

Industry/TSTF Standard Technical Specification Change Traveler

Add Action to LCO 3.8.9 to require entry into LCO 3.0.3 when there is a loss of function

Classification: 1) Correct Specifications

NUREGs Affected: 1430 1431 1432 1433 1434

Description:

Revise LCO 3.8.9, Conditions A, B, C, and E to state, "One or more ... subsystems inoperable" to permit plant operation to continue in Modes 1, 2, or 3 for the existing Completion Times if a loss of function does not result.

Justification:

Revision 0 Change NRC-02 added Condition F to the Actions of LCO 3.8.9 to require entry into LCO 3.0.3 whenever there were two or more electrical power distribution subsystems inoperable that result in a loss of function. However, should two or more subsystems be inoperable without causing a loss of function, the Actions to not specify an equivalent Condition. Therefore, LCO 3.0.3 would apply even if no loss of function resulted. This was not the intent of NRC-02.

Revising conditions A, B, C, and E to state, "One or more ... subsystems inoperable" would permit plant operation to continue in Modes 1, 2, or 3 for the existing Completion Times if a loss of function does not result. Action F would still require entry into LCO 3.0.3 if a loss of function does result.

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Revision History

OG Revision 0

Revision Status: Closed

Revision Proposed by:

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 02-Nov-95

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 02-Nov-95

TSTF Review Information

TSTF Received Date: 02-Nov-95 Date Distributed for Review 02-Nov-95

OG Review Completed: BWOG WOG CEOG BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 02-Nov-95

NRC Review Information

NRC Received Date: 03-Oct-95

9/12/00

OG Revision 0**Revision Status: Closed**

NRC Comments:

10/11/95 - E. Tomlinson reviewing.

12/15/95 - TSTF to resubmit TSTF-16.

6/11/96 - C. Grimes comment: TSTF-16 changes are a major problem, consistency problems. Needs clarification of 3.0.3.

9/18/96 - No change in status.

3/6/97 - replaced by Revision 1.

Final Resolution: Superseded by Revision

Final Resolution Date: 06-Mar-97

TSTF Revision 1**Revision Status: Closed**

Revision Proposed by: TSTF

Revision Description:

Revised to include all Action and Bases changes needed for all NUREGs.

TSTF Review Information

TSTF Received Date: 08-Feb-96

Date Distributed for Review 08-Feb-96

OG Review Completed: BWOG WOG CEOG BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 08-Feb-96

NRC Review Information

NRC Received Date: 08-Feb-96

NRC Comments:

3/6/97 - TSTF-16, Rev 1 received.

9/24/96 - Reviewer recommended rejection. Reviewer discussed comments with EELB and they agree to his proposal to reject because the change proposed correction of a problem because of incorporation of NRC-02, which should not have been accepted previously; it does not include a time element for determining the existence or absence or a loss of function; and the NUREGs treatment of Distribution Systems is a compromise that works poorly and is not satisfactory to either the Owner's Group nor the staff. Sent to C. Grimes for disposition.

10/30/96 - NRC planning on rejecting. Formal rejection and explanation coming.

3/18/97 - Traveler awaiting C. Grimes action since 9/26/96. No change in status.

4/10/97 - C. Grimes requested meeting with TSB staff via Note.

10/1/97 - NRC Rejects. The proposed change is Rejected. If allowed, this change could mean that a (typical 2 train/div.) plant could have both 4160 VAC safety busses de-energized for up to 8 hours without requiring a plant shutdown (This assumes that the plant has not already tripped because of the multiple distribution subsystem inoperabilities.). This is not acceptable. NRC-02 should have been rejected for the same reason (The example is an extreme case, and there may be valid reasons why a plant shutdown in this scenario would not be the most prudent action. However, this is not the issue at hand and should not enter into the discussion.).

This proposed change, as well as NRC-02, is a direct result of the apparent dissatisfaction with the compromise reached on distribution systems during development of the NUREGs. The appropriate action would be to revert to the distribution format initially proposed by the staff and rejected by the OGs. That format provided an AOT for each electrical power distribution subsystem based on the impact of its

9/12/00

TSTF Revision 1**Revision Status: Closed**

inoperability. The OGs rejected this idea on the grounds that establishing the impact of each inoperable distribution subsystem entailed an excessive amount of effort. However, this problem has apparently resolved itself because the OGs now indicate a willingness to evaluate the impact of multiple distribution subsystem inoperabilities for loss of function. Obviously, one can not assess the impact of multiple inoperabilities without thorough knowledge of the impact of all individual inoperabilities. Therefore, with this knowledge in hand, it is but a small step to assigning AOTs for each distribution subsystem.

In light of the fact that the staff does not accept the OGs proposal, the fact that the OGs are not satisfied with the NUREGs, and considering that the issue of assessing the impact of each distribution subsystem has apparently been resolved, reverting to the initial staff proposal appears to be the logical solution.

6/16/99 - Harry P to contact NRC by 6/25/99 to discuss.

10/30/99 - NRC provided proposed revisions.

Final Resolution: Superseded by Revision

Final Resolution Date: 02-Nov-99

TSTF Revision 2**Revision Status: Closed**

Revision Proposed by: NRC

Revision Description:

TSTF-16 is revised to incorporate NRC comments. The Conditions are modified to explicitly state the Bases description that the Condition does not result in a loss of function. A Note is added to Condition A which states, "Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources - Operating," for DC trains made inoperable by inoperable power distribution subsystems." This is in response to industry events in which it was not recognized that battery charging was lost on a loss of distribution systems and eventual inoperability of the DC systems. The NRC also requested that the relationship between subsystems and various components, (e.g., load centers, motor control centers, etc.) be clarified in the Bases. Additional information was not incorporated as that relationship is already described in the Background section of the 3.8.9 Bases.

TSTF Review Information

TSTF Received Date: 02-Nov-99

Date Distributed for Review 18-Nov-99

OG Review Completed: BWOG WOG CEOG BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 18-Nov-99

NRC Review Information

NRC Received Date: 23-Nov-99

NRC Comments:

1/10/00 - NRC has comments. TSTF to describe a set of circumstances in which both trains, i.e., subsystems, are inoperable and a safety function is not lost.

2/11/00 - Examples send to NRC. NRC reviewing.

3/8/2000 - NRC requested changes to the Bases of Specification 3.8.9 to clarify the term "subsystem".

Final Resolution: Superseded by Revision

Final Resolution Date: 08-Mar-00

9/12/00

TSTF Revision 3**Revision Status: Closed**

Revision Proposed by: NRC

Revision Description:

Revised to address NRC comments. Revised the Background and LCO sections of the 3.8.9 Bases to clarify what is meant by a "subsystem" and to provide consistent discussion of the Operability requirements.

TSTF Review Information

TSTF Received Date: 08-Mar-00

Date Distributed for Review 08-Mar-00

OG Review Completed: BWOG WOG CEOG BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 09-Mar-00

NRC Review Information

NRC Received Date: 09-May-00

NRC Comments:

3/25/00 - provided NRC with comments regarding an unintended consequence in TSTF-16. NRC considering. Waiting for NRC response prior to sending TSTF-16, Rev. 3.

7/13/00 - NRC provided comments. TSTF considering.

NRC provided comments on 8/10/00:

Your letter dated April 1,2000 pointed out an unintended consequence of rewording proposed in TSTF-16 for Specification 3.8.9, "Distribution System - Operating." Under technical specification rules, inclusion of the phrase "that does not result in loss of function" in Conditions A, B, and C could in some scenarios result in cycling in and out of these conditions with the concomitant starting and stopping of clocks, without actual change of operability of the affected subsystem(s). The net result is the potential to extend the completion time for recovering subsystem operability. After careful consideration, we prefer to remove the "that does not result in loss of function" language in the specified conditions.

With regard to the proposed change to Insert 3 for NUREG-1434 BWR/6, on review we feel that the insert in general does not adequately describe the circumstances under which a safety function can still be performed despite the loss of one or more subsystems in Division 1 or Division 2. In particular it seems appropriate to provide some acknowledgment of the role that Division 3 plays in the BWFUG design in combination with Division 1 and 2. We request that the TSTF formulate an alternative insert.

Finally, please find enclosed our final markup for the other portions of the Bases. This provides a consolidation of comments, some of which are in addition to those provided at our meeting on July 13,2000.

Final Resolution: Superseded by Revision

Final Resolution Date: 13-Jul-00

TSTF Revision 4**Revision Status: Active****Next Action: NRC**

Revision Proposed by: NRC

Revision Description:

Revised to incorporate NRC comments in 8/10/2000 letter. Eliminated phrase "that does not result in a loss of function" from Conditions A, B, and C. Clarified the Bases by including distribution panels in the

9/12/00

TSTF Revision 4**Revision Status: Active****Next Action: NRC**

descriptions. Revised Insert 3 to consistently describe the Required Action, and modified the Bases for Action A.1 and F.1. The BWR/6 Applicability Note was eliminated. This Note does not exist in the other NUREGs and the elimination is acceptable because the situation is already addressed in Condition E.

TSTF Review Information

TSTF Received Date: 01-Sep-00 Date Distributed for Review 07-Sep-00

OG Review Completed: BWOG WOG CEOG BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 12-Sep-00

Incorporation Into the NUREGs

File to BBS/LAN Date:

TSTF Informed Date:

TSTF Approved Date:

NUREG Rev Incorporated:

Affected Technical Specifications

Bkgnd 3.8.9 Bases	Distribution Systems - Operating	
Action 3.8.9.A	Distribution Systems - Operating	
Action 3.8.9.A Bases	Distribution Systems - Operating	
Action 3.8.9.B	Distribution Systems - Operating	
Action 3.8.9.B Bases	Distribution Systems - Operating	
Action 3.8.9.C	Distribution Systems - Operating	
Action 3.8.9.C Bases	Distribution Systems - Operating	
Action 3.8.9.E	Distribution Systems - Operating	NUREG(s)- 1430 1431 1432 Only
Action 3.8.9.E Bases	Distribution Systems - Operating	NUREG(s)- 1430 1431 1432 Only
LCO 3.8.9 Bases	Distribution Systems - Operating	NUREG(s)- 1433 1434 Only
Action 3.8.9.F	Distribution Systems - Operating	NUREG(s)- 1434 Only
Action 3.8.9.F Bases	Distribution Systems - Operating	NUREG(s)- 1434 Only

9/12/00

INSERT 1 (PWRs)

----- NOTE -----
Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources – Operating," for DC trains made inoperable by inoperable power distribution subsystems.

INSERT 1 (BWRs)

----- NOTE -----
Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources – Operating," for DC divisions made inoperable by inoperable power distribution subsystems.

INSERT 2 (PWRs)

Required Action A.1 is modified by a Note that requires the applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources – Operating," to be entered for DC trains made inoperable by inoperable power distribution subsystems. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. Inoperability of a distribution system can result in loss of charging power to batteries and eventual loss of DC power. This Note ensures that the appropriate attention is given to restoring charging power to batteries, if necessary, after loss of distribution systems.

INSERT 2 (BWRs)

Required Action A.1 is modified by a Note that requires the applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources – Operating," to be entered for DC divisions made inoperable by inoperable power distribution subsystems. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. Inoperability of a distribution system can result in loss of charging power to batteries and eventual loss of DC power. This Note ensures that the appropriate attention is given to restoring charging power to batteries, if necessary, after loss of distribution systems.

INSERT 3 (PWRs)

With one or more Train A and B required AC buses, load centers, motor control centers, or distribution panels (except AC vital buses), in one train inoperable and a loss of function has not occurred, 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 conditions, assuming no single failure.

INSERT 3 (BWRs)

With one or more Division 1 and 2 required AC buses, load centers, motor control centers, or distribution panels (except AC vital buses), in one division inoperable and a loss of function has not occurred, 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 conditions, assuming no single failure.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 5.	6 hours 36 hours
E. Two or more <u>Electrical Power</u> inoperable distribution subsystems that result in a loss of function.	E.1 Enter LCO 3.0.3	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.9.1 Verify correct breaker alignments and voltage to [required] AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems - Operating

LCO 3.8.9 Train A and Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

Insert 1

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. One ^(or more) AC electrical power distribution subsystem inoperable. _(S)</p>	<p>A.1 Restore AC electrical power distribution subsystem to OPERABLE status. _(S)</p>	<p>8 hours AND 16 hours from discovery of failure to meet LCO</p>
<p>B. One ^(or more) AC vital bus _(S) inoperable.</p>	<p>B.1 Restore AC vital bus subsystem to OPERABLE status. _(S)</p>	<p>2 hours AND 16 hours from discovery of failure to meet LCO</p>
<p>C. One ^(or more) DC electrical power distribution subsystem inoperable. _(S)</p>	<p>C.1 Restore DC electrical power distribution subsystem to OPERABLE status. _(S)</p>	<p>2 hours AND 16 hours from discovery of failure to meet LCO</p>

(continued)

TSTF-16, Rev 4

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems—Operating

BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital bus electrical power distribution systems are divided by train into [two] redundant and independent AC, DC, and AC vital bus electrical power distribution subsystems.

The AC electrical power subsystem for each train consists of a primary Engineered Safety Feature (ESF) 4.16 kV bus and secondary [480 and 120] V buses, distribution panels, motor control centers and load centers. Each [4.16 kV ESF bus] has at least [one separate and independent offsite source of power] as well as a dedicated onsite diesel generator (DG) source. Each [4.16 kV ESF bus] is normally connected to a preferred offsite source. After a loss of the preferred offsite power source to a 4.16 kV ESF bus, a transfer to the alternate offsite source is accomplished by utilizing a time delayed bus undervoltage relay. If all offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources—Operating," and the Bases for LCO 3.8.4, "DC Sources—Operating."

The secondary AC electrical power distribution system for each train includes the safety related load centers, motor control centers, and distribution panels shown in Table B 3.8.9-1.

The 120 VAC vital buses are arranged in two load groups per train and are normally powered from the inverters. The alternate power supply for the vital buses are Class 1E constant voltage source transformers powered from the same train as the associated inverter, and its use is governed by LCO 3.8.7, "Inverters—Operating." Each constant voltage source transformer is powered from a Class 1E AC bus.

There are two independent 125/250 VDC electrical power distribution subsystems (one for each train)

The list of all required distribution buses is presented in Table B 3.8.9-1.

Sub

buses,

The DC electrical distribution subsystem consists of [125]V bus(es) and distribution panel(s).

DC and vital AC

[and panels]

(continued)

BASES

*and distribution panels*LCO
(continued)

OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated [inverter via inverted DC voltage, inverter using internal AC source, or Class 1E constant voltage transformer].

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s). If any tie breakers are closed, 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 1E 4.16 kV buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 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 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems—Shutdown."

(continued)

BASES (continued)

ACTIONS

A.1

Insert 3

With one or more required AC electrical power distribution subsystems inoperable, the remaining AC electrical power distribution subsystem in the other train 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 power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

Condition A worst scenario is one train without AC power (i.e., no offsite power to the train 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 operator's attention be focused on minimizing the potential for loss of power to the remaining train by stabilizing the unit, and on restoring power to the affected train. 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 operator's attention is diverted from the evaluations and actions necessary to restore power to the affected train to the actions associated with taking the unit to shutdown within this time limit; and
- b. The potential for an event in conjunction with a single failure of a redundant component in the train with AC power.

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, a DC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 2 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the AC distribution system. At this time, a DC circuit could again

(continued)

BASES

ACTIONS

A.1 (continued)

become inoperable, and AC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

Insert 2

B.1

With one ^{or more} ~~required~~ AC vital bus ^{es} inoperable, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the ~~required~~ AC vital bus must be restored to OPERABLE status within 2 hours by powering the bus from the associated ^{or more} [inverter via inverted DC, inverter using internal AC Source, or Class 1E constant voltage transformer].

and a loss of function has not yet occurred

Condition B represents one ^{or more} AC vital bus ^{es} without power; potentially both the DC source and the associated AC source are nonfunctioning. In this situation the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining vital buses and restoring power to the affected vital bus.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without adequate vital AC power. Taking exception to LCO 3.0.2 for components without adequate vital AC power, that would have the Required Action Completion Times shorter than 2 hours if declared inoperable, is acceptable because of:

(continued)

BASES

Or distribution panels.

ACTIONS
(continued)C.1 one or moreand a loss of function
has not yet occurred,and
distribution
panels

With DC bus(es) ~~in one train inoperable~~, the remaining DC 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 DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the [required] DC buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

Or more DC buses

Or distribution
panels

Condition C represents one ~~train~~ without adequate DC power; potentially both with the battery significantly degraded and the associated charger nonfunctioning. In this situation, the unit 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 unit, minimizing the potential for loss of power to the remaining trains and restoring power to the affected train.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without power. Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

- a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) while allowing stable operations to continue;
- b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without DC power and not providing sufficient time for the operators to perform the necessary evaluations and actions to restore power to the affected train; and
- c. The potential for an event in conjunction with a single failure of a redundant component.

The 2 hour Completion Time for DC buses is consistent with Regulatory Guide 1.93 (Ref. 3).

(continued)

BASES

ACTIONS

C.1 (continued)

The second Completion Time for Required Action C.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 C is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the DC distribution system. At this time, an AC train could again become inoperable and DC distribution 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 will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

D.1 and D.2

If the inoperable distribution subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

E.1

Condition E corresponds to a level of degradation in the electrical distribution system that causes a required safety function to be lost. When more than one ~~condition is entered, 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

Inoperable electrical power distribution subsystem

(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems - Operating

LCO 3.8.9 Train A and Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

Insert 1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. One ^{or more} AC electrical power distribution subsystem _(S) inoperable.</p>	<p>A.1 Restore AC electrical power distribution subsystem to OPERABLE status. _(S)</p>	<p>8 hours AND 16 hours from discovery of failure to meet LCO</p>
<p>B. One ^{or more} AC vital bus _(S) inoperable.</p>	<p>B.1 Restore AC vital bus subsystem to OPERABLE status. _(S)</p>	<p>2 hours AND 16 hours from discovery of failure to meet LCO</p>
<p>C. One ^{or more} DC electrical power distribution subsystem _(S) inoperable.</p>	<p>C.1 Restore DC electrical power distribution subsystem to OPERABLE status. _(S)</p>	<p>2 hours AND 16 hours from discovery of failure to meet LCO</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3. <u>AND</u>	6 hours
	D.2 Be in MODE 5.	36 hours
E. <u>Two or more electrical trunks with power inoperable</u> distribution subsystems that result in a loss of safety function.	E.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.9.1 Verify correct breaker alignments and voltage to [required] AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

TSEF 16/10/4

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems—Operating

BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital bus electrical power distribution systems are divided by train into [two] redundant and independent AC, DC, and AC vital bus electrical power distribution subsystems.

The AC electrical power subsystem for each train consists of a primary Engineered Safety Feature (ESF) 4.16 kV bus and secondary [480 and 120] V buses, distribution panels, motor control centers and load centers. Each [4.16 kV ESF bus] has at least [one separate and independent offsite source of power] as well as a dedicated onsite diesel generator (DG) source. Each [4.16 kV ESF bus] is normally connected to a preferred offsite source. After a loss of the preferred offsite power source to a 4.16 kV ESF bus, a transfer to the alternate offsite source is accomplished by utilizing a time delayed bus undervoltage relay. If all offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources—Operating," and the Bases for LCO 3.8.4, "DC Sources—Operating."

The secondary AC electrical power distribution system for each train includes the safety related load centers, motor control centers, and distribution panels shown in Table B 3.8.9-1.

sub

buses

The DC electrical power distribution subsystem consists of [125]V bus(es) and distribution panel(s).

The 120 VAC vital buses are arranged in two load groups per train and are normally powered from the inverters. The alternate power supply for the vital buses are Class 1E constant voltage source transformers powered from the same train as the associated inverter, and its use is governed by LCO 3.8.7, "Inverters—Operating." Each constant voltage source transformer is powered from a Class 1E AC bus.

There are two independent 125/250 VDC electrical power distribution subsystems (one for each train).

The list of all required distribution buses is presented in Table B 3.8.9-1.

DC and vital AC

[and panels]

(continued)

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BASES

and distribution panels

LCO
(continued)

OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated [inverter via inverted DC voltage, inverter using internal AC source, or Class 1E constant voltage transformer].

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s). If any tie breakers are closed, 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 1E 4.16 kV buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

- a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOs 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 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems—Shutdown."

(continued)

ACTIONS

A.1

Insert 3

With one or more required AC buses, load centers, motor control centers, or distribution panels, except AC vital buses, in one train inoperable, the remaining AC electrical power distribution subsystem in the other train 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 power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

Condition A worst scenario is one train without AC power (i.e., no offsite power to the train 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 operator's attention be focused on minimizing the potential for loss of power to the remaining train by stabilizing the unit, and on restoring power to the affected train. 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 operator's attention is diverted from the evaluations and actions necessary to restore power to the affected train, to the actions associated with taking the unit to shutdown within this time limit; and
- b. The potential for an event in conjunction with a single failure of a redundant component in the train with AC power.

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, a DC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 2 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the AC distribution system. At this time, a DC circuit could again

(continued)

BASES

ACTIONS

A.1 (continued)

become inoperable, and AC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

Insert 2

B.1

or more

23

and a loss of function has not yet occurred

With one AC vital bus²³ inoperable^{or more}, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum [required] ESF functions not being supported. Therefore, the required AC vital bus must be restored to OPERABLE status within 2 hours by powering the bus from the associated [inverter via inverted DC, inverter using internal AC source, or Class 1E constant voltage transformer].

or more

23

Condition B represents one AC vital bus²³ without power; potentially both the DC source and the associated AC source are nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining vital buses and restoring power to the affected vital bus.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without adequate vital AC power. Taking exception to LCO 3.0.2 for components without adequate vital AC power, that would have the Required Action Completion Times shorter than 2 hours if declared inoperable, is acceptable because of:

(continued)

BASES

or distribution panels

ACTIONS
(continued)

C.1 one or more

and a loss of function has not yet occurred

and distribution panels

With DC bus(es) in one train inoperable, the remaining DC 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 DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the [required] DC buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

or more DC buses or distribution panels

Condition C represents one train without adequate DC power; potentially both with the battery significantly degraded and the associated charger nonfunctioning. In this situation, the unit 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 unit, minimizing the potential for loss of power to the remaining trains and restoring power to the affected train.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that would be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

- a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) while allowing stable operations to continue;
- b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without DC power and not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected train; and
- c. The potential for an event in conjunction with a single failure of a redundant component.

The 2 hour Completion Time for DC buses is consistent with Regulatory Guide 1.93 (Ref. 3).

(continued)

BASES

ACTIONS

C.1 (continued)

The second Completion Time for Required Action C.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 C is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the DC distribution system. At this time, an AC train could again become inoperable, and DC distribution 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 will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

D.1 and D.2

If the inoperable distribution subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

E.1

INSERT
E

~~With two trains with inoperable distribution subsystems that result in a loss of safety function, adequate core cooling, containment OPERABILITY and other vital functions for DBA mitigation would be compromised, and immediate plant shutdown in accordance with LCO 3.0.3 is required.~~

(continued)

INSERT E

Condition E 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 inoperable electrical power distribution subsystem 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.

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3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Train A and Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

Insert 1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><u>or more</u> A. One AC electrical power distribution subsystem inoperable. <u>S</u></p>	<p>A.1 Restore AC electrical power distribution subsystem to OPERABLE status. <u>(S)</u></p>	<p>8 hours <u>AND</u> 16 hours from discovery of failure to meet LCO</p>
<p><u>or more</u> B. One AC vital bus inoperable.</p>	<p>B.1 Restore AC vital bus subsystem to OPERABLE status. <u>(S)</u></p>	<p>2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO</p>
<p><u>or more</u> C. One DC electrical power distribution subsystem inoperable.</p>	<p>C.1 Restore DC electrical power distribution subsystem to OPERABLE status. <u>(S)</u></p>	<p>2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3.	6 hours.
	<u>AND</u> D.2 Be in MODE 5.	36 hours
<p><i>electrical power</i></p> <p>E. Two or more <i>inoperable</i> distribution subsystems that result in a loss of <i>safety</i>.</p>	E.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.9.1 Verify correct breaker alignments and voltage to [required] AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems—Operating

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BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital bus electrical power distribution systems are divided by train into [two] redundant and independent AC, DC, and AC vital bus electrical power distribution subsystems.

(Subsystem for each train)
a) The AC primary electrical power distribution system consists of ~~two~~ 4.16 kV Engineered Safety Feature (ESF) buses, each having at least [one separate and independent offsite source of power] as well as a dedicated onsite diesel generator (DG) source. Each [4.16 kV ESF bus] is normally connected to a preferred offsite source. After a loss of the preferred offsite power source to a 4.16 kV ESF bus, a transfer to the alternate offsite source is accomplished by utilizing a time delayed bus undervoltage relay. If all offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources—Operating," and the Bases for LCO 3.8.4, "DC Sources—Operating."

The secondary AC electrical power distribution system for each train includes the safety related load centers, motor control centers, and distribution panels shown in Table B 3.8.9-1.

sub

The 120 VAC vital buses are arranged in two load groups per train and are normally powered from the inverters. The alternate power supply for the vital buses are Class 1E constant voltage source transformers powered from the same train as the associated inverter, and its use is governed by LCO 3.8.7, "Inverters—Operating." Each constant voltage source transformer is powered from a Class 1E AC bus.

The DC electrical power distribution subsystem consists of [125]V bus(es) and distribution panel(s).

~~There are two independent 125/250 VDC electrical power distribution subsystems (one for each train).~~

The list of all required distribution buses is presented in Table B 3.8.9-1.

DC and vital AC

[and panels]

(continued)

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BASES

and distribution panels

LCO
(continued)

OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated [inverter via inverted DC voltage, inverter using internal AC source, or Class 1E constant voltage transformer].

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open. 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). If any tie breakers are closed, 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 1E 4.16 kV buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

- a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOs 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 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems—Shutdown."

(continued)

TETI 16 Nov 4

BASES (continued)

ACTIONS

A.1

Insert 3

~~With one or more required AC buses, load centers, motor control centers, or distribution panels, except AC vital buses, in one train inoperable, the remaining AC electrical power distribution subsystem in the other train 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 power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.~~

Condition A worst scenario is one train without AC power (i.e., no offsite power to the train 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 operator's attention be focused on minimizing the potential for loss of power to the remaining train by stabilizing the unit, and on restoring power to the affected train. 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 operator's attention is diverted from the evaluations and actions necessary to restore power to the affected train, to the actions associated with taking the unit to shutdown within this time limit; and
- b. The potential for an event in conjunction with a single failure of a redundant component in the train with AC power.

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, a DC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 2 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the AC

(continued)

BASES

ACTIONS

A.1 (continued)

distribution system. At this time, a DC circuit could again become inoperable, and AC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

Insert 2 →

B.1

or more

es

and a loss of function has not yet occurred,

With one AC vital bus inoperable, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the [required] AC vital bus must be restored to OPERABLE status within 2 hours by powering the bus from the associated [inverter via inverted DC, inverter using internal AC source, or Class 1E constant voltage transformer].

or more

es

Condition B represents one AC vital bus without power; potentially both the DC source and the associated AC source are nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining vital buses, and restoring power to the affected vital bus.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without adequate vital AC power. Taking exception to LCO 3.0.2 for components without adequate vital AC power, which would have the Required Action Completion Times shorter than 2 hours if declared inoperable, is acceptable because of:

(continued)

BASES

ACTIONS
(continued)

C.1

one or more

or distribution panels

and a loss of function has not yet occurred,

and distribution panels

With DC bus(es) ^{or} ~~in one train~~ inoperable, the remaining DC 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 DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the [required] DC buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

or more DC buses

or distribution panels

Condition C represents one ~~train~~ without adequate DC power; potentially both with the battery significantly degraded and the associated charger nonfunctioning. In this situation, the unit 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 unit, minimizing the potential for loss of power to the remaining trains and restoring power to the affected train.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components which would be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

- a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) while allowing stable operations to continue;
- b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without DC power and not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected train; and
- c. The potential for an event in conjunction with a single failure of a redundant component.

The 2 hour Completion Time for DC buses is consistent with Regulatory Guide 1.93 (Ref. 3).

(continued)

BASES

ACTIONS

C.1 (continued)

The second Completion Time for Required Action C.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 C is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the DC distribution system. At this time, an AC train could again become inoperable, and DC distribution 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 will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

D.1 and D.2

If the inoperable distribution subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

E.1

Condition E corresponds to a level of degradation in the electrical distribution system that causes a required safety function to be lost. When more than one ~~condition is entered, 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

*inoperable
electrical power
distribution subsystem*

(continued)

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3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems - Operating

LCO 3.8.9 [Division 1] and [Division 2] AC, DC, [and AC vital bus] electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

Insert 1

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more AC electrical power distribution subsystems inoperable.	A.1 Restore AC electrical power distribution subsystems to OPERABLE status.	8 hours <u>AND</u> 16 hours from discovery of failure to meet LCO
B. One or more AC vital buses inoperable.	B.1 Restore AC vital bus distribution subsystems to OPERABLE status.	2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO
C. One or more [station service] DC electrical power distribution subsystems inoperable.	C.1 Restore DC electrical power distribution subsystems to OPERABLE status.	2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3.	12 hours
	<u>AND</u> D.2 Be in MODE 4.	36 hours
E. One or more DG DC electrical power distribution subsystems inoperable.	E.1 Declare associated DG(s) inoperable.	Immediately
F. Two or more electrical power distribution subsystems inoperable that result in a loss of function.	F.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.9.1 Verify correct breaker alignments and voltage to [required] AC, DC, [and AC vital bus] electrical power distribution subsystems.	7 days

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems—Operating

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BASES

BACKGROUND

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

electrical power

The primary AC distribution system consists of three 4.16 kV Engineered Safety Feature (ESF) buses each having an offsite source of power as well as a dedicated onsite diesel generator (DG) source. Each 4.16 kV ESF bus is normally connected to a normal source startup auxiliary transformer (SAT) (2D). During a loss of the normal offsite power source to the 4.16 kV ESF buses, the alternate supply breaker from SAT 2C attempts to close. If all offsite sources are unavailable, the onsite emergency DGs supply power to the 4.16 kV ESF buses.

Subsystem for each division

The secondary plant distribution system includes 600 VAC emergency buses 2C and 2D and associated load centers, and transformers.

sub

Motor control centers, distribution panels,

The 120 VAC vital buses 2YV1, 2YV2, 2YV3, and 2YV4 are arranged in four load groups and are normally powered from DC. The alternate power supply for the vital buses is a Class 1E constant voltage source transformer powered from the same division as the associated inverter, and its use is governed by LCO 3.8.7, "Inverters—Operating." Each constant voltage source transformer is powered from AC.

Each subsystem consists of a 125V and a 250V bus and associated distribution panels.

There are two independent 125/250 VDC station service electrical power distribution subsystems and three independent 125 VDC DG electrical power distribution subsystems that support the necessary power for ESF functions.

Subsystem

The list of all distribution buses is presented in Table B 3.8.9-1. load centers, motor control centers, distribution panels, and transformers

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume ESF systems are OPERABLE. The

(continued)

BASES

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APPLICABLE
SAFETY ANALYSES
(continued)

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 3.4, Reactor Coolant System (RCS); and Section 3.6 Containment Systems.

The OPERABILITY of the AC, DC, and AC vital bus 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 or all onsite AC electrical power; and
- b. A worst case single failure.

The AC and DC electrical power distribution system satisfies Criterion 3 of the NRC Policy Statement.

LCO

The required electrical power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and AC vital bus 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 AC, DC, and AC vital bus electrical power distribution subsystems are required to be OPERABLE.

Maintaining the [Division 1 and 2] AC, DC, and AC vital bus 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. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated

and distribution panels
, including any load centers, motor control centers, and distribution panels, (continued)

BASES

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LCO
(continued)

battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated [inverter via inverted DC voltage, inverter using interval AC source, or Class 1E constant voltage transformer].

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open. 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). If any tie breakers are closed, 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 1E 4.16 kV ESF buses from being powered from the same offsite circuit.

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 are covered in the Bases for LCO 3.8.10, "Distribution Systems—Shutdown."

ACTIONS

A.1

Insert 3

With one or more required AC buses, load centers, motor control centers, or distribution panels in one division inoperable, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it

(continued)

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BASES

ACTIONS

A.1 (continued)

in a safe shutdown condition, assuming no single failure

The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

The Condition A 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 on restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because:

- a. There is a 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 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 5.5.12, "Safety Function Determination Program (SFDP).")

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, a DC bus is inoperable and subsequently returned OPERABLE, this LCO may already have been not met for up to 2 hours. This situation could lead to a total duration of 10 hours, since initial failure of the LCO, to restore the AC distribution system. At this time a DC circuit could again become inoperable, and AC distribution

(continued)

BASES

ACTIONS

A.1 (continued)

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 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

Insert 2

B.1

With one AC vital bus ^{or more} inoperable, ^(CS) the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the required AC vital bus must be restored to OPERABLE status within 2 hours by powering the bus from the associated [inverter via inverted DC, inverter using internal AC source, or Class 1E constant voltage transformer].

Condition B represents one AC vital bus ^{or more} without power; ^(ES) potentially both the DC source and the associated AC source are nonfunctioning. In this situation the plant is significantly more vulnerable to a complete loss of all noninterruptible 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 vital buses, and restoring power to the affected AC vital buses.

This 2 hour limit is more conservative than Completion Times allow for the majority of components that are without adequate vital AC power. Taking exception to LCO 3.0.2 for components without adequate vital AC power, that would have Required Action Completion Times shorter than 2 hours if declared inoperable, is acceptable because of:

(continued)

BASES

ACTIONS
(continued)

C.1

or distribution panel

or more

and a loss of function has not yet occurred

and distribution panels

With one station service DC bus inoperable, 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 buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

or distribution panels

or more DC buses

Condition C represents one division without adequate DC power, potentially with both the battery significantly degraded and the associated charger 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.

This 2 hour limit is more conservative than Completion Times allowed for the majority of components that would be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 2 hours, 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 potential for an event in conjunction with a single failure of a redundant component.

(continued)

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3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 [Division 1], [Division 2], and [Division 3] AC, DC, [and AC vital bus] electrical power distribution subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

NOTE

[Division 3] electrical power distribution subsystems are not required to be OPERABLE when High Pressure Core Spray System [and 2C standby service water pump] is inoperable.

Insert 1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. One ^{or more} [Division 1 or 2] AC electrical power distribution subsystem inoperable. ^{and} _S</p>	<p>A.1 Restore [Division 1 and 2] AC electrical power distribution subsystem(s) to OPERABLE status.</p>	<p>8 hours AND 16 hours from discovery of failure to meet LCO</p>
<p>B. ^{One or more} [Division 1 ^{and} 2] AC vital bus inoperable. _{es}</p>	<p>B.1 Restore [Division 1 and 2] AC vital bus distribution subsystem(s) to OPERABLE status.</p>	<p>2 hours AND 16 hours from discovery of failure to meet LCO</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><i>One or more (and)</i> C. 1 [Division 1 or 2] DC electrical power distribution subsystem inoperable.</p>	<p>C.1 Restore [Division 1 and 2] DC electrical power distribution subsystem(s) to OPERABLE status.</p>	<p>2 hours <u>AND</u> 16 hours from discovery of failure to meet LCO</p>
<p>D. Required Action and associated Completion Time of Condition A, B, or C not met.</p>	<p>D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 4.</p>	<p>12 hours 36 hours</p>
<p>E. One or more [Division 3] AC, DC, or AC vital bus electrical power distribution subsystems inoperable.</p>	<p>E.1 Declare High Pressure Core Spray System [and 2C Standby Service Water System] inoperable.</p>	<p>Immediately</p>
<p><i>electrical power</i> F. Two or more <i>inoperable</i> distribution subsystems that result in a loss of function.</p>	<p>F.1 Enter LCO 3.0.3.</p>	<p>Immediately</p>

B 3.8 ELECTRICAL POWER SYSTEMS

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B 3.8.9 Distribution Systems—Operating

BASES

BACKGROUND

The onsite Class 1E AC and DC electrical power distribution system is divided by division into three independent AC, DC, and AC vital bus electrical power distribution subsystems.

electrical power

The primary AC distribution ^{sub} system ^{for each division} consists of ~~each~~ ^a 4.16 kV Engineered Safety Feature (ESF) bus that has at least one separate and independent offsite source of power, as well as a dedicated onsite diesel generator (DG) source. Each 4.16 kV ESF bus is normally connected to a preferred source. If all offsite sources are unavailable, the onsite emergency DGs supply power to the 4.16 kV ESF buses. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources—Operating," and the Bases for LCO 3.8.4, "DC Sources—Operating." ^{cells}

distribution panels,

The secondary plant AC distribution system includes 480 V ESF load centers and associated loads, motor control centers, and transformers.

Each subsystem consists of a 125V bus and associated distribution panels.

The 120 VAC vital buses 2YV1, 2YV2, 2YV3, and 2YV4 are arranged in four load groups and are normally powered from DC. The alternate power supply for the vital buses is a Class 1E constant voltage source transformer powered from the same division as the associated inverter; its use is governed by LCO 3.8.7, "Inverters—Operating." Each constant voltage source transformer is powered from AC.

There are three independent 125 VDC electrical power distribution subsystems. The list of all distribution buses is located in Table [8.1.X.X].

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume ESF systems are OPERABLE. The AC, DC, and AC vital bus 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

(continued)

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BASES

APPLICABLE
SAFETY ANALYSES
(continued)

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 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

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

- a. An assumed loss of all offsite or onsite AC electrical power; and
- b. A worst case single failure.

The AC, DC, and AC vital bus electrical power distribution systems satisfy Criterion 3 of the NRC Policy Statement.

LCO

The required AC, DC, and AC vital bus power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and AC vital bus 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 Division 1, 2, and 3 AC, DC, and AC vital bus electrical power primary distribution subsystems are required to be OPERABLE.

Maintaining the Division 1, 2, and 3 AC, DC, and AC vital bus electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Any two of the three divisions of the distribution system are capable of providing the necessary electrical power to the associated ESF components. Therefore, a single failure within any system or within the electrical power distribution subsystems does not prevent safe shutdown of the reactor.

OPERABLE AC, electrical power distribution subsystems require the associated buses to be energized to their proper voltages. OPERABLE DC electrical power distribution

*including any load centers, motor control centers,
and distribution panels,* (continued)

BASES

ACTIONS

A.1 (continued)

restore the AC distribution system. At this time, a DC circuit could again become inoperable, and AC distribution 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 the LCO was initially not met, instead of at the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

Insert 2 →

and a loss of function has not yet occurred,

B.1

or more and

With one Division 1 ~~or~~ 2 AC vital bus^{es} inoperable, the remaining OPERABLE AC vital buses are capable of supporting the minimum safety functions necessary to shut down and maintain the unit in the safe shutdown condition. Overall reliability is reduced, however, because an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the required AC vital bus must be restored to OPERABLE status within 2 hours by powering the bus from the associated [inverter via inverted DC, inverter using internal AC source, or Class 1E constant voltage transformer].

or more es

Condition B represents one AC vital bus without power; potentially both the DC source and the associated AC source nonfunctioning. In this situation, the plant is significantly more vulnerable to a complete loss of all noninterruptible 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 vital buses, and restoring power to the affected vital bus.

This 2 hour limit is more conservative than Completion Times allowed for the majority of components that are without adequate vital AC power. Taking exception to LCO 3.0.2 for components without adequate AC vital power, that would have Required Action Completion Times shorter than 2 hours if declared inoperable, is acceptable because of:

(continued)

BASES

ACTIONS
(continued)

C.1

one or more

or distribution panels

and a loss of function has not yet occurred,

and

With Division 1 or 2 DC buses in one [division] inoperable, the remaining DC 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 DC electrical power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required DC buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

and distribution panels

or more DC buses

or distribution panels

Condition C represents one ~~division~~ without adequate DC power, potentially with both the battery significantly degraded and the associated charger 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.

This 2 hour limit is more conservative than Completion Times allowed for the majority of components that could be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, that would have Required Action Completion Times shorter than 2 hours, 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; and
- c. The potential for an event in conjunction with a single failure of a redundant component.

(continued)

(Single division systems are not included, although in this Action, Division 3 is considered redundant to Division 1 and 2 ECCS.)

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BASES

ACTIONS

E.1 (continued)

declaring the high pressure core spray inoperable allows the ACTIONS of LCO 3.5.1, "ECCS—Operating," to apply appropriate limitations on continued reactor operation.

F.1

two or

inoperable electrical power distribution subsystems

Condition F corresponds to a level of degradation in the electrical distribution system that causes a required safety function to be lost. When more than one condition is entered, 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.

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

Meeting this Surveillance verifies that the AC, DC, and AC vital bus electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. The correct breaker alignment ensures the appropriate separation and independence of the electrical divisions is maintained, and the appropriate voltage is available to each required bus. The verification of proper voltage availability on the buses ensures that the required voltage is readily available for motive as well as control functions for critical system loads connected to these buses. The 7 day Frequency takes into account the redundant capability of the AC, DC, and AC vital bus electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. FSAR, Chapter [6].
2. FSAR, Chapter [15].
3. Regulatory Guide 1.93, December 1974.

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BASES

LCO
(continued)

subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger. OPERABLE vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated [inverter via inverted DC voltage, inverter using internal AC source, or Class 1E constant voltage transformer].

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open. 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). If any tie breakers are closed, 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 1E 4.16 kV buses from being powered from the same offsite circuit.

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 are covered in the Bases for LCO 3.8.10, "Distribution Systems—Shutdown."

ACTIONS

A.1

Insert 3

With one or more Division 1 or 2 required AC buses, load centers, motor control centers, or distribution panels (except AC vital buses), in one division inoperable, the

(continued)

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BASES

ACTIONS

A.1 (continued)

~~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 power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

The Condition A 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 on restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because:

- a. There is 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 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 5.5.12, "Safety Function Determination Program (SFDP).")

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, a DC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 2 hours. This situation could lead to a total duration of 10 hours, since initial failure of the LCO, to

(continued)