

**Attachment 2**

**Marked-up Technical Specifications Pages**

**AFW Requirements and Surveillances Revisions**

**Surry Power Station Units 1 and 2  
Virginia Electric and Power Company  
(Dominion)**

### 3.6 TURBINE CYCLE

#### Applicability

Applies to the operating status of the Main Steam and Auxiliary Feed Systems.

#### Objectives

To define the conditions required in the Main Steam System and Auxiliary Feed System for protection of the steam generator and to assure the capability to remove residual heat from the core during a loss of station power/or accident situations.

#### Specification

A. A unit's Reactor Coolant System temperature or pressure shall not exceed 350°F or 450 psig, respectively, or the reactor shall not be critical unless the five main steam line code safety valves associated with each steam generator in unisolated reactor coolant loops are OPERABLE with lift settings as specified in Table 3.6-1A and 3.6-1B. Associated system piping shall also be OPERABLE.

C. ~~X~~ To assure residual heat removal capabilities, the following conditions shall be met prior to ~~the commencement of any unit operation that would establish~~ <sup>exceeding</sup> reactor coolant system conditions of 350°F and 450 psig which would preclude operation of the Residual Heat Removal System. The following shall apply:

1. ~~Two motor driven~~ <sup>Three</sup> auxiliary feedwater pumps shall be OPERABLE.
2. A minimum of 96,000 gallons of water shall be available in the protected condensate storage tank to supply emergency water to the auxiliary feedwater pump suction.

RELOCATE REVISED TS 3.6.D HERE

3. <sup>▲</sup> All main steam line code safety valves, associated with steam generators in unisolated reactor coolant loops, shall be OPERABLE with lift settings as specified in Table 3.6-1A and 3.6-1B.

B. With Reactor Coolant System conditions less than 350°F and 450 psig and the steam generators being used for heat removal, one motor driven auxiliary feedwater pump and associated flowpath shall be OPERABLE. Amendment Nos. 224 and 224

4. The auxiliary feedwater cross-connect capability shall be available, as follows:

*and the associated redundant flowpaths*

- a. Two of the three auxiliary feedwater pumps on the opposite unit (automatic initiation instrumentation need not be OPERABLE) capable of being used with the opening of the cross-connect.
- b. A minimum of 60,000 gallons of water available in the protected condensate storage tank of the opposite unit to supply emergency water to the auxiliary feedwater pump suction of that unit.
- c. Emergency power supplied to the opposite unit's auxiliary feedwater pumps and to the AFW cross-connect valves, as follows:
  1. Two diesel generators (the opposite unit's diesel generator and the shared backup diesel generator) OPERABLE with each generator's day tank having at least 290 gallons of fuel and with a minimum on-site supply of 35,000 gallons of fuel available.
  2. Two 4160V emergency buses energized.
  3. Two OPERABLE flow paths for providing fuel to the opposite unit's diesel generator and the shared backup diesel generator.
  4. Two station batteries, two chargers and the DC distribution systems OPERABLE.
  5. Emergency diesel generator battery, charger and the DC control circuitry OPERABLE for the opposite unit's diesel generator and for the shared back-up diesel generator.
  6. The 480V emergency buses energized which supply power to the auxiliary feedwater cross-connect valves:
    - a. For AFW from Unit 1 to Unit 2: Buses 1H1 and 1J1.
    - b. For AFW from Unit 2 to Unit 1: Buses 2H1 and 2J1.

7. One of the two physically independent circuits from the offsite

transmission network energizing the opposite unit's emergency buses.

INSERT A HERE FOR TSS 3.6.D, 3.6.E, 3.6.F, 3.6.G

C. Prior to reactor power exceeding 10%, the steam driven auxiliary feedwater pump shall be OPERABLE.

Two redundant flowpaths, including

headers, system piping, valves, and control board indication required for operation of the components enumerated in Specifications ~~3.6.D and 3.6.E~~ 3.6.C.1 and 3.6.C.2 shall be OPERABLE.

RELOCATE TO TS 3.6.C.3

Automatic initiation instrumentation associated with the opposite unit's auxiliary feedwater pumps need not be OPERABLE.

H. The specific activity of the secondary coolant system shall be  $\leq 0.10 \mu\text{Ci/cc}$  DOSE EQUIVALENT I-131. If the specific activity of the secondary coolant system exceeds  $0.10 \mu\text{Ci/cc}$  DOSE EQUIVALENT I-131, the reactor shall be shut down and cooled to  $500^\circ\text{F}$  or less within 6 hours after detection and in COLD SHUTDOWN within the following 30 hours.

F. With one auxiliary feedwater pump inoperable, restore at least three auxiliary feedwater pumps (two motor driven feedwater pumps and one steam driven feedwater pump) to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the following 12 hours.

I. The requirements of Specification 3.6.C.4 ~~3.6.D and 3.6.E~~ above concerning the opposite unit's auxiliary feedwater pumps; redundant flowpaths, including associated piping, valves, and control board indication; the headers, and the protected condensate storage tank may be modified to allow the the cross-connect piping from the opposite unit; following components to be inoperable, provided immediate attention is directed to making repairs.

flowpaths

1. One ~~train~~ of the opposite unit's ~~piping, valves, and control board indications~~ or two of the opposite unit's auxiliary feedwater pumps may be inoperable for a period not to exceed 14 days.

## **INSERT A - New TSs 3.6.D, 3.6.E, 3.6.F, and 3.6.G**

- D. With Reactor Coolant System conditions less than 350°F and 450 psig and the steam generators being used for heat removal, if either the motor driven pump or the associated flowpath becomes inoperable, immediately initiate action to restore the inoperable equipment to OPERABLE status.
- E. With the turbine driven pump inoperable on the affected unit and with Reactor Coolant System temperature and pressure greater than 350°F and 450 psig, respectively, immediately following REFUELING SHUTDOWN and prior to REACTOR CRITICAL, restore the inoperable pump to OPERABLE status within 7 days or be less than 350°F and 450 psig within the next 12 hours.
- F. The following actions shall be taken when one or more auxiliary feedwater pumps are inoperable on the affected unit for reasons other than those addressed in Specification 3.6.E:
1. With one auxiliary feedwater pump inoperable, restore the inoperable pump to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours.
  2. With two auxiliary feedwater pumps inoperable, be in HOT SHUTDOWN within 6 hours and be less than 350°F and 450 psig within the next 12 hours.
  3. With three auxiliary feedwater pumps inoperable, immediately initiate action to restore one inoperable pump to OPERABLE status. Specification 3.0.1 and all other required actions directing mode changes are suspended until one inoperable pump is restored to OPERABLE status.
- G. The following actions shall be taken with inoperability of a component or instrumentation other than the flow instrumentation in one or both redundant auxiliary feedwater flowpaths required by Specification 3.6.C.3 on the affected unit: (See Specification 3.7 and TS Table 3.7-6 for auxiliary feedwater flow instrumentation requirements.)
1. With component or instrumentation inoperability in one redundant flowpath, restore the inoperable component or instrumentation to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours.
  2. With component or instrumentation inoperability affecting both redundant flowpaths, immediately initiate action to restore the inoperable component or instrumentation in one flowpath to OPERABLE status. Specification 3.0.1 and all other required actions directing mode changes are suspended until the inoperable component or instrumentation in one flowpath is restored to OPERABLE status.

flowpaths;

2. Both ~~trains~~ of the opposite unit's ~~pipings, valves, and control board indications~~, the opposite unit's protected condensate storage tank; the cross-connect piping from the opposite unit; or three of the opposite unit's auxiliary feedwater pumps may be inoperable for a period not to exceed 72 hours.
  
3. A train <sup>C</sup> of the opposite unit's emergency power system as required by Section 3.6.B.4.c above may be inoperable for a period not to exceed 14 days; if this train's inoperability is related to a diesel fuel oil path, one diesel fuel oil path may be "inoperable" for 24 hours provided the other flow path is proven OPERABLE; if after 24 hours, the inoperable flow path <sup>NA</sup> cannot be restored to service, the diesel shall be considered "inoperable". During this 14 day period, the following limitations apply:
  - a. If the offsite power source becomes unable to energize the opposite unit's OPERABLE train, operation may continue provided its associated emergency diesel generator is energizing the OPERABLE train.
  - b. If the opposite unit's OPERABLE train's emergency diesel generator becomes unavailable, operation may continue for 72 hours provided the offsite power source is energizing the opposite unit's OPERABLE train.
  - c. Return of the originally inoperable train to OPERABLE status allows the second inoperable train to revert to the 14 day limitation.

If the above requirements are not met, be in ~~at least~~ HOT SHUTDOWN within the next 6 hours and ~~in COLD SHUTDOWN within the next 30 hours.~~

be less than 350°F and 450 psig within the following 12 hours.

J.X The requirements of Specification 3.6.B.2 <sup>C</sup> above may be modified to allow utilization of protected condensate storage tank water with the auxiliary ~~steam generator~~ feedwater pumps provided the water level is maintained above 60,000 gallons, sufficient replenishment water is available in the 300,000 gallon condensate storage tank, and replenishment of the protected condensate storage tank is commenced within two hours after the cessation of protected condensate storage tank water consumption.

Basis

A reactor which has been shutdown from power requires removal of core residual heat. While reactor coolant temperature or pressure is > 350°F or 450 psig, respectively, residual heat removal requirements are normally satisfied by steam bypass to the condenser. If the condenser is unavailable, steam can be released to the atmosphere through the safety valves or power operated relief valves.

The capability to supply feedwater to the generators is normally provided by the operation of the Condensate and Feedwater Systems.

→ INSERT 3 AS NEW PARAGRAPHS

In the event of complete loss of electrical power to the station, residual heat removal would continue to be assured by the availability of either the turbine driven auxiliary feedwater pump or one of the motor driven auxiliary feedwater pumps and the 110,000-gallon protected condensate storage tank.

SEPARATE PARAGRAPH

In the event of a fire or high energy line break which would render the auxiliary feedwater pumps inoperable on the affected unit, residual heat removal would continue to be assured by the availability of either the turbine driven auxiliary feedwater pump or one of the motor driven auxiliary feedwater pumps from the opposite unit. A minimum of two auxiliary feedwater pumps are required to be operable\* on the opposite unit to ensure compliance with the design basis accident analysis assumptions, in that auxiliary feedwater can be delivered via the cross-connect, even if a single active failure results in the loss of one of the two pumps. In addition, the requirement for operability of the opposite unit's emergency power system is to ensure that auxiliary feedwater from the opposite unit can be supplied via the cross-connect in the event of a common-mode failure of all auxiliary feedwater pumps in the affected unit due to a high energy line break in the main steam valve house. Without this requirement, a single failure (such as loss of the shared backup diesel generator) could result in loss of power to the opposite unit's emergency buses in the event of a loss of offsite power, thereby rendering the cross-connect inoperable. The longer allowed outage time for the opposite unit's emergency power system is based on the low probability of a high energy line break in the main steam valve house coincident with a loss of offsite power.

\* excluding automatic initiation instrumentation

## **INSERT B – New paragraphs in TS 3.6 Basis**

The Auxiliary Feedwater System provides a source of feedwater to the secondary side of the steam generators at times when the Feedwater System is not available, thereby maintaining heat sink capabilities of the steam generators. The Auxiliary Feedwater System provides heat removal until normal feedwater flow is restored or until an orderly cooldown to Reactor Coolant System conditions where the Residual Heat Removal System can be placed in service. The Auxiliary Feedwater System for each unit consists of two motor driven pumps, one turbine driven pump, a 110,000 gallon protected condensate storage tank, and associated common piping, redundant headers, valves, controls, and instrumentation. Although the flowpaths from the pumps to the steam generators include common piping, the configuration of the system provides two redundant flowpaths. The components in one flowpath are supplied by the H emergency bus, while the other is supplied by the J emergency bus. The auxiliary feedwater design basis accident is a loss of normal feedwater with offsite power available (the reactor coolant pumps running). The auxiliary feedwater flow required to remove the heat and cool the unit to residual heat removal conditions for this design basis case can be provided by any combination of two auxiliary feedwater pumps.

Refer to the Basis of Specification 4.8 for a discussion of auxiliary feedwater pump operability considerations.

Regarding the allowed outage times for auxiliary feedwater pump inoperability, Specification 3.6.E allows 7 days versus a 72 hour allowed outage time in Specification 3.6.F.1. The longer allowed outage time is based on the reduced decay heat following refueling and prior to reactor criticality.

In the unlikely event of loss of auxiliary feedwater capability on the affected unit (i.e., with all required auxiliary feedwater pumps inoperable or with both redundant flowpaths having an inoperable component or instrumentation), the required action is to immediately initiate action to restore operability of one inoperable pump or of the inoperable component or instrumentation in one flowpath. With such a loss of auxiliary feedwater capability, the unit is in a seriously degraded condition. In this condition, the unit should not be perturbed by any action, including a power change, which could result in a plant transient or trip. The seriousness of this condition requires that action be taken immediately to restore operability, where immediately means the required action should be pursued without delay and in a controlled manner. Under these circumstances, Specification 3.0.1 and all other required actions directing mode changes are suspended until one inoperable pump or the inoperable component or instrumentation in one flowpath is restored to operable status, because taking those actions could place the unit in a less safe condition.

REFERENCES

UFSAR Section 4, Reactor Coolant System

UFSAR Section 9.3, Residual Heat Removal System

UFSAR Section 10.3.1, Main Steam System

UFSAR Section 10.3.2, Auxiliary Steam System

UFSAR Section 10.3.5, Condensate and ~~Auxiliary~~ Feedwater Systems S

UFSAR Section 10.3.8, Secondary Vent and Drain Systems

~~UFSAR Section 14.3.2.5, Environmental Effects of a Steam Line Break~~

UFSAR Section 14.2.11, Loss of Normal Feedwater

UFSAR Section 14.3.2, Rupture of a Main  
Steam Pipe

UFSAR Appendix 14B, Effects of Piping System  
Breaks Outside Containment

7. Two emergency diesel generators OPERABLE as explained in Section 3.16.
- B. The requirements of Specification 3.9-A items 3, 4, 5, 6, and 7 may be modified as provided in Section 3.16-B.

Basis

During startup of a unit, the station's 4,160V and 480V normal and emergency buses are energized from the station's 34.5KV buses. At reactor power levels greater than 5 percent of rated power the 34.5KV buses are required to energize only the emergency buses because at this power level the station generator can supply sufficient power to the normal 4,160V and 480V lines to operate the unit. Three reactor coolant loop operation with all 4,160V and 480V buses energized is the normal mode of operation for a unit.

The electrical power requirements and the emergency power testing requirements for the auxiliary feedwater cross-connect are contained in TS 3.6.B.4.c and TS 4.6, respectively.

References

FSAR Section 8.4 Station Service Systems

FSAR Section 8.5 Emergency Power Systems

The day tanks are filled by transferring fuel from any one of two buried tornado missile protected fuel oil storage tanks, each of 20,000 gal capacity. Two of 100 percent capacity fuel oil transfer pumps per diesel generator are powered from the emergency buses to assure that an operating diesel generator has a continuous supply of fuel. The buried fuel oil storage tanks contain a seven (7) day supply of fuel, 35,000 gal minimum, for the full load operation of one diesel generator; in addition, there is an above ground fuel oil storage tank on-site with a capacity of 210,000 gal which is used for transferring fuel to the buried tanks.

One of the two buried fuel oil storage tanks may be inoperable to permit inspection and related repair of that buried fuel oil storage tank. While one tank is removed from service, the remaining buried fuel oil storage tank supplies fuel oil to the EDGs of both units. Prior to removal of one buried tank from service and while it is inoperable, verification of the volume in the remaining buried fuel oil storage tank and the above ground fuel oil storage tank is required to ensure an adequate source of fuel oil remains available onsite. In addition, verification of the offsite replacement fuel oil supply is also required. While one buried tank is out of service, the verification of the onsite and offsite fuel oil sources continues to support full load operation of one diesel generator for seven days.

If a loss of normal power is not accompanied by a loss-of-coolant accident, the safeguards equipment will not be required. Under this condition the following additional auxiliary equipment may be operated from each emergency bus:

- A. One component cooling pump
- B. One residual heat removal pump
- C. One motor-driven auxiliary steam generator feedwater pump

The emergency buses in each unit are capable of being interconnected under strict administrative procedures so that the equipment which would normally be operated by one of the diesels could be operated by the other diesel, if required.

The electrical power requirements and the emergency power testing requirements for the auxiliary feedwater cross-connect are contained in TS 3.6.B.4.c and TS 4.6 respectively.

C

## 4.8 AUXILIARY FEEDWATER SYSTEM

### Applicability

Applies to the periodic testing requirements of the Auxiliary Feedwater System.

### Objective

To verify the operability of the auxiliary feedwater pumps. P

### Specification

#### A. Tests and Frequencies

1. At least once per 31 days:

- a. Verify that the Auxiliary Feedwater System manual, power operated, and automatic valves in each flow path are in the correct position. This verification includes valves that are not locked, sealed, or otherwise secured in position, valves in the the cross-connect from the opposite unit and valves in the steam supply paths to the turbine driven auxiliary feedwater pump.

2. At least once per 92 days:

- a. Verify that each motor-operated valve in the auxiliary feedwater flow paths, including the cross-connect from the opposite unit, performs satisfactorily when tested in accordance with Specifications 4.0.5.

3. At least once per 92 days on a STAGGERED TEST BASIS:

- a. Verify that the auxiliary feedwater pumps perform satisfactorily when tested in accordance with Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable for the turbine driven pump. Note that the developed head test of the turbine driven pump is required to be performed within 24 hours after reaching HOT SHUTDOWN. Amendment Nos. 190 and 190

INSERT C HERE FOR TS 4.8.A.4

TS 4.8-2

03-07-94

- 4a. Within 72 hours prior to Reactor Coolant System temperature and pressure exceeding 350°F and 450 psig, respectively, the motor driven auxiliary feedwater pumps shall be flow tested from the 110,000 gallon above ground Emergency Condensate Storage Tank to the steam generators.
- 4b. Within 72 hours after achieving reactor criticality, the steam turbine driven auxiliary feedwater pump shall be flow tested from the 110,000 gallon above ground Emergency Condensate Storage Tank to the steam generators. The provisions of Specification 4.0.4 are not applicable.

5. During periods of reactor shutdown with the opposite unit's Reactor Coolant System temperature and pressure greater than 350° F and 450 psig, respectively:
- a. Continue to verify that the motor driven auxiliary feedwater pumps perform satisfactorily when tested at the frequency defined in Specification 4.8.A.3.
- b. Verify that each motor-operated valve in the auxiliary feedwater cross-connect flow path for the opposite unit performs satisfactorily when tested in accordance with Specifications 4.0.5.

INSERT D HERE FOR TS 4.8.A.6

B. Acceptance Criteria

The pump and valve tests, ~~except the system flow test~~, shall be considered satisfactory if they meet the ASME Section XI Inservice Testing Program acceptance criteria.

The ~~system flow~~ tests during unit startup from flowpath alignment REFUELING, or INTERMEDIATE ~~COLD, SHUTDOWN or REFUELING SHUTDOWN~~ shall be considered satisfactory if the control board indication demonstrates that flow paths exist to each steam generator.

Amendment Nos. ~~190 and 190~~

#### **INSERT C - New TS 4.8.A.4**

4. Whenever the unit's Reactor Coolant System temperature and pressure have been less than 350°F and 450 psig, respectively, for a period greater than 30 days, prior to Reactor Coolant System temperature and pressure exceeding 350°F and 450 psig, respectively, verify proper alignment of the required auxiliary feedwater flowpaths by verifying flow from the 110,000 gallon above ground Emergency Condensate Storage Tank to the steam generators from each of the auxiliary feedwater pumps.

#### **INSERT D - New TS 4.8.A.6**

6. On an 18-month frequency:
  - a. Verify each auxiliary feedwater automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.
  - b. Verify each auxiliary feedwater pump starts automatically on an actual or simulated actuation signal. Note that this surveillance is required to be performed for the turbine driven pump within 24 hours after reaching HOT SHUTDOWN.

**Basis**

The correct alignment for manual, power operated, and automatic valves in the Auxiliary Feedwater System steam and water flow paths, including the cross-connect flow path, will provide assurance that the proper flow paths exist for system operation. This position check does not include: 1) valves that are locked, sealed or otherwise secured in position since they are verified to be in their correct position prior to locking, sealing or otherwise securing; 2) vent, drain or relief valves on those flow paths; and, 3) those valves that cannot be inadvertently misaligned such as check valves. This surveillance does not require any testing or valve manipulation. It involves verification that those valves capable of being mispositioned are in the correct position.

→ The auxiliary feedwater pumps <sup>are</sup> will be tested periodically in accordance with ASME Section XI to demonstrate operability. <sup>INSERT E HERE</sup> ~~The pumps are flow tested on recirculation to the 110,000 gallon Emergency Condensate Storage Tank.~~  
~~Valves in the flow path to the steam generators and cross-connect flow path are tested periodically in accordance with ASME Section XI.~~

INSERT F HERE

The auxiliary feedwater pumps are capable of supplying feedwater to the opposite units steam generators. For a main steam line break or fire event in the Main Steam Valve House, one of the opposite units auxiliary feedwater pumps is required to supply feedwater to mitigate the consequences of those accidents. Therefore, when considering a single failure, both motor driven auxiliary feedwater pumps are required to be OPERABLE\* during shutdown to support the opposite unit if the Reactor Coolant System temperature or pressure of the opposite unit is greater than 350°F and 450 psig, respectively. Thus, to establish operability\* the motor driven auxiliary feedwater pumps will continue to be tested quarterly on the same STAGGERED TEST BASIS when the unit is shutdown to support the opposite unit. ~~The turbine driven pump is not required to be OPERABLE when the unit is shutdown and therefore, is not tested during periods of shutdown.~~

\* excluding automatic initiation instrumentation

#### **INSERT E – Add to second paragraph in TS 4.8 Basis**

Verification of the developed head of each auxiliary feedwater pump ensures that the pump performance has not degraded. Flow and differential head tests are normal inservice testing requirements. Because it is sometimes undesirable to introduce cold auxiliary feedwater into the steam generators while they are operating, the inservice testing is typically performed on recirculation flow to the 110,000 gallon Emergency Condensate Storage Tank.

#### **INSERT F - New paragraph in TS 4.8 Basis**

Appropriate surveillance and post-maintenance testing is required to declare equipment OPERABLE. Testing may not be possible in the applicable plant conditions due to the necessary unit parameters not having been established. In this situation, the equipment may be considered OPERABLE provided testing has been satisfactorily completed to the extent possible, and the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a condition where other necessary surveillance or post maintenance tests can be completed. Relative to the turbine driven auxiliary feedwater pump, Specification 4.8.A.3.a is modified by a note indicating that the developed head test of the turbine driven pump should be deferred until suitable conditions are established; this deferral is required because there may be insufficient steam pressure to perform the test.

TS 4.8-4 }  
03-07-94 }

The capacity of the Emergency Condensate Storage Tank and the flow rate of any one of the three auxiliary feedwater pumps in conjunction with the water inventory of the steam generators is capable of maintaining the plant in a safe condition and sufficient to cool the unit down.

Proper functioning of the steam turbine admission valve and the ability of the auxiliary feedwater pumps to start will demonstrate the integrity of the system. Verification of correct operation can be made both from instrumentation within the Main Control Room and direct visual observation of the pumps.

References

UFSAR Section 10.3(1), Main Steam System

UFSAR Section 10.3(2), Auxiliary Steam System

UFSAR Section 10.3.5, Condensate and Feedwater Systems

**Attachment 3**

**Proposed Technical Specifications Pages**

**AFW Requirements and Surveillances Revisions**

**Surry Power Station Units 1 and 2  
Virginia Electric and Power Company  
(Dominion)**

### 3.6 TURBINE CYCLE

#### Applicability

Applies to the operating status of the Main Steam and Auxiliary Feed Systems.

#### Objectives

To define the conditions required in the Main Steam System and Auxiliary Feed System for protection of the steam generator and to assure the capability to remove residual heat from the core during a loss of station power/or accident situations.

#### Specification

- A. A unit's Reactor Coolant System temperature or pressure shall not exceed 350°F or 450 psig, respectively, or the reactor shall not be critical unless the five main steam line code safety valves associated with each steam generator in unisolated reactor coolant loops are OPERABLE with lift settings as specified in Table 3.6-1A and 3.6-1B. Associated system piping shall also be OPERABLE.
- B. With Reactor Coolant System conditions less than 350°F and 450 psig and the steam generators being used for heat removal, one motor driven auxiliary feedwater pump and associated flowpath shall be OPERABLE.
- C. To assure residual heat removal capabilities, the following conditions shall be met prior to exceeding Reactor Coolant System conditions of 350°F and 450 psig which would preclude operation of the Residual Heat Removal System. The following shall apply:
  1. Three auxiliary feedwater pumps shall be OPERABLE.
  2. A minimum of 96,000 gallons of water shall be available in the protected condensate storage tank to supply emergency water to the auxiliary feedwater pump suctions.

Amendment Nos.

3. Two redundant flowpaths, including system piping, headers, valves, and control board indication required for operation of the components enumerated in Specifications 3.6.C.1 and 3.6.C.2, shall be OPERABLE.
4. The auxiliary feedwater cross-connect capability shall be available, as follows:
  - a. Two of the three auxiliary feedwater pumps and the associated redundant flowpaths on the opposite unit (automatic initiation instrumentation need not be OPERABLE) capable of being used with the opening of the cross-connect.
  - b. A minimum of 60,000 gallons of water available in the protected condensate storage tank of the opposite unit to supply emergency water to the auxiliary feedwater pump suction of that unit.
  - c. Emergency power supplied to the opposite unit's auxiliary feedwater pumps and to the AFW cross-connect valves, as follows:
    1. Two diesel generators (the opposite unit's diesel generator and the shared backup diesel generator) OPERABLE with each generator's day tank having at least 290 gallons of fuel and with a minimum on-site supply of 35,000 gallons of fuel available.
    2. Two 4160V emergency buses energized.
    3. Two OPERABLE flow paths for providing fuel to the opposite unit's diesel generator and the shared backup diesel generator.
    4. Two station batteries, two chargers and the DC distribution systems OPERABLE.
    5. Emergency diesel generator battery, charger and the DC control circuitry OPERABLE for the opposite unit's diesel generator and for the shared back-up diesel generator.

6. The 480V emergency buses energized which supply power to the auxiliary feedwater cross-connect valves:
    - a. For AFW from Unit 1 to Unit 2: Buses 1H1 and 1J1.
    - b. For AFW from Unit 2 to Unit 1: Buses 2H1 and 2J1.
  7. One of the two physically independent circuits from the offsite transmission network energizing the opposite unit's emergency buses.
- D. With Reactor Coolant System conditions less than 350°F and 450 psig and the steam generators being used for heat removal, if either the motor driven pump or the associated flowpath becomes inoperable, immediately initiate action to restore the inoperable equipment to OPERABLE status.
- E. With the turbine driven pump inoperable on the affected unit and with Reactor Coolant System temperature and pressure greater than 350°F and 450 psig, respectively, immediately following REFUELING SHUTDOWN and prior to REACTOR CRITICAL, restore the inoperable pump to OPERABLE status within 7 days or be less than 350°F and 450 psig within the next 12 hours.
- F. The following actions shall be taken when one or more auxiliary feedwater pumps are inoperable on the affected unit for reasons other than those addressed in Specification 3.6.E:
1. With one auxiliary feedwater pump inoperable, restore the inoperable pump to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours.
  2. With two auxiliary feedwater pumps inoperable, be in HOT SHUTDOWN within 6 hours and be less than 350°F and 450 psig within the next 12 hours.

3. With three auxiliary feedwater pumps inoperable, immediately initiate action to restore one inoperable pump to OPERABLE status. Specification 3.0.1 and all other required actions directing mode changes are suspended until one inoperable pump is restored to OPERABLE status.
- G. The following actions shall be taken with inoperability of a component or instrumentation other than the flow instrumentation in one or both redundant auxiliary feedwater flowpaths required by Specification 3.6.C.3 on the affected unit: (See Specification 3.7 and TS Table 3.7-6 for auxiliary feedwater flow instrumentation requirements.)
1. With component or instrumentation inoperability in one redundant flowpath, restore the inoperable component or instrumentation to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours.
  2. With component or instrumentation inoperability affecting both redundant flowpaths, immediately initiate action to restore the inoperable component or instrumentation in one flowpath to OPERABLE status. Specification 3.0.1 and all other required actions directing mode changes are suspended until the inoperable component or instrumentation in one flowpath is restored to OPERABLE status.
- H. The specific activity of the secondary coolant system shall be  $\leq 0.10 \mu\text{Ci/cc}$  DOSE EQUIVALENT I-131. If the specific activity of the secondary coolant system exceeds  $0.10 \mu\text{Ci/cc}$  DOSE EQUIVALENT I-131, the reactor shall be shut down and cooled to 500°F or less within 6 hours after detection and in COLD SHUTDOWN within the following 30 hours.

- I. The requirements of Specification 3.6.C.4 above concerning the opposite unit's auxiliary feedwater pumps; the associated redundant flowpaths, including piping, headers, valves, and control board indication; the cross-connect piping from the opposite unit; and the protected condensate storage tank may be modified to allow the following components to be inoperable, provided immediate attention is directed to making repairs. Automatic initiation instrumentation associated with the opposite unit's auxiliary feedwater pumps need not be OPERABLE.
1. One of the opposite unit's flowpaths or two of the opposite unit's auxiliary feedwater pumps may be inoperable for a period not to exceed 14 days.
  2. Both of the opposite unit's flowpaths; the opposite unit's protected condensate storage tank; the cross-connect piping from the opposite unit; or three of the opposite unit's auxiliary feedwater pumps may be inoperable for a period not to exceed 72 hours.
  3. A train of the opposite unit's emergency power system as required by Section 3.6.C.4.c above may be inoperable for a period not to exceed 14 days; if this train's inoperability is related to a diesel fuel oil path, one diesel fuel oil path may be "inoperable" for 24 hours provided the other flowpath is proven OPERABLE; if after 24 hours, the inoperable flowpath cannot be restored to service, the diesel shall be considered "inoperable." During this 14 day period, the following limitations apply:
    - a. If the offsite power source becomes unable to energize the opposite unit's OPERABLE train, operation may continue provided its associated emergency diesel generator is energizing the OPERABLE train.
    - b. If the opposite unit's OPERABLE train's emergency diesel generator becomes unavailable, operation may continue for 72 hours provided the offsite power source is energizing the opposite unit's OPERABLE train.

- c. Return of the originally inoperable train to OPERABLE status allows the second inoperable train to revert to the 14 day limitation.

If the above requirements are not met, be in HOT SHUTDOWN within the next 6 hours and be less than 350°F and 450 psig within the following 12 hours.

- J. The requirements of Specification 3.6.C.2 above may be modified to allow utilization of protected condensate storage tank water with the auxiliary feedwater pumps provided the water level is maintained above 60,000 gallons, sufficient replenishment water is available in the 300,000 gallon condensate storage tank, and replenishment of the protected condensate storage tank is commenced within two hours after the cessation of protected condensate storage tank water consumption.

### Basis

A reactor which has been shutdown from power requires removal of core residual heat. While reactor coolant temperature or pressure is  $> 350^{\circ}\text{F}$  or 450 psig, respectively, residual heat removal requirements are normally satisfied by steam bypass to the condenser. If the condenser is unavailable, steam can be released to the atmosphere through the safety valves or power operated relief valves. The capability to supply feedwater to the generators is normally provided by the operation of the Condensate and Feedwater Systems.

The Auxiliary Feedwater System provides a source of feedwater to the secondary side of the steam generators at times when the Feedwater System is not available, thereby maintaining heat sink capabilities of the steam generators. The Auxiliary Feedwater System provides heat removal until normal feedwater flow is restored or until an orderly cooldown to Reactor Coolant System conditions where the Residual Heat Removal System can be placed in service. The Auxiliary Feedwater System for each unit consists of two motor driven pumps, one turbine driven pump, a 110,000 gallon protected condensate storage tank, and associated common piping, redundant headers, valves, controls, and instrumentation. Although the flowpaths from the pumps to the steam generators include common piping, the configuration of the system provides two redundant flowpaths. The components in one flowpath are supplied by the H emergency bus, while the other is supplied by the J emergency bus. The auxiliary feedwater design basis accident is a loss of normal feedwater with offsite power available (the reactor coolant pumps running). The auxiliary feedwater flow required to remove the heat and cool the unit to residual heat removal conditions for this design basis case can be provided by any combination of two auxiliary feedwater pumps.

Refer to the Basis of Specification 4.8 for a discussion of auxiliary feedwater pump operability considerations.

Regarding the allowed outage times for auxiliary feedwater pump inoperability, Specification 3.6.E allows 7 days versus a 72 hour allowed outage time in Specification 3.6.F.1. The longer allowed outage time is based on the reduced decay heat following refueling and prior to reactor criticality.

In the unlikely event of loss of auxiliary feedwater capability on the affected unit (i.e., with all required auxiliary feedwater pumps inoperable or with both redundant flowpaths having an inoperable component or instrumentation), the required action is to immediately initiate action to

restore operability of one inoperable pump or of the inoperable component or instrumentation in one flowpath. With such a loss of auxiliary feedwater capability, the unit is in a seriously degraded condition. In this condition, the unit should not be perturbed by any action, including a power change, which could result in a plant transient or trip. The seriousness of this condition requires that action be taken immediately to restore operability, where immediately means the required action should be pursued without delay and in a controlled manner. Under these circumstances, Specification 3.0.1 and all other required actions directing mode changes are suspended until one inoperable pump or the inoperable component or instrumentation in one flowpath is restored to operable status, because taking those actions could place the unit in a less safe condition.

In the event of complete loss of electrical power to the station, residual heat removal would continue to be assured by the availability of either the turbine driven auxiliary feedwater pump or one of the motor driven auxiliary feedwater pumps and the 110,000-gallon protected condensate storage tank.

In the event of a fire or high energy line break which would render the auxiliary feedwater pumps inoperable on the affected unit, residual heat removal would continue to be assured by the availability of either the turbine driven auxiliary feedwater pump or one of the motor driven auxiliary feedwater pumps from the opposite unit. A minimum of two auxiliary feedwater pumps are required to be operable\* on the opposite unit to ensure compliance with the design basis accident analysis assumptions, in that auxiliary feedwater can be delivered via the cross-connect, even if a single active failure results in the loss of one of the two pumps. In addition, the requirement for operability of the opposite unit's emergency power system is to ensure that auxiliary feedwater from the opposite unit can be supplied via the cross-connect in the event of a common-mode failure of all auxiliary feedwater pumps in the affected unit due to a high energy line break in the main steam valve house. Without this requirement, a single failure (such as loss of the shared backup diesel generator) could result in loss of power to the opposite unit's emergency buses in the event of a loss of offsite power, thereby rendering the cross-connect inoperable. The longer allowed outage time for the opposite unit's emergency power system is based on the low probability of a high energy line break in the main steam valve house coincident with a loss of offsite power.

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\* excluding automatic initiation instrumentation

The specified minimum water volume in the 110,000-gallon protected condensate storage tank is sufficient for 8 hours of residual heat removal following a reactor trip and loss of all offsite electrical power. It is also sufficient to maintain one unit at hot shutdown for 2 hours, followed by a 4 hour cooldown from 547°F to 350°F (i.e., RHR operating conditions). If the protected condensate storage tank level is reduced to 60,000 gallons, the immediately available replenishment water in the 300,000-gallon condensate tank can be gravity-fed to the protected tank if required for residual heat removal. An alternate supply of feedwater to the auxiliary feedwater pump suction is also available from the Fire Protection System Main in the auxiliary feedwater pump cubicle.

The five main steam code safety valves associated with each steam generator have a total combined capacity of 3,842,454 pounds per hour at their individual relieving pressure; the total combined capacity of all fifteen main steam code safety valves is 11,527,362 pounds per hour. The nominal power rating steam flow is 11,260,000 pounds per hour. The combined capacity of the safety valves required by Specification 3.6 always exceeds the total steam flow corresponding to the maximum steady state power than can be obtained during three reactor coolant loop operation.

The availability of the auxiliary feedwater pumps, the protected condensate storage tank, and the main steam line safety valves adequately assures that sufficient residual heat removal capability will be available when required.

The limit on steam generator secondary side iodine-131 activity is based on limiting the inhalation dose at the site boundary following a postulated steam line break accident to a small fraction of the 10 CFR 100 limits. The accident analysis, which is performed based on the guidance of NUREG-0800 Section 15.1-5, assumes the release of the entire contents of the faulted steam generator to the atmosphere.

REFERENCES

UFSAR Section 4, Reactor Coolant System  
UFSAR Section 9.3, Residual Heat Removal System  
UFSAR Section 10.3.1, Main Steam System  
UFSAR Section 10.3.2, Auxiliary Steam System  
UFSAR Section 10.3.5, Condensate and Feedwater Systems  
UFSAR Section 10.3.8, Secondary Vent and Drain Systems  
UFSAR Section 14.2.11, Loss of Normal Feedwater  
UFSAR Section 14.3.2, Rupture of a Main Steam Pipe  
UFSAR Appendix 14B, Effects of Piping System Breaks Outside Containment

Amendment Nos.

7. Two emergency diesel generators OPERABLE as explained in Section 3.16.
- B. The requirements of Specification 3.9-A items 3, 4, 5, 6, and 7 may be modified as provided in Section 3.16-B.

Basis

During startup of a unit, the station's 4,160V and 480V normal and emergency buses are energized from the station's 34.5KV buses. At reactor power levels greater than 5 percent of rated power the 34.5KV buses are required to energize only the emergency buses because at this power level the station generator can supply sufficient power to the normal 4,160V and 480V lines to operate the unit. Three reactor coolant loop operation with all 4,160V and 480V buses energized is the normal mode of operation for a unit.

The electrical power requirements and the emergency power testing requirements for the auxiliary feedwater cross-connect are contained in TS 3.6.C.4.c and TS 4.6, respectively. |

References

FSAR Section 8.4 Station Service Systems

FSAR Section 8.5 Emergency Power Systems

The day tanks are filled by transferring fuel from any one of two buried tornado missile protected fuel oil storage tanks, each of 20,000 gal capacity. Two of 100 percent capacity fuel oil transfer pumps per diesel generator are powered from the emergency buses to assure that an operating diesel generator has a continuous supply of fuel. The buried fuel oil storage tanks contain a seven (7) day supply of fuel, 35,000 gal minimum, for the full load operation of one diesel generator; in addition, there is an above ground fuel oil storage tank on-site with a capacity of 210,000 gal which is used for transferring fuel to the buried tanks.

One of the two buried fuel oil storage tanks may be inoperable to permit inspection and related repair of that buried fuel oil storage tank. While one tank is removed from service, the remaining buried fuel oil storage tank supplies fuel oil to the EDGs of both units. Prior to removal of one buried tank from service and while it is inoperable, verification of the volume in the remaining buried fuel oil storage tank and the above ground fuel oil storage tank is required to ensure an adequate source of fuel oil remains available onsite. In addition, verification of the offsite replacement fuel oil supply is also required. While one buried tank is out of service, the verification of the onsite and offsite fuel oil sources continues to support full load operation of one diesel generator for seven days.

If a loss of normal power is not accompanied by a loss-of-coolant accident, the safeguards equipment will not be required. Under this condition the following additional auxiliary equipment may be operated from each emergency bus:

- A. One component cooling pump
- B. One residual heat removal pump
- C. One motor-driven auxiliary steam generator feedwater pump

The emergency buses in each unit are capable of being interconnected under strict administrative procedures so that the equipment which would normally be operated by one of the diesels could be operated by the other diesel, if required.

The electrical power requirements and the emergency power testing requirements for the auxiliary feedwater cross-connect are contained in TS 3.6.C.4.c and TS 4.6 respectively. |

## 4.8 AUXILIARY FEEDWATER SYSTEM

### Applicability

Applies to the periodic testing requirements of the Auxiliary Feedwater System.

### Objective

To verify the operability of the auxiliary feedwater pumps.

### Specification

#### A. Tests and Frequencies

1. At least once per 31 days:
  - a. Verify that the Auxiliary Feedwater System manual, power operated, and automatic valves in each flowpath are in the correct position. This verification includes valves that are not locked, sealed, or otherwise secured in position, valves in the cross-connect from the opposite unit and valves in the steam supply paths to the turbine driven auxiliary feedwater pump.
2. At least once per 92 days:
  - a. Verify that each motor-operated valve in the auxiliary feedwater flowpaths, including the cross-connect from the opposite unit, performs satisfactorily when tested in accordance with Specifications 4.0.5.
3. At least once per 92 days on a STAGGERED TEST BASIS:
  - a. Verify that the auxiliary feedwater pumps perform satisfactorily when tested in accordance with Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable for the turbine driven pump. Note that the developed head test of the turbine driven pump is required to be performed within 24 hours after reaching HOT SHUTDOWN.

4. Whenever the unit's Reactor Coolant System temperature and pressure have been less than 350°F and 450 psig, respectively, for a period greater than 30 days, prior to Reactor Coolant System temperature and pressure exceeding 350°F and 450 psig, respectively, verify proper alignment of the required auxiliary feedwater flowpaths by verifying flow from the 110,000 gallon above ground Emergency Condensate Storage Tank to the steam generators from each of the auxiliary feedwater pumps.
5. During periods of reactor shutdown with the opposite unit's Reactor Coolant System temperature and pressure greater than 350°F and 450 psig, respectively:
  - a. Continue to verify that the motor driven auxiliary feedwater pumps perform satisfactorily when tested at the frequency defined in Specification 4.8.A.3.
  - b. Verify that each motor-operated valve in the auxiliary feedwater cross-connect flowpath for the opposite unit performs satisfactorily when tested in accordance with Specifications 4.0.5.
6. On an 18-month frequency:
  - a. Verify each auxiliary feedwater automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.
  - b. Verify each auxiliary feedwater pump starts automatically on an actual or simulated actuation signal. Note that this surveillance is required to be performed for the turbine driven pump within 24 hours after reaching HOT SHUTDOWN.

B. Acceptance Criteria

The pump and valve tests shall be considered satisfactory if they meet the ASME Section XI Inservice Testing Program acceptance criteria.

The flowpath alignment tests during unit startup from REFUELING, COLD, or INTERMEDIATE SHUTDOWN shall be considered satisfactory if the control board indication demonstrates that flowpaths exist to each steam generator.

Basis

The correct alignment for manual, power operated, and automatic valves in the Auxiliary Feedwater System steam and water flowpaths, including the cross-connect flowpath, will provide assurance that the proper flowpaths exist for system operation. This position check does not include: 1) valves that are locked, sealed or otherwise secured in position since they are verified to be in their correct position prior to locking, sealing or otherwise securing; 2) vent, drain or relief valves on those flowpaths; and, 3) those valves that cannot be inadvertently misaligned such as check valves. This surveillance does not require any testing or valve manipulation. It involves verification that those valves capable of being mispositioned are in the correct position.

Valves in the auxiliary feedwater flowpaths to the steam generators and cross-connect flowpath are tested periodically in accordance with ASME Section XI. The auxiliary feedwater pumps are tested periodically in accordance with ASME Section XI to demonstrate operability. Verification of the developed head of each auxiliary feedwater pump ensures that the pump performance has not degraded. Flow and differential head tests are normal inservice testing requirements. Because it is sometimes undesirable to introduce cold auxiliary feedwater into the steam generators while they are operating, the inservice testing is typically performed on recirculation flow to the 110,000 gallon Emergency Condensate Storage Tank.

Appropriate surveillance and post-maintenance testing is required to declare equipment OPERABLE. Testing may not be possible in the applicable plant conditions due to the necessary unit parameters not having been established. In this situation, the equipment may be considered OPERABLE provided testing has been satisfactorily completed to the extent possible, and the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a condition where other necessary surveillance or post maintenance tests can be completed. Relative to the turbine driven auxiliary feedwater pump, Specification 4.8.A.3.a is modified by a note indicating that the developed head test of the turbine driven pump should be deferred until suitable conditions are established; this deferral is required because there may be insufficient steam pressure to perform the test.

Amendment Nos.

The auxiliary feedwater pumps are capable of supplying feedwater to the opposite unit's steam generators. For a main steam line break or fire event in the Main Steam Valve House, one of the opposite units auxiliary feedwater pumps is required to supply feedwater to mitigate the consequences of those accidents. Therefore, when considering a single failure, both motor driven auxiliary feedwater pumps are required to be OPERABLE\* during shutdown to support the opposite unit if the Reactor Coolant System temperature or pressure of the opposite unit is greater than 350°F and 450 psig, respectively. Thus, to establish operability\* the motor driven auxiliary feedwater pumps will continue to be tested quarterly on the same STAGGERED TEST BASIS when the unit is shutdown to support the opposite unit.

The capacity of the Emergency Condensate Storage Tank and the flow rate of any one of the three auxiliary feedwater pumps in conjunction with the water inventory of the steam generators is capable of maintaining the plant in a safe condition and sufficient to cool the unit down.

Proper functioning of the steam turbine admission valve and the ability of the auxiliary feedwater pumps to start will demonstrate the integrity of the system. Verification of correct operation can be made both from instrumentation within the Main Control Room and direct visual observation of the pumps.

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\* excluding automatic initiation instrumentation

### References

UFSAR Section 10.3.1, Main Steam System

UFSAR Section 10.3.2, Auxiliary Steam System

UFSAR Section 10.3.5, Condensate and Feedwater Systems

Amendment Nos.