CP&L

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
SUBMITTAL OF TECHNCIAL SPECIFICATION BASES CHANGE
DC SOURCES - SHUTDOWN (LCO 3.8.5)

Gentlemen:

In accordance with Technical Specification (TS) 5.5.10.d for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Carolina Power & Light Company is submitting Revision 13 to the BSEP Unit 1 and Unit 2 TS Bases. Revision 13 was implemented on December 20, 2000, in support of Amendments 211 and 238 to the Operating Licenses for BSEP Unit Nos. 1 and 2, respectively. The NRC issued these amendments on November 29, 2000.

The Safety Evaluation for Amendments 211 and 238 required a paragraph to be included in the Bases. This paragraph, with non-significant editorial changes associated with the use of acronyms, has been incorporated into the "Applicable Safety Analyses" section of TS Bases 3.8.5, "DC Sources - Shutdown."

Please refer any questions regarding this submittal to Mr. Leonard R. Beller, Supervisor - Licensing, at (910) 457-2073.

Sincerely,

Leonard R. Beller for

David C. DiCello
Manager - Regulatory Affairs
Brunswick Steam Electric Plant

MAT/mat

A001

Enclosures:

1. Summary of Revision to Technical Specification Bases
2. Technical Specification Bases Pages Replacement Instructions
3. Replacement Bases Pages – Units 1 and 2

cc (with enclosures):

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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
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SUBMITTAL OF TECHNCIAL SPECIFICATION BASES CHANGE
DC SOURCES - SHUTDOWN (LCO 3.8.5)

Summary of Revision to Technical Specification Bases			
Revision	**Affected Units**	**Date Incorporated**	**Title/Description**
13	1 & 2	12/20/00	**Title**: DC Sources - Shutdown **Description**: The Bases revision reflects Amendments 211 and 238 which revised the operability requirements of Technical Specification 3.8.5, "DC Sources - Shutdown," to require one of the unit's DC electrical power subsystems to be operable when the unit is in modes 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment.

ENCLOSURE 2

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
SUBMITTAL OF TECHNCIAL SPECIFICATION BASES CHANGE
DC SOURCES - SHUTDOWN (LCO 3.8.5)

Technical Specification Bases Page Replacement Instructions

Unit 1	
Remove	**Insert**
Bases Book 1	
Title Page - Revision 12	Title Page - Revision 13
LOEP-1, Revision 12	LOEP-1, Revision 13
Bases Book 2	
LOEP-1, Revision 11	LOEP-1, Revision 13
LOEP-4, Revision 8	LOEP-4, Revision 13
B 3.8-61 - B 3.8-74, Revision 6 B 3.8-75 - B3.8-85, Revision 8 B 3.8-86 - B3.8-91, Revision 7	B 3.8-61 - B 3.8-92, Revision 13

Unit 2	
Remove	**Insert**
Bases Book 1	
Title Page - Revision 12	Title Page - Revision 13
LOEP-1, Revision 12	LOEP-1, Revision 13
Bases Book 2	
LOEP-1, Revision 11	LOEP-1, Revision 13
LOEP-4, Revision 8	LOEP-4, Revision 13
B 3.8-61 - B 3.8-74, Revision 6 B 3.8-75 - B3.8-85, Revision 8 B 3.8-86 - B3.8-91, Revision 7	B 3.8-61 - B 3.8-92, Revision 13

ENCLOSURE 3

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62
SUBMITTAL OF TECHNCIAL SPECIFICATION BASES CHANGE
DC SOURCES - SHUTDOWN (LCO 3.8.5)

REPLACEMENT BASES PAGES - UNITS 1 AND 2

Unit 1
Bases Book 1 Replacement Pages

BASES

TO

THE FACILITY OPERATING LICENSE DPR-71

TECHNICAL SPECIFICATIONS

FOR

BRUNSWICK STEAM ELECTRIC PLANT

UNIT 1

CAROLINA POWER & LIGHT COMPANY

REVISION 13

LIST OF EFFECTIVE PAGES - BASES

Page No.	Revision No.	Page No.	Revision No.
Title Page	13	B 3.1-7	0
		B 3.1-8	0
List of Effective Pages - Book 1		B 3.1-9	0
		B 3.1-10	0
LOEP-1	13	B 3.1-11	0
LOEP-2	3	B 3.1-12	0
LOEP-3	12	B 3.1-13	0
LOEP-4	12	B 3.1-14	0
		B 3.1-15	0
i	0	B 3.1-16	0
ii	0	B 3.1-17	0
		B 3.1-18	0
B 2.0-1	0	B 3.1-19	0
B 2.0-2	0	B 3.1-20	0
B 2.0-3	0	B 3.1-21	0
B 2.0-4	10	B 3.1-22	0
B 2.0-5	0	B 3.1-23	0
B 2.0-6	0	B 3.1-24	0
B 2.0-7	0	B 3.1-25	0
B 2.0-8	0	B 3.1-26	0
		B 3.1-27	0
B 3.0-1	0	B 3.1-28	0
B 3.0-2	0	B 3.1-29	0
B 3.0-3	0	B 3.1-30	0
B 3.0-4	0	B 3.1-31	0
B 3.0-5	0	B 3.1-32	0
B 3.0-6	0	B 3.1-33	0
B 3.0-7	0	B 3.1-34	0
B 3.0-8	0	B 3.1-35	0
B 3.0-9	0	B 3.1-36	0
B 3.0-10	0	B 3.1-37	0
B 3.0-11	0	B 3.1-38	0
B 3.0-12	0	B 3.1-39	0
B 3.0-13	0	B 3.1-40	0
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B 3.0-15	0	B 3.1-42	0
		B 3.1-43	0
B 3.1-1	0	B 3.1-44	0
B 3.1-2	0	B 3.1-45	0
B 3.1-3	0	B 3.1-46	0
B 3.1-4	0	B 3.1-47	0
B 3.1-5	0	B 3.1-48	0
B 3.1-6	0		

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Unit 1
Bases Book 2 Replacement Pages

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		B 3.4-34	0
LOEP-1	13	B 3.4-35	0
LOEP-2	3	B 3.4-36	0
LOEP-3	11	B 3.4-37	0
LOEP-4	13	B 3.4-38	0
LOEP-5	6	B 3.4-39	0
		B 3.4-40	0
i	0	B 3.4-41	0
ii	7	B 3.4-42	0
		B 3.4-43	0
B 3.4-1	0	B 3.4-44	0
B 3.4-2	0	B 3.4-45	0
B 3.4-3	1	B 3.4-46	0
B 3.4-4	1	B 3.4-47	0
B 3.4-5	1	B 3.4-48	0
B 3.4-6	1	B 3.4-49	0
B 3.4-7	0		
B 3.4-8	0	B 3.5-1	0
B 3.4-9	0	B 3.5-2	0
B 3.4-10	0	B 3.5-3	0
B 3.4-11	0	B 3.5-4	0
B 3.4-12	0	B 3.5-5	0
B 3.4-13	0	B 3.5-6	0
B 3.4-14	9	B 3.5-7	0
B 3.4-15	0	B 3.5-8	0
B 3.4-16	0	B 3.5-9	0
B 3.4-17	0	B 3.5-10	0
B 3.4-18	0	B 3.5-11	0
B 3.4-19	0	B 3.5-12	0
B 3.4-20	0	B 3.5-13	0
B 3.4-21	0	B 3.5-14	0
B 3.4-22	0	B 3.5-15	0
B 3.4-23	0	B 3.5-16	9
B 3.4-24	0	B 3.5-17	0
B 3.4-25	0	B 3.5-18	0
B 3.4-26	0	B 3.5-19	0
B 3.4-27	0	B 3.5-20	0
B 3.4-28	0	B 3.5-21	0
B 3.4-29	0	B 3.5-22	0
B 3.4-30	0	B 3.5-23	0
B 3.4-31	0	B 3.5-24	0
B 3.4-32	0	B 3.5-25	0

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LIST OF EFFECTIVE PAGES - BASES (continued)

Page No.	Revision No.	Page No.	Revision No.
B 3.8-40	6	B 3.8-81	13
B 3.8-41	6	B 3.8-82	13
B 3.8-42	6	B 3.8-83	13
B 3.8-43	6	B 3.8-84	13
B 3.8-44	6	B 3.8-85	13
B 3.8-45	6	B 3.8-86	13
B 3.8-46	6	B 3.8-87	13
B 3.8-47	6	B 3.8-88	13
B 3.8-48	6	B 3.8-89	13
B 3.8-49	6	B 3.8-90	13
B 3.8-50	6	B 3.8-91	13
B 3.8-51	6	B 3.8-92	13
B 3.8-52	6		
B 3.8-53	6	B 3.9-1	0
B 3.8-54	6	B 3.9-2	0
B 3.8-55	6	B 3.9-3	0
B 3.8-56	6	B 3.9-4	0
B 3.8-57	6	B 3.9-5	0
B 3.8-58	6	B 3.9-6	0
B 3.8-59	6	B 3.9-7	0
B 3.8-60	6	B 3.9-8	0
B 3.8-61	13	B 3.9-9	0
B 3.8-62	13	B 3.9-10	0
B 3.8-63	13	B 3.9-11	0
B 3.8-64	13	B 3.9-12	0
B 3.8-65	13	B 3.9-13	0
B 3.8-66	13	B 3.9-14	0
B 3.8-67	13	B 3.9-15	0
B 3.8-68	13	B 3.9-16	0
B 3.8-69	13	B 3.9-17	0
B 3.8-70	13	B 3.9-18	0
B 3.8-71	13	B 3.9-19	0
B 3.8-72	13	B 3.9-20	0
B 3.8-73	13	B 3.9-21	0
B 3.8-74	13	B 3.9-22	0
B 3.8-75	13	B 3.9-23	0
B 3.8-76	13	B 3.9-24	0
B 3.8-77	13	B 3.9-25	0
B 3.8-78	13	B 3.9-26	0
B 3.8-79	13	B 3.9-27	0
B 3.8-80	13	B 3.9-28	0
		B 3.9-29	0

(continued)

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources—Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources—Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation and during movement of irradiated fuel assemblies in the secondary containment.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

In general, when the unit is shutdown, the Technical Specification requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBAs, which are analyzed for operating MODES, are not as significant a concern during shutdown MODES due to lower energy involved. The Technical Specifications, therefore, require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an industry initiative to manage shutdown and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

LCO

The required Unit 1 DC electrical power subsystem consisting of two 125 V batteries in series, two battery chargers (one per battery), and the corresponding control equipment and interconnecting cabling supplying power to the associated bus, needed to support one DC distribution subsystem is required to be OPERABLE. This requirement ensures the availability of sufficient DC electrical power sources to

(continued)

BASES

LCO (continued)

operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3, would require the unit to be shutdown, but would not require immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

(continued)

BASES

ACTIONS (continued)

A.1, A.2.1, A.2.2, A.2.3, and A.2.4

By allowance of the option to declare required features inoperable with associated DC electrical power subsystem(s) inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. However, in many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystem and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires certain Surveillances required by LCO 3.8.4 to be met. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required unless Unit 2 Specification 3.8.4, "DC Sources—Operating," requires performance of these SRs.

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1 (continued)

When Unit 2 Specification 3.8.4 requires performance of these SRs, DC source availability is not limited, due to the Unit 2 requirements for DC source OPERABILITY. Therefore, in this condition, other DC sources would be available to supply the required loads.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36(c)(2)(ii).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Cell Parameters

BASES

BACKGROUND	This LCO delineates the limits on electrolyte temperature, level, float voltage, and specific gravity for the DC electrical power subsystems batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources—Operating," and LCO 3.8.5, "DC Sources—Shutdown."
APPLICABLE SAFETY ANALYSES	The initial conditions of Design Basis Accident (DBA) and transient analyses in UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power subsystems provide normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation. The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit as discussed in the Bases for LCO 3.8.4 and LCO 3.8.5. Since battery cell parameters support the operation of the DC electrical power subsystems, they satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).
LCO	Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Electrolyte limits are conservatively established, allowing continued DC electrical system function even with Category A and B limits not met.
APPLICABILITY	The battery cell parameters are required solely for the support of the associated DC electrical power subsystem. Therefore, these cell parameters are only required when the associated DC electrical power subsystem is required to be OPERABLE. Refer to the Applicability discussions in Bases for LCO 3.8.4 and LCO 3.8.5.

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BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each battery with battery cell parameters not within limits. Complying with the Required Actions may allow for continued operation, and subsequent batteries with battery cell parameters not within limits are governed by subsequent Condition entry and application of associated Required Actions.

A.1, A.2, and A.3

With parameters of one or more cells in one or more batteries not within limits (i.e., Category A limits not met or Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of Category A or B limits not met, and continued operation is permitted for a limited period.

The pilot cell(s) electrolyte level and float voltage are required to be verified to meet the Category C limits within 1 hour (Required Action A.1). This check provides a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cell(s). One hour is considered a reasonable amount of time to perform the required verification.

Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at

(continued)

BASES

ACTIONS

A.1, A.2, and A.3 (continued)

7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the normal Frequency of pilot cell Surveillances.

Continued operation prior to declaring the affected batteries inoperable is permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. Taking into consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable for operation prior to declaring the DC batteries inoperable.

B.1

When any battery parameter is outside the Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement is not ensured and the corresponding DC electrical power subsystem must be declared inoperable. Additionally, other potentially extreme conditions, such as any Required Action of Condition A and associated Completion Time not met or average electrolyte temperature of representative cells < 60°F, also are cause for immediately declaring the associated DC electrical power subsystem inoperable.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 4), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.

SR 3.8.6.2

The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 4).

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.3

This Surveillance verification that the average temperature of representative cells is within limits is consistent with a recommendation of IEEE-450 (Ref. 4) that states that the temperature of electrolytes in representative cells should be determined on a quarterly basis.

Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on manufacturer's recommendations and the battery sizing calculations.

Table 3.8.6-1

This Table delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designed pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity approximate the state of charge of the entire battery.

The Category A limits specified for electrolyte level are based on manufacturer's recommendations and are consistent with the guidance in IEEE-450 (Ref. 4), with the extra ¼ inch allowance above the high water level indication for operating margin to account for temperature and charge effects. In addition to this allowance, Footnote (a) to Table 3.8.6-1 permits the electrolyte level to be temporarily above the specified maximum level during and following equalizing charge (i.e., for up to 3 days following the completion of an equalize charge), provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 4) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on the manufacturer's recommendations and on the recommendation of IEEE-450 (Ref. 4), which states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells. The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer's fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 4), the specific gravity readings are based on a temperature of 77°F (25°C).

The specific gravity readings are corrected for actual electrolyte temperature and level. For each 3°F (1.67°C) above 77°F (25°C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3°F below 77°F. The specific gravity of the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation. Level correction will be in accordance with manufacturer's recommendations.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any battery cell that may be jumpered out.

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer's fully charged, nominal specific gravity) with the average of all connected cells ≥ 1.205 (0.010 below the manufacturer's fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging cells having higher specific gravities.

Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

and maintain a margin of safety. When any battery parameter is outside the Category C limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

The Category C limit specified for electrolyte level (above the top of the plates and not overflowing) ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limit for voltage is based on IEEE-450, Appendix C (Ref. 4), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.

The Category C limit on average specific gravity ≥ 1.195, is based on manufacturer's recommendations (0.020 below the manufacturer's recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must be no less than 0.020 below the average of all connected cells. This limit ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging with cells having higher specific gravities.

The footnotes to Table 3.8.6-1 that apply to specific gravity are applicable to Category A, B, and C specific gravity. Footnote (b) requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current, while on float charge, is < 2 amps. This current provides, in general, an indication of acceptable overall battery condition.

Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charging current is an acceptable alternative to specific gravity measurement for determining the state of charge of the designated pilot cell. This phenomenon is discussed in IEEE-450 (Ref. 4). Footnote (c) allows the float charge current to be used as an alternate to specific

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

gravity for up to 7 days following a battery recharge. Within 7 days, each connected cell's specific gravity must be measured to confirm the state of charge. Following a minor battery recharge (such as equalizing charge that does not follow a deep discharge) specific gravity gradients are not significant, and confirming measurements may be made in less than 7 days.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36(c)(2)(ii).

4. IEEE Standard 450, 1987.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Distribution Systems—Operating

BASES

BACKGROUND

The onsite Class 1E AC and DC electrical power distribution system is divided into redundant and independent AC and DC electrical power distribution subsystems.

The Class 1E AC electrical distribution system is divided into four load groups. Each load group consists of a primary emergency bus, its downstream secondary emergency bus, 120 VAC vital bus, and transformers and interconnecting cables. The buses associated with each of the four load groups are defined as follows:

Load group E1 consists of 4.16 kV bus E1, 480 V bus E5, and 120 VAC vital bus 1E5.

Load group E2 consists of 4.16 kV bus E2, 480 V bus E6, and 120 VAC vital bus 1E6.

Load group E3 consists of 4.16 kV bus E3, 480 V bus E7, and 120 VAC vital bus 2E7.

Load group E4 consists of 4.16 kV bus E4, 480 V bus E8, and 120 VAC vital bus 2E8.

The E1 and E2 load groups are supplied from Unit 1 balance of plant (BOP) buses and primarily serve Unit 1 loads. The E3 and E4 load groups are supplied from Unit 2 BOP buses and primarily serve Unit 2 loads. In some instances loads associated with one unit are actually supplied from the opposite unit's load group buses.

Each primary emergency bus (4.16 kV emergency bus) has access to two offsite sources of power via a common circuit path from its associated upstream BOP bus (master/slave breakers and interconnecting cables). In addition, each 4.16 kV emergency bus can be provided power from an onsite diesel generator (DG) source. The upstream BOP bus associated with each 4.16 kV emergency bus is normally connected to the main generator output via the unit auxiliary transformer. During a loss of the normal power source to the 4.16 kV BOP bus, the preferred source supply breaker attempts to close. If all offsite sources are

(continued)

BASES

BACKGROUND (continued)

unavailable, the affected 4.16 kV emergency bus is isolated from its associated upstream 4.16 kV BOP bus and the onsite emergency DG will supply power to the 4.16 kV emergency bus. Control power for each 4.16 kV emergency bus is supplied from a Class 1E battery with manual transfer capability to another Class 1E battery. Additional descriptions of this system may be found in the Bases for Specification 3.8.1, "AC Sources-Operating," and the Bases for Specification 3.8.4, "DC Sources-Operating".

The secondary plant distribution system includes 480 VAC emergency buses E5, E6, E7, and E8 and associated motor control centers (MCCs), transformers, and interconnecting cables. Secondary emergency buses E5, E6, E7, and E8 are supplied from primary emergency buses E1, E2, E3, and E4, respectively. Control power for each 480 VAC emergency bus is supplied from a Class 1E battery with manual transfer capability to another Class 1E battery. Additional descriptions of this system may be found in the Bases for Specification 3.8.4, "DC Sources-Operating".

The 120 VAC vital buses 1E5, 1E6, 2E7, and 2E8 are arranged in four load groups and are powered from secondary emergency buses E5, E6, E7, and E8, respectively.

There are two independent 125/250 VDC electrical power distribution subsystems.

The list of required distribution buses is presented in Table B 3.8.7-1.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC and DC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, "Power Distribution Limits"; Section 3.5, "Emergency Core Cooling System (ECCS) and Reactor Core Isolation Cooling (RCIC) System"; and Section 3.6, "Containment Systems."

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of the AC and DC electrical power distribution subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining distribution systems OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power; and

b. A worst case single failure.

The AC and DC electrical power distribution system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

LCO

The required electrical power distribution subsystems listed in Table B 3.8.7-1 ensure the availability of AC and DC electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The Unit 1 AC and DC electrical power distribution subsystems are required to be OPERABLE. In addition, since some components required by Unit 1 receive power through Unit 2 DC electrical power distribution subsystems (e.g., control power for two of the four 4.16 kV emergency buses, two of the four 480 VAC emergency buses, and for two of the DGs, and two of four engineered safeguard system (ESS) panels), the Unit 2 DC electrical power distribution subsystems needed to support the required equipment must also be OPERABLE. As stated in Table B 3.8.7-1, each division of the AC and DC electrical power distribution systems is a subsystem.

Maintaining the Division I and II AC and DC electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor.

The AC electrical power distribution subsystems require the associated buses and electrical circuits to be energized to their proper voltages. The DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated batteries or chargers.

(continued)

BASES

LCO (continued)

Based on the number of safety significant electrical loads associated with each bus listed in Table B 3.8.7-1, if one or more of the buses becomes inoperable, entry into the appropriate ACTIONS of LCO 3.8.7 is required. Other buses, such as MCCs and distribution panels, which help comprise the AC and DC distribution systems are not listed in Table B 3.8.7-1. The loss of electrical loads associated with these buses may not result in a complete loss of a redundant safety function necessary to shut down the reactor and maintain it in a safe condition. Therefore, should one or more of these buses become inoperable due to a failure not affecting the OPERABILITY of a bus listed in Table B 3.8.7-1 (e.g., a breaker supplying a single MCC fails open), the individual loads on the bus must be declared inoperable, and the appropriate Conditions and Required Actions of the LCOs governing the individual loads would be entered. However, if one or more of these buses is inoperable due to a failure also affecting the OPERABILITY of a bus listed in Table B 3.8.7-1 (e.g., loss of a 4.16 kV emergency bus, which results in de-energization of all buses powered from the 4.16 kV emergency bus), then although the individual loads are still considered inoperable, the Conditions and Required Actions of the LCO for the individual loads are not required to be entered, since LCO 3.0.6 allows this exception (i.e., the loads are inoperable due to the inoperability of a support system governed by a Technical Specification; the 4.16 kV emergency bus).

In addition, tie breakers and transfer switches between redundant safety related AC and DC power distribution subsystems, if they exist, must be open. This includes control power transfer switches associated with the 4.16 kV and 480 V emergency buses and transfer switches associated with the ESS and DG panels. The requirement for tie breakers to be open between redundant buses and divisions is necessary to ensure independence of the redundant buses and divisions. Independence of the redundant buses and divisions is required to ensure that single-failure criteria are satisfied. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, which could cause the failure of a redundant subsystem and a loss of essential safety function(s). Except as noted below, if any tie breakers are closed or transfer switches aligned to the alternate supply,

(continued)

BASES

LCO (continued)

the affected redundant electrical power distribution subsystems are considered inoperable. This applies to the onsite, safety related, redundant electrical power distribution subsystems. It does not, however, preclude redundant Class IE 4.16 kV emergency buses from being powered from the same offsite circuit.

An exception to the requirement to maintain the cross-tie breakers open between the 4.16 kV emergency buses applies during breaker setup and/or Appendix R and Station Blackout testing of cross-tie breakers and their associated control circuitry. During these evolutions it is permissible to close one of the two series cross-tie breakers between the 4.16 kV buses if the remaining series cross-tie breaker has been racked-out and removed from its cubicle and control power for the closed breaker is maintained at all times while the breaker is closed; under these conditions independence of the redundant buses and divisions is maintained such that single-failure criteria are satisfied.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, and 3 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Electrical power distribution subsystem requirements for MODES 4 and 5 and other conditions in which AC and DC electrical power distribution subsystems are required are covered in the Bases for LCO 3.8.8, "Distribution Systems—Shutdown."

ACTIONS

A.1

With one AC electrical power distribution subsystem inoperable due to either inoperable load group E3 bus(es) or inoperable load group E4 bus(es), the remaining AC electrical power distribution load groups are capable of

(continued)

BASES

ACTIONS

A.1 (continued)

supporting the minimum safety functions necessary to shut down the operating reactor and maintain both reactors in a safe condition, assuming no single failure in the remaining AC electrical power distribution load groups, when Unit 2 is in MODE 4 or 5. (If Unit 2 is in MODE 1, 2, or 3, then the Unit 2 ACTIONS of Specification 3.8.7, "Distribution Systems—Operating," require restoration of the associated AC electrical power distribution subsystem within 8 hours of the inoperability.) The overall reliability is reduced in Condition A, because a single failure in a remaining load group could result in the minimum required ESF functions not being supported. As a result, Required Action A.1 limits the time period to perform planned maintenance on a Unit 2 load group to 7 days. This is acceptable based on the following:

a. The other unit's load group buses are not as critical to the operating unit (fewer operating unit loads) as the operating unit's load group buses.

b. Performing maintenance on these components will increase the reliability of the Class 1E AC Electrical Power Distribution System.

c. The 7 day Completion Time provides a reasonable time frame for performance of planned maintenance.

During the planned maintenance of the load group buses, if a condition is discovered on these buses requiring corrective maintenance, this maintenance may be performed within the 7 day Completion Time of Required Action A.1.

The Class 1E AC Electrical Power Distribution System is divided into four load groups. Each load group consists of a primary emergency bus, its downstream secondary emergency bus, 120 VAC vital bus, and transformers and interconnecting cables. The buses associated with each of the four load groups are defined as follows:

(continued)

BASES

ACTIONS

A.1 (continued)

Load group E1 consists of 4.16 kV bus E1, 480 V bus E5, and 120 VAC vital bus 1E5.

Load group E2 consists of 4.16 kV bus E2, 480 V bus E6, and 120 VAC vital bus 1E6.

Load group E3 consists of 4.16 kV bus E3, 480 V bus E7, and 120 VAC vital bus 2E7.

Load group E4 consists of 4.16 kV bus E4, 480 V bus E8, and 120 VAC vital bus 2E8.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, an AC bus in a load group in a different division is inoperable and subsequently returned OPERABLE, this LCO may already have been not met for up to 8 hours. This situation could lead to a total duration of 176 hours (since initial failure to meet the LCO) to restore the AC Electrical Power Distribution System. At this time an AC bus in a load group in a different division could again become inoperable, and the load group removed under Condition A could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock". This results in establishing the "time zero" at the time this LCO was initially not met, instead of at the time Condition A was entered. The 176 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

If while in Condition A, emergency buses associated with another load group become inoperable (e.g., buses in load groups E3 and E4 are concurrently inoperable), Condition B and F must be entered, as appropriate.

(continued)

BASES

ACTIONS (continued)

B.1

With one or more required AC buses or distribution panels in one division inoperable for reasons other than Condition A, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining AC electrical power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses and distribution panels must be restored to OPERABLE status within 8 hours.

The Condition B worst scenario is one division without AC power (i.e., no offsite power to the division and the associated DG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operators' attention be focused on minimizing the potential for loss of power to the remaining division by stabilizing the unit and restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

a. The potential for decreased safety if the unit operators' attention is diverted from the evaluations and actions necessary to restore power to the affected division to the actions associated with taking the unit to shutdown within this time limit.

b. The low potential for an event in conjunction with a single failure of a redundant component in the division with AC power. (The redundant component is verified OPERABLE in accordance with Specification 5.5.11, "Safety Function Determination Program (SFDP).")

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, a DC bus is inoperable and subsequently

(continued)

BASES

ACTIONS

B.1 (continued)

returned OPERABLE, this LCO may already have been not met for up to 7 days. This situation could lead to a total duration of 176 hours, since initial failure to meet the LCO, to restore the AC electrical power distribution system. At this time a DC bus could again become inoperable, and the AC electrical power distribution system could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This results in establishing the "time zero" at the time this LCO was initially not met, instead of at the time Condition B was entered. The 176 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

C.1, C.2, C.3 and C.4

Condition C applies to the 125 VDC buses listed in Table B 3.8.7-1 which can be supplied from either a normal or an alternate DC source. These buses are listed below:

a. 125 VDC Control Power Buses for 4.16 kV Switchgear E1, E2, E3, and E4;

b. 125 VDC Control Power Buses for 480 V Switchgear E5, E6, E7, and E8;

c. 125 VDC ESS Logic Cabinets H58, H59, H60, and H61; and

d. 125 VDC DG Panels DG-1, DG-2, DG-3, and DG-4.

Condition A permits the de-energization of the E3 load group bus(es) or the E4 load group bus(es) for planned maintenance when Unit 2 is in MODE 4 or 5. During a 4.16 kV or 480 V bus outage it is desirable to clear both the normal and alternate sources of DC control power to the bus for personnel safety. The de-energized AC bus is inoperable and not capable of supplying its loads regardless of the availability of DC control power. Hence, entry into Condition C as a result of performing maintenance under Condition A is not necessary; Condition D would apply.

(continued)

BASES

ACTIONS

C.1, C.2, C.3 and C.4 (continued)

With one or more DC electrical power distribution subsystems inoperable due to loss of normal DC source, the remaining DC electrical power distribution subsystem(s) are capable of supporting the minimum safety functions necessary to shutdown the reactor and maintain it in a safe shutdown condition, provided safety function is not lost and assuming no single failure. However, the overall reliability is reduced because a single failure in the DC electrical power distribution system could result in a loss of two of four AC electrical load groups and the minimum required ESF functions not being supported. Therefore, action must be immediately initiated to transfer the DC electrical power distribution system to its alternate source and the affected supported equipment immediately declared inoperable. Upon completion of the transfer of the affected supported equipment's DC electrical power distribution subsystem to its OPERABLE alternate DC source, the affected supported equipment may be declared OPERABLE again. The ESS logic cabinets transfer automatically upon loss of the normal source. For an ESS logic cabinet, verification that the automatic transfer has occurred and alternate power is available to the ESS logic cabinet will satisfy Required Action C.2. By allowance of the option to declare affected supported equipment inoperable with associated DC electrical power distribution subsystems inoperable due to loss of normal DC source, more conservative restrictions are implemented in accordance with the affected system LCOs' ACTIONS. When any control power transfer switch associated with the 4.16 kV and 480 V emergency buses or any transfer switch associated with the ESS and DG panels is transferred to the alternate source, a single failure in the DC system could render two of four AC electrical load groups inoperable. Therefore, to prevent indefinite operation in this degraded condition, power from the normal DC source must be restored in 7 days.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. Required Actions C.1 and C.2 should be completed as quickly as possible. The 7 day Completion Time of Required Action C.4 is considered to be acceptable due to the low potential for an event in conjunction with a single failure

(continued)

BASES

ACTIONS

C.1, C.2, C.3 and C.4 (continued)

of a redundant component and is consistent with the allowed Completion Time for an inoperable DC electrical power subsystem specified in Specification 3.8.4, "DC Sources—Operating."

The second Completion Time for Required Action C.4 establishes a limit on the maximum time allowed for any combination of required electrical power distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition C is entered while, for instance, an AC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 8 hours. This situation could lead to a total duration of 176 hours, since initial failure to meet the LCO, to restore the DC electrical power distribution system. At this time, an AC bus could again become inoperable, and the DC electrical power distribution system could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This allowance results in establishing the "time zero" at the time the LCO was initially not met, instead of at the time Condition C was entered. The 176 hour Completion Time is an acceptable limitation on this potential of failing to meet the LCO indefinitely.

D.1

With one DC electrical power distribution subsystem inoperable for reasons other than Condition C, the remaining DC electrical power distribution subsystem is capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the required DC electrical power distribution subsystem must be restored to OPERABLE status within 7 days by powering the bus from the associated batteries or chargers.

(continued)

BASES

ACTIONS

D.1 (continued)

Condition D represents one division without adequate DC power, potentially with both the battery(s) significantly degraded and the associated charger(s) nonfunctioning. In this situation the plant is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the plant, minimizing the potential for loss of power to the remaining divisions, and restoring power to the affected division.

The 7 day Completion Time is consistent with the allowed Completion Time for an inoperable DC electrical power subsystem specified in Specification 3.8.4, "DC Sources—Operating". Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 7 days, is acceptable because of:

a. The potential for decreased safety when requiring a change in plant conditions (i.e., requiring a shutdown) while not allowing stable operations to continue;

b. The potential for decreased safety when requiring entry into numerous applicable Conditions and Required Actions for components without DC power, while not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected division;

c. The low potential for an event in conjunction with a single failure of a redundant component.

The second Completion Time for Required Action D.1 establishes a limit on the maximum time allowed for any combination of required electrical power distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition D is entered while, for instance, an AC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 8 hours. This situation could lead to a total duration of 176 hours, since initial failure to

(continued)

BASES

ACTIONS

D.1 (continued)

meet the LCO, to restore the DC electrical power distribution system. At this time, an AC bus could again become inoperable, and the DC electrical power distribution system could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This allowance results in establishing the "time zero" at the time the LCO was initially not met, instead of at the time Condition D was entered. The 176 hour Completion Time is an acceptable limitation on this potential of failing to meet the LCO indefinitely.

E.1 and E.2

If the inoperable electrical power distribution subsystem(s) cannot be restored to OPERABLE status within the associated Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1

Condition F corresponds to a level of degradation in the electrical power distribution system that causes a required safety function to be lost. When more than one AC or DC electrical power distribution subsystem is lost, and this results in the loss of a required function, the plant is in a condition outside the accident analysis. Therefore, no additional time is justified for continued operation. LCO 3.0.3 must be entered immediately to commence a controlled shutdown.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the AC and DC electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. This includes verifying that distribution bus tie breakers are open and control power transfer switches associated with the 4.16 kV and 480 V emergency buses and transfer switches associated with the ESS and DG panels are aligned to their normal DC sources. The correct breaker alignment ensures the appropriate separation and independence of the electrical buses are maintained, and power is available to each required bus. The verification of energization of the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. This may be performed by verification of absence of low voltage alarms or by verifying a load powered from the bus is operating. The 7 day Frequency takes into account the redundant capability of the AC and DC electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

SR 3.8.7.2

This Surveillance verifies that no combination of more than two power conversion modules (consisting of either two lighting inverters or one lighting inverter and one plant uninterruptible power supply unit) are aligned to Division II (bus B). Two power conversion modules aligned to Division II (bus B) was an initial assumption in the DC battery load study. Limiting two power conversion modules to be aligned to Division II ensures the associated batteries will supply DC power to safety related equipment during a design basis event. The 7 day Frequency takes into account the redundant capability of the DC electrical power distribution subsystems and indications available in the control room to alert the operator of power conversion module misalignment.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36(c)(2)(ii).

Table B 3.8.7-1 (page 1 of 1)
AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	DIVISION I[a]	DIVISION II[a]
AC emergency buses	4160 V	Emergency Buses E1, E3	Emergency Buses E2, E4
	480 V	Emergency Buses E5, E7	Emergency Buses E6, E8
AC vital buses	120 V	Distribution Panels 1E5, 2E7	Distribution Panels 1E6, 2E8
DC buses	250 V	Switchboard 1A	Switchboard 1B
	125 V	ESS logic Cabinets H58, H60	ESS logic Cabinets H59, H61
	125 V	DG Panels DG-1, DG-3	DG Panels DG-2, DG-4
DC control power buses	125 V	4.16 kV Switchgear E1, E3	4.16 kV Switchgear E2, E4
	125 V	480 V Switchgear E5, E7	480 V Switchgear E6, E8

(a) Each division of the AC and DC electrical power distribution systems is a subsystem.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Distribution Systems—Shutdown

BASES

BACKGROUND

A description of the AC and DC electrical power distribution system is provided in the Bases for LCO 3.8.7, "Distribution Systems—Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC and DC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the AC and DC electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC and DC electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

The AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

(continued)

BASES (continued)

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications required systems, equipment, and components—both specifically addressed by their own LCO, and implicitly required by the definition of OPERABILITY. In addition, DC control power for operation of two of the four 4.16 kV emergency buses and two of the four 480 V emergency buses, as well as control power for two of the four diesel generators, is provided by the Unit 2 DC electrical power subsystems. Therefore, the Unit 2 DC electrical power distribution subsystems needed to support required components are also required to be OPERABLE.

In addition, it is acceptable for required buses to be cross-tied during shutdown conditions, permitting a single source to supply multiple redundant buses, provided the source is capable of maintaining proper frequency (if required) and voltage.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel;

b. Systems needed to mitigate a fuel handling accident are available;

(continued)

BASES

APPLICABILITY (continued)

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC and DC electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.7.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3, would require the unit to be shutdown, but would not require immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made, (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

(continued)

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5 (continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal-shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR-SDC inoperable and not in operation, which results in taking the appropriate RHR-SDC ACTIONS.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the plant safety systems may be without power.

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the AC and DC electrical power distribution subsystems are functioning properly, with the correct breaker alignment. The correct breaker alignment ensures power is available to each required bus. The verification of energization of the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. This may be performed by verification of the absence of low voltage alarms or by verifying a load powered from the bus is operating. The 7 day Frequency takes into account the redundant capability of the electrical power distribution subsystems, as well as other indications available in the control room that alert the operator to subsystem malfunctions.

(continued)

BASES (continued)

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15.
3. 10 CFR 50.36(c)(2)(ii).

Unit 2
Bases Book 1 Replacement Pages

BASES

TO

THE FACILITY OPERATING LICENSE DPR-62

TECHNICAL SPECIFICATIONS

FOR

BRUNSWICK STEAM ELECTRIC PLANT

UNIT 2

CAROLINA POWER & LIGHT COMPANY

REVISION 13

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B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources—Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources—Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation and during movement of irradiated fuel assemblies in the secondary containment.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

In general, when the unit is shutdown, the Technical Specification requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBAs, which are analyzed for operating MODES, are not as significant a concern during shutdown MODES due to lower energies involved. The Technical Specifications, therefore, require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an industry initiative to manage shutdown and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

LCO

The required Unit 2 DC electrical power subsystem consisting of two 125 V batteries in series, two battery chargers (one per battery), and the corresponding control equipment and interconnecting cabling supplying power to the associated bus, needed to support one DC distribution subsystem is required to be OPERABLE. This requirement ensures the availability of sufficient DC electrical power sources to

(continued)

BASES

LCO (continued)

operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3, would require the unit to be shutdown, but would not require immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

(continued)

BASES

ACTIONS (continued)

A.1, A.2.1, A.2.2, A.2.3, and A.2.4

By allowance of the option to declare required features inoperable with associated DC electrical power subsystem(s) inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. However, in many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires certain Surveillances required by LCO 3.8.4 to be met. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required unless Unit 1 Specification 3.8.4, "DC Sources—Operating," requires performance of these SRs.

(continued)

BASES

SUREILLANCE REQUIREMENTS

SR 3.8.5.1 (continued)

When Unit 1 Specification 3.8.4 requires performance of these SRs, DC source availability is not limited, due to the Unit 1 requirements for DC source OPERABILITY. Therefore, in this condition, other DC sources would be available to supply the required loads.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36(c)(2)(ii).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Cell Parameters

BASES

BACKGROUND	This LCO delineates the limits on electrolyte temperature, level, float voltage, and specific gravity for the DC electrical power subsystems batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources—Operating," and LCO 3.8.5, "DC Sources—Shutdown."
APPLICABLE SAFETY ANALYSES	The initial conditions of Design Basis Accident (DBA) and transient analyses in UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power subsystems provide normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation. The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit as discussed in the Bases for LCO 3.8.4 and LCO 3.8.5. Since battery cell parameters support the operation of the DC electrical power subsystems, they satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).
LCO	Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Electrolyte limits are conservatively established, allowing continued DC electrical system function even with Category A and B limits not met.
APPLICABILITY	The battery cell parameters are required solely for the support of the associated DC electrical power subsystem. Therefore, these cell parameters are only required when the associated DC electrical power subsystem is required to be OPERABLE. Refer to the Applicability discussions in Bases for LCO 3.8.4 and LCO 3.8.5.

(continued)

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note indicating that a separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each battery with battery cell parameters not within limits. Complying with the Required Actions may allow for continued operation, and subsequent batteries with battery cell parameters not within limits are governed by subsequent Condition entry and application of associated Required Actions.

A.1, A.2, and A.3

With parameters of one or more cells in one or more batteries not within limits (i.e., Category A limits not met or Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of Category A or B limits not met, and continued operation is permitted for a limited period.

The pilot cell(s) electrolyte level and float voltage are required to be verified to meet the Category C limits within 1 hour (Required Action A.1). This check provides a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cell(s). One hour is considered a reasonable amount of time to perform the required verification.

Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at

(continued)

BASES

ACTIONS

A.1, A.2, and A.3 (continued)

7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the normal Frequency of pilot cell Surveillances.

Continued operation prior to declaring the affected batteries inoperable is permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. Taking into consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable for operation prior to declaring the DC batteries inoperable.

B.1

When any battery parameter is outside the Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement is not ensured and the corresponding DC electrical power subsystem must be declared inoperable. Additionally, other potentially extreme conditions, such as any Required Action of Condition A and associated Completion Time not met or average electrolyte temperature of representative cells < 60°F, also are cause for immediately declaring the associated DC electrical power subsystem inoperable.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 4), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.

SR 3.8.6.2

The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 4).

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.3

This Surveillance verification that the average temperature of representative cells is within limits is consistent with a recommendation of IEEE-450 (Ref. 4) that states that the temperature of electrolytes in representative cells should be determined on a quarterly basis.

Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on manufacturer's recommendations and the battery sizing calculations.

Table 3.8.6-1

This Table delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designed pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity approximate the state of charge of the entire battery.

The Category A limits specified for electrolyte level are based on manufacturer's recommendations and are consistent with the guidance in IEEE-450 (Ref. 4), with the extra ¼ inch allowance above the high water level indication for operating margin to account for temperature and charge effects. In addition to this allowance, Footnote (a) to Table 3.8.6-1 permits the electrolyte level to be temporarily above the specified maximum level during and following equalizing charge (i.e., for up to 3 days following the completion of an equalize charge), provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 4) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on the manufacturer's recommendations and on the recommendation of IEEE-450 (Ref. 4), which states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells. The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer's fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 4), the specific gravity readings are based on a temperature of 77°F (25°C).

The specific gravity readings are corrected for actual electrolyte temperature and level. For each 3°F (1.67°C) above 77°F (25°C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3°F below 77°F. The specific gravity of the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation. Level correction will be in accordance with manufacturer's recommendations.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any battery cell that may be jumpered out.

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer's fully charged, nominal specific gravity) with the average of all connected cells ≥ 1.205 (0.010 below the manufacturer's fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging cells having higher specific gravities.

Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

and maintain a margin of safety. When any battery parameter is outside the Category C limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

The Category C limit specified for electrolyte level (above the top of the plates and not overflowing) ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limit for voltage is based on IEEE-450, Appendix C (Ref. 4), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.

The Category C limit on average specific gravity ≥ 1.195, is based on manufacturer's recommendations (0.020 below the manufacturer's recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must be no less than 0.020 below the average of all connected cells. This limit ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging with cells having higher specific gravities.

The footnotes to Table 3.8.6-1 that apply to specific gravity are applicable to Category A, B, and C specific gravity. Footnote (b) requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current, while on float charge, is < 2 amps. This current provides, in general, an indication of acceptable overall battery condition.

Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charging current is an acceptable alternative to specific gravity measurement for determining the state of charge of the designated pilot cell. This phenomenon is discussed in IEEE-450 (Ref. 4). Footnote (c) allows the float charge current to be used as an alternate to specific

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

gravity for up to 7 days following a battery recharge. Within 7 days, each connected cell's specific gravity must be measured to confirm the state of charge. Following a minor battery recharge (such as equalizing charge that does not follow a deep discharge) specific gravity gradients are not significant, and confirming measurements may be made in less than 7 days.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36(c)(2)(ii).

4. IEEE Standard 450, 1987.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Distribution Systems—Operating

BASES

BACKGROUND

The onsite Class 1E AC and DC electrical power distribution system is divided into redundant and independent AC and DC electrical power distribution subsystems.

The Class 1E AC electrical distribution system is divided into four load groups. Each load group consists of a primary emergency bus, its downstream secondary emergency bus, 120 VAC vital bus, and transformers and interconnecting cables. The buses associated with each of the four load groups are defined as follows:

Load group E1 consists of 4.16 kV bus E1, 480 V bus E5, and 120 VAC vital bus 1E5.

Load group E2 consists of 4.16 kV bus E2, 480 V bus E6, and 120 VAC vital bus 1E6.

Load group E3 consists of 4.16 kV bus E3, 480 V bus E7, and 120 VAC vital bus 2E7.

Load group E4 consists of 4.16 kV bus E4, 480 V bus E8, and 120 VAC vital bus 2E8.

The E1 and E2 load groups are supplied from Unit 1 balance of plant (BOP) buses and primarily serve Unit 1 loads. The E3 and E4 load groups are supplied from Unit 2 BOP buses and primarily serve Unit 2 loads. In some instances loads associated with one unit are actually supplied from the opposite unit's load group buses.

Each primary emergency bus (4.16 kV emergency bus) has access to two offsite sources of power via a common circuit path from its associated upstream BOP bus (master/slave breakers and interconnecting cables). In addition, each 4.16 kV emergency bus can be provided power from an onsite diesel generator (DG) source. The upstream BOP bus associated with each 4.16 kV emergency bus is normally connected to the main generator output via the unit auxiliary transformer. During a loss of the normal power source to the 4.16 kV BOP bus, the preferred source supply breaker attempts to close. If all offsite sources are

(continued)

BASES

BACKGROUND (Continued)

unavailable, the affected 4.16 kV emergency bus is isolated from its associated upstream 4.16 kV BOP bus and the onsite emergency DG will supply power to the 4.16 kV emergency bus. Control power for each 4.16 kV emergency bus is supplied from a Class 1E battery with manual transfer capability to another Class 1E battery. Additional descriptions of this system may be found in the Bases for Specification 3.8.1, "AC Sources-Operating," and the Bases for Specification 3.8.4, "DC Sources-Operating".

The secondary plant distribution system includes 480 VAC emergency buses E5, E6, E7, and E8 and associated motor control centers (MCCs), transformers, and interconnecting cables. Secondary emergency buses E5, E6, E7, and E8 are supplied from primary emergency buses E1, E2, E3, and E4, respectively. Control power for each 480 VAC emergency bus is supplied from a Class 1E battery with manual transfer capability to another Class 1E battery. Additional descriptions of this system may be found in the Bases for Specification 3.8.4, "DC Sources-Operating".

The 120 VAC vital buses 1E5, 1E6, 2E7, and 2E8 are arranged in four load groups and are powered from secondary emergency buses E5, E6, E7, and E8, respectively.

There are two independent 125/250 VDC electrical power distribution subsystems.

The list of required distribution buses is presented in Table B 3.8.7-1.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC and DC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, "Power Distribution Limits"; Section 3.5, "Emergency Core Cooling System (ECCS) and Reactor Core Isolation Cooling (RCIC) System"; and Section 3.6, "Containment Systems."

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of the AC and DC electrical power distribution subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining distribution systems OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power; and

b. A worst case single failure.

The AC and DC electrical power distribution system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

LCO

The required electrical power distribution subsystems listed in Table B 3.8.7-1 ensure the availability of AC and DC electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The Unit 2 AC and DC electrical power distribution subsystems are required to be OPERABLE. In addition, since some components required by Unit 2 receive power through Unit 1 DC electrical power distribution subsystems (e.g., control power for two of the four 4.16 kV emergency buses, two of the four 480 VAC emergency buses, and for two of the DGs, and two of four engineered safeguard system (ESS) panels), the Unit 1 DC electrical power distribution subsystems needed to support the required equipment must also be OPERABLE. As stated in Table B 3.8.7-1, each division of the AC and DC electrical power distribution systems is a subsystem.

Maintaining the Division I and II AC and DC electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor.

The AC electrical power distribution subsystems require the associated buses and electrical circuits to be energized to their proper voltages. The DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated batteries or chargers.

(continued)

BASES

LCO (continued)

Based on the number of safety significant electrical loads associated with each bus listed in Table B 3.8.7-1, if one or more of the buses becomes inoperable, entry into the appropriate ACTIONS of LCO 3.8.7 is required. Other buses, such as MCCs and distribution panels, which help comprise the AC and DC distribution systems are not listed in Table B 3.8.7-1. The loss of electrical loads associated with these buses may not result in a complete loss of a redundant safety function necessary to shut down the reactor and maintain it in a safe condition. Therefore, should one or more of these buses become inoperable due to a failure not affecting the OPERABILITY of a bus listed in Table B 3.8.7-1 (e.g., a breaker supplying a single MCC fails open), the individual loads on the bus must be declared inoperable, and the appropriate Conditions and Required Actions of the LCOs governing the individual loads would be entered. However, if one or more of these buses is inoperable due to a failure also affecting the OPERABILITY of a bus listed in Table B 3.8.7-1 (e.g., loss of a 4.16 kV emergency bus, which results in de-energization of all buses powered from the 4.16 kV emergency bus), then although the individual loads are still considered inoperable, the Conditions and Required Actions of the LCO for the individual loads are not required to be entered, since LCO 3.0.6 allows this exception (i.e., the loads are inoperable due to the inoperability of a support system governed by a Technical Specification; the 4.16 kV emergency bus).

In addition, tie breakers and transfer switches between redundant safety related AC and DC power distribution subsystems, if they exist, must be open. This includes control power transfer switches associated with the 4.16 kV and 480 V emergency buses and transfer switches associated with the ESS and DG panels. The requirement for tie breakers to be open between redundant buses and divisions is necessary to ensure independence of the redundant buses and divisions. Independence of the redundant buses and divisions is required to ensure that single-failure criteria are satisfied. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, which could cause the failure of a redundant subsystem and a loss of essential safety function(s). Except as noted below, if any tie breakers are closed or transfer switches aligned to the alternate supply,

(continued)

BASES (continued)

LCO (continued)

the affected redundant electrical power distribution subsystems are considered inoperable. This applies to the onsite, safety related, redundant electrical power distribution subsystems. It does not, however, preclude redundant Class IE 4.16 kV emergency buses from being powered from the same offsite circuit.

An exception to the requirement to maintain the cross-tie breakers open between the 4.16 kV emergency buses applies during breaker setup and/or Appendix R and Station Blackout testing of cross-tie breakers and their associated control circuitry. During these evolutions it is permissible to close one of the two series cross-tie breakers between the 4.16 kV buses if the remaining series cross-tie breaker has been racked-out and removed from its cubicle and control power for the closed breaker is maintained at all times while the breaker is closed; under these conditions independence of the redundant buses and divisions is maintained such that single-failure criteria are satisfied.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, and 3 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Electrical power distribution subsystem requirements for MODES 4 and 5 and other conditions in which AC and DC electrical power distribution subsystems are required are covered in the Bases for LCO 3.8.8, "Distribution Systems—Shutdown."

ACTIONS

A.1

With one AC electrical power distribution subsystem inoperable due to either inoperable load group E1 bus(es), or inoperable load group E2 bus(es), the remaining AC electrical power distribution load groups are capable of

(continued)

BASES

ACTIONS

A.1 (continued)

supporting the minimum safety functions necessary to shut down the operating reactor and maintain both reactors in a safe condition, assuming no single failure in the remaining AC electrical power distribution load groups, when Unit 1 is in MODE 4 or 5. (If Unit 1 is in MODE 1, 2, or 3, then the Unit 1 ACTIONS of Specification 3.8.7, "Distribution Systems—Operating," require restoration of the associated AC electrical power distribution subsystem within 8 hours of the inoperability.) The overall reliability is reduced in Condition A, because a single failure in a remaining load group could result in the minimum required ESF functions not being supported. As a result, Required Action A.1 limits the time period to perform planned maintenance on a Unit 1 load group to 7 days. This is acceptable based on the following:

a. The other unit's load group buses are not as critical to the operating unit (fewer operating unit loads) as the operating unit's load group buses.

b. Performing maintenance on these components will increase the reliability of the Class 1E AC Electrical Power Distribution System.

c. The 7 day Completion Time provides a reasonable time frame for performance of planned maintenance.

During the planned maintenance of the load group buses, if a condition is discovered on these buses requiring corrective maintenance, this maintenance may be performed within the 7 day Completion Time of Required Action A.1.

The Class 1E AC Electrical Power Distribution System is divided into four load groups. Each load group consists of a primary emergency bus, its downstream secondary emergency bus, 120 VAC vital bus, and transformers and interconnecting cables. The buses associated with each of the four load groups are defined as follows:

(continued)

BASES

ACTIONS

A.1 (continued)

Load group E1 consists of 4.16 kV bus E1, 480 V bus E5, and 120 VAC vital bus 1E5.

Load group E2 consists of 4.16 kV bus E2, 480 V bus E6, and 120 VAC vital bus 1E6.

Load group E3 consists of 4.16 kV bus E3, 480 V bus E7, and 120 VAC vital bus 2E7.

Load group E4 consists of 4.16 kV bus E4, 480 V bus E8, and 120 VAC vital bus 2E8.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, an AC bus in a load group in a different division is inoperable and subsequently returned OPERABLE, this LCO may already have been not met for up to 8 hours. This situation could lead to a total duration of 176 hours (since initial failure to meet the LCO) to restore the AC Electrical Power Distribution System. At this time an AC bus in a load group in a different division could again become inoperable, and the load group removed under Condition A could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock". This results in establishing the "time zero" at the time this LCO was initially not met, instead of at the time Condition A was entered. The 176 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

If while in Condition A, emergency buses associated with another load group become inoperable (e.g., buses in load groups E1 and E2 are concurrently inoperable), Condition B and F must be entered, as appropriate.

(continued)

BASES

ACTIONS (continued)

B.1

With one or more required AC buses or distribution panels in one division inoperable for reasons other than Condition A, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining AC electrical power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, and distribution panels must be restored to OPERABLE status within 8 hours.

The Condition B worst scenario is one division without AC power (i.e., no offsite power to the division and the associated DG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operators' attention be focused on minimizing the potential for loss of power to the remaining division by stabilizing the unit and restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

a. The potential for decreased safety if the unit operators' attention is diverted from the evaluations and actions necessary to restore power to the affected division to the actions associated with taking the unit to shutdown within this time limit.

b. The low potential for an event in conjunction with a single failure of a redundant component in the division with AC power. (The redundant component is verified OPERABLE in accordance with Specification 5.5.11, "Safety Function Determination Program (SFDP).")

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, a DC bus is inoperable and subsequently

(continued)

BASES

ACTIONS

B.1 (continued)

returned OPERABLE, this LCO may already have been not met for up to 7 days. This situation could lead to a total duration of 176 hours, since initial failure to meet the LCO, to restore the AC electrical power distribution system. At this time a DC bus could again become inoperable, and the AC electrical power distribution system could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This results in establishing the "time zero" at the time this LCO was initially not met, instead of at the time Condition B was entered. The 176 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

C.1, C.2, C.3 and C.4

Condition C applies to the 125 VDC buses listed in Table B 3.8.7-1 which can be supplied from either a normal or an alternate DC source. These buses are listed below:

a. 125 VDC Control Power Buses for 4.16 kV Switchgear E1, E2, E3, and E4;

b. 125 VDC Control Power Buses for 480 V Switchgear E5, E6, E7, and E8;

c. 125 VDC ESS Logic Cabinets H58, H59, H60, and H61; and

d. 125 VDC DG Panels DG-1, DG-2, DG-3, and DG-4.

Condition A permits the de-energization of the E1 load group bus(es) or the E2 load group bus(es) for planned maintenance when Unit 1 is in MODE 4 or 5. During a 4.16 kV or 480 V bus outage it is desirable to clear both the normal and alternate sources of DC control power to the bus for personnel safety. The de-energized AC bus is inoperable and not capable of supplying its loads regardless of the availability of DC control power. Hence, entry into Condition C as a result of performing maintenance under Condition A is not necessary; Condition D would apply.

(continued)

BASES

ACTIONS

C.1, C.2, C.3 and C.4 (continued)

With one or more DC electrical power distribution subsystems inoperable due to loss of normal DC source, the remaining DC electrical power distribution subsystem(s) are capable of supporting the minimum safety functions necessary to shutdown the reactor and maintain it in a safe shutdown condition, provided safety function is not lost and assuming no single failure. However, the overall reliability is reduced because a single failure in the DC electrical power distribution system could result in a loss of two of four AC electrical load groups and the minimum required ESF functions not being supported. Therefore, action must be immediately initiated to transfer the DC electrical power distribution system to its alternate source and the affected supported equipment immediately declared inoperable. Upon completion of the transfer of the affected supported equipment's DC electrical power distribution subsystem to its OPERABLE alternate DC source, the affected supported equipment may be declared OPERABLE again. The ESS logic cabinets transfer automatically upon loss of the normal source. For an ESS logic cabinet, verification that the automatic transfer has occurred and alternate power is available to the ESS logic cabinet will satisfy Required Action C.2. By allowance of the option to declare affected supported equipment inoperable with associated DC electrical power distribution subsystems inoperable due to loss of normal DC source, more conservative restrictions are implemented in accordance with the affected system LCOs' ACTIONS. When any control power transfer switch associated with the 4.16 kV and 480 V emergency buses or any transfer switch associated with the ESS and DG panels is transferred to the alternate source, a single failure in the DC system could render two of four AC electrical load groups inoperable. Therefore, to prevent indefinite operation in this degraded condition, power from the normal DC source must be restored in 7 days.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. Required Actions C.1 and C.2 should be completed as quickly as possible. The 7 day Completion Time of Required Action C.4 is considered to be acceptable due to the low potential for an event in conjunction with a single failure

(continued)

BASES

ACTIONS

C.1, C.2, C.3 and C.4 (continued)

of a redundant component and is consistent with the allowed Completion Time for an inoperable DC electrical power subsystem specified in Specification 3.8.4, "DC Sources—Operating."

The second Completion Time for Required Action C.4 establishes a limit on the maximum time allowed for any combination of required electrical power distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition C is entered while, for instance, an AC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 8 hours. This situation could lead to a total duration of 176 hours, since initial failure to meet the LCO, to restore the DC electrical power distribution system. At this time, an AC bus could again become inoperable, and the DC electrical power distribution system could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This allowance results in establishing the "time zero" at the time the LCO was initially not met, instead of at the time Condition C was entered. The 176 hour Completion Time is an acceptable limitation on this potential of failing to meet the LCO indefinitely.

D.1

With one DC electrical power distribution subsystem inoperable for reasons other than Condition C, the remaining DC electrical power distribution subsystem is capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the required DC electrical power distribution subsystem must be restored to OPERABLE status within 7 days by powering the bus from the associated batteries or chargers.

(continued)

BASES

ACTIONS

D.1 (continued)

Condition D represents one division without adequate DC power, potentially with both the battery(s) significantly degraded and the associated charger(s) nonfunctioning. In this situation the plant is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the plant, minimizing the potential for loss of power to the remaining divisions, and restoring power to the affected division.

The 7 day Completion Time is consistent with the allowed Completion Time for an inoperable DC electrical power subsystem specified in Specification 3.8.4, "DC Sources—Operating". Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 7 days, is acceptable because of:

a. The potential for decreased safety when requiring a change in plant conditions (i.e., requiring a shutdown) while not allowing stable operations to continue;

b. The potential for decreased safety when requiring entry into numerous applicable Conditions and Required Actions for components without DC power, while not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected division;

c. The low potential for an event in conjunction with a single failure of a redundant component.

The second Completion Time for Required Action D.1 establishes a limit on the maximum time allowed for any combination of required electrical power distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition D is entered while, for instance, an AC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 8 hours. This situation could lead to a total duration of 176 hours, since initial failure to

(continued)

BASES

ACTIONS

D.1 (continued)

meet the LCO, to restore the DC electrical power distribution system. At this time, an AC bus could again become inoperable, and the DC electrical power distribution system could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This allowance results in establishing the "time zero" at the time the LCO was initially not met, instead of at the time Condition D was entered. The 176 hour Completion Time is an acceptable limitation on this potential of failing to meet the LCO indefinitely.

E.1 and E.2

If the inoperable electrical power distribution subsystem(s) cannot be restored to OPERABLE status within the associated Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1

Condition F corresponds to a level of degradation in the electrical power distribution system that causes a required safety function to be lost. When more than one AC or DC electrical power distribution subsystem is lost, and this results in the loss of a required function, the plant is in a condition outside the accident analysis. Therefore, no additional time is justified for continued operation. LCO 3.0.3 must be entered immediately to commence a controlled shutdown.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the AC and DC electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. This includes verifying that distribution bus tie breakers are open and control power transfer switches associated with the 4.16 kV and 480 V emergency buses and transfer switches associated with the ESS and DG panels are aligned to their normal DC sources. The correct breaker alignment ensures the appropriate separation and independence of the electrical buses are maintained, and power is available to each required bus. The verification of energization of the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. This may be performed by verification of absence of low voltage alarms or by verifying a load powered from the bus is operating. The 7 day Frequency takes into account the redundant capability of the AC and DC electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

SR 3.8.7.2

This Surveillance verifies that no combination of more than two power conversion modules (consisting of either two lighting inverters or one lighting inverter and one plant uninterruptible power supply unit) are aligned to Division II (bus B). Two power conversion modules aligned to Division II (bus B) was an initial assumption in the DC battery load study. Limiting two power conversion modules to be aligned to Division II ensures the associated batteries will supply DC power to safety related equipment during a design basis event. The 7 day Frequency takes into account the redundant capability of the DC electrical power distribution subsystems and indications available in the control room to alert the operator of power conversion module misalignment.

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36(c)(2)(ii).

Table B 3.8.7-1 (page 1 of 1)
AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	DIVISION I[a]	DIVISION II[a]
AC emergency buses	4160 V	Emergency Buses E1, E3	Emergency Buses E2, E4
	480 V	Emergency Buses E5, E7	Emergency Buses E6, E8
AC vital buses	120 V	Distribution Panels 1E5, 2E7	Distribution Panels 1E6, 2E8
DC buses	250 V	Switchboard 2A	Switchboard 2B
	125 V	ESS logic Cabinets H58, H60	ESS logic Cabinets H59, H61
	125 V	DG Panels DG-1, DG-3	DG Panels DG-2, DG-4
DC control power buses	125 V	4.16 kV Switchgear E1, E3	4.16 kV Switchgear E2, E4
	125 V	480 V Switchgear E5, E7	480 V Switchgear E6, E8

(a) Each division of the AC and DC electrical power distribution systems is a subsystem.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Distribution Systems—Shutdown

BASES

BACKGROUND

A description of the AC and DC electrical power distribution system is provided in the Bases for LCO 3.8.7, "Distribution Systems—Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC and DC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the AC and DC electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC and DC electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

The AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

(continued)

BASES (continued)

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications required systems, equipment, and components—both specifically addressed by their own LCO, and implicitly required by the definition of OPERABILITY. In addition, DC control power for operation of two of the four 4.16 kV emergency buses and two of the four 480 V emergency buses, as well as control power for two of the four diesel generators, is provided by the Unit 1 DC electrical power subsystems. Therefore, the Unit 1 DC electrical power distribution subsystems needed to support required components are also required to be OPERABLE.

In addition, it is acceptable for required buses to be cross-tied during shutdown conditions, permitting a single source to supply multiple redundant buses, provided the source is capable of maintaining proper frequency (if required) and voltage.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel;

b. Systems needed to mitigate a fuel handling accident are available;

(continued)

BASES

APPLICABILITY (continued)

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC and DC electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.7.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3, would require the unit to be shutdown, but would not require immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made, (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

(continued)

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5 (continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal-shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR-SDC inoperable and not in operation, which results in taking the appropriate RHR-SDC ACTIONS.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the plant safety systems may be without power.

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the AC and DC electrical power distribution subsystems are functioning properly, with the correct breaker alignment. The correct breaker alignment ensures power is available to each required bus. The verification of energization of the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. This may be performed by verification of the absence of low voltage alarms or by verifying a load powered from the bus is operating. The 7 day Frequency takes into account the redundant capability of the electrical power distribution subsystems, as well as other indications available in the control room that alert the operator to subsystem malfunctions.

(continued)

BASES (continued)

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 15.
3. 10 CFR 50.36(c)(2)(ii).