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U.S. Nuclear Regulatory Commission
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT CONVERSION TO IMPROVED TECHNICAL SPECIFICATIONS; REVISED AFW REQUIREMENTS

On January 26, 1998, Consumers Energy Company submitted a Technical Specification Change Request (TSCR) to convert the Palisades Technical Specifications to closely emulate the Standard Technical Specifications for Combustion Engineering Plants, NUREG-1432 (STS). During the final stages of their review of that submittal, the NRC staff provided suggestions for revision of LCO 3.7.5, Auxiliary Feedwater, to more closely implement the requirements of the Current Technical Specifications (CTS) in the Improved Technical Specifications (ITS). Those suggestions have been incorporated and the affected LCO and Bases sections are provided in the enclosures to this letter. These changes do not affect the classification of changes or the No Significant Hazards analyses provided in our January 26, 1998 conversion request or in supplements to that request.

Enclosure 1 contains revised pages for ITS LCO 3.7.5, Auxiliary Feedwater, and its Bases. Enclosure 2 contains those same pages from our September 17, 1999 submittal of clean ITS pages, marked with shading for proposed additions and strike-out for proposed deletions.

The Palisades Plant Review Committee has reviewed this TSCR and has determined that proposing this change does not involve an unreviewed safety question. This change has been reviewed by the Nuclear Performance Assessment Department.

SUMMARY OF COMMITMENTS

This submittal contains no new commitments and no revisions to existing commitments.

Nathan L. Haskell
Director, Licensing

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

A001

Enclosures

CONSUMERS ENERGY COMPANY
IMPROVED TECHNICAL SPECIFICATIONS; REVISED AFW REQUIREMENTS

To the best of my knowledge, the content of this submittal of revised Auxiliary Feedwater LCO and Bases pages for the Improved Technical Specifications, is truthful and complete.

Nathan L. Haskell
Director, Licensing

Sworn and subscribed to before me this 9th day of November 1999.

Janice M. Milan, Notary Public
Allegan County, Michigan
(Acting in Van Buren County, Michigan)
My commission expires September 6, 2003

ENCLOSURE 1

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

CONVERSION TO IMPROVED
TECHNICAL SPECIFICATIONS

IMPROVED TECHNICAL SPECIFICATIONS
REVISED AFW LCO AND BASES PAGES

3.7 PLANT SYSTEMS

3.7.5 Auxiliary Feedwater (AFW) System

LCO 3.7.5 Two AFW trains shall be OPERABLE.

----------NOTES----------

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

2. The steam driven pump is only required to be operable prior to making the reactor critical.

3. Two AFW pumps may be placed in manual for testing, for a period of up to 4 hours.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One steam supply to turbine driven AFW pump inoperable.	A.1 Restore steam supply to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more AFW trains inoperable for reasons other than Condition A in MODE 1, 2, or 3. AND At least 100% of required AFW flow available to each steam generator. AND At least two AFW pumps OPERABLE.	B.1 Restore train(s) to OPERABLE status.	72 hours AND 10 days from discovery of failure to meet the LCO
C. Required Action and associated Completion Time of Condition A or B not met. OR One or more AFW trains inoperable for reasons other than Condition A or B with at least 100% of the required AFW flow available in MODE 1, 2, or 3.	C.1 Be in MODE 3. AND C.2 Be in MODE 4.	6 hours 30 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two AFW trains inoperable with less than 100% of the required AFW flow available, in MODE 1, 2, or 3. OR Required AFW train inoperable in MODE 4.	----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes or power reductions are suspended until at least 100% of the required AFW flow is available. ---------- D.1 Initiate action to restore one AFW train to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.1	Verify each required AFW manual, power operated, and automatic valve in each water flow path and in both steam supply flow paths to the steam turbine driven pump, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.5.2	----------NOTE---------- Not required to be met for the turbine driven AFW pump in MODE 3 below 800 psig in the steam generators. ---------- Verify the developed head of each required AFW pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.3	----------NOTE---------- Only required to be met in MODES 1, 2 or 3 when AFW is not in operation. ---------- 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.	18 months
SR 3.7.5.4	----------NOTE---------- Only required to be met in MODES 1, 2, and 3. ---------- Verify each required AFW pump starts automatically on an actual or simulated actuation signal.	18 months

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 Primary Coolant System upon the loss of normal feedwater supply. The AFW pumps take suction through a common suction line from the Condensate Storage Tank (CST) (LCO 3.7.6, "Condensate Storage and Supply") and pump to the steam generator secondary side via two separate and independent flow paths to a common AFW supply header for each steam generator. 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 (ADVs) (LCO 3.7.4, "Atmospheric Dump Valves (ADVs)"). If the main condenser is available, steam may be released via the turbine bypass valve.

The AFW System consists of two motor driven AFW pumps and one steam turbine driven pump configured into two trains. One train (A/B) consists of a motor driven pump (P-8A) and the turbine driven pump (P-8B) in parallel, the discharges join together to form a common discharge. The A/B train common discharge separates to form two flow paths, which feed each steam generator via each steam generator's AFW penetration. The second motor driven pump (P-8C) feeds both steam generators through separate flow paths via each steam generator AFW penetration and forms the other train (C). The two trains join together at each AFW penetration to form a common supply to the steam generators. Each AFW pump is capable of providing 100% 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 both steam generators.

BASES

BACKGROUND (continued)

The steam turbine driven AFW pump receives steam from either main steam header upstream of the Main Steam Isolation Valve (MSIV). Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump. The steam supply from steam generator E-50A receives an open signal from the Auxiliary Feedwater Actuation Signal (AFAS) instrumentation. The steam supply from steam generator E-50B does not. This steam source is a manual backup. The turbine driven AFW pump feeds both steam generators through the same flow paths as motor driven AFW pump P-8A.

One pump at full flow is sufficient to remove decay heat and cool the plant to Shutdown Cooling (SDC) System entry conditions.

The AFW System supplies feedwater to the steam generators during normal plant startup, shutdown, and hot standby conditions.

The AFW System is designed to supply sufficient water to the steam generators to remove decay heat with steam generator pressure at the setpoint of the MSSVs, with exception of AFW pump P-8C. If AFW pump P-8C is used, operator action may be required to either trip two of four Primary Coolant Pumps (PCPs), start an additional AFW pump, or reduce steam generator pressure. This will allow the required flowrates to the steam generators that are assumed in the safety analyses. Subsequently, the AFW System supplies sufficient water to cool the plant to SDC entry conditions, and steam is released through the ADVs, or the turbine bypass valve if the condenser is available.

The AFW System actuates automatically on low steam generator level by an AFAS as described in LCO 3.3.3, "Engineered Safety Feature (ESF) Instrumentation" and 3.3.4, "ESF Logic." The AFAS initiates signals for starting the AFW pumps and repositioning the valves to initiate AFW flow to the steam generators. The actual pump starts are on an "as required" basis. P-8A is started initially, if the pump fails to start, or if the required flow is not established in a specified period of time, P-8C is started. If P-8A and P-8C do not start, or if required flow is not established in a specified period of time, then P-8B is started.

The AFW System is discussed in the FSAR, Section 9.7 (Ref. 1).

BASES

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% with the exception of AFW pump P-8C. If AFW pump P-8C is used, operator action may be required to either trip two of the four PCPs, start an additional AFW pump or reduce steam generator pressure. This will allow the required flowrate to the steam generators that are assumed in the safety analyses.

The limiting Design Basis Accident for the AFW System is a 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.

The AFW System design is such that it can perform its function following loss of normal feedwater combined with a loss of offsite power with one AFW pump injecting AFW to one steam generator.

The AFW System satisfies Criterion 3 of 10 CFR 50.36(c)(2).

LCO

This LCO requires that two AFW trains be OPERABLE to ensure that the AFW System will perform the design safety function to mitigate the consequences of accidents that could result in overpressurization of the primary coolant pressure boundary. Three independent AFW pumps, in two diverse trains, ensure 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 from independent emergency buses. The third AFW pump is powered by a diverse means, a steam driven turbine supplied with steam from a source not isolated by the closure of the MSIVs.

BASES

LCO (continued)

The AFW System 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 to both steam generators. Prior to making the reactor critical during a plant startup, the turbine driven AFW pump shall be OPERABLE with redundant steam supplies from each of the two main steam lines upstream of the MSIVs and capable of supplying AFW flow to both steam generators. When steam generator pressure is reduced, it is not required to have design inlet pressure available to the turbine driver in order to declare the turbine driven AFW pump OPERABLE. As steam generator pressure drops, the required AFW pump discharge head decreases accordingly. The reduced steam generator pressure available at lower temperatures in MODE 3 does not inhibit the turbine driven AFW pump's ability to feed the steam generator (Ref. 3). The piping, valves, instrumentation, and controls in the required flow paths shall also be OPERABLE.

The LCO is modified by three Notes. Note one indicates that only one AFW train, which includes a motor driven pump, is required to be OPERABLE in MODE 4. 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 pressure available in MODE 4 to power the turbine driven AFW pump. Note two states that the turbine driven AFW pump is only required to be made OPERABLE prior to making the reactor critical. It is required to be OPERABLE during subsequent MODE 1, 2, and 3 operation. This allowance is needed to provide sufficient steam pressure to perform turbine and pump testing. Note three indicates that any two AFW pumps may be placed in manual mode for the purpose of testing, for not more than 4 hours. In this situation, the third AFW pump would still be available in the event of a plant transient. The two pumps that are in manual could be used at the discretion of the operator.

APPLICABILITY

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

During heatup, the turbine driven AFW pump is only required to be made OPERABLE prior to making the reactor critical. It is required to be OPERABLE during subsequent MODE 1, 2, and 3 operation. This allowance is needed to provide sufficient steam pressure to perform turbine and pump testing.

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.

BASES

ACTIONS

A.1

If one of the two steam supplies to the turbine driven AFW pump is inoperable, action must be taken to restore OPERABLE status within 7 days. The 7 day Completion Time is reasonable based on the following reasons:

a. The redundant OPERABLE steam supply to the turbine driven AFW pump;

b. The availability of redundant OPERABLE motor driven AFW pumps; and

c. The low probability of an event requiring the inoperable steam supply to 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 the 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.

B.1

With one or more AFW trains (pump or flow paths) inoperable, for reasons other than Condition A, in MODE 1, 2, or 3, and at least 100% of the required AFW flow available to each steam generator, and at least two AFW pumps OPERABLE, action must be taken to restore the components to 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 the associated flow paths remain to supply feedwater to both 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.

BASES

ACTIONS

B.1 (continued)

The 10 day Completion Time provides a limitation time allowed in the 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

When either Required Action A.1 or B.1 cannot be completed within the required Completion Time, or with one or more AFW trains (pump or flow paths) inoperable, for reasons other than Condition A or B with at least 100% of the required AFW flow available in MODES 1, 2, and 3, the plant must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be placed in at least MODE 3 within 6 hours, and in MODE 4 within 30 hours.

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

D.1

Required Action D.1 is modified by a Note indicating that all required MODE changes or power reductions are suspended until at least 100% of the required AFW flow is available.

With two trains inoperable and less than 100% of the required AFW flow available in MODES 1, 2, and 3, or the required AFW train inoperable in MODE 4, the plant 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 plant 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 100% of the required AFW flow available. LCO 3.0.3 is not applicable, as it could force the plant into a less safe condition.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1

Verifying the correct alignment for the required manual, power operated, and automatic valves in the AFW water and steam supply flow paths provides assurance that the proper flow paths exist for AFW operation. This SR does not apply to valves that 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.

This test need not be performed for the steam driven AFW pump for MODE 4 operation.

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 required 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 Section XI of the ASME Code (Ref. 2). 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.

This SR is modified by a Note indicating that this SR for the turbine driven AFW pump does not have to be met in MODE 3 when steam pressure is below 800 psig. This is because there is insufficient steam pressure and pump discharge pressure to allow the turbine driven pump to reach the normal test conditions.

Performance of inservice testing, discussed in the ASME Code, Section XI (Ref. 2), at 3 month intervals satisfies this requirement.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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, by demonstrating that each automatic valve in the flow path actuates to its correct position on an actual or simulated actuation signal. Specific signals (e.g., AFAS) are tested under Section 3.3, "Instrumentation." This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is acceptable, based on the design reliability and operating experience of the equipment.

This SR is modified by a Note which states the SR is only required to be met in MODES 1, 2, and 3 when AFW is not in operation. With AFW in operation, the required trains are already aligned with the flow control valves in manual control.

SR 3.7.5.4

This SR ensures that the AFW pumps will start in the event of any accident or transient that generates an AFAS by demonstrating that each AFW pump starts automatically on an actual or simulated actuation signal. Specific signals (e.g., AFAS, handswitch) are tested under Section 3.3, "Instrumentation."

This test need not be performed for the steam driven AFW pump for MODE 4 operation.

The 18 month Frequency is acceptable, based on the design reliability and operating experience of the equipment.

This SR is modified by a Note. The Note states that the SR is only required to be met in MODES 1, 2, and 3. In MODE 4, the required pump is already operating and the autostart function is not required.

REFERENCES

1. FSAR, Section 9.7

2. ASME, Boiler and Pressure Vessel Code, Section XI, Inservice Inspection, Article IWV-3400.

3. Palisades Design Basis Document 1.03, Auxiliary Feedwater System, Section 3.4.1.

ENCLOSURE 2

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

CONVERSION TO IMPROVED
TECHNICAL SPECIFICATIONS

FORMERLY SUBMITTED AFW LCO AND BASES PAGES
MARKED TO SHOW CHANGES

3.7 PLANT SYSTEMS

3.7.5 Auxiliary Feedwater (AFW) System

LCO 3.7.5 Two AFW trains shall be OPERABLE.

----------NOTES----------

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

2. ~~The turbine driven AFW pump is only required to be OPERABLE in MODES 1 and 2.~~ The steam driven pump is only required to be operable prior to making the reactor critical.

3. Two AFW pumps may be placed in manual for testing, for a period of up to 4 hours.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One steam supply to turbine driven AFW pump inoperable~~ in MODE 1 or 2~~.	A.1 Restore steam supply to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more AFW trains inoperable for reasons other than Condition A in MODE 1, 2, or 3. AND At least 100% of required AFW flow available to ~~both~~ each steam generator~~s~~. AND At least two AFW pumps OPERABLE.	B.1 Restore train(s) to OPERABLE status.	72 hours AND 10 days from discovery of failure to meet the LCO
C. Required Action and associated Completion Time of Condition A or B not met. OR One or more AFW trains inoperable for reasons other than Condition A or ~~B~~ with at least 100% of the required AFW flow available ~~to only one steam generator~~ in MODE 1, 2, or 3. ~~OR~~ ~~Only one AFW pump OPERABLE in MODE 1, 2, or 3.~~	C.1 Be in MODE 3. AND C.2 Be in MODE 4.	6 hours 30 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two AFW trains inoperable with less than 100% of the required AFW flow available~~ to each steam generator~~, in MODE 1, 2, or 3. OR Required AFW train inoperable in MODE 4.	----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes or power reductions are suspended until at least 100% of the required AFW flow is available ~~to at least one steam generator~~. ---------- D.1 Initiate action to restore one AFW train to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.1	Verify each required AFW manual, power operated, and automatic valve in each water flow path and in both steam supply flow paths to the steam turbine driven pump, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.5.2	----------NOTE---------- Not required to be met for the turbine driven AFW pump in MODE 3 below 800 psig in the steam generators. ---------- Verify the developed head of each required AFW pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.3	----------NOTE---------- Only required to be met in MODES 1, 2 or 3 when AFW is not in operation. ---------- 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.	18 months
SR 3.7.5.4	----------NOTE---------- Only required to be met in MODES 1, 2, and 3. ---------- Verify each required AFW pump starts automatically on an actual or simulated actuation signal.	18 months

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 Primary Coolant System upon the loss of normal feedwater supply. The AFW pumps take suction through a common suction line from the Condensate Storage Tank (CST) (LCO 3.7.6, "Condensate Storage and Supply") and pump to the steam generator secondary side via two separate and independent flow paths to a common AFW supply header for each steam generator. 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 (ADVs) (LCO 3.7.4, "Atmospheric Dump Valves (ADVs)"). If the main condenser is available, steam may be released via the turbine bypass valve.

The AFW System consists of two motor driven AFW pumps and one steam turbine driven pump configured into two trains. One train (A/B) consists of a motor driven pump (P-8A) and the turbine driven pump (P-8B) in parallel, the discharges join together to form a common discharge. The A/B train common discharge separates to form two flow paths, which feed each steam generator via each steam generator's AFW penetration. The second motor driven pump (P-8C) feeds both steam generators through separate flow paths via each steam generator AFW penetration and forms the other train (C). The two trains join together at each AFW penetration to form a common supply to the steam generators. Each AFW pump is capable of providing 100% 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 both steam generators.

BASES

BACKGROUND (continued)

The steam turbine driven AFW pump receives steam from either main steam header upstream of the Main Steam Isolation Valve (MSIV). Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump. The steam supply from steam generator E-50A receives an open signal from the Auxiliary Feedwater Actuation Signal (AFAS) instrumentation. The steam supply from steam generator E-50B does not. This steam source is a manual backup. The turbine driven AFW pump feeds both steam generators through the same flow paths as motor driven AFW pump P-8A.

One pump at full flow is sufficient to remove decay heat and cool the plant to Shutdown Cooling (SDC) System entry conditions.

The AFW System supplies feedwater to the steam generators during normal plant startup, shutdown, and hot standby conditions.

The AFW System is designed to supply sufficient water to the steam generators to remove decay heat with steam generator pressure at the setpoint of the MSSVs, with exception of AFW pump P-8C. If AFW pump P-8C is used, operator action may be required to either trip two of four Primary Coolant Pumps (PCPs), start an additional AFW pump, or reduce steam generator pressure. This will allow the required flowrates to the steam generators that are assumed in the safety analyses. Subsequently, the AFW System supplies sufficient water to cool the plant to SDC entry conditions, and steam is released through the ADVs, or the turbine bypass valve if the condenser is available.

The AFW System actuates automatically on low steam generator level by an AFAS as described in LCO 3.3.3, "Engineered Safety Feature (ESF) Instrumentation" and 3.3.4, "ESF Logic." The AFAS initiates signals for starting the AFW pumps and repositioning the valves to initiate AFW flow to the steam generators. The actual pump starts are on an "as required" basis. P-8A is started initially, if the pump fails to start, or if the required flow is not established in a specified period of time, P-8C is started. If P-8A and P-8C do not start, or if required flow is not established in a specified period of time, then P-8B is started.

The AFW System is discussed in the FSAR, Section 9.7 (Ref. 1).

BASES

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% with the exception of AFW pump P-8C. If AFW pump P-8C is used, operator action may be required to either trip two of the four PCPs, start an additional AFW pump or reduce steam generator pressure. This will allow the required flowrate to the steam generators that are assumed in the safety analyses.

The limiting Design Basis Accident for the AFW System is a 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.

The AFW System design is such that it can perform its function following loss of normal feedwater combined with a loss of offsite power with one AFW pump injecting AFW to one steam generator.

The AFW System satisfies Criterion 3 of 10 CFR 50.36(c)(2).

LCO

This LCO requires that two AFW trains be OPERABLE to ensure that the AFW System will perform the design safety function to mitigate the consequences of accidents that could result in overpressurization of the primary coolant pressure boundary. Three independent AFW pumps, in two diverse trains, ensure 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 from independent emergency buses. The third AFW pump is powered by a diverse means, a steam driven turbine supplied with steam from a source not isolated by the closure of the MSIVs.

BASES

LCO (continued)

The AFW System 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 to both steam generators. ~~In MODES 1 and 2~~ Prior to making the reactor critical during a plant startup, the turbine driven AFW pump shall be OPERABLE with redundant steam supplies from each of the two main steam lines upstream of the MSIVs and capable of supplying AFW flow to both steam generators. When steam generator pressure is reduced , it is not required to have design inlet pressure available to the turbine driver in order to declare the turbine driven AFW pump OPERABLE. As steam generator pressure drops, the required AFW pump discharge head decreases accordingly. The reduced steam generator pressure available at lower temperatures in MODE 3 does not inhibit the turbine driven AFW pump's ability to feed the steam generator (Ref. 3). The piping, valves, instrumentation, and controls in the required flow paths shall also be OPERABLE.

The LCO is modified by three Notes. Note one indicates that only one AFW train, which includes a motor driven pump, is required to be OPERABLE in MODE 4. 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 pressure available in MODE 4 to power the turbine driven AFW pump. Note two states that the turbine driven AFW pump is only required to be made OPERABLE ~~in MODES 1 and 2~~ prior to making the reactor critical. It is required to be OPERABLE during subsiquent MODE 1, 2, and 3 operation. This allowance is needed ~~for a~~ to provide sufficient steam pressure to ~~power~~ perform turbine and pump testing ~~the turbine driven AFW pump~~. Note three indicates that any two AFW pumps may be placed in manual mode for the purpose of testing, for not more than 4 hours. In this situation, the third AFW pump would still be available in the event of a plant transient. The two pumps that are in manual could be used at the discretion of the operator.

APPLICABILITY

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

During heatup, the turbine driven AFW pump is only required to be made OPERABLE prior to making the reactor critical. It is required to be OPERABLE during subsequent MODE 1, 2, and 3 operation. This allowance is needed to provide sufficient steam pressure to perform turbine and pump testing.

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.

BASES

ACTIONS

A.1

If one of the two steam supplies to the turbine driven AFW pumps is inoperable ~~in MODE 1 or 2~~, action must be taken to restore OPERABLE status within 7 days. The 7 day Completion Time is reasonable based on the following reasons:

a. The redundant OPERABLE steam supply to the turbine driven AFW pump;

b. The availability of redundant OPERABLE motor driven AFW pumps; and

c. The low probability of an event requiring the inoperable steam supply to 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 the 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 Completions Times apply simultaneously, and the more restrictive must be met.

B.1

With one or more AFW trains (pump or flow paths) inoperable, for reasons other than Condition A, in MODE 1, 2, or 3, and at least 100% of the required AFW flow available to ~~both~~ each steam generator~~s~~, and at least two AFW pumps OPERABLE, action must be taken to restore the components to 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 the associated flow path~~s~~ remain to supply feedwater to both 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.

BASES

ACTIONS

B.1 (continued)

The 10 day Completion Time provides a limitation time allowed in the 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

When either Required Action A.1 or B.1 cannot be completed within the required Completion Time, or ~~if one or more required AFW components are inoperable~~ with one or more AFW trains (pump or flow paths) inoperable, for reasons other than Condition A or B with at least 100% of the required AFW flow available ~~to only one steam generator, or only one AFW pump is OPERABLE~~ in MODES 1, 2, and 3, the plant must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be placed in at least MODE 3 within 6 hours, and in MODE 4 within 30 hours.

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

D.1

Required Action D.1 is modified by a Note indicating that all required MODE changes or power reductions are suspended until at least 100% of the required AFW flow is available ~~to at least one steam generator~~.

With two trains inoperable and ~~both steam generators having~~ less than 100% of the required AFW flow available in MODES 1, 2, and 3, or the required AFW train inoperable in MODE 4, the plant 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 plant 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 100% of the required AFW flow available ~~to at least one steam generator~~. LCO 3.0.3 is not applicable, as it could force the plant into a less safe condition.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1

Verifying the correct alignment for the required manual, power operated, and automatic valves in the AFW water and steam supply flow paths provides assurance that the proper flow paths exist for AFW operation. This SR does not apply to valves that 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.

This test need not be performed for the steam driven AFW pump for MODE ~~3 or~~ 4 operation.

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 required AFW pump's developed head at the flow test point is greater than or equal to ~~this~~ 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 Section XI of the ASME Code (Ref. 2). 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.

~~This test need not be performed for the steam driven AFW pump for MODE 3 or 4.~~

This SR is modified by a Note indicating that this SR for the turbine driven AFW pump does not have to be met in MODE 3 when steam pressure is below 800 psig. This is because there is insufficient steam pressure and pump discharge pressure to allow the turbine driven pump to reach the normal test conditions.

Performance of inservice testing, discussed in the ASME Code, Section XI (Ref. 2), at 3 month intervals satisfies this requirement.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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, by demonstrating that each automatic valve in the flow path actuates to its correct position on an actual or simulated actuation signal. Specific signals (e.g., AFAS) are tested under Section 3.3, "Instrumentation." This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is acceptable, based on the design reliability and operating experience of the equipment.

This SR is modified by a Note which states the SR is only required to be met in MODES 1, 2, and 3 when AFW is not in operation. With AFW in operation, the required trains are already aligned with the flow control valves in manual control.

SR 3.7.5.4

This SR ensures that the AFW pumps will start in the event of any accident or transient that generates an AFAS by demonstrating that each AFW pump starts automatically on an actual or simulated actuation signal. Specific signals (e.g., AFAS, handswitch) are tested under Section 3.3, "Instrumentation."

This test need not be performed for the steam driven AFW pump for MODE ~~3 or~~ 4 operation.

The 18 month Frequency is acceptable, based on the design reliability and operating experience of the equipment.

This SR is modified by a Note. The Note states that the SR is only required to be met in MODES 1, 2, and 3. In MODE 4, the required pump is already operating and the autostart function is not required.

REFERENCES

1. FSAR, Section 9.7
2. ASME, Boiler and Pressure Vessel Code, Section XI, Inservice Inspection, Article IWV-3400.
3. Palisades Design Basis Document 1.03, Auxiliary Feedwater System, Section 3.4.1.