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16.9 AUXILIARY SYSTEMS

16.9.7 KEOWEE LAKE LEVEL

COMMITMENT

Ensure the proper requirements are met for the following lake Keowee level ranges.

APPLICABILITY: Maintain level to ensure operability of specified systems and/or components.

NOTE: An instrument error of ± 1.15 ft has been applied to lake levels identified in this SLC. This is based on control room indicator or computer point being used to verify level. Keowee personnel may be contacted to determine absolute lake level. Levels identified as (abs) are absolute values without instrument error included.

LAKE LEVEL	REQUIRED ACTION	REQUIRED ACTION NOT MET
A. All Lake Levels	A.1 Verify the availability of the EWST and HPSW-25 to supply sealing and lubrication to the CCW Pump shafts.	A.1.1 If the EWST or HPSW-25 are unavailable and the Absolute Lake Level is below 798.1 feet, then the LPSW system is inoperable. Enter Tech. Spec. 3.0. If Absolute Lake Level is above 798.1 feet, contact Mechanical Systems Engineering to determine if Gravity flow is available. If gravity flow is not available, enter Tech. Spec. 3.0.

LAKE LEVEL	REQUIRED ACTION	REQUIRED ACTION NOT MET
B. Lake Level < 801.15 ft. (800.0 abs)	B.1 Verify at least two sources of CCW are available by <u>siphon</u> flow to the CCW crossover piping. The two sources must come from different Oconee Units. To ensure the sources will siphon flow to the CCW crossover piping, the CCW intake piping must be maintained water solid. At least 3 CCW pumps <u>shall</u> be running for any unit to be considered a source.	B.1.1 If only one siphon assisted source is available, then the LPSW system cannot withstand a single failure. Enter a 72 hour LCO per T.S. 3.3.7.
		B.1.2 If no siphon assisted sources are available, then declare the LPSW system inoperable. Enter T.S. 3.0.
	B.2 For any Oconee Unit with an RCS temperature $\geq 250^{\circ}$ F, verify at least 3 CCW pumps are running on that unit to ensure the flow through the condenser portion of the ECCW (second siphon) is operable.	B.2.1 Declare the ECCW system inoperable per T.S. 3.4.5 on the applicable Oconee Unit.
C. Lake level < 796.65 ft. (795.5 abs)	C.1 Declare the Keowee Step-up Transformer <u>Mulsifyre</u> inoperable AND Refer to SLC 16.9.2 to establish required firewatch.	C.1.1 Notify Compliance of the need to meet the reporting requirements of SLC 16.9.2.

LAKE LEVEL	REQUIRED ACTION	REQUIRED ACTION NOT MET
D. Lake level < 790.15 ft. (789 abs)	D.1 Verify at least two sources of CCW are available by <u>siphon</u> flow to the CCW crossover piping. The two sources must come from different Oconee Units. To ensure the sources will siphon flow to the CCW crossover piping, the CCW intake piping must be maintained water solid. For any unit to be considered a source, all 4 CCW pumps <u>shall</u> be running.	D.1.1 If only one siphon assisted source is available, then the LPSW system cannot withstand a single failure. Enter a 72 hour LCO per T.S. 3.3.7.
		D.1.2 If no siphon assisted sources are available, then declare the LPSW system inoperable. Enter T.S. 3.0.
	D.2 For any Oconee unit with an RCS temperature $\geq 250^{\circ}\text{F}$, verify all 4 CCW pumps are running on that unit to ensure the flow through the condenser portion of the ECCW (second siphon) is operable.	D.2.1 Declare the ECCW system operable per T.S. 3.4.5 on the applicable Oconee unit.
E. Lake level < 787.40 ft. (786.25 abs)	E.1 Prior to lake level decreasing below 787.40 close valves (1) (2) 3CCW-319 and (1) (2) 3CCW-320.	E.1.1 Declare the affected unit unavailable as a siphon assisted source. Refer to item D, above.
F. Lake level < 787.15 ft. (786.00 abs)	F.1 Restore lake level to greater than 787.15.	F.1.1 The LPSW system cannot withstand a single failure. Enter a 72 hour LCO per T.S. 3.3.7.

SURVEILLANCE: Keowee Lake Level shall be monitored once per shift.

BASES:

The CCW system provides the suction source to the CCW crossover piping which supplies suction to the LPSW system. Normally this crossover header is aligned to all three Oconee Units and any operating CCW pump can provide adequate flow for the requirements of the LPSW systems for all 3 units. During certain analyzed accident conditions, a loss of power to the CCW pumps for all 3 units must be assumed. This results in a loss of forced flow to the CCW crossover header.

In the event of loss of off-site power (LOOP), the Emergency CCW (ECCW) siphon must be capable of supplying suction to the LPSW pumps to meet the requirements of Tech Spec 3.3.7. The ECCW supply to LPSW (first siphon) must be capable of withstanding a single active failure. In support of the ECCW supply to LPSW siphon, HPSW must supply seal water to the CCW pump shafts to prevent air inleakage that may defeat the siphon. The EWST through HPSW-25 provides the seal water necessary to the CCW pumps immediately following a LOOP (Refer to SLC 16.9.1 for HPSW pump requirements). If all AC power is lost (SBO event), ECCW must be capable of supplying flow through the condensers (second siphon) for decay heat removal per Tech Spec 3.4.5. Single failure is not postulated for SBO events.

With the lake level less than 801.15 feet, siphon flow capability must be established. To ensure a siphon flowpath will be established in the event forced flow is stopped, at least one unit's CCW flowpath from the intake structure to the CCW crossover must be maintained water solid. Since the Continuous Vacuum Priming connections to the CCW inlet piping are normally isolated, the CCW flowpath is maintained water solid by requiring a minimum number of CCW pumps operating. Water solid is defined as sufficient positive pressure to prevent gases from coming out of solution and sufficient flow to ensure gases that may come out of solution will be swept away and not accumulate to the point of blocking siphon flow. A CCW flowpath is defined as two 8 ft. CCW pump discharge valves open to a common 11 ft. CCW inlet header.

The minimum number of CCW pumps necessary to ensure siphon flow capability varies with lake level. With lake level between 801.15 and 790.15, the CCW flowpath is maintained water solid by operating at least three CCW pumps on each Oconee unit being used as a siphon source. In the event lake level falls below 790.15, the CCW flowpath is maintained water solid by operating all four CCW pumps on that Oconee unit.

With lake level greater than 799.25 feet (798.1 abs), it may be possible to provide adequate suction pressure to the LPSW pumps due to gravity flow without dependance upon siphon flow. For simplicity, information is not included to determine if gravity flow is possible. Mechanical Systems Engineering should be contacted to determine whether or not gravity flow is possible if an LCO is entered and lake level is greater than 799.25.

Due to a potential single failure that could close all the CCW pump discharge valves associated with one Oconee unit, siphon sources from at least two

Oconee unit's CCW intakes must be available to supply the CCW crossover header. A 72 hour LCO must be entered per Tech Spec 3.3.7 if only one siphon source is available.

The minimum number of running CCW pumps required to provide siphon flow to the CCW crossover piping, as described above, will also ensure operability of ECCW siphon flow through the condenser, also known as the "second siphon". If any Oconee unit fails to maintain the minimum number of CCW pumps running when the RCS is heated above 250°F as described in items A and C, then the ECCW system for that unit must be declared inoperable per Tech Spec 3.4.5.

Should lake level fall below 796.65, the Keowee main Step-up Transformer Mulsifyre system may not provide the required flowrates. For this reason, the Mulsifyre should be declared inoperable and the appropriate compensatory actions taken.

Should lake level fall below 787.40, a postulated pipe break (due to a seismic event) downstream of valves (1)(2)3CCW-319 and (1)(2)3CCW-320 could cause a loss of the siphon supply to the CCW crossover for any unit which has these valves open. For this reason, it should be verified that the two units being utilized for meeting the requirements of A.1 or C.1 have their respective Radwaste supply valves closed prior to lake level decreasing below 787.40.

With lake level below 787.15, the LPSW pumps could experience inadequate NPSH with siphon flow from the CCW intake. Calculations show this could occur if a single failure causes the minimum number of LPSW pumps (one for Unit 3 or two for the shared Unit 1 and 2 systems) to be available during a design basis event. Therefore, the LPSW system must be considered unable to withstand a single failure for lake level below 787.15 and a 72 hour LCO must be entered per T.S. 3.3.7. Action should be initiated to raise and maintain Keowee lake level >787.15. The level of 787.15 for LPSW system operability is based upon calculations and testing performed to determine the level required to ensure adequate NPSH to the LPSW pumps during worst case accident configurations. This testing in conjunction with flow model calculations determined that this lake level would be sufficient to maintain the LPSW systems operable, provided additional steps as identified by procedural guidance to the operators were utilized.

REFERENCES:

1. PIR 0-092-0535
2. Calculation OSC-5018, Rev. 1
3. Units 1 and 2 LPSW System Flow Test, TT/1/A/0251/21
4. CCW Design Basis Document
5. Calculation OSC-2895, Rev. 3
6. Calculation OSC-5325
7. PIR-4-090-0109
8. LER 269/93-04, Rev. 0 and Rev. 1
9. Calculation OSC-5304
10. Calculation OSC-5022, Rev. 1
11. Calculation OSC-2280, Rev. 5
12. Calculation OSC-5349, Rev.1
13. Calculation OSC-5670, Rev. 1
14. Calculation OSC-5461, Rev. 2

STATION MANAGER APPROVAL BL Peete by JH 76 DATE 10-27-94