

## B 3.7 PLANT SYSTEMS

### B 3.7.7 Nuclear Service Water System (NSWS)

#### BASES

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**BACKGROUND** The NSWS provides a transfer mechanism for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the NSWS also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

The NSWS is normally supplied from Lake Norman as a non-seismic source, through a single supply line as shown in Figure B 3.7.7-1. An additional safety-related and seismic supply of water to the NSWS, in the event of a loss of Lake Norman, is the Standby Nuclear Service Water Pond (SNSWP). The supply line from Lake Norman separates into two supply headers, each header is capable of being isolated by two, independently powered, motor operated valves. The two supply headers feed into two separate supply trains. The "A" train supplies water to the "A" pump on each unit and the "B" train to the "B" pump on each unit. During normal operation, only one pump, per unit, is in operation to supply NSWS flow to the essential and non-essential headers for each unit. The "B" train supply is automatically realigned to the SNSWP and supplies the "B" header on an SI signal from either unit. The "A" train supply is automatically realigned to the low-level supply from Lake Norman and supplies the "A" header on an SI signal from either unit.

Essential headers provide flow to the following safety related components and systems:

1. Component Cooling (CCW) Heat Exchangers and Pump Motor Coolers,
2. Containment Spray Heat Exchangers and Pump Motor Coolers,
3. Control Room Area Chiller Condensers,
4. Diesel Generator Heat Exchangers,
5. Centrifugal Charging Pump Motor, Bearing Oil and Gear Oil Coolers,
6. Nuclear Service Water Pump Motor Coolers,
7. Auxiliary Feedwater Pump Motor Coolers,
8. Safety Injection Pump Motor and Bearing Oil Coolers,
9. Residual Heat Removal Pump Motor Coolers,
10. Fuel Pool Pump Motor Coolers,
11. Assured Auxiliary Feedwater Supply,
12. Assured Component Cooling System Makeup,
13. Assured Fuel Pool Cooling System makeup, and
14. Assured Diesel Generator Engine Cooling System makeup.

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BACKGROUND (continued)

The non-essential channel supply comes from the "A" and "B" train crossover piping and isolates on an SI or Blackout signal.

The Reactor Coolant Pump Motor Air Coolers are not essential for safe shutdown, but are set up to receive cooling flow until the Containment, High-High signal is received. The pumps and valves are remote and manually aligned, except in the unlikely event of a loss of coolant accident (LOCA). The pumps aligned to the critical loops are automatically started upon receipt of a safety injection or Station Blackout signal, and all essential valves are aligned to their post accident positions.

Additional information about the design and operation of the NSWS, along with a list of the components served, is presented in the UFSAR, Section 9.2 (Ref. 1). The principal safety related function of the NSWS is the removal of decay heat from the reactor via the CCW System.

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APPLICABLE  
SAFETY ANALYSES

The design basis of the NSWS is for one NSWS train, in conjunction with the CCW System and the Containment Spray system, to remove core decay heat following a design basis LOCA as discussed in the UFSAR, Section 6.2 (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the ECCS pumps. The NSWS is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The NSWS, in conjunction with the CCW System, also removes heat from the residual heat removal (RHR) system, as discussed in the UFSAR, Section 5.4 (Ref. 3), from RHR entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of CCW and RHR System trains that are operating. One NSWS train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum NSWS inlet temperature of 95°F is not exceeded.

The NSWS satisfies Criterion 3 of 10 CFR 50.36 (Ref. 4).

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LCO

Two NSWS trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident

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LCO (continued)

heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

An NSWS train is considered OPERABLE during MODES 1, 2, 3, and 4 when:

- a. The associated unit's pump is OPERABLE; and
- b. The associated piping, valves, and instrumentation and controls required to perform the safety related function are OPERABLE.

Portions of the NSWS system are shared between the two units (Figure B 3.7.7-1). The shared portions of the system must be OPERABLE for each unit when that unit is in the MODE of Applicability. Additionally, both normal and emergency power for shared components must also be OPERABLE. If a shared NSWS component becomes inoperable, or normal or emergency power to shared components becomes inoperable, then the Required Actions of this LCO must be entered independently for each unit that is in the MODE of applicability of the LCO.

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APPLICABILITY

In MODES 1, 2, 3, and 4, the NSWS is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the NSWS and required to be OPERABLE in these MODES.

In MODES 5 and 6, the requirements of the NSWS are determined by the systems it supports.

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ACTIONS

A.1

If one NSWS train is inoperable, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE NSWS train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE NSWS train could result in loss of NSWS function. Required Action A.1 is modified by two Notes. The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources—Operating," should be entered if an inoperable NSWS train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops—MODE 4," should be entered if an inoperable NSWS train results in an inoperable decay heat removal train.

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ACTIONS (continued)

This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period.

B.1 and B.2

If the NSWS train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

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

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SURVEILLANCE  
REQUIREMENTS

SR 3.7.7.1

This SR is modified by a Note indicating that the isolation of the NSWS components or systems may render those components inoperable, but does not affect the OPERABILITY of the NSWS.

Verifying the correct alignment for manual, power operated, and automatic valves in the NSWS flow path provides assurance that the proper flow paths exist for NSWS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

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SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.7.2

This SR verifies proper automatic operation of the NSWS valves on an actual or simulated actuation safety injection signal. The NSWS is a normally operating system that cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.7.7.3

This SR verifies proper automatic operation of the NSWS pumps on an actual or simulated actuation signal. The NSWS is a normally operating system that cannot be fully actuated as part of normal testing during normal operation. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

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REFERENCES

1. UFSAR, Section 9.2.
2. UFSAR, Section 6.2.
3. UFSAR, Section 5.4.
4. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
5. 10 CFR 50, Appendix A, GDC 5, "Sharing of Structures, Systems, and Components".

FIGURE B 3.7.7-1 NUCLEAR SERVICE WATER SYSTEM

