined. The safety analysis acceptance criteria are not impacted by these changes. The proposed changes will not result in plant operation in a configuration outside the design basis.

Therefore, it is concluded that the proposed change does not involve a significant reduction in a margin of safety.

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safety.

5.2 Applicable Regulatory Requirements/Criteria

The proposed change does not affect the regulatory requirements for the AFW system. Therefore, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Consideration

A review has determined that the proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

7.0 References

None

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 13-Aug-99

Owners Group Comments:
(No Comments)

Owners Group Resolution: Superceeded Date:

OG Revision 1 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Proposed Condition E is modified to contain a Note, similar to the Note in Condition F, which suspends requirements to change MODES until an AFW train is restored to OPERABLE status.

Owners Group Review Information

Date Originated by OG: 08-Dec-99

Owners Group Comments:
(No Comments)

Owners Group Resolution: Superceeded Date: 08-Dec-99

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OG Revision 2 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Reworded Condition A to "Turbine driven AFW train inoperable due to one inoperable steam supply OR, etc." New Conditions C and E are be reworded in the same fashion. Clarification was made in the Bases that the turbine driven train remains capable of performing its specified function, but it is considered inoperable because of the lack of redundant steam supplies to the pump. This is consistent with the statements in the other Conditions regarding an AFW train inoperable for reasons than Condition A.

Owners Group Review Information

Date Originated by OG: 29-Nov-00

Owners Group Comments:
WOG approved with editorial corrections to the justification.

Owners Group Resolution: Approved Date: 08-Mar-01

TSTF Review Information

TSTF Received Date: 06-Apr-01 Date Distributed for Review: 06-Apr-01

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

5/2/01 - CEOG recommends reconsidering need for the new Condition E. Recommend that the new Condition be deleted and that for this situation the three AFW trains inoperable Condition be entered.

TSTF Resolution: Superceeded Date: 02-May-01

OG Revision 3 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Eliminated proposed Condition E.

Owners Group Review Information

Date Originated by OG: 03-May-01

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 03-May-01

TSTF Review Information

TSTF Received Date: 25-May-01 Date Distributed for Review: 10-Jun-01

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

Approved on 5/2/01 pending resolution of need for Condition E.

6/10/2001 - Change prepared. Need CEOG and BWOG prioritization information.

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OG Revision 3 Revision Status: Closed

TSTF Resolution: Approved Date: 25-May-01

NRC Review Information

NRC Received Date: 27-Jun-01

NRC Comments: Date of NRC Letter: 12-Jul-02

7/1/2002 - E-mail from Steve Wideman: On July 1, 2002, I had a telecon with Craig Harbuck (TS Section) and Jim Tatum (Plant System Branch) regarding TSTF-412, "Provide Actions for One Steam Supply to Turbine Driven AFW/EFW Pump Inoperable," at their request. Jim Tatum essentially indicated that some change to the STS was needed but was questioning the proposed new Condition for one MD AFW/EFW train inoperable AND one TD AFW/EFW train inoperable due to one inoperable steam supply as to whether it was appropriate to all the different plant designs. Jim also indicated that if the AFW/EFW design basis can be met then a 72 hour Completion Time (as opposed to 24 hours would be appropriate). Jim kept referring to an amendment (No. 173 for Waterford) and what was done for Waterford. I did not commit to make any changes but agree to review the Waterford submittal and amendment. Additionally, Jim and Craig indicated that they would develop some specific comments and provide those comments to the NEI TSTF.

7/12/02 - NRC provided letter with comments.

Final Resolution: NRC Requests Changes: TSTF Considering Final Resolution Date: 12-Jul-02

TSTF Revision 1 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
Revised to address the comments in the NRC's 7/12/02 letter. The letter is attached and is annotated to indicate that the NRC's suggested changes were adopted.

Condition C is revised to address the condition of one turbine-driven AFW train inoperable due to one inoperable steam supply and one motor driven AFW train inoperable. For new Condition C, Required Action C.1 requires restoration of the affected steam supply to OPERABLE status in 24 hours for plants that can no longer meet the safety analysis flow to the SGs assuming no single active failure and a feedwater line break (FLB) or main steamline break (MSLB) or 48 hours for plants that can still meet the safety analysis requirements. New Required Action C.2 is also provided that addresses restoration of the inoperable motor driven AFW train within 24 or 48 hours as explained above for Required Action C.1. A Reviewer's Note is added to the Bases explain the applicability of the two bracketed Completion Times for Required Actions C.1 and C.2.

The existing Condition C is revised to Condition D, and existing Condition C is revised to address the case where three trains of AFW are inoperable due to the turbine driven AFW train being inoperable solely due to one inoperable steam supply.

Existing Condition D becomes Condition E and is revised to address two motor driven AFW trains inoperable and turbine driven AFW train inoperable for reasons other than one inoperable steam supply. The existing Condition E is revised to Condition F.

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TSTF Revision 1 Revision Status: Closed

Owners Group Review Information

Date Originated by OG: 08-Dec-04

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 08-Dec-04

TSTF Review Information

TSTF Received Date: 19-Jan-05 Date Distributed for Review: 19-Jan-05

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 25-Jan-05

NRC Review Information

NRC Received Date: 31-Jan-05

Final Resolution: Superceded by Revision

TSTF Revision 2 Revision Status: Active

Revision Proposed by: WOG

Revision Description:
Revised the Bases to address NRC comments. Changed the Required Action A.1 Bases, paragraph a, to state that the proposed Completion Time is appropriate because the turbine driven train is still capable of performing its specified function for most postulated events. Eliminated the repeated phrase "turbine driven" from the Required Action E.1 Bases.

Owners Group Review Information

Date Originated by OG: 08-Dec-05

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 02-Jan-06

TSTF Review Information

TSTF Received Date: 02-Jan-06 Date Distributed for Review: 02-Jan-06

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

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TSTF Revision 2 Revision Status: Active

(No Comments)

TSTF Resolution: Approved Date: 31-Jan-06

NRC Review Information

NRC Received Date: 31-Jan-06

Affected Technical Specifications

Action 3.7.5.A	EFW Systems		NUREG(s)- 1430 Only
Action 3.7.5.A Bases	EFW Systems		NUREG(s)- 1430 Only
Action 3.7.5.C	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	New Action	
Action 3.7.5.C	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	Renamed to D and modified	
Action 3.7.5.C Bases	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	New Action	
Action 3.7.5.C Bases	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	Renamed to D and modified	
Action 3.7.5.D	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	Renamed to E and modified.	
Action 3.7.5.D Bases	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	Renamed to E and modified.	
Action 3.7.5.E	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	Renamed to F	
Action 3.7.5.E Bases	EFW Systems		NUREG(s)- 1430 Only
	Change Description:	Renamed to F	
Action 3.7.5.A	AFW Systems		NUREG(s)- 1431 1432 Only
Action 3.7.5.A Bases	AFW Systems		NUREG(s)- 1431 1432 Only
Action 3.7.5.C	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	New Action	
Action 3.7.5.C	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	Renamed to D and modified	

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Action 3.7.5.C Bases	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	Renamed to D and modified	
Action 3.7.5.C Bases	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	New Action	
Action 3.7.5.D	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	Renamed to E and modified.	
Action 3.7.5.D Bases	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	Renamed to E and modified.	
Action 3.7.5.E	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	Renamed to F	
Action 3.7.5.E Bases	AFW Systems		NUREG(s)- 1431 1432 Only
	Change Description:	Renamed to F	

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3.7 PLANT SYSTEMS

3.7.5 Emergency Feedwater (EFW) System

LCO 3.7.5 [Three] EFW trains shall be OPERABLE.

----------NOTE----------
Only one EFW train, which includes a motor driven pump, is required to be OPERABLE in MODE 4.

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

ACTIONS

----------NOTE----------
LCO 3.0.4.b is not applicable when entering MODE 1.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [Turbine driven EFW train inoperable due to one inoperable steam supply~~One steam supply to turbine driven EFW pump inoperable.~~ OR ----------NOTE---------- Only applicable if MODE 2 has not been entered following refueling. ---------- One turbine driven EFW pump inoperable in MODE 3 following refueling.	A.1 Restore affected equipment to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One EFW train inoperable [for reasons other than Condition A] in MODE 1, 2, or 3.	B.1 Restore EFW train to OPERABLE status.	72 hours AND [10 days from discovery of failure to meet the LCO
C. Turbine driven EFW train inoperable due to one inoperable steam supply. AND One motor driven EFW train inoperable.	C.1 Restore the steam supply to the turbine driven train to OPERABLE status. OR C.2 Restore the motor driven EFW train to OPERABLE status.	[24 or 48] hours [24 or 48] hours
~~C~~D. Required Action and associated Completion Time of Condition A [, B, or ~~B~~C] not met. [OR Two EFW trains inoperable in MODE 1, 2, or 3 for reasons other than Condition C].] OR ----------NOTE---------- This Condition is only applicable when the turbine driven EFW train is inoperable solely due to one inoperable steam supply. ---------- Three EFW trains inoperable.	~~C~~D.1 Be in MODE 3. AND ~~C~~D.2 Be in MODE 4.	6 hours [18] hours

~~D~~E. ----------NOTE---------- This Condition is only applicable when the turbine driven EFW train is inoperable for reasons other than one inoperable steam supply. ---------- [Three] EFW trains inoperable in MODE 1, 2, or 3.	~~D~~E.1 ----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one EFW train is restored to OPERABLE status. ---------- Initiate action to restore one EFW train to OPERABLE status.	Immediately
~~E~~F. Required EFW train inoperable in MODE 4.	~~E~~F.1 Initiate action to restore EFW train to OPERABLE status.	Immediately

BASES

LCO

This LCO provides assurance that the EFW System will perform its design safety function to mitigate the consequences of accidents that could result in overpressurization of the reactor coolant pressure boundary. [Three] independent EFW pumps, in two diverse trains are required to be OPERABLE to ensure the availability of residual heat removal capability for all events accompanied by a loss of offsite power and a single failure. [This is accomplished by powering two pumps by steam driven turbines supplied with steam from a source not isolated by the closure of the MSIVs, and one pump from a power source that, in the event of loss of offsite power, is supplied by the emergency diesel generator.]

The EFW System is considered to be OPERABLE when the components and flow paths required to provide EFW flow to the steam generators are OPERABLE. This requires that the [two] turbine driven EFW pump(s) be OPERABLE with redundant steam supplies from each of the main steam lines upstream of the MSIVs and capable of supplying EFW flow to either of the two steam generators. The [nonsafety grade] motor driven EFW pump(s) and [the] associated flow path(s) to the EFW System [are] also required to be OPERABLE. The piping, valves, instrumentation, and controls in the required flow paths shall also be OPERABLE. The primary and secondary sources of water to the EFW System are required to be OPERABLE. The associated flow paths from the EFW System primary and secondary sources of water to all EFW pumps also are required to be OPERABLE.

The LCO is modified by a Note indicating that one EFW train, which includes a motor driven EFW pump, is required in MODE 4. This is because of reduced heat removal requirements, the short duration of MODE 4 in which feedwater is required, and the insufficient steam supply available in MODE 4 to power the turbine driven EFW pump.

APPLICABILITY

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

In MODE 4, with RCS temperature above [212]°F, the EFW System may be used for heat removal via the steam generators. In MODE 4, the steam generators are used for heat removal until the DHR System is in operation.

In MODES 5 and 6, the steam generators are not used for DHR and the EFW System is not required.

BASES

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable EFW train when entering MODE 1. There is an increased risk associated with entering MODE 1 with EFW inoperable and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

[A.1

With ~~one of the two steam supplies to~~ the turbine driven EFW pump inoperable due to one inoperable steam supply, or if a turbine driven pump is inoperable for any reason while in MODE 3 immediately following refueling, action must be taken to restore the inoperable equipment to an OPERABLE status within 7 days. The 7 day Completion Time is reasonable, based on the following reasons:

a. For the inoperability of ~~a steam supply to~~ the turbine driven EFW pump due to one inoperable steam supply, the 7 day Completion Time is reasonable since there is a redundant steam supply line for the turbine driven pump and the turbine driven train is still capable of performing its specified function for most postulated events.

b. For the inoperability of a turbine driven EFW pump while in MODE 3 immediately subsequent to a refueling, the 7 day Completion Time is reasonable due to the minimal decay heat levels in this situation.

c. For both the inoperability of ~~a steam supply line to~~ the turbine driven pump due to one inoperable steam supply and an inoperable turbine driven EFW pump while in MODE 3 immediately following refueling, the 7 day Completion Time is reasonable due to the availability of redundant OPERABLE motor driven EFW pumps, and due to the low probability of an event requiring the use of the turbine driven EFW pump.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between ~~72 hours~~7 days and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

BASES

ACTIONS (continued)

Condition A is modified by a Note which limits the applicability of the Condition for an inoperable turbine driven EFW pump in MODE 3 to when the unit has not entered MODE 2 following a refueling. Condition A allows one EFW train to be inoperable for 7 days vice the 72 hour Completion Time in Condition B. This longer Completion Time is based on the reduced decay heat following refueling and prior to the reactor being critical.]

B.1

When one of the required EFW trains (pump or flow path) is inoperable in MODE 1, 2, or 3 [for reasons other than Condition A], action must be taken to restore the train to OPERABLE status within 72 hours. This Condition includes the loss of two steam supply lines to one of the turbine driven EFW pumps. The 72 hour Completion Time is reasonable, based on the redundant capabilities afforded by the EFW System, time needed for repairs, and the low probability of a DBA occurring during this time period. The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 72 hours and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

C.1 and C.2

With one of the required motor driven EFW trains (pump or flow path) inoperable and the turbine driven EFW train inoperable due to one inoperable steam supply, action must be taken to restore the affected equipment to OPERABLE status within [24] [48] hours. Assuming no single active failures when in this condition, the accident (a FLB or MSLB) could result in the loss of the remaining steam supply to the turbine driven EFW pump due to the faulted SG. In this condition, the EFW system may no longer be able to meet the required flow to the SGs assumed in the safety analysis, [either due to the analysis requiring flow from two EFW pumps or due to the remaining EFW pump having to feed a faulted SG].

----------REVIEWER'S NOTE----------
Licensees should adopt the appropriate Completion Time based on their plant design. The 24 hour Completion Time is applicable to plants that can no longer meet the safety analysis requirement of 100% EFW flow to the SG(s) assuming no single active failure and a FLB or MSLB results in the loss of the remaining steam supply to the turbine driven EFW pump. The 48 hour Completion Time is applicable to plants that can still meet the safety analysis requirement of 100% EFW flow to the SG(s) assuming no single active failure and a FLB or MSLB results in the loss of the remaining steam supply to the turbine driven EFW pump.

[The 24 hour Completion Time is reasonable based on the remaining OPERABLE steam supply to the turbine driven EFW pump, the availability of the remaining OPERABLE motor driven EFW pump, and the low probability of an event occurring that would require the inoperable steam supply to be available for the turbine driven EFW pump]

[The 48 hour Completion Time is reasonable based on the fact that the remaining motor driven EFW train is capable of providing 100 % of the EFW flow requirements, and the low probability of an event occurring that would challenge the EFW system.]

D.1 and D.2

When either Required Action A.1 or [~~Required Action~~ B.1, C.1, or C.2] cannot be completed within the required Completion Time, [or when two EFW trains are inoperable in MODE 1, 2, or 3, for reasons other than Condition C, or if three EFW trains are inoperable but the turbine driven EFW pump is inoperable solely due to one inoperable steam supply~~]~~ 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 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.

BASES

ACTIONS (continued)

In MODE 4, with two EFW trains inoperable, operation is allowed to continue because only one motor driven EFW train is required in accordance with the Note that modifies the LCO. Although not required, the unit may continue to cool down and initiate DHR.

~~D~~E.1

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

With [all] EFW trains inoperable in MODE 1, 2, or 3, and the turbine driven EFW train is inoperable for reasons other than one inoperable steam supply, 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 nonsafety grade equipment. In such a condition, the unit should not be perturbed by any action, including a power change, that might result in a trip. The seriousness of this condition requires that action be started immediately to restore at least one EFW train to OPERABLE status. LCO 3.0.3 is not applicable, as it could force the units into a less safe condition.

~~E~~F.1

In MODE 4, either the steam generator loops or the DHR loops can be used to provide heat removal, which is addressed in LCO 3.4.6, "RCS Loops - MODE 4." With one EFW train inoperable, action must be taken to immediately restore the inoperable train to OPERABLE status.

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1

Verifying the correct alignment for manual, power operated, and automatic valves in the EFW water and steam supply flow paths provides assurance that the proper flow paths exist for EFW operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since those 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 manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 EFW pump's developed head at the flow test point is greater than or equal to the required developed head ensures that EFW pump performance has not degraded during the cycle. Flow and differential head are normal tests of pump performance required by Section XI of the ASME Code (Ref. 3). Because it is undesirable to introduce cold EFW into the steam generators while they are operating, this test is performed on recirculation flow.

This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. Performance of inservice testing in the ASME Code, Section XI (Ref. 3), 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 insufficient steam pressure to perform the test.

SR 3.7.5.3

This SR verifies that EFW can be delivered to the appropriate steam generator in the event of any accident or transient that generates a Steam and Feedwater Rupture Control System (SFRCS) signal by demonstrating that each automatic valve in the flow path actuates to its correct position on an actual or simulated actuation signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The [18] month Frequency is also acceptable based on operating experience and design reliability of the equipment. This SR is modified by a Note that states the SR is not required to be met in MODE 4. In MODE 4, the required ~~AFW~~EFW train is already aligned and operating. This SR is modified by [a] [two] Note[s]. [Note 1 indicates that the SR be deferred until

BASES

SURVEILLANCE REQUIREMENTS (continued)

suitable test conditions are established. This deferral is required because there is insufficient steam pressure to perform the test.] [The] Note [2] states that the SR is not required to be met in MODE 4. [In MODE 4, the required pump is already operating and the autostart function is not required.] [In MODE 4, the heat removal requirements would be less providing more time for operator action to manually start the required ~~AFW~~EFW pump.]

SR 3.7.5.4

This SR verifies that the turbine driven EFW pumps start in the event of any accident or transient that generates an SFRCS signal by demonstrating that each turbine driven EFW pump starts automatically on an actual or simulated actuation signal. These pumps are not required in MODE 4. The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This SR is modified by [a] [two] Note[s]. [Note 1 indicates that the SR be deferred until suitable test conditions are established. This deferral is required because there is insufficient steam pressure to perform the test.] [The] Note [2] states that the SR is not required to be met in MODE 4. [In MODE 4, the required pump is already operating and the autostart function is not required.] [In MODE 4, the heat removal requirements would be less providing more time for operator action to manually start the required ~~AFW~~EFW pump.]

----------REVIEWER'S NOTE----------
Some plants may not routinely use the ~~AFW~~EFW for heat removal in MODE 4. The second justification is provided for plants that use a startup feedwater pump rather than ~~AFW~~EFW for startup and shutdown.

SR 3.7.5.5

This SR ensures that the EFW System is properly aligned by verifying the flow paths to each steam generator prior to entering MODE 2 after more than 30 days in any combination of MODE 5 or 6, or defueled. OPERABILITY of EFW flow paths must be demonstrated before sufficient core heat is generated that would require the operation of the EFW

3.7 PLANT SYSTEMS

3.7.5 Auxiliary Feedwater (AFW) System

LCO 3.7.5 [Three] AFW trains shall be OPERABLE.

----------NOTE----------
[Only one AFW train, which includes a motor driven pump, is required to be OPERABLE in MODE 4.]

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

ACTIONS

----------NOTE----------
LCO 3.0.4.b is not applicable [when entering MODE 1.]

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [~~One steam supply to turbine driven AFW pump inoperable.~~Turbine driven AFW train inoperable due to one inoperable steam supply 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 to OPERABLE status.	7 days]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One AFW train inoperable in MODE 1, 2, or 3 [for reasons other than Condition A].	B.1 Restore AFW train to OPERABLE status.	72 hours
C. Turbine driven AFW train inoperable due to one inoperable steam supply. AND One motor driven AFW train inoperable.	C.1 Restore the steam supply to the turbine driven train to OPERABLE status. OR C.2 Restore the motor driven AFW train to OPERABLE status.	[24 or 48] hours [24 or 48] hours
~~C~~D. Required Action and associated Completion Time for Condition A [, B, or ~~B~~C] not met. [OR Two AFW trains inoperable in MODE 1, 2, or 3~~.~~ for reasons other than Condition C.] OR ----------NOTE---------- This Condition is only applicable when the turbine driven AFW train is inoperable solely due to one inoperable steam supply. ---------- Three AFW trains inoperable.	~~C~~D.1 Be in MODE 3. AND ~~C~~D.2 [Be in MODE 4.	6 hours [18] hours]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~D~~E. ----------NOTE---------- This Condition is only applicable when the turbine driven AFW train is inoperable for reasons other than one inoperable steam supply. ---------- [Three] AFW trains inoperable in MODE 1, 2, or 3.	~~D~~E.1 ----------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. ---------- Initiate action to restore one AFW train to OPERABLE status.	Immediately]
~~E~~F. Required AFW train inoperable in MODE 4.	~~E~~F.1 Initiate action to restore AFW train to OPERABLE status.	Immediately

B 3.7 PLANT SYSTEMS

B 3.7.5 Auxiliary Feedwater (AFW) System

BASES

BACKGROUND

The AFW System automatically supplies feedwater to the steam generators to remove decay heat from the Reactor Coolant System upon the loss of normal feedwater supply. The AFW pumps take suction through separate and independent suction lines from the condensate storage tank (CST) (LCO 3.7.6, "Condensate Storage Tank (CST)") and pump to the steam generator secondary side via separate and independent connections to the main feedwater (MFW) piping outside containment. The steam generators function 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, "Main Steam Safety Valves (MSSVs)") or atmospheric dump valves (LCO 3.7.4, "Atmospheric Dump Valves"). If the main condenser is available, steam may be released via the steam bypass valves and recirculated to the CST.

The AFW System consists of [two] motor driven AFW pumps and one steam turbine driven pump configured into [three] trains. Each motor driven pump provides [100]% of AFW flow capacity, and the turbine driven pump provides [200]% of the required capacity to the steam generators, as assumed in the accident analysis. The pumps are equipped with independent recirculation lines to prevent pump operation against a closed system. Each motor driven AFW pump is powered from an independent Class 1E power supply and feeds [two] steam generators, although each pump has the capability to be realigned from the control room to feed other steam generators. The steam turbine driven AFW pump receives steam from two main steam lines upstream of the main steam isolation valves. Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump.

The AFW System is capable of supplying feedwater to the steam generators during normal unit startup, shutdown, and hot standby conditions.

The turbine driven AFW pump supplies a common header capable of feeding all steam generators with DC powered control valves actuated to the appropriate steam generator by the Engineered Safety Feature Actuation System (ESFAS). One pump at full flow is sufficient to remove decay heat and cool the unit to residual heat removal (RHR) entry conditions. Thus, the requirement for diversity in motive power sources for the AFW System is met.

BASES

BACKGROUND (continued)

The AFW System is designed to supply sufficient water to the steam generator(s) to remove decay heat with steam generator pressure at the setpoint of the MSSVs. Subsequently, the AFW System supplies sufficient water to cool the unit to RHR entry conditions, with steam released through the ADVs.

The AFW System actuates automatically on steam generator water level - low-low by the ESFAS (LCO 3.3.2, "Engineered Safety Features Actuation System (ESFAS) Instrumentation"). The system also actuates on loss of offsite power, safety injection, and trip of all MFW pumps.

The AFW System is discussed in the FSAR, Section [10.4.9] (Ref. 1).

APPLICABLE SAFETY ANALYSES

The AFW System mitigates the consequences of any event with loss of normal feedwater.

The design basis of the AFW System 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 pressures corresponding to the lowest steam generator safety valve set pressure plus 3%.

In addition, the AFW System must supply enough makeup water to replace steam generator secondary inventory lost as the unit cools to MODE 4 conditions. Sufficient AFW flow must also be available to account for flow losses such as pump recirculation and line breaks.

The limiting Design Basis Accidents (DBAs) and transients for the AFW System are as follows:

a. Feedwater Line Break (FWLB) and

b. Loss of MFW.

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

The AFW System design is such that it can perform its function following an FWLB between the MFW isolation valves and containment, combined with a loss of offsite power following turbine trip, and a single active failure of the steam turbine driven AFW pump. In such a case, the

BASES

APPLICABILITY

In MODES 1, 2, and 3, the AFW System is required to be OPERABLE in the event that it is called upon to function when the MFW is lost. In addition, the AFW System is required to supply enough makeup water to replace the steam generator secondary inventory, lost as the unit cools to MODE 4 conditions.

In MODE 4 the AFW System may be used for heat removal via the steam generators.

In MODE 5 or 6, the steam generators are not normally used for heat removal, and the AFW System is not required.

ACTIONS

----------REVIEWER'S NOTE----------
The LCO 3.0.4.b Note prohibits application of the LCO 3.0.4.b exception when entering MODE 1 if the plant does not depend on AFW for startup. If the plant does depend on AFW for startup, the Note should state, "LCO 3.0.4.b is not applicable."

A Note prohibits the application of LCO 3.0.4.b to an inoperable AFW train [when entering MODE 1]. There is an increased risk associated with [entering a MODE or other specified condition in the Applicability] [entering MODE 1] with an AFW train inoperable and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

[A.1

If ~~one of the two steam supplies to~~ the turbine driven AFW train is inoperable due to one inoperable steam supply, or if a turbine driven pump is inoperable for any reason while in MODE 3 immediately following refueling, action must be taken to restore the inoperable equipment to an OPERABLE status within 7 days. The 7 day Completion Time is reasonable, based on the following reasons:

a. For the inoperability of ~~a steam supply to~~ the turbine driven AFW pump due to one inoperable steam supply, the 7 day Completion Time is reasonable since there is a redundant steam supply line for the turbine driven pump and the turbine driven train is still capable of performing its specified function for most postulated events.

b. For the inoperability of a turbine driven AFW pump while in MODE 3 immediately subsequent to a refueling, the 7 day Completion Time is reasonable due to the minimal decay heat levels in this situation.

BASES

ACTIONS (continued)

c. For both the inoperability of ~~a steam supply line to~~ the turbine driven pump due to one inoperable steam supply and an inoperable turbine driven AFW pump while in MODE 3 immediately following a refueling outage, the 7 day Completion Time is reasonable due to the availability of redundant OPERABLE motor driven AFW pumps, and due to the low probability of an event requiring the use of the turbine driven AFW pump.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 7 days and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

Condition A is modified by a Note which limits the applicability of the Condition for an inoperable turbine driven AFW pump in MODE 3 to when the unit has not entered MODE 2 following a refueling. Condition A allows one AFW train to be inoperable for 7 days vice the 72 hour Completion Time in Condition B. This longer Completion Time is based on the reduced decay heat following refueling and prior to the reactor being critical.]

B.1

With one of the required AFW trains (pump or flow path) inoperable in MODE 1, 2, or 3 [for reasons other than Condition A], action must be taken to restore OPERABLE status within 72 hours. This Condition includes the loss of two steam supply lines to the turbine driven AFW pump. The 72 hour Completion Time is reasonable, based on redundant capabilities afforded by the AFW System, time needed for repairs, and the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 72 hours and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

BASES

ACTIONS (continued)

C.1 and C.2

With one of the required motor driven AFW trains (pump or flow path) inoperable and the turbine driven AFW train inoperable due to one inoperable steam supply, action must be taken to restore the affected equipment to OPERABLE status within [24] [48] hours. Assuming no single active failures when in this condition, the accident (a FLB or MSLB) could result in the loss of the remaining steam supply to the turbine driven AFW pump due to the faulted SG. In this condition, the AFW system may no longer be able to meet the required flow to the SGs assumed in the safety analysis, [either due to the analysis requiring flow from two AFW pumps or due to the remaining AFW pump having to feed a faulted SG].

----------REVIEWER'S NOTE----------
Licensees should adopt the appropriate Completion Time based on their plant design. The 24 hour Completion Time is applicable to plants that can no longer meet the safety analysis requirement of 100% AFW flow to the SG(s) assuming no single active failure and a FLB or MSLB results in the loss of the remaining steam supply to the turbine driven AFW pump. The 48 hour Completion Time is applicable to plants that can still meet the safety analysis requirement of 100% AFW flow to the SG(s) assuming no single active failure and a FLB or MSLB results in the loss of the remaining steam supply to the turbine driven AFW pump.

[The 24 hour Completion Time is reasonable based on the remaining OPERABLE steam supply to the turbine driven AFW pump, the availability of the remaining OPERABLE motor driven AFW pump, and the low probability of an event occurring that would require the inoperable steam supply to be available for the turbine driven AFW pump]

[The 48 hour Completion Time is reasonable based on the fact that the remaining motor driven AFW train is capable of providing 100 % of the AFW flow requirements, and the low probability of an event occurring that would challenge the AFW system.]

D.1 and D.2

When Required Action A.1 [or B.1, C.1, or C.2] cannot be completed within the required Completion Time, or if two AFW trains are inoperable in MODE 1, 2, or 3 for reasons other than Condition C, or if three AFW trains are inoperable but the turbine driven AFW pump is inoperable solely due to one inoperable steam supply, 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 within [18] hours.

BASES

ACTIONS (continued)

D.1 and D.2 (Continued)

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.

In MODE 4 with two AFW trains inoperable, operation is allowed to continue because only one motor driven pump AFW train is required in accordance with the Note that modifies the LCO. Although not required, the unit may continue to cool down and initiate RHR.

~~D~~E.1

If all [three] AFW trains are inoperable in MODE 1, 2, or 3, and the turbine driven AFW train is inoperable for reasons other than one inoperable steam supply, 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 nonsafety related equipment. In such a condition, the unit should not be perturbed by any action, including a power change, that might result in a trip. The seriousness of this condition requires that action be started immediately to restore one AFW train to OPERABLE status.

Required Action ~~D~~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. In this case, LCO 3.0.3 is not applicable because it could force the unit into a less safe condition.

~~E~~F.1

In MODE 4, either the reactor coolant pumps or the RHR loops can be used to provide forced circulation. This is addressed in LCO 3.4.6, "RCS Loops - MODE 4." With one required AFW train inoperable, action must be taken to immediately restore the inoperable train to OPERABLE status. The immediate Completion Time is consistent with LCO 3.4.6.

3.7 PLANT SYSTEMS

3.7.5 Auxiliary Feedwater (AFW) System

LCO 3.7.5 [Three] AFW trains shall be OPERABLE.

----------NOTE----------
Only one AFW train, which includes a motor driven pump, is required to be OPERABLE in MODE 4.

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

ACTIONS

----------NOTE----------
LCO 3.0.4.b is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [Turbine driven AFW train inoperable due to one inoperable steam supply~~One steam supply to turbine driven AFW pump inoperable~~. 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 to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One AFW train inoperable [for reasons other than Condition A] in MODE 1, 2, or 3.	B.1 Restore AFW train to OPERABLE status.	72 hours AND [10 days from discovery of failure to meet the LCO]
C. Turbine driven AFW train inoperable due to one inoperable steam supply. AND One motor driven AFW train inoperable.	C.1 Restore the steam supply to the turbine driven train to OPERABLE status. OR C.2 Restore the motor driven AFW train to OPERABLE status.	[24 or 48] hours [24 or 48] hours
~~C~~D. Required Action and associated Completion Time of Condition A [, B, or ~~B~~C] not met. [OR [Two] AFW trains inoperable in MODE 1, 2, or 3 for reasons other than Condition C.] OR ----------NOTE---------- This Condition is only applicable when the turbine driven AFW train is inoperable solely due to one inoperable steam supply. ---------- Three AFW trains inoperable.	~~C~~D.1 Be in MODE 3. AND ~~C~~D.2 Be in MODE 4.	6 hours [18] hours

~~D~~E. ----------NOTE---------- This Condition is only applicable when the turbine driven AFW train is inoperable for reasons other than one inoperable steam supply. ---------- [[Three] AFW trains inoperable in MODE 1, 2, or 3.	~~D~~E.1 ----------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. ---------- Initiate action to restore one AFW train to OPERABLE status.	Immediately]
~~E~~F. Required AFW train inoperable in MODE 4.	~~E~~F.1 ----------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. ---------- Initiate action to restore one AFW train to OPERABLE status.	Immediately

BASES

BACKGROUND (continued)

The AFW System is designed to supply sufficient water to the steam generator(s) to remove decay heat with steam generator pressure at the setpoint of the MSSVs. Subsequently, the AFW System supplies sufficient water to cool the unit to SDC entry conditions, and steam is released through the ADVs.

The AFW System actuates automatically on low steam generator level by the EFAS as described in LCO 3.3.~~2~~4, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation." The EFAS logic is designed to feed either or both steam generators with low levels, but will isolate the AFW System from a steam generator having a significantly lower steam pressure than the other steam generator. The EFAS automatically actuates the AFW turbine driven pump and associated DC operated valves and controls 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 AFW System is discussed in the FSAR, Section [10.4.9] (Ref. 1).

APPLICABLE SAFETY ANALYSES

The AFW System mitigates the consequences of any event with a loss of normal feedwater.

The design basis of the AFW System 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 pressures corresponding to the lowest MSSV set pressure plus 3%.

The limiting Design Basis Accidents (DBAs) and transients for the AFW System 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.

BASES

APPLICABILITY

In MODES 1, 2, and 3, the AFW System is required to be OPERABLE and to function in the event that the MFW is lost. In addition, the AFW System 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 AFW System may be used for heat removal via the steam generator.

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

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable AFW train. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an AFW train inoperable and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

[A.1

If ~~one of the two steam supplies to~~ the turbine driven AFW pump~~s~~ is inoperable due to one inoperable steam supply, or if a turbine driven pump is inoperable for any reason while in MODE 3 immediately following refueling, action must be taken to restore the inoperable equipment to an OPERABLE status within 7 days. The 7 day Completion Time is reasonable based on the following reasons:

a. For the inoperability of ~~a steam supply to~~ the turbine driven AFW pump due to one inoperable steam supply, the 7 day Completion Time is reasonable since there is a redundant steam supply line for the turbine driven pump and the turbine driven train is still capable of performing its specified function for most postulated events.

b. For the inoperability of a turbine driven AFW pump while in MODE 3 immediately subsequent to a refueling outage, the 7 day Completion Time is reasonable due to the minimal decay heat levels in this situation.

c. For both the inoperability of ~~a steam supply line to~~ the turbine driven pump due to one inoperable steam supply and an inoperable turbine driven AFW pump while in MODE 3 immediately following a refueling outage, the 7 day Completion Time is reasonable due to the availability of redundant OPERABLE motor driven AFW pumps; and due to the low probability of an event requiring the use of the turbine driven AFW pump.

BASES

ACTIONS (continued)

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 7 days and 10 days dictates that both Completion Times apply simultaneously and the more restrictive must be met.

Condition A is modified by a Note which limits the applicability of the Condition for an inoperable turbine driven AFW pump in MODE 3 to when the unit has not entered MODE 2 following a refueling. Condition A allows one AFW train to be inoperable for 7 days vice the 72 hour Completion Time in Condition B. This longer Completion Time is based on the reduced decay heat following refueling and prior to the reactor being critical.]

B.1

With one of the required AFW trains (pump or flow path) inoperable in MODE 1, 2, or 3 [for reasons other than Condition A], action must be taken to restore OPERABLE status within 72 hours. This Condition includes the loss of two steam supply lines to the turbine driven AFW pump. The 72 hour Completion Time is reasonable based on the redundant capabilities afforded by the AFW System, 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. The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 72 hours and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

BASES

ACTIONS (continued)

C.1 and C.2

With one of the required motor driven AFW trains (pump or flow path) inoperable and the turbine driven AFW train inoperable due to one inoperable steam supply, action must be taken to restore the affected equipment to OPERABLE status within [24] [48] hours. Assuming no single active failures when in this condition, the accident (a FLB or MSLB) could result in the loss of the remaining steam supply to the turbine driven AFW pump due to the faulted SG. In this condition, the AFW system may no longer be able to meet the required flow to the SGs assumed in the safety analysis, [either due to the analysis requiring flow from two AFW pumps or due to the remaining AFW pump having to feed a faulted SG].

----------REVIEWER'S NOTE----------
Licensees should adopt the appropriate Completion Time based on their plant design. The 24 hour Completion Time is applicable to plants that can no longer meet the safety analysis requirement of 100% AFW flow to the SG(s) assuming no single active failure and a FLB or MSLB results in the loss of the remaining steam supply to the turbine driven AFW pump. The 48 hour Completion Time is applicable to plants that can still meet the safety analysis requirement of 100% AFW flow to the SG(s) assuming no single active failure and a FLB or MSLB results in the loss of the remaining steam supply to the turbine driven AFW pump.

[The 24 hour Completion Time is reasonable based on the remaining OPERABLE steam supply to the turbine driven AFW pump, the availability of the remaining OPERABLE motor driven AFW pump, and the low probability of an event occurring that would require the inoperable steam supply to be available for the turbine driven AFW pump]

[The 48 hour Completion Time is reasonable based on the fact that the remaining motor driven AFW train is capable of providing 100 % of the AFW flow requirements, and the low probability of an event occurring that would challenge the AFW system.]

D.1 and D.2

When either Required Action A.1 [or B.1, C.1, or C.2] cannot be completed within the required Completion Time, [or if two AFW trains are inoperable in MODES 1, 2, and 3 for reasons other than Condition C, or if three AFW trains are inoperable but the turbine driven AFW pump is inoperable solely due to one inoperable steam supply], 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 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.

In MODE 4, with [two AFW trains inoperable in MODES 1, 2, and 3], operation is allowed to continue because only one motor driven AFW pump is required in accordance with the Note that modifies the LCO. Although it is not required, the unit may continue to cool down and start the SDC.

~~D~~E.1

Required Action ~~D~~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.

With all [three] AFW trains inoperable in MODES 1, 2, and 3, and the turbine driven AFW train is inoperable for reasons other than one inoperable steam supply, 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 nonsafety grade equipment. In such a condition, the unit should not be perturbed by any action, including a power change, that might result in a trip. The seriousness of this condition requires that action be started immediately to restore one AFW train to OPERABLE status. LCO 3.0.3 is not applicable, as it could force the unit into a less safe condition.

~~E~~F.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.