

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.7	Verify both KHU's underground tie breakers cannot be closed simultaneously.	12 months
SR 3.8.1.8	Verify each KHU's overhead emergency power path tie breaker cannot be closed when tie breaker to underground emergency power path is closed.	12 months
SR 3.8.1.9	Verify on an actual or simulated emergency actuation signal each KHU auto starts and: <ul style="list-style-type: none"> <li>a. Achieves frequency <math>\geq 57</math> Hz and <math>\leq 63</math> Hz and voltage <math>\geq 13.5</math> kV and <math>\leq 14.49</math> kV in <math>\leq 23</math> seconds; and</li> <li>b. Supplies the equivalent of one Unit's maximum safeguard loads plus two Unit's hot shutdown loads when synchronized to system grid and loaded at maximum practical rate.</li> </ul>	12 months
SR 3.8.1.10	Verify each KHU's battery capacity is adequate to supply, and maintain in OPERABLE status, required emergency loads for design duty cycle when subjected to a battery service test.	12 months
SR 3.8.1.11	Verify each KHU's battery cells, cell end plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	12 months

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	Verify each KHU's battery cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.	12 months
SR 3.8.1.13	<p>-----NOTE----- Only applicable when the overhead electrical disconnects for the KHU associated with the underground emergency power path are closed.</p> <p>-----</p> <p>Verify on an actual or simulated zone overlap fault signal each KHU's overhead tie breaker and underground tie breaker actuate to the correct position.</p>	12 months
SR 3.8.1.14	<p>-----NOTES----- Not required to be performed for an SL breaker when its standby bus is energized from a LCT via an isolated power path.</p> <p>-----</p> <p>Verify each closed SL and closed N breaker opens on an actuation of each redundant trip coil.</p>	18 months
SR 3.8.1.15	<p>-----NOTE----- Redundant breaker trip coils shall be verified on a STAGGERED TEST BASIS.</p> <p>-----</p> <p>Verify each 230 kV switchyard circuit breaker actuates to the correct position on a switchyard isolation actuation signal.</p>	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.8.1.16</p> <p>-----NOTE----- Only applicable when complying with Required Action C.2.2.4. -----</p> <p>Verify one KHU provides an alternate manual AC power source capability by manual or automatic KHU start with manual synchronize, or breaker closure, to energize its non-required emergency power path.</p>	<p>As specified by Required Action C.2.2.4</p>
<p>SR 3.8.1.17</p> <p>Verify each KHU's Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers. The allowable values with a time delay of 5 seconds <math>\pm</math> 1 second shall be as follows:</p> <ul style="list-style-type: none"> <li>a. Undervoltage <math>\geq</math> 12.42 kV and <math>\leq</math> 12.63 kV</li> <li>b. Overvoltage <math>\geq</math> 14.90 kV and <math>\leq</math> 15.18 kV</li> <li>c. Underfrequency <math>\geq</math> 53.992 hz and <math>\leq</math> 54.008 hz</li> <li>d. Overfrequency <math>\geq</math> 65.992 hz and <math>\leq</math> 66.008 hz</li> </ul>	<p>18 months</p>

## BASES

LCO  
(continued)

An OPERABLE KHU and its required overhead emergency power path must be capable of automatically supplying power from the KHU through the KHU main step-up transformer, the 230 kV yellow bus, the Unit startup transformer and both E breakers to both main feeder buses. At least one channel of switchyard isolation (by actuation from degraded grid voltage protection) is required to be OPERABLE to isolate the 230 kV switchyard yellow bus. If closed, each N breaker must be capable of opening using either of its associated breaker trip circuits. Either of the following combinations provides an acceptable KHU and required overhead emergency power path:

### Keowee Hydro Unit

- 1A) Keowee Unit 1 generator,
- 2A) Keowee ACB 1 (enabled by one channel of Switchyard Isolate Complete),
- 3A) Keowee auxiliary transformer 1X, Keowee ACB 5, Keowee Load Center 1X,
- 4A) Keowee MCC 1XA,
- 5A) Keowee Battery #1, Charger #1 or Standby Charger, and Distribution Center 1DA,
- 6A) ACB-1 to ACB-3 interlock,
- 7A) Keowee Unit 1 Voltage and Frequency out of tolerance (OOT) logic
- 8) Keowee reservoir level  $\geq 775$  feet above sea level,

### Keowee Hydro Unit

- 1B) Keowee Unit 2 generator,
- 2B) Keowee ACB 2 (enabled by one channel of Switchyard Isolate Complete),
- 3B) Keowee auxiliary transformer 2X, Keowee ACB 6, Keowee Load Center 2X,
- 4B) Keowee MCC 2XA,
- 5B) Keowee Battery #2, Charger #2 or Standby Charger, and Distribution Center 2DA,
- 6B) ACB-2 to ACB-4 interlock,
- 7B) Keowee Unit 2 Voltage and Frequency out of tolerance (OOT) logic

### Overhead Emergency Power Path

- 9) Keowee main step-up transformer,
- 10) PCB 9 (enabled by one channel of Switchyard Isolate Complete),
- 11) The 230kV switchyard yellow bus capable of being isolated by one channel of Switchyard Isolate,
- 12) A unit startup transformer and associated yellow bus PCB (CT-1 / PCB 18, CT-2 / PCB 27, CT-3 / PCB 30), and
- 13) Both E breakers.

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(continued)

An OPERABLE KHU and its required underground emergency power path must be capable of automatically supplying power from the KHU through the underground feeder, transformer CT-4, both standby buses, and both Unit S breakers to both main feeder buses. If closed, each N breaker and each SL breaker must be capable of opening using either of its associated breaker trip circuits. Either of the following combinations provides an acceptable KHU and required underground emergency power path:

<u>Keowee Hydro Unit</u>	<u>Keowee Hydro Unit</u>
1A) Keowee Unit 1 generator,	1B) Keowee Unit 2 generator,
2A) Keowee ACB 3,	2B) Keowee ACB 4,
3A.1) Keowee auxiliary transformer CX, Keowee ACB 7, Keowee Load Center 1X,	3B.1) Keowee auxiliary transformer CX, Keowee ACB 8, Keowee Load Center 2X,
3A.2) One Oconee Unit 1 S breaker capable of feeding switchgear 1TC,	3B.2) One Oconee Unit 1 S breaker capable of feeding switchgear 1TC,
3A.3) Switchgear 1TC capable of feeding Keowee auxiliary transformer CX,	3B.3) Switchgear 1TC capable of feeding Keowee auxiliary transformer CX,
4A) Keowee MCC 1XA,	4B) Keowee MCC 2XA,
5A) Keowee Battery #1, Charger #1 or Standby Charger, and Distribution Center 1DA,	5B) Keowee Battery #2, Charger #2 or Standby Charger, and Distribution Center 2DA,
6A) ACB-1 to ACB-3 interlock,	6A) ACB-2 to ACB-4 interlock,
7A) Keowee Unit 1 Voltage and Frequency OOT logic	7B) Keowee Unit 2 Voltage and Frequency OOT logic
8) Keowee reservoir level $\geq 775$ feet above sea level,	

### Underground Emergency Power Path

- 9) The underground feeder,
- 10) Transformer CT-4,
- 11) Both SK breakers,
- 12) Both standby buses,
- 13) Both S breakers, and
- 14) ACB-3 to ACB-4 interlock.

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SR 3.8.1.9

This surveillance verifies the KHUs' response time to an Emergency Start signal (normally performed using a pushbutton in the control room) to ensure ES equipment will have adequate power for accident mitigation. UFSAR Section 6.3.3.3 (Ref. 9) establishes the 23 second time requirement for each KHU to achieve rated frequency and voltage. Since the only available loads of adequate magnitude for simulating a accident is the grid, subsequent loading on the grid is required to verify the KHU's ability to assume rapid loading under accident conditions. Sequential block loads are not available to fully test this feature. This is the reason for the requirement to load the KHUs at the maximum practical rate. The 12 month Frequency for this SR is adequate based on operating experience to provide reliability verification without excessive equipment cycling for testing.

SR 3.8.1.10

A battery service test is a special test of the battery capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length should correspond to the design duty cycle requirements as specified in Reference 4.

The Surveillance Frequency of 12 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 6) and Regulatory Guide 1.129 (Ref. 7), which state that the battery service test should be performed with intervals between tests not to exceed 18 months.

SR 3.8.1.11

Visual inspection of the battery cells, cell plates, and battery racks provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance. The 12 month Frequency for this SR is consistent with manufacturers recommendations and IEEE-450 (Ref. 8), which recommends detailed visual inspection of cell condition and rack integrity on a yearly basis.

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SR 3.8.1.16 (continued)

OPERABLE. When the overhead emergency power path is inoperable, the SR verifies by administrative means that the KHU associated with the overhead emergency power path is OPERABLE.

This SR is modified by a Note indicating that the SR is only applicable when complying with Required Action C.2.2.4.

SR 3.8.1.17

This SR verifies the Keowee Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers on an out of tolerance trip signal. The 18 month Frequency is based on engineering judgement and provides reasonable assurance that the Voltage and Frequency out of tolerance logic trips and blocks closure of these breakers when required.

There are three over voltage relays, three under voltage relays, and three over/under frequency relays per KHU with each relay actuating an auxiliary relay used to provide two out of three logic. These relays monitor generator output voltage and if two phases are above/below setpoint, prevent the power path breakers from closing or if closed, provide a trip signal which is applied after a time delay, to open the power path breakers. Testing demonstrates that relays actuate at preset values, that timers time out and that two under voltage relays, two over voltage relays, or two over/under frequency relays will actuate the logic channel. This ensures that the power path breakers will not close and if closed, will trip after a preset time delay that becomes effective when the KHU first reaches the required frequency and voltage band.

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REFERENCES

1. UFSAR, Section 3.1.39
2. UFSAR, Chapter 16
3. 10 CFR 50.36
4. UFSAR, Chapter 6
5. UFSAR, Chapter 15
6. Regulatory Guide 1.32
7. Regulatory Guide 1.129

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REFERENCES  
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8. IEEE-450-1980
  9. UFSAR, Section 6.3.3.3
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