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16.9 AUXILIARY SYSTEMS

16.9.1 Fire Suppression Water Supply Systems

COMMITMENT The Fire Suppression Water Supply Systems shall be OPERABLE as follows:

Oconee

a. High Pressure Service Water (HPSW) pumps A and B with automatic initiation logic, and associated piping and valves supplying water to the sprinkler system and fire hose stations.

b. The HPSW pumps shall be aligned to the high pressure fire header.

Keowee

c. The Fire Protection Pump, automatic initiation logic. the associated piping and valves supplying water to the Main Transformer water spray system and hose stations listed in SLC 16.9.4 with the exception of the Mechanical Equipment Gallery stations

----------NOTE----------
The Oconee High Pressure Service Water (HPSW) system is used both in support of the Oconee Low Pressure Service Water (LPSW) system and for Fire Suppression. The most restrictive requirements for the HPSW system are derived from the support function for LPSW. (See SLC 16.9.8 - HPSW requirement to support LPSW.)

APPLICABILITY: At all times

16.9 AUXILIARY SYSTEMS

16.9.7 Keowee Lake Level

COMMITMENT a. Keowee lake level shall be > 794.15 ft to ensure that the requirements of ITS 3.7.7 (LPSW System) are met for all three Units.

b. One siphon sources shall be OPERABLE to ensure that the requirements of ITS 3.7.7 (LPSW System) are met for Unit 1.

c. The HPSW system shall be OPERABLE to supply sealing water to the CCW pumps to ensure that the requirements of ITS 3.7.7 (LPSW System) are met for Unit 1.

d. Maintain lake level ≥ 784.15 ft to assure that the Keowee Oil Storage Room Water Spray System shall be OPERABLE.

e. Maintain lake level ≥ 781.15 ft to assure that adequate water supply shall be available for 7 days of Keowee emergency operation.

f. Maintain lake level ≥ 780.60 ft to assure that the Keowee Step-up Transformer Mulsifyre System shall be OPERABLE.

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

1. The requirements of Commitment a, b and c do not apply in MODE 5.

2. The requirements of Commitments b and c do not apply to Unit 2 and 3.

3. Commitment f does not apply in MODE 5 when the Keowee step up transformer is not required to be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, 4,
MODE 5 when a Keowee Hydro Unit (KHU) is required to be OPERABLE

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. HPSW System not available to supply sealing water to CCW pumps. OR HPSW System not available to supply sealing water to Unit 3 CCW pumps.	A.1 Verify lake level is greater than minimum level required for gravity (non-siphon) flow per Table 16.9.7-1. OR A.2 ----------NOTE---------- Unit 2 cannot supply both Units 1 & 2 LPSW pumps and Unit 3 LPSW pumps simultaneously. ---------- Verify LPSW pumps are capable of being supplied suction by Unit 2 ECCW per ITS 3.7.8.	Immediately Immediately
B. Required Action and associated Completion Time of Condition A not met.	B.1 Enter ITS LCO 3.0.3.	Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One required siphon source from Unit 1 inoperable.	C.1 Establish an additional siphon source by starting additional CCW pump(s) on Unit 1. OR C.2 ----------NOTE---------- Unit 2 cannot supply both Units 1 & 2 LPSW pumps and Unit 3 LPSW pumps simultaneously. ---------- Verify LPSW pumps are capable of being supplied suction by Unit 2 ECCW per ITS 3.7.8 OR C.3 Verify lake level greater than minimum level required for gravity (non-siphon) flow per Table 16.9.7-1.	Immediately Immediately Immediately
D. Required Action and associated Completion Time of Condition C not met.	D.1.1 Verify one ECCW siphon header OPERABLE on Unit 2. AND D.1.2 Enter applicable Condition for one required LPSW pump inoperable in accordance with ITS 3.7.7. OR D.2 Enter ITS LCO 3.0.3.	Immediately Immediately Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Keowee Lake Level < 794.15 ft.	E.1 Enter applicable Condition for one required LPSW pump inoperable in accordance with ITS 3.7.7.	Immediately
F. Keowee Lake Level < 784.15 ft.	F.1 Declare the Keowee Oil Storage Room Water Spray System inoperable.	Immediately
G. Keowee Lake Level < 781.15 ft.	G.1 Cease commercial power generation using KHUs. AND G.2 Notify the Plant Operations Review Committee (PORC) per NSD-308 and Request plant operation (and reportability) guidance.	Immediately Immediately
H. Keowee Lake Level < 780.6 ft.	H.1 Declare Keowee Step-up transformer Mulsifyre inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 16.9.7.1	Verify Keowee lake level is within limits.	12 hours

TABLE 16.9.7-1
MINIMUM LAKE LEVEL FOR GRAVITY FLOW TO LPSW PUMPS SUCTION

If Keowee lake level ≥ minimum lake level in the following table, then gravity flow will provide adequate suction for the LPSW pumps without relying on the ECCW siphon:

Number of CCW Pump Discharge Valves Currently Open	Minimum Lake Level for Gravity Flow (feet absolute) *
1	805.06
2	801.79
3	800.85
4	800.37
5	800.08
6	799.87
7	799.71
8	799.59
9	799.48
10	799.40
11	799.33
12	799.26

* Note: These lake levels are based on the assumption that all CCW crossover isolation valves (1CCW-40, 2CCW-41, 3CCW-42 and 3CCW-94) are open. If any of these valves are closed. contact Mechanical Systems Engineering to determine the minimum lake level required for gravity flow.

BASES:

An instrument error of 1.15 ft has been added to the absolute lake level to obtain the indicated lake levels identified in this SLC. The indicated lake levels in this SLC are based on the use of a computer point to verify level. Absolute lake level can be determined at the Keowee Hydro intake structure.

LPSW System Commitments:

UNITS 2 and 3:

The CCW system provides the source of water to the CCW crossover piping which supplies suction to the LPSW system. Normally, this crossover header is aligned to all three Oconee units, and CCW pumps provide adequate flow for the requirements of the LPSW systems for all 3 units. To meet the requirements of ITS 3.7.7, the Emergency CCW (ECCW) system must be capable of supplying suction to the LPSW pumps in the event of a Loss of Off-site Power (LOOP). The ECCW supply to LPSW must be capable of withstanding a single active failure.

After a loss of power to the CCW pumps, the ECCW System is designed to supply suction to the LPSW pumps using a siphon assisted by the Essential Siphon Vacuum (ESV) pumps. ITS 3.7.8 establishes requirements for the ECCW and ESV Systems.

UNIT 1:

The CCW system provides the source of water to the CCW crossover piping which supplies suction to the LPSW system. Normally, this crossover header is aligned to all three Oconee units, and CCW pumps provide adequate flow for the requirements of the LPSW systems for all 3 units. To meet the requirements of ITS 3.7.7, the Emergency CCW (ECCW) system must be capable of supplying suction to the LPSW pumps in the event of a Loss of Off-site Power (LOOP). The ECCW supply to LPSW must be capable of withstanding a single active failure.

After a loss of power to the CCW pumps, the ECCW System is designed to supply suction to the LPSW pumps using an unassisted siphon. To maintain siphon flow capability, the ECCW piping must be relatively air-free and leak-tight. At high lake levels, such as those depicted in Table 16.9.7-1, gravity flow may be adequate to supply suction to the LPSW pumps without relying on the siphon.

To help maintain ECCW siphon flow capability, HPSW must supply seal water to the CCW pump shafts to prevent air inleakage that may defeat the siphon. The Elevated Water Storage Tank (EWST) through valve HPSW-25 provides the seal water necessary to the CCW pumps immediately following a LOOP. For longer-term CCW pump restart capability following a LOOP, refer to SLC 16.9.8 for HPSW pump requirements.

If the lake level is > 799.26 feet, it is possible to provide adequate suction pressure to the LPSW pumps due to gravity flow without dependance upon siphon

flow. The minimum lake level for gravity flow depends on the number of open CCW pump discharge valves before and during the LOOP event. Since the CCW pump discharge valves remain as is after a LOOP event, the number of open CCW pump discharge valves during a LOOP is the same as the number of open CCW pump discharge valves before the LOOP event. Table 16.9.7-1 provides the minimum lake level for gravity flow as a function of the number of open CCW pump discharge valves.

To ensure siphon capability will be established in the event forced flow is stopped, the CCW inlet piping 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 piping is maintained water-solid by requiring a minimum number of CCW pumps operating on a given unit. "Water-solid" is defined as sufficient positive pressure to prevent gases from coming out of solution and sufficient flow to ensure accumulated gases will be swept away. The CCW flowpath is maintained water-solid by operating at least three CCW pumps on each Oconee unit being used as a siphon source.

One siphon sources shall be capable of providing siphon flow to the LPSW pumps. A "siphon source" for Unit 1 is defined as a water-solid flow path consisting of two 8 ft. CCW pump discharge valves open to a common 11 ft. CCW inlet header. One 11 ft. CCW inlet header being supplied by two CCW pumps alone does not constitute a siphon source. This is because a third CCW pump must be running to supply sufficient back-pressure through the other 11 ft. CCW inlet header. Therefore, whenever at least three CCW pumps are operating on a given unit, a water-solid flow path is assured in the 11 ft. CCW inlet header being fed by the two pumps. Running four CCW pumps does not result in two siphon sources on one unit.

The failure of a siphon source for Units 1 is not postulated since the siphon sources contain no active components. If the Unit 2 ECCW System is fully OPERABLE per ITS 3.7.8, then Unit 2 may be credited for supplying either the Units 1 & 2 LPSW pumps or the Unit 3 LPSW pumps, and an ACTION need not be declared for those pumps being supplied by Unit 2 ECCW. If a 72 hour ACTION has been declared because lake level has fallen below 794.15 ft, then at least one siphon source must continue to be maintained to avoid entering ITS 3.0.3.

Since ITS 3.7.8 has been implemented for Units 2 and 3, this SLC does not apply to Unit 2 and 3. However, Unit 2 can help in meeting the requirement to maintain two siphon sources for Units 1. For example, if Unit 1 cannot operate three CCW pumps, then Unit 2 may be credited as one of the two required siphon sources provided that both ECCW siphon headers for Unit 2 are OPERABLE under ITS 3.7.8. Since the Unit 2 ECCW siphon headers rely on active components, they are vulnerable to active single failures. Therefore, both ECCW headers for Unit 2 must be OPERABLE for Unit 2 to qualify as a single siphon source for Unit 1.

If only one ECCW siphon header is OPERABLE for Unit 2 and Unit 1 cannot be its own siphon source, then the Units 1 and 2 LPSW pumps are not single failure proof and an appropriate Action for one required LPSW pump inoperable entered in accordance with ITS 3.7.7 for Unit 1

ALL THREE UNITS:

With lake level below 794.15 ft, calculations show that the LPSW pumps could experience inadequate NPSH with assisted siphon flow if a single failure causes only the minimum number of LPSW pumps (two for the shared Unit 1 and 2 LPSW System) 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 794.15 ft and a 72 hour ACTION must be entered per ITS 3.7.7 by declaring one required LPSW pump inoperable.

Keowee Oil Storage Room Commitment:

Should lake level fall below 784.15 ft, the Keowee Oil Storage Room water spray system may not provide the required flow rates because the system is dependent on lake level for driving head. For this reason, the spray system should be declared inoperable.

Keowee Hydro Station Commitment:

With lake level below 781.15 ft, the water supply (for Keowee Hydro Station to provide emergency power to the overhead path at 46.5 MVA and the underground path at 22.35 MVA) could be inadequate for 7 days of continuous operation at these levels. Neither Keowee Hydro or Oconee Nuclear Station should be considered inoperable at this lake level. Keowee Hydro should not generate to the grid at lake levels below 781.15 ft in order to ensure ample water capacity for emergency power operation.

Keowee Main Start-up Transformer Commitment:

Should lake level fall below 780.60 ft, the Keowee main Step up Transformer Mulsifyre system may not provide the required flow rates because the system is dependent upon lake level for driving head. For this reason, the Mulsifyre should be declared inoperable.

REFERENCES:

1. PIR 0 092 0535, Potential Insufficient NPSH for LPSW pumps
2. LER 269/93 04, Rev. 0 and Rev. 1
3. OSS-0254.00-00-1003, Rev. 8, Design Basis Specification for the CCW System
4. OSS-0254.00-00-1039, Rev. 10, Design Basis Specification for the LPSW System
5. Calculation OSC 2895, Rev. 4, Hydraulic Calculations for Keowee Deluge Systems
6. Calculation OSC 5325, Rev. 0, Keowee Lake Level Uncertainty Calculation
7. Calculation OSC 5304, Rev. 1, Minimum Lake Level for Radwaste Equipment Cooling System Isolation
8. Calculation OSC 5022, Rev. 1, USQ Evaluation for Operability Evaluation of PIR 0-092-0535
9. Calculation OSC 2280, Rev. 10, LPSW NPSH and Minimum Required Lake Level

10. Calculation OSC 5349, Rev. 1, Minimum Lake Level Required to Maintain Sufficient NPSH to the LPSW pumps via Gravity Flow
11. Calculation OSC 5670, Rev. 5, Required Number of CCW Intake Flow Paths
12. Calculation OSC 5461, Rev. 1, Isolation of the Continuous Vacuum Priming System to the CCW Intake Piping
13. Calculation OSC-5409, Rev. 4, Single Failure Analysis of the ECCW System Supply to the LPSW Supply
14. Calculation OSC-3528, Rev. 3, Keowee Lake Level Minimum Administartive Limits
15. CTS 3.19, Emergency Condensor Circulating water, Ammendment Nos. 229/230/226

16.9 AUXILIARY SYSTEMS

16.9.8 HPSW Pump Requirements to Support LPSW

COMMITMENT The HPSW System shall be OPERABLE as follows:

a. Two HPSW Pumps (combination of two of either HPSW A, HPSW B or Jockey Pump) shall be OPERABLE and capable of restarting prior to complete drain of the Elevated Water Storage Tank (EWST),

AND

b.1 The EWST with HPSW-25 shall be OPERABLE to provide sealing/cooling water for CCW Pumps.

OR

b.2 Lake level shall be above the minimum lake level necessary to provide gravity flow to the suction of the LPSW Pumps without dependency on siphon flow.

----------NOTE----------
This Selected Licensee Commitment does not apply to Units 2 and 3.

APPLICABILITY: Any time the LPSW system is required to be operable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Jockey Pump unable to maintain EWST level. OR Jockey Pump unable to fill EWST.	A.1 Declare Jockey Pump inoperable. AND A.2 Initiate actions to evaluate EWST operability	Immediately Immediately
B. One required HPSW pump inoperable. AND --------NOTE--------- Unit 2 ECCW cannot supply both Units 1 & 2 LPSW pumps and Unit 3 LPSW pumps simultaneously. ---------- Required LPSW pump not supplied by Unit 2 ECCW per ITS 3.7.8.	B.1 Declare required LPSW pump not supplied by Unit 2 ECCW inoperable.	Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One Unit 1 Main Feeder Bus inoperable. AND --------NOTE--------- Unit 2 ECCW cannot supply both Units 1 & 2 LPSW pumps and Unit 3 LPSW pumps simultaneously. ---------- Required LPSW pump not supplied from Unit 2 ECCW per ITS 3.7.8.	C.1 Declare affected LPSW pump inoperable.	Immediately
D. Two required HPSW pumps inoperable. AND --------NOTE--------- Unit 2 ECCW cannot supply both Units 1 & 2 LPSW pumps and Unit 3 LPSW pumps simultaneously. ---------- LPSW pumps not supplied from Unit 2 ECCW per ITS 3.7.8.	D.1 Enter ITS LCO 3.0.3.	Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. EWST inoperable AND Lake Level not adequate to support gravity flow per SLC 16.9.7. AND --------NOTE-------- Unit 2 ECCW cannot supply both Units 1 & 2 LPSW pumps and Unit 3 LPSW pumps simultaneously. ---------- LPSW pumps not supplied from Unit 2 ECCW per ITS 3.7.8.	E.1 Enter ITS LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 16.9.8.1 NA.	NA

BASES

Surveillance per SLC 16.9.1 and the Appendix B testing program is adequate to demonstrate the availability of the equipment and systems discussed here.

The HPSW system provides support for the LPSW system suction, station fire suppression capability, back-up service water to the TDEFW Pump Bearing and Oil coolers. HPSW system make-up demands are normally met by the HPSW Jockey Pump.

The HPSW system must provide upper guide bearing sealing and motor cooling to the Unit 1 CCW Pumps to ensure the CCW system can provide a suction supply to the LPSW system. This is required to provide sealing water for CCW Pump shafts to prevent loss of siphon flow and to provide cooling for the CCW Pump(s) after restart of the CCW Pump(s) for Unit 1. Sealing is required any time the CCW system is in the siphon flow mode of operation. Cooling to the CCW Pump motors is required any time the CCW Pumps are required to operate. The Unit 2 and Unit 3 CCW pumps no longer rely upon the HPSW system for these functions, since the Siphon Seal Water (SSW) System, supplied from the LPSW system, fulfills these functions. Under some conditions, the Unit 2 ECCW System can supply adequate suction supply to the LPSW pumps for either Units 1 and 2 or Unit 3 per ITS 3.7.8. Therefore, the action statements for SLC 16.9.8 allow credit for the Unit 2 CCW supply to the LPSW system if ITS 3.7.8 requirements are met.

At certain lake levels unassisted gravity flow may be possible. If so, the EWST is not required to support siphon flow by providing sealing of the CCW Pump Upper Guide Bearing to prevent some of the air in-leakage that could defeat the ECCW siphon. However, HPSW is still required to support operation of the Unit 1 CCW Pumps since procedures require that the Unit 1 CCW pumps must be restarted following a LOCA/LOOP.

LPSW takes suction from the CCW crossover header. During certain analyzed accident conditions, a loss of power to the CCW Pumps for all three units must be assumed. This results in a loss of forced flow to the CCW crossover header. Initially, the sealing requirements for Unit 1 are met via the EWST. The duration of the event may last beyond the capability of the inventory of the EWST. Therefore the HPSW Pumps must be capable of being started following a loss of power in order to meet the cooling and seal lubrication requirements of the Unit 1 CCW Pumps.

The HPSW Jockey Pump is supplied by "load shed" power and would not be available until after the load shed is reset. The CCW Design Basis Document (Section 20.1.1.3) requires a restart of a CCW Pump (for Unit 1) within one and one-half hours (for Unit 1). The load shed must be reset to restart the CCW pump (for Unit 1), thus the power would also be available to the Jockey Pump within that time frame. The Jockey Pump is of smaller capacity, would not meet fire protection capacity requirements, and would take longer to refill the EWST. Therefore, the Jockey Pump is considered as a substitute for an HPSW Pump only for purposes of supporting the siphon or the restart of a Unit 1 CCW Pump and not for Fire Protection.

The HPSW Jockey Pump is of smaller capacity than HPSW Pumps A and B. Calculation OSC-5945, "HPSW Pump and Fire Protection Flow Test Acceptance Criteria" calculates the accident loads and concludes the HPSW Jockey Pump has sufficient capacity to supply those loads plus system leakage provided it is able to fill the EWST or maintain the EWST level without HPSW pump operation. Accident loads plus system leakage are calculated to be approximately the same as normal loads plus normal system leakage.

All three HPSW pumps are powered from the Unit 1 Main Feeder Busses. Backup power to the Unit 1 Main Feeder Busses is not available from another unit. Therefore, if one of the two available Unit 1 Main Feeder Busses is removed from service, then the remaining HPSW pumps are vulnerable to a single failure of the other Unit 1 Main Feeder Bus. This would also result in LPSW not being single failure proof since HPSW is necessary for LPSW operation in the conditions described above.

An EWST level of 55,000 gallons (including instrument uncertainty) is the minimum level for EWST operability since this will ensure adequate inventory to supply seal water flow to the CCW pumps for at least 1.5 hours during a LOCA/LOOP. The EWST shall supply seal water flow to the CCW pumps to reduce the rate of air in-leakage at the CCW pump shaft seal that could defeat the ECCW siphon within less than 1.5 hours. Within 1.5 hours, operators are required to restart a CCW pump, and the abnormal procedure ensures that the Jockey Pump or an HPSW pump will be restarted to fill the EWST prior to restarting a CCW pump. The EWST is considered inoperable (1) if HPSW-25 is inoperable, (2) if in any way water cannot be supplied from the EWST to the CCW pumps, or (3) if EWST level is < 55,000 gallons. The 55,000 gallon minimum EWST level is based on the assumption that the Jockey Pump, when operating, is capable of maintaining the EWST level without HPSW pump operation. If the Jockey Pump cannot maintain EWST level when operating, and if this is due to an increase in system flow demands (as opposed to an equipment problem with the Jockey Pump), then the basis for the 55,000 gallons minimum level may be invalid. If this occurs, EWST operability should be evaluated for the specific circumstances to ensure the EWST level is adequate to maintain seal water to the CCW pumps for at least 1.5 hours.

REFERENCES:

1. OSC-5409, Rev. 6, "Single Failure Analysis of the ECCW System Supply to the LPSW System".
2. OSC-5349, Rev. 1, "Minimum Lake Level Required to Maintain Sufficient NPSH to the LPSW Pumps via Gravity Flow".
3. OSC-5945, Rev. 2, "HPSW Pump and Fire Protection Test Acceptance Criteria".
4. PIP 0-094-0952
5. PIP 0-094-0995
6. PIP 0-095-0307
7. PIP 0-095-0174

8. Oconee UFSAR Sections 9.2.2, 9.5.1, 15.0, Table 9-4, Figure 9-9 through 9-12; 12/31/97 update.
9. Selected Licensee Commitments 16.9.1, 16.9.7, as amended.
10. OSS-0254.00-00-1002, Rev. 9, "Design Basis Specification for HPSW".
11. OSS-0254.00-00-1039, Rev. 11, "Design Basis Specification for LPSW".
12. OSS-0254.00-00-1003, Rev. 10, "Design Basis Specification for CCW".
13. Letter dated 4/20/94 from J. W. Hampton (Duke) to NRC regarding supplemental information for revision to Tech. Spec. 3.4.
14. PIP 0-099-1054
15. AP/1/A/1700/011, Rev 21, "Loss of Power."