

### 3.7 PLANT SYSTEMS

#### 3.7.8 Service Water (SW) System

LCO 3.7.8 The SW System shall be OPERABLE with:

- a. Six OPERABLE SW pumps;
- b. SW ring header continuous flowpath not interrupted;
- c. Required automatic non-essential-SW-load isolation valves OPERABLE or affected non-essential flowpath isolated; and
- d. Opposite unit containment accident fan cooler unit SW outlet motor operated valves closed or SW flowpath isolated.

-----NOTE-----  
Only five SW pumps are required to be OPERABLE with one unit in MODE 5 or 6, or defueled, and the SW System capable of providing required cooling water flow to required equipment.  
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APPLICABILITY: MODES 1, 2, 3, and 4.

#### ACTIONS

-----NOTE-----  
Enter applicable Conditions and Required Actions for systems made inoperable by SW System.  
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CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SW pump inoperable.  <u>AND</u>  Both units in MODES 1, 2, 3, or 4.	A.1 Restore SW pump to OPERABLE status.	7 days  <u>AND</u>  14 days from discovery of failure to meet the LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Two or three SW pumps inoperable.	B.1 Restore SW pump(s) to OPERABLE status.	72 hours
C. SW ring header continuous flowpath interrupted.	C.1 Verify SW System capable of providing required cooling water flow to required equipment.  <u>AND</u> C.2 Restore the SW ring header continuous flowpath.	1 hour   7 days  <u>AND</u> 14 days from discovery of failure to meet the LCO
D. -----NOTE----- Separate Condition entry is allowed for each non-essential-SW-load flowpath. -----  One or more non-essential-SW-load flowpath(s) with one required automatic isolation valve inoperable.  <u>AND</u>  Affected non-essential flowpath(s) not isolated.	D.1 -----NOTE----- Not required to be met if in Condition E. -----  Verify required redundant automatic isolation valve in the affected non-essential flowpath(s) OPERABLE.  <u>AND</u> D.2 Isolate the affected non-essential flowpath(s).	1 hour   72 hours  <u>AND</u> 14 days from discovery of failure to meet the LCO

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## BASES

### BACKGROUND (continued)

Emergency Diesel Generator output breaker closure generates an automatic sequenced start of the SW pumps in order to meet the immediate cooling needs of G-01 and/or G-02 upon a Loss of Offsite Power event. This function is not required for SW pump OPERABILITY. The Bases for LCO 3.8.1, "AC Sources – Operating," provides information regarding this function on standby emergency power OPERABILITY.

Additional information about the design and operation of the SW System, along with a list of the components served, is presented in the FSAR, Section 9.6 (Ref. 1).

### APPLICABLE SAFETY ANALYSES

The design basis of the SW System is three SW pumps when both units are in MODES 1, 2, 3 or 4 (Refs 5 and 6), in conjunction with the CCW System and a 100% capacity containment cooling system, to remove core decay heat following a design basis LOCA as discussed in the FSAR, Section 14.3.4 (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 SW System is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The SW System, in conjunction with the CCW System, also cools the unit from residual heat removal (RHR), as discussed in the FSAR, Section 9.2, (Ref. 3) 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 pumps and heat exchangers that are operating. Heat transferred from the reactor core to the SW System during accidents and anticipated operational occurrences in which the unit is cooled down and placed on residual heat removal (RHR) operation is removed by Lake Michigan. Operating limits for the SW System are based on the approved SW System analyses as stated in Appendix C, Additional Conditions, Operating Licenses DPR-24 and DPR-27.

The SW System satisfies Criterion 3 of the NRC Policy Statement.

### LCO

The SW System is required to be OPERABLE to provide the required redundancy to ensure that the system will function to remove post accident heat loads, assuming the worst case single active failure. The SW System is OPERABLE during MODES 1, 2, 3, and 4 when:

- a. six SW pumps are OPERABLE;

## BASES

- LCO (continued)
- b. the SW ring header continuous flowpath is not interrupted;
  - c. the required non-essential-SW-load isolation valves are OPERABLE or the affected non-essential flowpath is isolated;
  - d. the opposite unit's containment fan cooler SW outlet motor operated valves are closed or the SW flowpath is isolated; and
  - e. the instrumentation and controls required to perform the safety related function are OPERABLE.

The LCO is modified by a Note indicating that only five SW pumps are required to be OPERABLE with one unit in MODE 5 or 6, or defueled, and the SW System is capable of providing required cooling water flow to required equipment. Operation of the SW System with five operable Service Water pumps for an indefinite period of time is allowed if the system is in a configuration that ensures that all relevant design basis requirements are met while sustaining the most limiting single active failure. If only five SW pumps are operable, the most limiting single active failure is the loss of the safeguards train that provides the "Start" signal for three of the operable SW pumps.

Calculations (References 5 and 6) demonstrate that two operating SW pumps are sufficient to meet all the current design basis acceptance criteria, provided that enough SW flowpaths are isolated prior to the postulated accident. The required SW configuration is specified in TRM 3.7.7. The isolation of these flowpaths necessitates that the non-accident unit be in MODE 5 or 6, or defueled.

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

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

ACTIONS The Actions Table is modified by a Note which requires the applicable Conditions and Required Actions to be entered for the system made inoperable as a result of any SW System inoperability. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

## BASES

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### ACTIONS (continued) A.1

If one SW pump is inoperable and both units are in MODES 1, 2, 3 or 4, action must be taken to restore the pump to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE SW pumps assure adequate system flow capability. However, the overall reliability is reduced because a single failure could result in less than the required number of pumps to assure this flow. The 7 day Completion Time is based on the redundant capabilities afforded by the remaining OPERABLE pumps, and the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO. The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 7 days and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

### B.1

If two or three SW pumps are inoperable, action must be taken to restore at least the minimum number of pumps to OPERABLE status required to exit this Condition within 72 hours. In this Condition, the remaining OPERABLE SW pumps are capable of providing the required system flow capability provided the requirements of the LCO are met (e.g., SW ring header continuous flowpath, non-essential SW isolation valves and the opposite Unit's containment fan cooler service water outlet valves). With four or more SW pumps inoperable, Condition G must be entered.

The 72 hour Completion Time is based on the redundant capabilities afforded by the remaining OPERABLE pumps, the probability for an additional active or passive failure, and the low probability of a DBA occurring during this time period.

### C.1 and C.2

If the SW ring header continuous flowpath is interrupted, the ability of the System to provide required cooling water flow to required equipment must be verified within 1 hour. The 1 hour Completion Time for Required Action C.1 effectively limits the allowed system configuration to alignments previously evaluated and found

## BASES

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**ACTIONS (continued)** acceptable (Reference 4). Evaluated alignments with the continuous flowpath interrupted include a minimum required number of OPERABLE SW pumps with each OPERABLE SW pump aligned to all required portions of the SW header. Acceptable alignments must comport to the SW system analyses. Additionally, the 1 hour Completion Time provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) without requiring initiation of a unit shutdown. The 1 hour Completion Time is commensurate with the importance of maintaining the SW System in an OPERABLE configuration.

Additionally, Required Action C.2 directs that the SW ring header continuous flowpath must be restored within 7 days. Since acceptable alignments during this period may include less than five OPERABLE SW pumps, Required Action B.1 may limit operation in Condition C to less than 7 days.

With one or more ring header isolation valves incapable of being closed, the SW System will continue to be capable of providing the required cooling water flow to required equipment. However, the ability to isolate a break in the system while continuing to provide cooling water to required equipment may be impaired.

With one or more ring header isolation valves closed, the SW System may remain capable of providing the required cooling water flow to the minimum required number of components depending on system alignment and the OPERABILITY of other SW System components.

Multiple closed ring header isolation valves could result in loss of cooling water to required equipment (e.g. closure of valves SW-2869 and SW-2870 will render two of the four containment fan coolers inoperable on each Unit). If multiple closed ring header isolation valves result in required equipment being inoperable, the Note to the ACTIONS Table requires entry into the applicable conditions and required actions for the systems made inoperable.

The 7 day Completion Time is acceptable based on the redundant capabilities afforded by the remaining OPERABLE equipment, and the low probability of a DBA or SW System line break occurring during this time period. Piping failures are not considered as the single failure for system functionality during an accident.

The second Completion Time for Required Action C.2 establishes a limit on the maximum time allowed for any combination of Conditions to be in

## BASES

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ACTIONS (continued) effect during any continuous failure to meet this LCO. The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 7 days and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

### D.1 and D.2

In the event one required automatic isolation valves in one or more non-essential-SW-load flowpath(s) is inoperable and the affected non-essential flowpath(s) is not isolated, the required redundant automatic isolation valve in the affected non-essential flowpath(s) must be verified OPERABLE within 1 hour. This verification may be performed administratively.

The 1 hour Completion Time for Required Action D.1 provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) without requiring initiation of a unit shutdown. The 1 hour Completion Time is commensurate with the importance of maintaining the SW System in an OPERABLE configuration. Required Action D.1 is modified by a Note stating it is not required to be met if in Condition E. This Note precludes entry into Condition H, when the required redundant automatic isolation valve in the affected non-essential flowpath(s) is inoperable and Required Action D.1 cannot be met.

Additionally, the valve(s) must be restored to OPERABLE status or the flowpath(s) isolated with a seismically qualified isolation valve within 72 hours. In this Condition, the overall reliability is reduced because a single failure could result in system configuration which could not assure adequate flow to required equipment. The 72 hour Completion Time is based on the flow capabilities afforded by the number of OPERABLE pumps, and the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action D.2 establishes a limit on the maximum time allowed for any combination of Conditions to be in effect during any continuous failure to meet this LCO.

The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 72 hours and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

## BASES

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### ACTIONS (continued) E.1 and E.2

With two required automatic isolation valves in one or more non-essential-SW-load flowpath(s) inoperable, the affected flowpath(s) shall be isolated with a seismically qualified isolation valve within 1 hour. The Completion Time of 1 hour reflects the importance of isolating the non-essential-SW-loads to meet SW capacity demands under limiting conditions.

### F.1 and F.2

If one or more opposite unit containment fan cooler service water outlet motor operated valves are open and the opposite unit containment accident fan cooler unit SW flowpath is not isolated, the ability of the SW System to provide required cooling water flow to required equipment must be verified within 1 hour. The 1 hour Completion Time for ACTION F.1 effectively limits the allowed system configuration to a configuration that has been previously evaluated and found acceptable. Additionally, the 1 hour Completion Time provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) without requiring initiation of a unit shutdown. The 1 hour Completion Time is commensurate with the importance of maintaining the SW System in an OPERABLE configuration.

Additionally, the flowpath associated with any opposite unit containment fan cooler service water outlet motor operated valve that is open must be isolated within 72 hours. (The flowpath is considered isolated if total flow would not exceed the expected flowrate during accident conditions.) In this Condition, the overall reliability is reduced because a single failure could result in a system configuration which could not assure adequate flow to required equipment. The 72 hour Completion Time is based on the confirmed ability of the SW pumps to provide required cooling water flow to required components. This time frame is also considered acceptable based on the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action F.2 establishes a limit on the maximum time allowed for any combination of Conditions to be in effect during any continuous failure to meet this LCO. The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 72 hours and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.



## BASES

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### ACTIONS (continued) G.1

If four or more SW pumps are inoperable, action must be taken within 1 hour to restore the SW pump(s) to OPERABLE status. The 1 hour Completion Time provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) to either restore the pump(s) to OPERABLE status or prepare for an orderly shutdown of the plant, and is commensurate with the importance of maintaining the SW System in an OPERABLE configuration.

#### H.1 and H.2

If the SW System cannot be restored to OPERABLE status within the associated Completion Times, 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 3.7.8.1

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

Verifying the correct alignment for manual, power operated, and automatic valves in the SW System flow path provides assurance that the proper flow paths exist for SW System operation. Included within the scope of this SR are the containment accident fan cooler isolation valves for the opposite unit. 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 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

## BASES

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### SURVEILLANCE REQUIREMENTS (continued)

#### SR 3.7.8.2

This SR verifies proper automatic operation of the SW System non-essential-SW-load isolation valves on an actual or simulated actuation signal. The SW System 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 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

#### SR 3.7.8.3

This SR verifies proper automatic operation of the SW System pumps on an actual or simulated actuation signal. The SW System is a normally operating system that cannot be fully actuated as part of normal testing during normal operation. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

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### REFERENCES

1. FSAR. Section 9.6.
  2. FSAR. Section 14.3.4.
  3. FSAR. Section 9.2.
  4. Technical Requirements Manual, TLCO 3.7.7, SW System
  5. 97-0054-04-C, LOCA Injection Phase Calculation
  6. 97-0126-04-C, LOCA Recirculation Phase Calculation.
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