ITS DISCUSSION OF DIFFERENCES

ITS Section 3.8: Electrical Power Systems

3.8.2-01
3.8.1-07

1 NUREG LCO 3.8.1.c, NUREG 3.8.1 Condition F, & NUREG SR 3.8.1.11, SR 3.8.1.18, SR 3.8.1.19 and NUREG 3.8.2 LCO Bases - The automatic load sequencing design for this unit is provided by individual timers in the circuitry for each component which are initiated by a loss of power, and subsequent restoration of power, to the circuit. The design does not include an overall "train" sequencer which controls all loading to the diesel generator or engineered safety features bus. Therefore, there is no need to separately identify this component in LCO 3.8.1 and LCO 3.8.2 Bases, nor in a separate Condition if inoperable (NUREG 3.8.1 Condition F). Additionally, the diesel generator may be directly, adversely affected by an inoperable sequencing timer. Therefore, the sequencing timers are addressed with operability of the diesel generators. Statement are added to the 3.8.1 Bases LCO discussion and the Bases for NUREG SRs 3.8.1.11 and 3.8.1.19 to clarify the operability requirements of the diesel generators with respect to these sequencing timers. If the time delays between loads are degraded, two or more loads are added at insufficient intervals, the associated diesel generator is declared inoperable. However, if a relay fails to start a load, then the individual component that was not started is declared inoperable and the appropriate Conditions for that component are entered. This is consistent with the interpretation of the current license basis.

2 NUREG LCO 3.8.1, Required Action A.3, second Completion Time, and Required Action B.4 Completion Times - The CTS 3.7.2.C Completion Time of 7 days for the diesel generators (DGs) is retained. Similarly, the overall Completion Time for "failure to meet the LCO" is extended to 10 days. The overall Completion Time is the additive time for an inoperable DG and an inoperable offsite feed as though they occur back-to-back. The 7 day Completion Time has been previously found acceptable and the plant specific risk assessment has not identified the allowed outage time for the AC Sources to represent an unacceptable risk. This change is consistent with current license basis.

3 NUREG SR 3.8.1.2, SR 3.8.1.2, Notes 1 & 3, SR 3.8.1.3, Note 4, and SR 3.8.1.7 - The diesel generator design does not provide for gradual acceleration. Consequently, all starts are fast starts and subject to the 15 second acceptance criteria. Therefore, SR 3.8.1.2 is revised to be equivalent to NUREG SR 3.8.1.7, and SR 3.8.1.7 and the Notes related to use of SR 3.8.1.7 are unnecessary. These changes are consistent with current license basis.

Further, NUREG SR 3.8.1.2, Note 1 would be inconsistent with the remainder of the NUREG. Any test which satisfies the requirements of another test may be credited to satisfy both. This is standard practice and fully satisfies the requirements without specific identification. A specific note here would present confusion for other SRs which may be satisfied by alternate testing but for which the specific SR does not contain a similar note. This change incorporates TSTF-253.

4 NUREG SR 3.8.1.2 & SR 3.8.1.3 Frequency, & Table 3.8.1-1 - The variable DG test Frequency requirements are not included per Generic Letter 94-01. Implementation of the provisions of the maintenance rule for the DGs, including the applicable regulatory

guidance, provides the program to assure DG reliability and performance. Further, a monthly Frequency is consistent with CTS SR 4.6.1.1. This change is consistent with current license basis.

3.8.1-25 5 Not used.

3.8.1-19 6 NUREG SR 3.8.1.4, 3.8.1.5, & SR 3.8.1.6 - The design of the DG fuel oil system includes an engine mounted day tank; but not a day tank separate from the engine mounted tank. This change is consistent with current license basis.

3.8.1-21 7 NUREG SR 3.8.1.11, Note 2, SR 3.8.1.19, Note 2, SR 3.8.4.7, Note 2, & SR 3.8.4.8, Note - The requirement to restrict the performance of this SR from MODES 1 and 2 (or MODES 1 through 4, as appropriate for the respective SRs) is not included since such a restriction is inconsistent with the remainder of the NUREG and is unnecessary. The NRC Staff has previously concluded (see Generic Letter 91-04) that the TS need not restrict surveillances as only being performed during shutdown. Administrative controls and risk insights have, to-date, provided adequate restriction such that when surveillances are performed during power operation, proper regard is considered for their effect on the safe operation of the plant. If the performance of a surveillance during plant operation would adversely affect safety, EOI/ANO-1 has postponed, and will continue to postpone, the surveillance until the unit is in a condition or mode that is consistent with the safe conduct of that surveillance. This requirement has been adequately performed under administrative control in the past (i.e., it is not in the current TS) and is proposed to continue to be administratively controlled. This is consistent with current license basis.

8 NUREG SR 3.8.1.8, Note, SR 3.8.1.11, Note 2, SR 3.8.1.19, Note 2, SR 3.8.4.7, Note 2, & SR 3.8.4.8, Note - Incorporated TSTF-008, Rev 2.

9 NUREG SR 3.8.1.9 and SR 3.8.1.10 - These SRs for testing full and partial load rejection capability of the DGs are not adopted. Failure of one DG is assumed to occur during a design basis accident without specifying the mechanism for the failure. While capability to operate following these events (i.e., DG load rejection) is desirable, it is not required by the safety analysis. Both DGs are prohibited from being placed in
3.8.1-23
parallel with the offsite power source simultaneously by station procedures. Therefore, it is not possible for both DGs to be lost due to a load rejection event. Further, such surveillance requirements do not exist in the CTS. Since the SRs are not part of the current license basis and the loss of both DGs due to a load rejection event is prohibited by requirements contained within station procedures, it is acceptable to not adopt these additional requirements. Nevertheless, ANO-1 performs a load rejection test in accordance with industry guidelines that meets the requirements of Regulatory Guide 1.108. However, performance of such is not required from a safety analysis perspective. This change is consistent with current license basis.

10 NUREG SR 3.8.1.12 & SR 3.8.1.20 - SR 3.8.1.12 is not included since it does not confirm the capability of the tested components to perform any function required or
3.8.1-19, 3.8.1-23
assumed by the safety analysis. The auto start initiated by a ESAS signal is intended to

prepare the DG for loading should a loss of power subsequently occur. Without the ESAS start, the DG loading may be delayed for up to an additional 12 seconds. However, the safety analysis assumes DG start on undervoltage and does not credit the possibility that the DG may already be running when the undervoltage occurs. In addition, the SR does not result in load sequencing and since the ESAS start ciruitry does not affect the undervoltage start circuitry, no safety value is obtained from performance of this SR. As such, it is not appropriate for a TS requirement. The safety analysis assumes/requires loading of the DG only following a loss of offsite power. If offsite power is available, it is utilized, and if it is lost, the DG is started and loaded as tested by proposed SR 3.8.1.8 or SR 3.8.1.9. Therefore, the ESAS start of the DG is not utilized by the safety analysis. This change is consistent with the current license basis.

SR 3.8.1.20 is not adopted since it confirms only that the unit design controls have been appropriately implemented. Such special post-modification testing is not typical for inclusion in the Technical Specifications and is not proposed to be incorporated. A similar SR is likewise not included in the CTS. It is unlikely that past modifications preventing a simultaneous start of both DGs since the DGs are redundant components and do not share same train electronic or fluid support components. The design and configuration controls for the unit have been adequately confirmed through post-modification testing and will continue to be confirmed in this manner. Since a similar requirement is not found in the CTS and since plant modifications are adequately controlled within station programs and procedures, SR 3.8.1.20 is not adopted. This change is consistent with the current license basis.

11 NUREG SR 3.8.1.13 - The ANO-1 design does not include automatic bypassing of the emergency diesel generator trips during emergency operation following an engineered safeguards actuation signal. This change is consistent with current license basis.

3.8.2-01 12 NUREG 3.8.2 - NUREG SR 3.8.2.1 and the associated Bases are revised to reflect specific changes made to the list of referenced SRs. The body of SR 3.8.2.1 has been revised to include ITS SRs 3.8.1.4, 3.8.1.7, 3.8.1.8, and 3.8.1.9 (NUREG SRs 3.8.1.4, 3.8.1.8, 3.8.1.11, and 3.8.1.19, respectively) as those SRs that are exempted in MODES 5 and 6. ITS SR 3.8.1.4 requires a verification of the diesel generator fuel oil day tank level. The purpose of this level are to provide additional volume to allow, in conjunction with the volume contained in the fuel oil storage tanks, for a seven day supply of fuel oil on site. In MODES 5 and 6, the loads experienced by the diesel should be much lower than the loads the diesel would experience if loaded with full emergency loads in response to an accident from 100% power that assumes a loss of offsite power. Since the loading of the diesel generator is expected to be lower in MODE 5 and 6, if required to run, the 160 gallons of fuel oil contributed by the diesel day tank should not be required to contribute to a seven day supply of fuel oil.

ITS SRs 3.8.1.8 and 3.8.1.9 are not applicable since they test the response to ESAS signals which are not required to be OPERABLE in shutdown MODES. ITS SR 3.8.1.7 is not applicable since only one offsite AC source is required to be Operable by

LCO 3.8.2. Therefore, require an auto-transfer capability is not necessary since there may be no other source to transfer the loads to.

Although the CTS does not contain explicit requirements for electrical systems in MODES 5 and 6, these changes are consistent with ANO's interpretation of the current license basis.

The ITS SR 3.8.2.1 Bases have been revised to reflect the changes in the SR. In addition, information has been added to further clarify the applicability of the ITS 3.8.1 SRs in MODES 5 and 6.

13 NUREG 3.8.4, Condition A, NUREG 3.8.9, Conditions B and C, and NUREG 3.8.7 Bases - The NUREG 3.8.4 and 3.8.9 Conditions are revised to retain the CTS 3.7.3 allowed time for continued operation with an inoperable battery, battery charger, or DC electrical power distribution subsystem. As long as there is no "loss of function" identified, the CTS time frame of 8 hours has been previously determined to be acceptable and the plant specific risk assessment has not identified the allowed outage time for the DC Sources to represent an unacceptable risk. The "loss of function" will continue to be determined in accordance with the SFDP and if identified, appropriate actions will be taken in accordance with the Specification for the lost function. NUREG LCO 3.8.9, Condition B is also revised to allow 8 hours for one 120 VAC vital bus electrical power distribution subsystem inoperable. This time period is consistent with the proposed ITS 3.8.9 Condition A and C Completion Times for an AC or DC subsystem inoperability. The Bases provided for a 2 hour Completion Time also support an 8 hour Completion Time. The NUREG 3.8.7 Bases were revised to incorporate reference to the correct Completion Time. These changes are consistent with current license basis.

3.8.5-01 14 NUREG 3.8.4 and 3.8.5 - NUREG SR 3.8.4.2, SR 3.8.4.3, SR 3.8.4.4, and SR 3.8.4.5 are not proposed to be adopted. NUREG SR 3.8.4.2, SR 3.8.4.3 and SR 3.8.4.4 are omitted since visible corrosion does not necessarily mean the battery is inoperable (as indicated in the Bases for NUREG SR 3.8.4.4). Also, the bracketed values of resistance specified in the NUREG are vendor recommended values; that is, values at which some action should be taken, not necessarily when the OPERABILITY of the battery is in question. Therefore, NUREG SR 3.8.4.5 is also proposed to be omitted. The safety analyses do not assume a specific battery resistance value, but typically assume the batteries will supply adequate power. Therefore, the key issue is the overall battery resistance. Between surveillances, the resistance of each connection varies independently from all the others. Some of these connection resistances may be higher or lower than others, and the battery may still be able to perform its function and should not be considered inoperable solely because one connector's resistance is high. Overall resistance is a direct impact on OPERABILITY, however, it is adequately determined as acceptable through completion of the battery service and discharge tests. Finally, acceptable resistance is currently determined through the battery service and discharge tests since the CTS does not include a surveillance equivalent to NUREG SR 3.8.4.2, SR 3.8.4.3, SR 3.8.4.4, and SR 3.8.4.5. Similarly, visual indication of physical damage or abnormal deterioration is cause for investigation, but does not necessarily mean that the battery could not perform its function if called upon. Such indication would be documented under the station's condition reporting program and evaluated consistent with the extent of the damage or deterioration.

3.8.4-04 By letter dated April 9, 1999, and supplemented by letter dated July 29, 1999, ANO proposed changes to the Surveillance Requirements (SRs) associated with the DC Sources. The proposed changes used NUREG-1430 as a template for the new SRs. These proposed SRs were approved by the NRC as Amendment 200, dated September 14, 1999. Although NUREG-1430 was used as the guidance document for the incorporation of the DC Source SRs, the NRC staff did not require the incorporation of these specific NUREG SRs. Although not required by the CTS, these SRs are performed under the ANO battery maintenance program, consistent with the requirements contained in IEEE 450 – 1995.

15 NUREG SR 3.8.1.14, SR 3.8.1.15, and SR 3.8.1.16 - These SRs for testing a twenty-four hour run, hot restart capability, and synchronization capability of the DGs are not adopted. 3.8.1-23 Critical criteria for DG operability is satisfactorily demonstrated by the one hour run which allows the DG to reach a stable engine temperature. However, operation beyond this time frame may provide information with regard to the DGs capability to perform for long periods as designed. ANO-1 currently performs a 24-hour test consistent with Regulatory Guide 1.108 requirements and will continue to do so. Nevertheless, since this test is not intended for critical data collection and verification associated with DG operability and the test is not included in the CTS, SR 3.8.1.14 is not adopted within the ITS.

The hot restart capability is considered to be a requirement beyond the current licensing basis. Although this function is likewise performed at ANO-1, it is not required by the safety analysis. By letter dated June 3, 1977 (1CNA067708) the NRC requested that ANO apply for an amendment to incorporate comparable technical specifications to those presented in the letter. These included at least once per 18 months simulating a loss of offsite power in conjunction with a safety injection actuation test signal, and:

1) verifying de-energization of the emergency busses and load shedding from the emergency buses,
2) Verifying the diesel starts from ambient condition on the auto-start signal, energizes the emergency busses with permanently connected loads, energizes the auto-connected emergency loads through the load sequencer and operates for ≥ 5 minutes while its generator is loaded with the emergency loads, and
3) Verifying that on diesel generator trip, the loads are shed from the emergency busses and the diesel re-starts on the auto-start signal, the emergency busses are energized with permanently connected loads, the auto-connected emergency loads are energized through the load sequencer and the diesel operates for ≥ 5 minutes while its generator is loaded with the emergency loads.

Item 3 did involve a hot restart. However, in a letter dated December 17, 1979 (1CNA127919), which approved modifications needed to respond to the June 3, 1977 letter, the Staff required that the Technical Specifications to be submitted should address testing of the emergency power system using the following steps:

1) Simulating a loss of off-site power,
2) Simulating a loss of off-site power in conjunction with an ESF signal, and
3) Simulating interruption of off-site power and subsequent reconnection of the onsite power source to their respective buses.

The technical specifications approved by the Staff in Amendment 60, dated October 23, 1981, required a test to be conducted once every 18 months to demonstrate the ability of the diesel generators to perform as designed by:

1) simulating a loss of off-site power,
2) simulating a loss of off-site power in conjunction with an ESF signal,
3) simulating interruption of off-site power and subsequent reconnection of the on-site power source to their respective busses, and
4) operating the diesel generator for ≥ 1 hour after operating temperatures have stabilized.

The new requirements were, therefore, approved by the NRC without the inclusion of a hot restart test. Since this test is not contained in the CTS and is not required by the current license basis, SR 3.8.1.15 is not adopted.

SR 3.8.1.16 acts to verify that the sync-check relay associated with the offsite power source breaker feeding the associated vital bus is Operable. Synchronization with the offsite power source has no impact on DG operation since the DG continues to carry the bus load after parallelling with offsite power. Once the offsite power source is connected, the DG must be manually unloaded from supplying power to the bus. In addition, the safety analysis does not require that loads be transferred back to offsite power. Further, this surveillance requirement does not exist in the CTS. Therefore, since the safety analysis does not require operation of the offsite power source bus breaker sync-check relay and no current requirement exists in the CTS, SR 3.8.1.16 will not be adopted. This change is consistent with the current license basis.

16 Not used.

3.8.2-01
3.8.5-01,
3.8.8-01,
3.8.10-01

17 Not used.

18 Not used.

19 NUREG 3.8.4 - The NUREG SR 3.8.4.7 Note 1 restriction to use the substitution of the modified performance discharge test for the service test only "once per 60 months" is not adopted. As indicated in the Bases, the modified performance discharge test is required to envelope the duty cycle of the service test. It is therefore, a conservative test and should be allowed at any time. Further, IEEE-450, on which the service test and substitution of a modified performance discharge test are based, contains no such limitation. Finally, the CTS for ANO-1 does not contain this limitation, nor the limitation for use of a "modified" performance discharge test. This change is consistent with current license basis.

3.8.1-19, 3.8.3-01

20 The deletion of NUREG SR 3.8.3.6 is consistent with Generic Traveler TSTF-002, Rev. 1.

21 NUREG SR 3.8.1.17 - The design of the diesel generator logic does not include an ESAS override of the test mode as described in this SR. As such, a similar SR is not included in the CTS and is not proposed to be included in the ITS. This change is consistent with current license basis.

22 NUREG 3.8.6 - The LCO is revised to omit the "Train A and Train B" terminology which is not used, with respect to batteries, at ANO-1. This change is administrative in that the Bases are adequate to describe the batteries to which the LCO is applicable.

23 NUREG SR 3.8.1.11 and SR 3.8.1.19 - The details of the acceptance criteria for these SRs are revised to match CTS 4.6.1.2 acceptance criteria of "demonstrate the ability of the DGs to perform as designed" for a loss of offsite power and for a loss of offsite power in conjunction with an ES signal, and to be consistent with the changes made to NUREG SR 3.8.1.2. Steady state voltage and frequency requirements are not included in the current licensing basis (see DOD 40). This change is consistent with CTS.

24 Not used.

25 NUREG LCO 3.8.3 - The lube oil requirements are not included in this Specification since the design does not provide for a measurable indication of the amount of lube oil available. The design provides only a dip stick which indicates "sufficient" lube oil available, i.e., above the minimum mark. When lube oil is below the maximum, but above the minimum, action is initiated to add lube oil to the system. Thus, sufficient lube oil is always available. The administrative controls and maintenance practices have, to-date, provided adequate restriction such that when surveillances are performed, proper regard is considered for their effect on the safe operation of the plant. If the lube oil is below the minimum mark, the DG is considered inoperable and if the lube oil is between the maximum and minimum marks, prompt actions is initiated to restore the lube oil level. These administrative controls will continue to be imposed, and this requirement, which is not in the CTS, is proposed to continue to be administratively controlled. This change is consistent with current license basis.

26 NUREG Bases - This change is editorial in nature and incorporated only to provide nomenclature consistent with that used in other plant related documents.

27 **NUREG Bases** - This change provides plant specific revisions to discussions of design, analysis, reference documents, or operational parameters or procedures.
B 3.8.1 BACKGROUND - Added discussion of DG "intended service" rating, moved information regarding definition of an offsite circuit to the LCO section, and deleted incorrect information regarding the capability of the offsite circuit transformers.
B 3.8.1 BACKGROUND, LCO & NUREG SR 3.8.1.8- Revised discussion of offsite circuits design.

ITS DISCUSSION OF DIFFERENCES

B 3.8.1 LCO - Revised offsite circuits automatic transfer design discussion since only one circuit is normally available for automatic transfer, and neither circuit is the normal ESF bus power source. The normal power source is the unit auxiliary transformer, and startup transformer No. 2 is normally unavailable for automatic transfer.

B 3.8.1 ACTIONS - Removed references to non-applicable guidance documents. These guidance documents were not used in the development of the original surveillance requirements, and are not applicable to the proposed SRs.

B 3.8.1 ACTIONS A.1, A.2, B.1, B.2, C.1 and C.2 - The turbine driven emergency feedwater (EFW) pump is redundant to the motor driven pump. There are only two EFW pumps.

B 3.8.1 Required Actions A.1 & B.1 - Added missing Completion Time Bases.

B 3.8.1 Required Action A.2 – Clarified (consistent with the Required Action presentation) that the Required Action applies to conditions when offsite power is not "available to supply." The ANO-1 design is such that offsite power is not normally connected, but available for automatic transfer to the ES buses.

B 3.8.1 Required Actions D.1 & D.2 - Omitted discussion of susceptibility to a single failure that is not be true for some situations that would result in entry into this condition.

B 3.8.1 SRs - Removed references to non-applicable guidance documents. These guidance documents were not used in the development of the original surveillance requirements, and are not applicable to the proposed SRs.

NUREG SR 3.8.1.2, SR 3.8.1.11, & SR 3.8.1.19 Bases - The DG engine coolant is not a forced circulation while the engine is not running; natural circulation provides the cooling.

NUREG SR 3.8.1.3 Bases - The discussions of DG power factors omitted since these are not included in the SR or in the CTS.

ANO-237

NUREG SR 3.8.1.4 Bases - The DG fuel oil day tank volume discussion is revised as appropriate to reflect unit specific design. SAR Section 8.3.1.1.7.2 provides the basis for this requirement.

3.8.1-19, 3.8.1-20

NUREG SR 3.8.1.6 (ITS SR 3.8.1.6) Bases - The SR and Bases are revised to omit discussion of automatic fuel oil transfer. Control room alarms provide indication of potential fuel oil system problems that could affect the operation of the diesel generators. Automatic operation of the diesel fuel oil transfer system is not credited in the accident analyses discussed in Section 14 of the SAR. This change is consistent with the ANO-1 current license basis.

NUREG SR 3.8.1.8 (ITS SR 3.8.1.7) Bases - The Frequency discussion is revised to match the DG testing Frequency.

NUREG SR 3.8.1.11 (ITS SR 3.8.1.8) Bases - The loss of offsite power testing is revised to reflect unit specific design.

3.8.1-19

NUREG SR 3.8.1.19 (ITS SR 3.8.1.9) Bases - Discussion of Regulatory Guide revised so that the recommendations are not stated to be "requirements" since Regulatory Guides are not requirements, but rather provide only guidance on an acceptable method to implement the requirements.

NUREG SR 3.8.1.19 (ITS SR 3.8.1.9) Bases - The loss of offsite power testing in conjunction with an ES signal is revised to reflect unit specific operating restrictions necessary to preserve decay heat removal during the conduct of the surveillance.

3.8.2-01 28 **NUREG Bases** – This change provides plant specific revisions to discussions of design, analysis, reference documents, or operational parameters or procedures.
B 3.8.2 APPLICABILITY and ACTION A.2.2 – Provided clarification that movement of irradiated fuel assemblies may occur in either the reactor building or the fuel handling area.
B 3.8.2 APPLICABILITY – Revised discussion to provide assurance that adequate decay heat removal is available for the irradiated fuel assemblies in the core. Coolant inventory makeup can be considered as a form of decay heat removal. This change provides a more encompassing statement. This is consistent with the requirements for component operability in MODES 5 and 6, as required by other LCOs in the ITS.

29 **NUREG Bases** - This change provides plant specific revisions to discussions of design, analysis, reference documents, or operational parameters or procedures.
B 3.8.3 BACKGROUND, LCO, ACTION A.1 & NUREG SR 3.8.3.1 - The DG fuel oil storage tank volume is sufficient for 3.5 days of operation at full load.
B 3.8.3 BACKGROUND - The DG fuel oil system description is revised to reflect the interconnections of storage tanks and day tanks.
B 3.8.3 BACKGROUND, ACTIONS and SRs - Removed references to non-applicable guidance documents. These guidance documents were not used in the development of the original surveillance requirements, and are not applicable to the proposed SRs.
B 3.8.3 BACKGROUND & NUREG SR 3.8.3.3 - The DG fuel oil properties discussion is revised for consistency with the ANO-specific design of the fuel oil storage system.
ANO-238 **SR 3.8.3.1 Bases** - The fuel oil storage tank volume discussion is revised as appropriate to reflect unit specific design. SAR Section 8.3.1.1.7.2 provides the basis for this requirement.
3.8.3-02 **SR 3.8.3.4 Bases** - The discussion of the DG air start system Surveillance is revised to delete bracketed information. This information adds nothing to clarify the Surveillance requirement. The SR ensures sufficient capacity for the required number of air starts by ensuring the pressure is above a minimum necessary for the five starts.
B 3.8.3 APPLICABLE SAFETY ANALYSES - Revised to refer to the Applicable Safety Analyses for LCO 3.8.1.

30 **NUREG Bases** - This change provides plant specific revisions to discussions of design, analysis, reference documents, or operational parameters or procedures.
B 3.8.4 BACKGROUND & LCO - The Battery System description is revised to reflect plant design and nomenclature and eliminate non-applicable discussions.
B 3.8.4 BACKGROUND, ACTIONS and SRs - Removed references to non-applicable guidance documents. These guidance documents were not used in the development of the original surveillance requirements, and are not applicable to the proposed SRs
3.8.4-08 **SR 3.8.4.7 and SR 3.8.4.8 Bases** – Revised to delete a statement that the performance discharge test is normally performed in an as found condition and added a statement that the modified performance discharge test is performed as found. IEEE-450 requires tests that verify that that the battery meets the design requirements of the system to which it is connected be performed "as found" (Section 5.c). The test that

satisfies this requirement is the service test (Section 5.3). The performance discharge test is a test of battery capacity, not a test of battery capability to meet the design requirements of the system (Section 5.2). Therefore, IEEE-450 does not require the performance discharge test to be performed in the "as found" condition. In addition, in order to have a consistent basis for trending the results of performance discharge tests, they must be performed from a fully charged state. This usually requires that the battery be placed on an equalize charge for a short period of time just prior to the start of the test. This is consistent with the current license basis implemented in Amendment 200. Since the modified performance discharge test may be used in lieu of the service test, a statement has been added to the ITS SR 3.8.4.2 Bases that states that this test is performed "as found" Since the ITS SR 3.8.4.3 Bases refer to the ITS SR 3.8.4.2 Bases for the description of the modified performance discharge test, this provides assurance that the appropriate as found testing will occur.

B 3.8.4 ACTIONS B.1 and B.2 & NUREG SR 3.8.4.7 - Removed references to non-applicable guidance documents. These guidance documents were not used in the development of the original surveillance requirements, and are not applicable to the proposed SRs.

SR 3.8.4.8 Bases – The definition of battery degradation is revised from ≥ 10% to > 10% to be consistent with IEEE-450, 1995.

3.8.6-02, 3.8.6-03

SR Table 3.8.6-1 Bases – Category A, B, and C discussions of Specific gravity have been revised to reflect the manufacturer's recommendations for the ANO-1 batteries.

3.8.5-01

B 3.8.5 LCO – The battery system description is revised to reflect plant design and nomenclature.

B 3.8.5 APPLICABILITY and ACTION A.2.2 - Provided clarification that movement of irradiated fuel assemblies may occur in either the reactor building or the fuel handling area.

B 3.8.6 APPLICABLE SAFETY ANALYSIS - unit specific nomenclature and references provided.

B 3.8.6 SURVEILLANCE REQUIREMENTS - Battery parameters were revised to reflect plant procedure acceptance criteria.

31 **NUREG Bases** - This change provides plant specific revisions to discussions of design, analysis, reference documents, or operational parameters or procedures.

B 3.8.7 BACKGROUND, LCO - The Inverter description is revised to reflect plant design and nomenclature.

3.8.7-06

B 3.8.7 Action A.1 – The discussion of the Required Action has been revised to recognize that with the automatic transfer to the alternate AC source, that the associated vital 120 VAC bus remains Operable. This reflects the ANO-1 plant specific design.

3.8.7-04

3.8.8-01

B 3.8.8 APPLICABLE SAFETY ANALYSES, and LCO – The descriptions of the inverters are revised to reflect plant design and nomenclature.

B 3.8.8 – SR 3.8.8.1 Bases has been revised to reflect that the design of the ANO-1 inverters does not include a frequency readout.

B 3.8.8 APPLICABILITY and ACTION A.2.2 - Provided clarification that movement of irradiated fuel assemblies may occur in either the reactor building or the fuel handling area.

32 **NUREG Bases** - This change provides plant specific revisions to discussions of design, analysis, reference documents, or operational parameters or procedures.

B 3.8.9 BACKGROUND, LCO, ACTIONS B.1 & C.1, & Table B 3.8.9-1 - The distribution system description is revised to reflect plant design and nomenclature.

3.8.9-04. 3.8.9-09, 3.8.9-15

B 3.8.9 BACKGROUND, LCO, ACTION A.1, & Table B 3.8.9-1 – The distribution system is revised to delete reference to distribution panels with respect to the AC electrical power subsystem. The distribution panels referred to in the Bases for Required Action A.1 are distribution panels associated with the ES electrical subsystem. The CTS 3.7.1.B requirements define the required distribution systems as consisting of 4160 V switchgear, 480 V load centers, 480 V motor control centers, and 120 V AC distribution panels in both of the ESAS distribution systems. Amendment 176, dated February 17, 1995, included a revision to CTS 3.7.1.B that added the requirement that the 120 V AC distribution panels be Operable. Both the letter requesting the change, dated August 30, 1994, and the Safety Evaluation associated with Amendment 176 state that CTS 3.7.1.B applies to the vital 120 VAC distribution panels. Therefore, other specific distribution panels that are not classified as 120 VAC vital distribution panels are not included in the ANO-1 ITS. This change is consistent with the current license basis.

3.8.9-06

B 3.8.9 BACKGROUND, LCO – The description of the 120 VAC vital distribution system has been revised to reflect the description provided in SAR Section 8.3.1.1.6. The ANO-1 120 VAC vital distribution system nomenclature refers to 'distribution panels' but does not use the term 'bus.' This change maintains plant specific terminology.

3.8.10-01

B 3.8.10 APPLICABILITY and ACTION A.2.2 – Provided clarification that movement of irradiated fuel assemblies may occur in either the reactor building or the fuel handling area.

3.8.1-09, 3.8.4-05, 3.8.6-01, 3.8.7-03, 3.8.9-07

33 NUREG 3.8.1, 3.8.4, 3.8.6, 3.8.7, and 3.8.9 Bases, Applicable Safety Analysis – revised inaccurate statement of analysis assumptions. The implication of the statement being revised is that a single failure is always assumed and that a loss of offsite power is required to be applied to all accidents. There are accidents that do not assume a loss of offsite power in the ANO-1 SAR. There are also accidents in the ANO-1 SAR that do not assume a single failure. Correction of the inaccurate statement has no impact on the remainder of the Bases.

3.8.3-03

34 NUREG Bases – The discussion related to Condition A has been revised to delete a discussion of a reduction of level caused by feed and bleed operations that may be required due to increasing particulates or other fuel oil quality degradations. The ANO fuel oil system is designed such that batch feed and bleeds, that would reduce fuel oil inventory below the minimum LCO required level, are not required. The ANO system design allows filtration of the fuel oil storage tank contents while continuously making up from the bulk storage tank. Therefore, the information on batch feed and bleeds is deleted as not applicable to ANO-1.

35 NUREG LCO 3.8.9 Condition B - This Condition and the Required Action are revised from an individual bus basis to a subsystem basis. The LCO is written on a subsystem basis because the redundancy is provided on a subsystem basis. Each subsystem

contains two 120 V AC vital buses, but even with the loss of both of the buses in one subsystem, the other subsystem is adequate to provide for safe shutdown. A subsystem basis is also consistent with the Bases description of the need for the Required Action.

36 NUREG LCO 3.8.4 Required Action B.1 and LCO 3.8.9 Required Action D.1 Completion Times are revised from 6 hours to 12 hours consistent with CTS 3.7.3.B. NUREG LCO 3.8.7 (for Inverters) Required Action B.1 Completion Time is also revised from 6 hours to 12 hours for consistency with other electrical section shutdown actions. Since the CTS contains no explicit requirements for Inverters, this change is not directly related to current license basis, however, it is consistent with the current license basis for the remainder of the electrical section shutdown actions.

3.8.1-06 37 NUREG LCO 3.8.1 Required Actions A.1 and B.1 - The periodic Completion Time for these Required Actions is has been revised from once per 8 hours to once per 12 hours for consistency with the length of the shifts of the ANO-1 operating crews. This change is acceptable because incorrect breaker alignments are readily identified by either trouble alarms, which annunciate in the control room, or other indications of a "dead" bus. Verifying the operability of the offsite power sources every 12 hours in conjunction with the presence of these alarms provides assurance that a degradation of one or both offsite power sources would be readily identified, allowing a timely entry into the appropriate Condition.

3.8.1-05 38 Not used.

39 NUREG SR 3.8.1.8 - This SR revised to reflect the unit design for utilization of offsite circuits. When power is supplied from the Unit Auxiliary Transformer during normal operation, a unit trip detected by the main generator lockout relays would initiate a fast transfer to the selected preferred power supply. (ST1 is typically the selected preferred offsite circuit power supply. ST2 is typically disabled from auto transfer by placing the bus feeder breakers control switches in a pull-to-lock position, because ST2 is shared by both units and has limited capacity. This is to ensure ST2 is available to supply ES bus loads.) The transfer would open the Unit Auxiliary Transformer supply breaker and simultaneously close the preferred power supply breaker (i.e., the selected startup transformer's breaker) in a few cycles provided that the preferred power supply had acceptable voltage and was ready to accept the load. If the fast transfer to the startup transformer fails, then there will be an attempt to automatic slow transfer to the same startup transformer initiated by 4.16 KV bus A1 (A2) undervoltage auxiliary relays (after loads are shed from the bus.) If both fast and slow transfers fail to take place, then the transfer would have to be manual to the alternate offsite circuit, i.e., typically ST2. If a load is transferred to ST2 manually upon a unit trip, sufficient load is shed to ensure degraded voltage isolation does not occur. Thus, this SR is written to test the automatic transfer to the selected offsite circuit and the manual transfer to the remaining offsite circuit. As indicated in the Bases, this test maintains the requirements included in CTS Table 4.1-1, item 33. This change is consistent with current license basis.

40 NUREG SR 3.8.1.2 - This SR is revised to omit the specific acceptance criteria for steady state voltage and frequency. CTS 4.6.1.1 requires only the DG be demonstrated "ready for loading." This acceptance criteria is retained in the ITS. The Bases indicate that this acceptance criteria is met if the DG exceeds the minimum voltage of 3750 V within the time allowed. All acceptance criteria have been administratively controlled to-date and are proposed to continue to be so controlled. This change is consistent with current license basis.

3.8.1-15 41 NUREG SR 3.8.1.3 and Bases – SR 3.8.1.3 acceptance criteria have been revised to incorporate ANO-1 specific values. Regulatory Guide 1.9, Section C.2.2 requires the full load test to be conducted at 90 to 100 percent of the continuos load rating of the diesel generator. The ANO-1 diesel generator loading is based on the intended service rating of 2750 kW. Therefore a load range of ≥ 2475 kW and ≤ 2750 kW has been incorporated. The associated Bases have been revised to provide an explanation of the basis this load test range, and to discuss the ANO-1 treatment of instrument uncertainty as applied to this parameter. The maximum and minimum values for the test load range are considered to contain all necessary instrument uncertainties. Therefore, additional conservatisms are not required to be incorporated in the implementing procedures.

42 NUREG LCO 3.8.3 - NUREG Conditions E and F and NUREG SR 3.8.3.4 are revised to refer to the "required" air start receivers. The air start system for each DG consists of two redundant banks of two tanks each. One bank of two tanks is sufficient to provide margin to the required start attempt. Hence, only one bank is "required" by the LCO. This is consistent with current license basis (CTS 4.6.1.5).

3.8.10-01 43 NUREG LCO 3.8.9 and 3.8.10 - SR 3.8.9.1 and SR 3.8.10.1 are revised to omit voltage from the acceptance criteria. The installed instrumentation does not provide for direct voltage readings for each required subsystem. Rather, voltage is generally presumed to be sufficient if there is no indication of an undervoltage on the 4160 V buses. Therefore, specific requirements for verification of voltage are not included. This change is consistent with current license basis.

3.8.9-03 44 Not used.

45 NUREG LCO 3.8.7 - The LCO is revised to allow switching between the inservice inverter and a swing inverter without entering an ACTION. Both inverters are typically aligned to the alternate AC source prior to the load transfer. While this is not a frequent operation, it is unnecessarily restrictive to require entry into an ACTION to implement a design feature. An allowed time of 2 hours provides ample time to perform the transfer or return to the original configuration if the transfer can not be completed for some unforeseen reason.

3.8.7-01, 3.8.9-03 46 Not used.

47 NUREG LCO 3.8.9 - The ACTIONS for ITS 3.8.9 are revised to be applicable for more than one subsystem inoperable. Condition F identifies the appropriate ACTION for two or more electrical power distribution subsystems inoperable that result in a loss

of function. However, no Condition is applicable if the inoperability of two or more subsystems does not result in a loss of function. This change allows continued operation if no loss of function exists. In addition, the Bases statements of "and a loss of function has not yet occurred" are not incorporated since this is inconsistent with usage and with the remainder of the NUREG. Such wording is inconsistent with usage since Conditions A, B, and C would still be applicable and entered, but moot since Condition E would require a shutdown. Should the lost function be restored, the Completion Time for Condition A, B, or C, as applicable, would have begun at the time of initial entry into the Condition, not at the time of restoration of the lost function. Further, the Bases wording is inconsistent with numerous other such Conditions in the NUREG which do not identify applicability based on no loss of function.

48 NUREG SR 3.8.4.6 is not adopted. This NUREG Surveillance demonstrates the design capability of the charger and is not directly related to verification of the lowest functional level required to confirm the assumed safety related function, and is not a CTS (current licensing basis) requirement. Adopting this NUREG Surveillance at ANO-1 would result in an outage impact and/or non-trivial temporary test setup.

The ANO-1 battery charger design includes a fully redundant spare charger for each of the two inservice chargers. It is standard practice to alternate chargers to equalize run times. This results in continuous verification of the charger's capability to carry nominal DC loads while maintaining the battery fully charged (which satisfies ITS SR 3.8.4.1). Furthermore, each outage (once per 18 months) one charger will be used to recharge the battery after its required service or performance discharge test. This test will confirm the charger capability to function at its current-limit, and continue to fully recharge the battery. This capability will be demonstrated by alternating chargers such that each charger is utilized once per 36 months (nominally). Together, the required ITS SR 3.8.4.1 and the other licensee-controlled performance tests and monitoring will continue to adequately verify the necessary safety function of the chargers. This is consistent with the current license basis.

49 NUREG Bases 3.8.6 - This editorial change adds Bases for the ITS 3.8.4 Actions Note where none were previously provided. NUREG 3.8.6 Actions are preceded by a Note that states that separate entry is allowed for each battery. No Bases were provided for this Note, which is inconsistent with the format of other sections of the NUREG Bases.

50 Not used

51. NUREG Bases - ANO-1 was designed and licensed to the AEC's General Design Criteria (GDC) which was published in the Federal Register on July 11, 1967 [32FR10213]. Appendix A to 10 CFR 50 effective in 1971 [36FR3256] and subsequently amended, is somewhat different from the proposed 1967 criteria. SAR Section 1.4 includes an evaluation of ANO with respect to the 1967 criteria. The NUREG statement concerning the GDC criteria is modified in the ITS to reference the current licensing basis description in the SAR.

52. NUREG Bases - The Criterion statement at the conclusion of the Applicable Safety Analysis section was modified at each occurrence to refer to 10 CFR 50.36 instead of the NRC Policy Statement. This is an editorial change associated with the implementation of the 10 CFR 50.36 rule changes after NUREG-1430, Revision 1 was issued.

3.8.4-05, 3.8.9-08

The 10 CFR 50.36 Criterion satisfied by the ITS LCOs was modified to preserve consistency with the ANO-1 license basis. The NUREG Criterion specified were modified to be consistent with the analysis assumptions regarding equipment availability and operating condition (i.e., MODE). The ANO-1 accident analyses are not specifically performed in MODES 3 and 4. With no specific analyses in these MODES, a direct comparison with the first three criteria of 10 CFR 50.36 could not be made. Therefore, Criterion 4 was determined to be applicable.

53. NUREG 3.8.6 – Incorporated TSTF-278.

54 NUREG Table 3.8.6-1, Footnote b requires level correction of specific gravity. This correction is not incorporated in the ANO-1 ITS Table 3.8.4-1, Footnote b.

If the electrolyte level is between the high and low level marks and the temperature corrected specific gravity is within the manufacturer's nominal specific gravity, IEEE-450-1995, Annex A, Paragraph A.3, states that it is not necessary to correct the specific gravity of the battery for electrolyte level. The vendor of the ANO-1 batteries (C&D Technologies, Inc) has stated that, in essence, the level correction factor allows the battery user to estimate what the specific gravity would be after the cell has been topped up with water. Thus if cells have been determined to be in a fully charged state, but electrolyte levels are below the high level indicator, the user can determine if the cells require water or electrolyte (of the same specific gravity as originally provided) for the topping up process, by applying the level correction to his "as found" specific gravity readings. Although the correction for specific gravity can provide useful information, C&D considers this correction to be meaningless as a means of determining battery operability. C&D's Operating Instructions do not recommend correcting electrolyte specific gravity for level. Therefore, a level correction is not applied to the Category A, B or C specific gravity measurement. This change is consistent with current license basis.

3.8.2-01, 3.8.5-01, 3.8.8-01, 3.8.10-01, ANO-365

55. Generic Change TSTF-36, Rev. 4, has been incorporated in ITS 3.8.2, 3.8.5, 3.8.8, and 3.8.10 and their associated Bases.

3.8.5-01, 3.8.8-01

56. Generic Change TSTF-204, Rev. 3, has been incorporated in ITS 3.8.5 and 3.8.8 and their associated Bases. This generic change has been revised to maintain the proper relationship with ITS 3.8.10. NUREG 3.8.5 Required Action A.1 and NUREG 3.8.8 Required Action A.1 have been deleted, as, with the incorporation of the generic change, the allowance to declare the affected required features inoperable is not appropriate since only one DC source and one inverter are required to be Operable in Mode 5 and 6. The remaining Required Actions in ITS 3.8.5 and 3.8.8 have been renumbered, as appropriate.

ITS DISCUSSION OF DIFFERENCES

3.8.5-01, 3.8.8-01, 3.8.10-01

57. NUREG 3.8.5 and 3.8.8 and their associated Bases have been revised to include Required Action A.1.5 in the ITS. NUREG 3.8.10 and its associated Bases have been revised to include Required Action A.2.6 in the ITS. These actions direct the operator to enter the applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System," for those LTOP features made inoperable as a result of entry into Condition A. NUREG 3.8.5, 3.8.8, and 3.8.10 do not provide any guidance to ensure that the appropriate actions are taken in the event an electrical failure results in deenergizing an LTOP feature. With the inclusion of LCO 3.0.6 in the ITS, inoperabilities in LTOP system features which are a result solely of inoperabilities in DC sources, inverters, or distribution, would not require the appropriate LTOP actions to be taken. The allowance of LCO 3.0.6 is based on the premise that these support systems contain appropriate Actions for the inoperability, without having to also take the supported system's Actions. However, in the case of LTOP system features, rather than attempt to apply sufficient Actions in each support system, a Required Action has been added requiring simultaneous entry into the LTOP system Actions has been added. The addition of this Required Action to ITS 3.8.5, 3.8.8, and 3.8.10 ensures that the appropriate corrective measures will be taken in the event an electrical failure results in the loss of an LTOP feature.

3.8.2-01, 3.8.5-01, 3.8.10-01

58. NUREG 3.8.2, 3.8.5 and 3.8.10 Bases – The Bases Applicable Safety Analyses (ASA) discussions have been revised to reflect the plant specific safety analyses in MODES 5 and 6. The only accident described in the ANO-1 SAR that is analyzed for MODES 5 and 6 is the fuel handling accident. Therefore, the ASA discussions are revised accordingly. In addition, the ITS 3.8.2 Bases ASA discussion is revised to include a statement on shutdown risk and the interaction of NUMARC 91-06. This statement is consistent with statements inserted in the ASA discussions in the Bases for ITS 3.8.5 and 3.8.8 by TSTF-204, Rev. 3, and provides additional guidance concerning the need for equipment beyond that required by the technical specifications.

3.8.5-01

59. NUREG 3.8.5 Bases – Applicability discussion has been revised to provide assurance that adequate decay heat removal is available for the irradiated fuel assemblies in the core. Coolant inventory makeup can be considered as a form of decay heat removal. This change provides a more encompassing statement. This is consistent with the requirements for component operability in MODES 5 and 6, as required by other LCOs in the ITS.

3.8.2-01

60. NUREG 3.8.2 and Bases – The Bases Background and LCO discussions have been revised to provide a specific description of the ANO offsite AC sources and onsite AC sources During operation in MODES 5 and 6. This information is required to clarify the requirements due to the accident analysis assumptions in these MODES, and due to the configurations that the AC sources may be placed in during operation in these MODES. The revised discussions recognize that the unit auxiliary transformer may be used as an offsite AC source when backfed from the 500 kV switchyard. This same alignment is not credited in ITS 3.8.1.

In addition, the onsite AC sources in MODES 5 and 6 allow the use of the alternate AC (AAC) diesel generator (DG) in lieu of the required emergency diesel generator. The AAC DG was installed to meet the requirements of 10 CFR 50.63(c)(iii)(2). The AAC DG was designed to provide vital and non-vital AC power to either ANO-1 or ANO-2, or both units simultaneously. The AAC DG does not have auto-start and auto-tie on capabilities, but is manually started and aligned as required. The design considerations assumed that the AAC DG would be started from the control room and be at rated speed and voltage within 10 minutes after the onset of a station blackout condition. The capacity of the AAC DG, 4400 kW at 4160 V, is more than sufficient to accommodate the ANO-1 shutdown loads, in conjunction with the ANO-2 emergency loads in this application, since it is sized to handle the emergency loads and non-vital loads on both units simultaneously.

The NUREG 3.8.2 Bases LCO discussion states that it is acceptable for trains to be cross tied during shutdown conditions, allowing a single offsite power circuit to supply all required trains. The LCO discussion has been revised in the ITS to also allow trains to be cross tied such that one onsite power source may supply the required equipment. This is acceptable since outage activities are evaluated to maintain risk at an acceptable low level using guidance contained in NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as stated in the ITS 3.8.2 Bases Applicable Safety Analyses discussion.

The NUREG 3.8.2 Bases LCO discussion of the Operability requirements of the required diesel generator have also been revised to require that the emergency diesel generator be capable of being started , accelerating to rated speed and voltage, and being connected to its respective Engineered Safeguards (ES) bus, and to allow the use of the AAC DG as the required onsite AC power source. The ANO-1 SAR does not describe any accident analyses for MODE 5 and 6 accidents that would require the emergency diesel generators to automatically start and load within a 15 second timeframe. In MODES 5 and 6, 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 many Design Basis Accidents (DBAs) that are analyzed in MODES 1 and 2 have no specific analyses in MODES 3, 4, 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 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. In addition, accidents that could possibly occur during operation in MODES 5 and 6 are expected to occur at a pace that allows sufficient time for manual operator action. Therefore, manual actions to start and load the diesel generator are acceptable.

As a result of this change, Note 2 has been added to ITS SR 3.8.2.1, that excepts the 15 second acceptance criteria of ITS SR 3.8.1.2 (NUREG SR 3.8.1.2). The associated SR Bases discussion has been revised to discuss this Note. Although the time for the DG to reach ready-to-load conditions is not required as an acceptance criteria, the Bases does state that this time is trended to help determine if a condition exists that is degrading the starting capabilities of the DG.

3.8.10-01 61. NUREG 3.8.10 – The LCO and associated Bases have been revised to provide a list of those ITS Specifications that apply to equipment/systems that require the electrical distribution system to be Operable in order to perform their safety functions in MODES 5 and 6. This is considered to be an editorial; enhancement, to provide the operator with a clear relationship between systems that are required to be Operable and the electrical distribution system in these MODES.

3.8.2-01, 3.8.5-01, 3.8.8-01, 3.8.10-01 62. Generic Change TSTF-286, Rev. 2, has been incorporated in ITS 3.8.2, 3.8.5, 3.8.8, and 3.8.10 and their associated Bases.

ANO-363 63. NUREG-3.8.1 and Bases – Required Action A.3 has been revised to incorporate a Note allowing startup transformer No. 2 (S/U #2) to be out of service for a 30 day period of time for preplanned preventative maintenance, consistent with CTS 3.7.2.B. This allowance was granted to ANO-1 by Amendment 206, dated April 28, 2000. S/U #2 is an offsite power source that is shared by ANO-1 and ANO-2. As such, there is no appropriate time to perform preventative maintenance, since at least one unit is always on line and the preventative maintenance can not be completed in the provided Completion Time for ANO-1, or the Allowed Outage Time provided for ANO-2. This allowance has been found acceptable, when compensatory measures are considered. These compensatory measures were provided in the Bases associated with CTS 3.7.2.B, and have been incorporated in the proposed Bases for ITS 3.8.1 Required Action A.3. This change is consistent with the current license basis.

3.8.1-21 64. Incorporated TSTF-283, Rev. 3, in the ITS SR 3.8.1.7 (NUREG SR 3.8.1.8) Note.

ANO-295 65. The Completion Time provided by NUREG 3.3.7 Action A.1 has been extended from 24 hours to 72 hours. Condition A has also been revised to address two inoperable inverters in the same train of electrical distribution. The CTS contains no references for restoration periods of inverters. Station procedures have conservatively incorporated the regulatory guidance (GL 91-11) of a 24-hour restoration period until further study could be performed. In addition, the BWOG is presently developing a generic change to address extension of the 24-hour Completion Time to 72 hours. However, it is unlikely that such a change will be processed and approved prior to the ANO-1 ITS conversion. Therefore, justification is provided below to support a 72-hour provision for inverter inoperability. Past operating experience at ANO-1 has indicated that 24 hours does not provide sufficient time to restore an inoperable inverter, especially if such inoperability is unexpected, the failure mechanism is initially unknown, and the failure occurs during non-working hours.

The four inverters of consequence each supply a vital 120 VAC panel, two panels on one train and two on the opposite train. Inverter inoperabilities normally result in the respective vital 120 VAC panel being powered from an alternate AC source that could be lost upon a loss of AC power to the respective train (no battery backup in this condition). The battery source through the inverter supplying the vital 120 VAC panel must be conservatively restored within a specified time frame since the alternate AC source is interruptible. No consequence of such an electrical lineup exists unless an event occurs during the allotted restoration period that eliminates the alternate AC power source to the affected vital 120 VAC panel. For the purposes of this discussion, however, the worse case assumption of a loss of the vital 120 VAC panel due to inverter inoperability and a subsequent loss of the alternate AC supply will be considered.

Each vital 120 VAC panel provides power to specific safety equipment, including the RPS, ESAS, EFIC System, instrumentation, etc. Generally, the loss of a vital 120 VAC panel will result in "fail-safe" conditions. The RPS channel, ESAS instrumentation channel, and the EFIC instrumentation channel powered by that 120 VAC panel will be deenergized, resulting in a trip of that instrument channel. This results in a condition that is consistent with the Required Actions for these systems that requires an inoperable channel to be placed in trip or bypass within 1 hour. Some control room instrumentation will be lost. Operability of some same-train safety equipment will be impacted, such as the post accident hydrogen analyzer. However, in these cases, redundant systems and components are available to perform the required function.

In a few cases, components may not position to a fail safe condition. One example is a loss of power to a reactor building pressure transmitter that is used as an input to the RPS and ESAS instrumentation channels. The transmitter will fail low on a loss of power and be unavailable to cause actuation of the associated RPS and ESAS instrumentation channel on high containment pressure. However, the same associated RPS and ESAS instrumentation channels will have lost power due to the loss of the vital 120 VAC panel and will have failed to the actuated state. Even if the RPS and ESAS instrumentation channels had not been lost, the failure of the reactor building pressure transmitter would not result in a worse condition than that of a loss of the system components that actuate on a high containment pressure signal. A loss of power to an ESAS logic channel would prevent a trip from actuating the appropriate ES components, until power was restored. Allowing these conditions to exist for a 72 hour period of time is acceptable, since the ITS will require the same Actions that are currently required if an entire train of ES components was inoperable for 72 hours. A loss of power affecting one channel of EFIC logic would prevent a trip from actuating the appropriate components, until power was restored. Allowing these conditions to exist for a 72 hour period of time is acceptable, since the ITS will require the same Actions that are currently required if an entire train of EFIC logic was inoperable for 72 hours.

As mentioned previously, two inverters and associated vital 120 VAC panels are powered from the same electrical power train. Those components not responding to their failed safe mode will only affect the operability of one train of TS required equipment. Although this condition could result in two instrumentation channels of RPS, ESAS, and EFIC being deenergized, this is acceptable since this would result in a system actuation of RPS, ESAS and EFIC. With respect to ESAS, and EFIC, although the logic channels that are deenergized could not trip, the logic channels that are still energized would receive a trip signal from the de-energized instrument channels, resulting in the actuation of the ES and EFIC components associated with the logic channels. Therefore, allowing both inverters in the same train to be inoperable for periods of up to 72 hours is consistent with the restoration periods of other TS components which they support. Finally, the plant design and analysis assumes the loss of one full train of safety function(s) for ensuring the reactor can be shutdown and maintained shutdown.

Since it is likely that the affected vital 120 VAC panel(s) will remain powered from the alternate AC source during inverter inoperability and given that the loss of a vital 120 VAC panel or both vital 120 VAC panels on the same train result in components positioning to their fail-safe condition or would render a TS component inoperable that has a 72-hour or greater Completion Time, the allowance for a 72-hour Completion Time for single inverter operability or inoperability of both inverters on a single train is acceptable.

CTS

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources—Operating

3.8.1-05

LCO 3.8.1 The following AC electrical power sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; [and] 3.7.1.A 3.7.1.F 3.7.1.G

b. Two diesel generators (DGs) each capable of supplying one train of the onsite Class 1E AC Electrical Power Distribution System ~~[; and]~~. 3.7.1.C

~~c. Automatic load sequencers for Train A and Train B].~~ 1

APPLICABILITY: MODES 1, 2, 3, and 4. 3.7.1 3.7.2.A

ACTIONS

3.8.1-06

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One ~~[required]~~ offsite circuit inoperable.	A.1	Perform SR 3.8.1.1 for OPERABLE ~~[required]~~ offsite circuit.	1 hour AND Once per ~~8~~ 12 hours thereafter 37
	AND		
	A.2	Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to one train concurrent with inoperability of redundant required feature(s)
	AND		
			(continued)

N/A

3.0.5

CTS

AND-363

<INSERT 3.8-2A>

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME	
A. (continued)	A.3 Restore {required} offsite circuit to OPERABLE status.	72 hours AND ~~8~~ 10 days from discovery of failure to meet LCO	63 3.7.2.B 3.7.2.B Table 3.5.1-1 Note 14 2 NA
B. One ~~[required]~~ DG inoperable.	B.1 Perform SR 3.8.1.1 for OPERABLE {required} offsite circuit(s).	1 hour AND Once per ~~8~~ 12 hours thereafter	3.7.2.C NA 37
	AND B.2 Declare required feature(s) supported by the inoperable DG inoperable when its redundant required feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)	3.0.5 3.7.2.C
	AND B.3.1 Determine OPERABLE DG~~(s)~~ is not inoperable due to common cause failure.	{24} hours	3.7.2.C edit
	OR B.3.2 Perform SR 3.8.1.2 for OPERABLE DG~~(s)~~.	{24} hours	3.7.2.C edit
	AND	(continued)	

3.8.1-06

ANO-363

<INSERT 3.8-2A

--------------------------NOTE--------------------------
Startup Transformer No. 2 may be removed from service for up to 30 days for preplanned preventative maintenance. This 30 day Completion Time may be applied not more than once in any 10 year period. The provisions of LCO 3.0.4 are not applicable to Startup Transformer No. 2 during this 30 day preventative maintenance period.

CTS

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME	
B. (continued)	B.4	Restore ~~[required]~~ DG to OPERABLE status.	~~72 hours~~ 7 days AND ~~6~~ 10 days from discovery of failure to meet LCO 2	3.7.2.C NA
C. Two ~~[required]~~ offsite circuits inoperable.	C.1	Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition C concurrent with inoperability of redundant required feature(s)	3.0.5
	AND			
	C.2	Restore one ~~[required]~~ offsite circuit to OPERABLE status.	24 hours	NA

(continued)

CTS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME	
D. One ~~{required}~~ offsite circuit inoperable. AND One ~~[required]~~ DG inoperable.	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.~~9~~ 6, "Distribution Systems—~~Operating~~," when Condition D is entered with no AC power source to any train. ----------------------------		NA
	D.1 Restore ~~{required}~~ offsite circuit to OPERABLE status.	12 hours	NA
	OR D.2 Restore ~~[required]~~ DG to OPERABLE status.	12 hours	NA
E. Two ~~[required]~~ DGs inoperable.	E.1 Restore one ~~[required]~~ DG to OPERABLE status.	2 hours	NA

(continued)

 CTS

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME	
~~F. ---REVIEWER'S NOTE--- This Condition may be deleted if the unit design is such that any sequencer failure mode will only affect the ability of the associated DG to power its respective safety loads following a loss of offsite power independent of, or coincident with, a Design Basis Event. ------------------------ One [required] [automatic load sequencer] inoperable.~~	~~F.1~~	~~Restore [required] [automatic load sequencer] to OPERABLE status.~~	~~[12] hours~~	1
F ~~G~~. Required Action and Associated Completion Time of Condition A, B, C, D, ~~or~~ E ~~, or F~~ not met.	F ~~G~~.1	Be in MODE 3.	12 hours	3.7.2.A & H 3.0.5
	AND			
	F ~~G~~.2	Be in MODE 5.	36 hours	3.7.2.A & H 3.0.5
G ~~H~~. Three or more ~~[required]~~ AC sources inoperable.	G ~~H~~.1	Enter LCO 3.0.3.	Immediately	3.7.2.A

CTS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY	
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each ~~[required]~~ offsite circuit.	7 days	NA
SR 3.8.1.2	-----NOTE~~S~~----- ~~1. Performance of SR 3.8.1.7 satisfies this SR.~~ ~~2.~~ All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. ~~3. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met.~~ ----- Verify each DG starts from standby conditions and achieves ~~steady state voltage ≥ [3740] V and ≤ [4580] V, and frequency ≥ [58.8] Hz and ≤ [61.2] Hz.~~ "ready-to-load" conditions. , in ≤ 15 seconds,	~~As specified in Table 3.8.1-1~~ 31 days	3 3 3 4 4.6.1.1 40

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY	CTS
SR 3.8.1.3	-------------------NOTES------------------- 1. DG loadings may include gradual loading as recommended by the manufacturer.		NA
	2. Momentary transients outside the load range do not invalidate this test.		NA
	3. This Surveillance shall be conducted on only one DG at a time.		NA
	4. This SR shall be preceded by and ~~[immediately]~~ follow, without shutdown, a successful performance of SR 3.8.1.2. ~~[or SR 3.8.1.7]~~ 3 4		NA edit
	Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ ~~[4500]~~ 2475 kW and ≤ ~~[5000]~~ 2750 kW.	~~As specified in Table 3.8.1-1.~~ 31 days 41 6	4.6.1.1
SR 3.8.1.4	Verify each day tank ~~[and engine mounted tank]~~ contains ≥ ~~[220]~~ 160 gal lons of fuel oil.	31 days	4.6.1.4.c 3.7.1.C edit
SR 3.8.1.5	Check for and remove accumulated water from each day tank ~~[and engine mounted tank]~~. 6	~~[31]~~ 31 days	NA
SR 3.8.1.6	Verify the fuel oil transfer system operates to ~~[automatically]~~ transfer fuel oil from storage tank~~[s]~~ to the day tank ~~[and engine mounted tank]~~. 27 6	~~[92]~~ 31 days	4.6.1.4.b 3.7.1.c.3

3.8.1.25

3.8.1-15

3.8.1-19
3.8.1-20

(continued)

CTS

3.8.1-19
3.8.1-21

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.1.7~~	~~NOTE~~ ~~All DG starts may be preceded by an engine prelube period.~~ ~~Verify each DG starts from standby condition and achieves, in ≤ [10] seconds, voltage ≥ [3740] V and ≤ [4580] V, and frequency ≥ [58.8] Hz and ≤ [61.2] Hz.~~	~~184 days~~
SR 3.8.1.~~8~~ 7	NOTE This Surveillance shall not normally be performed in MODE 1 or 2. ~~However, credit may be taken for unplanned events that satisfy this SR.~~ However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Verify ~~[~~automatic ~~[and manual]~~ transfer of AC power sources ~~from the normal offsite circuit to each alternate [required] offsite circuit.~~ to the selected offsite circuit and manual transfer to the alternate required offsite circuit.	~~[~~18 months~~]~~

(3) (64) (8) (39)

Table 4.1-1, item 33

edit

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	-------------------NOTES------------------- 1. This Surveillance shall not be performed in MODE 1 or 2. However, credit may be taken for unplanned events that satisfy this SR. 2. If performed with the DG synchronized with offsite power, it shall be performed at a power factor ≤ [0.9]. --- Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ [63] Hz; b. Within [3] seconds following load rejection, the voltage is ≥ [3740] V and ≤ [4580] V; and c. Within [3] seconds following load rejection, the frequency is ≥ [58.8] Hz and ≤ [61.2] Hz.	[18 months]
SR 3.8.1.10	-------------------NOTE------------------- This Surveillance shall not be performed in MODE 1 or 2. However, credit may be taken for unplanned events that satisfy this SR. --- Verify each DG operating at a power factor ≤ [0.9] does not trip, and voltage is maintained ≤ [5000] V during and following a load rejection of ≥ [4500] kW and ≤ [5000] kW.	[18 months]

9

9

(continued)

 CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
SR 3.8.1.~~11~~ 8	-----------------NOTE~~S~~----------------- ~~1.~~ All DG starts may be preceded by an engine prelube period. ~~2. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR.~~ --- Verify on an actual or simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. DG auto-starts from standby condition and: 1. achieves "ready-to-load" conditions 2 ~~1~~. energizes ~~permanently~~ connected loads ~~in ≤ [10]~~ 15 seconds, 3 ~~2~~. energizes auto-connected shutdown load through ~~[~~automatic load sequenc~~er~~ing timers, and ~~3. maintains steady-state voltage ≥ [3740] V and ≤ [4580] V,~~ ~~4. maintains steady-state frequency ≥ [58.8] Hz and ≤ [61.2] Hz, and~~ 4 ~~5~~. supplies ~~permanently~~ connected ~~and auto-connected shutdown~~ loads for ≥ 5 minutes.	~~[~~18 months~~]~~	NA 7 8 4.6.1.2.a 4.6.1.2 & T4.1-1 item 32 1 23 4.6.1.2.d edit

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	-------------------NOTES------------------- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not be performed in MODE 1 or 2. However, credit may be taken for unplanned events that satisfy this SR. --- Verify on an actual or simulated [Engineered Safety Feature (ESF)] actuation signal each DG auto-starts from standby condition and: a. In ≤ [12] seconds after auto-start and during tests, achieves voltage ≥ [3740] V and ≤ [4580] V; b. In ≤ [12] seconds after auto-start and during tests, achieves frequency ≥ [58.8] Hz and ≤ [61.2] Hz; c. Operates for ≥ 5 minutes; d. Permanently connected loads remain energized from the offsite power system; and e. Emergency loads are energized [or auto-connected through the automatic load sequencer] from the offsite power system.	[18 months]

10

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.1.13~~	~~-----NOTE----- This Surveillance shall not be performed in MODE 1 or 2. However, credit may be taken for unplanned events that satisfy this SR.~~ ~~Verify each DG automatic trip is bypassed on [actual or simulated loss of voltage signal on the emergency bus concurrent with an actual or simulated ESF actuation signal] except:~~ ~~a. Engine overspeed; [and]~~ ~~b. Generator differential current[;~~ ~~c. Low lube oil pressure;~~ ~~d. High crankcase pressure; and~~ ~~e. Start failure relay].~~	~~[18 months]~~

11

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.14	------------------NOTES------------------ 1. Momentary transients outside the load and power factor ranges do not invalidate this test. 2. This Surveillance shall not be performed in MODE 1 or 2. However, credit may be taken for unplanned events that satisfy this SR. -- Verify each DG operating at a power factor ≤ [0.9] operates for ≥ 24 hours: a. For ≥ [2] hours loaded ≥ [5250] kW and ≤ [6000] kW; and b. For the remaining hours of the test loaded ≥ [4500] kW and ≤ [5000] kW.	[18 months]
SR 3.8.1.15	------------------NOTES------------------ 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ [2] hours loaded ≥ [4500] kW and ≤ [5000] kW. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. -- Verify each DG starts and achieves, in ≤ [10] seconds, voltage ≥ [3740] V and ≤ [4580] V, and frequency ≥ [58.8] Hz and ≤ [61.2] Hz.	[18 months]

15

15

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.~~16~~ 15	-----NOTE----- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR. ----- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	[18 months]
[SR 3.8.1.17 21	-----NOTE----- This Surveillance shall not be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. ----- Verify, with a DG operating in test mode and connected to its bus, an actual or simulated ESF actuation signal overrides the test mode by: a. Returning DG to ready-to-load operation[; and b. Automatically energizing the emergency load from offsite power].	[18 months]]

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	-----------------NOTE----------------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR. ------------------------------------- Verify interval between each sequenced load block is within ± [10% of design interval] for each emergency [and shutdown] load sequencer.	[18 months]

(continued)

1

3.8.1-19

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY	
SR 3.8.1.~~19~~ 9	-----------------NOTE~~S~~----------------- ~~1.~~ All DG starts may be preceded by an engine prelube period. ~~2. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR.~~ --		NA 7 8
	Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal:	~~[~~18 months~~]~~	4.6.1.2.b
	a. De-energization of emergency buses;		4.6.1.2
	b. Load shedding from emergency buses; and		T4.1-1 item 32 edit
	c. DG auto-starts from standby condition and: 1. achieves "ready-to-load" conditions 2 ~~1~~. energizes ~~permanently~~ connected loads, in ≤ ~~[10]~~ 15 seconds, 3 ~~2~~. energizes auto-connected emergency loads through ~~[~~load sequence~~r]~~ing timers, and ~~3. achieves steady-state voltage ≥ [3740] V and ≤ [4580] V,~~ ~~4. achieves steady-state frequency ≥ [58.8] Hz and ≤ [61.2] Hz, and~~ 4 ~~5~~. supplies ~~permanently~~ connected ~~and auto-connected emergency~~ loads for ≥ ~~[5]~~ 60 minutes.		1 23 4.6.1.2.d edit

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.20	---NOTE--- All DG starts may be preceded by an engine prelube period. ------ Verify, when started simultaneously from standby condition, each DG achieves, in ≤ [10] seconds, voltage ≥ [3740] V and ≤ [4580] V, and frequency ≥ [58.8] Hz and ≤ [61.2] Hz.	10 years

10

4

Table 3.8.1-1 (page 1 of 1)
Diesel Generator Test Schedule

NUMBER OF FAILURES IN LAST 25 VALID TESTS[(a)]	FREQUENCY
≤ 3	31 days
≥ 4	7 days[(b)] (but no less than 24 hours)

(a) Criteria for determining number of failures and valid tests shall be in accordance with Regulatory Position C.2.1 of Regulatory Guide 1.9, Revision 3, where the number of tests and failures is determined on a per DG basis.

(b) This test frequency shall be maintained until seven consecutive failure free starts from standby conditions and load and run tests have been performed. This is consistent with Regulatory Position [ ], of Regulatory Guide 1.9, Revision 3. If, subsequent to the 7 failure free tests, 1 or more additional failures occur such that there are again 4 or more failures in the last 25 tests, the testing interval shall again be reduced as noted above and maintained until 7 consecutive failure free tests have been performed.

[Note: If Revision 3 of Regulatory Guide 1.9 is not approved, the above table will be modified to be consistent with the existing version of Regulatory Guide 1.108, GL 84-15, or other approved guidance.]

3.8.2-01

CTS

3.8 ELECTRICAL POWER SYSTEMS

3.8.2 AC Sources—Shutdown

NA

LCO 3.8.2 The following AC electrical power sources shall be OPERABLE:

a. One qualified circuit between the offsite transmission network and the onsite Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown"; and

b. One diesel generator (DG) capable of supplying one train of the onsite Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10.

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

3.8.2-01

ANO-365

CTS

NA

55

NOTE
LCO 3.0.3 is not applicable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required offsite circuit inoperable.	------------NOTE------------ Enter applicable Conditions and Required Actions of LCO 3.8.10, with one required train de-energized as a result of Condition A. ----------------------------	
	A.1 Declare affected required feature(s) with no offsite power available inoperable.	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	A.2.3 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately 62
	AND	
	A.2.4 Initiate action to restore required offsite power circuit to OPERABLE status.	Immediately

(continued)

3.8.2-01

CTS
NA

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One required DG inoperable.	B.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	B.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
Suspend operations involving positive reactivity additions that could resut in loss of required SDM or boron concentration	B.3 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND	
	B.4 Initiate action to restore required DG to OPERABLE status.	Immediately

62

3.8.2-01

CTS

NA

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.2.1	------------------------------NOTE------------------------------ 1. ~~The following SRs are~~ 15 not required to be performed: SR 3.8.1.3~~, SR 3.8.1.9 through SR 3.8.1.11, SR 3.8.1.13 through SR 3.8.1.16, [SR 3.8.1.18,] and SR 3.8.1.19~~. 2. The 15 second acceptance criteria of SR 3.8.1.2 is not applicable. --- For AC sources required to be OPERABLE, the SRs of Specification 3.8.1, "AC Sources—Operating," except ~~SR 3.8.1.8, SR 3.8.1.17, and SR 3.8.1.20~~ SR 3.8.1.4, SR 3.8.1.7, SR 3.8.1.8, and SR 3.8.1.9, are applicable.	In accordance with applicable SRs

12

60

25

CTS

3.7.1.C

3.8 ELECTRICAL POWER SYSTEMS

3.8.3 Diesel Fuel Oil~~, Lube Oil,~~ and Starting Air

LCO 3.8.3 The stored diesel fuel oil~~, lube oil,~~ and starting air subsystem shall be within limits for each required diesel generator (DG).

APPLICABILITY: When associated DG is required to be OPERABLE. 3.7.1.A & N/A

ACTIONS

--------------------------------NOTE--------------------------------
Separate Condition entry is allowed for each DG. NA

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more DG~~s~~ fuel oil storage tank(s) with fuel ~~level~~ volume < ~~[33,000]~~ 20,000 ~~gal~~ and > ~~[28,285]~~ 17,140 ~~gal~~ ~~in storage tank.~~ gallons	A.1 Restore fuel oil ~~level~~ to within limits.	48 hours
~~B. One or more DGs with lube oil inventory < [500] gal and > [425] gal.~~	~~B.1 Restore lube oil inventory to within limits.~~	~~48 hours~~
B ~~C~~. One or more DGs with stored fuel oil total particulates not within limit.	B ~~C~~.1 Restore fuel oil total particulates to within limits.	7 days

edit
NA
edit
25
NA

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME	
C ~~D~~. One or more DGs with new fuel oil properties not within limits.	C ~~D~~.1 Restore stored fuel oil properties to within limits.	30 days	NA
D ~~E~~. One or more DGs with required starting air receiver pressure < ~~[225]~~ 175 psig and ≥ ~~[125]~~ 158 psig.	D ~~E~~.1 Restore required starting air receiver pressure to ~~≥ [225]~~ psig. within limits	48 hours	42 NA edit
E ~~F~~. Required Action and associated Completion Time not met. OR One or more DGs with diesel required fuel oil ~~, lube oil,~~ or starting air subsystem not within limits for reasons other than Condition A, B, C, ~~D,~~ or ~~E~~ D.	E ~~F~~.1 Declare associated DG inoperable.	Immediately	NA 25 42

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY	
SR 3.8.3.1	Verify each fuel oil storage tank contains ≥ ~~[33,000]~~ 20,000 gal lons of fuel.	31 days	4.6.1.4.d 3.7.1.c edit

(continued)

 25 CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
~~SR 3.8.3.2~~	~~Verify lube oil inventory is ≥ [500] gal.~~	~~31 days~~	25
SR 3.8.3.~~3~~ 2	Verify fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of, the Diesel Fuel Oil Testing Program.	In accordance with the Diesel Fuel Oil Testing Program	4.6.1.4.e NA
SR 3.8.3.~~4~~ 3	Verify each DG required air start receiver pressure is ≥ ~~[225]~~ 175 psig.	31 days	42 4.6.1.4.a 4.6.1.5
SR 3.8.3.~~5~~ 4	Check for and remove accumulated water from each fuel oil storage tank.	~~[31]~~ 92 days	NA
~~SR 3.8.3.6~~	~~For each fuel oil storage tank: a. Drain the fuel oil; b. Remove the sediment; and c. Clean the tank.~~	~~10 years~~	20

3.8.3-01

CTS

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources—Operating

LCO 3.8.4 Both ~~The Train A and Train B~~ DC electrical power subsystems shall be OPERABLE. 3.7.3 edit

APPLICABILITY: MODES 1, 2, 3, and 4. 3.7.3

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME	
A. One DC electrical power subsystem inoperable.	A.1 Restore DC electrical power subsystem to OPERABLE status.	~~2~~ 8 hours	3.7.3.A.3 13
B. Required Action and Associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	~~6~~ 12 hours 36 hours	36 3.7.3.B

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY	
SR 3.8.4.1 Verify battery terminal voltage is ≥ ~~[129/258]~~ 124.7 V on float charge.	7 days	4.6.2.1

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.2	Verify no visible corrosion at battery terminals and connectors. OR Verify battery connection resistance [is ≤ [1E-5 ohm] for inter-cell connections, ≤ [1E-5 ohm] for inter-rack connections, ≤ [1E-5 ohm] for inter-tier connections, and ≤ [1E-5 ohm] for terminal connections].	92 days
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration.	[12] months
SR 3.8.4.4	Remove visible terminal corrosion and verify battery cell to cell and terminal connections are [clean and tight, and are] coated with anti-corrosion material.	[12] months
SR 3.8.4.5	Verify battery connection resistance [is ≤ [1E-5 ohm] for inter-cell connections, ≤ [1E-5 ohm] for inter-rack connections, ≤ [1E-5 ohm] for inter-tier connections, and ≤ [1E-5 ohm] for terminal connections].	[12] months

14

14

14

14

(continued)

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
~~SR 3.8.4.6~~	~~NOTE~~ ~~This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR.~~ ~~Verify each battery charger supplies ≥ [400] amps at ≥ [125/250] V for ≥ [8] hours.~~	~~[18 months]~~	48
SR 3.8.4.~~7~~ 2	~~NOTES~~ ~~1. The modified performance discharge test in SR 3.8.4.8 may be performed in lieu of the service test in SR 3.8.4.7 once per 60 months.~~ ~~2. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR.~~ Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test or a modified performance discharge test.	~~[18 months]~~ 6 months 6	19 7 8 4.6.2.2 19

(continued)

 CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
SR 3.8.4.~~8~~ 3	~~-------------------NOTE--------------------~~ ~~This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR.~~ ~~---~~ 7 8 Verify battery capacity is ≥ ~~[80]~~% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	60 months AND 12 months when battery shows degradation, or has reached ~~[85]~~% of the expected life with capacity < 100% of manufacturer's rating AND 24 months when battery has reached ~~[85]~~% of the expected life with capacity ≥ 100% of manufacturer's rating	4.6.2.3

3,8,5-01

CTS
NA

ANO-365

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources—Shutdown

LCO 3.8.5 One DC electrical power subsystem shall be OPERABLE ~~to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."~~ 56

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

------ NOTE ------
LCO 3.0.3 is not applicable. 55

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ~~or more~~ required DC electrical power subsystem~~s~~ inoperable.	~~A.1 Declare affected required feature(s) inoperable.~~	~~Immediately~~
	~~OR~~	56
	A.~~2~~1.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.~~2~~1.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	A.~~2~~1.3 ~~Initiate action to suspend operations involving positive reactivity additions.~~ Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately 62
	AND	
		(continued)

3.8.5-01

CTS
NA

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.~~2~~1.4	Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

<INSERT 3.8-31A>

57

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	-------------------NOTE------------------- The following SRs are not required to be performed: ~~SR 3.8.4.6,~~ SR 3.8.4.~~7~~2, and SR 3.8.4.~~8~~3. -- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.4.1 ~~SR 3.8.4.2~~ ~~SR 3.8.4.3~~ ~~SR 3.8.4.4~~ ~~SR 3.8.4.5~~ ~~SR 3.8.4.6~~ SR 3.8.4.~~7~~2 SR 3.8.4.~~8~~3	In accordance with applicable SRs

48

14

<INSERT 3.8-31A>

3.8.2-01

AND		
A.1.5	Enter applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System," for LTOP features made inoperable by Condition A.	Immediately

CTS

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery Cell Parameters

3.7.4

LCO 3.8.6 Battery cell parameters ~~for the Train A and Train B batteries~~ shall be within ~~the~~ limits ~~of Table 3.8.6-1~~. 22 53

APPLICABILITY: When associated DC electrical power subsystems are required to be OPERABLE. 3.7.4

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each battery. NA

CONDITION	REQUIRED ACTION		COMPLETION TIME	
A. One or more batteries with one or more battery cell parameters not within Category A or B limits. Table 3.8.6-1	A.1	Verify pilot cell ~~(s)~~ electrolyte level and float voltage meet Table 3.8.6-1 Category C ~~values~~ limits.	1 hour	3.7.4.A.1 edit
	AND			53
	A.2	Verify battery cell parameters meet Table 3.8.6-1 Category C ~~values~~ limits.	24 hours AND Once per 7 days thereafter	3.7.4.A.2 edit
	AND			
	A.3	Restore battery cell parameters to Category A and B limits ~~of~~ Table 3.8.6-1.	31 days	3.7.4.A.3 53

(continued)

 CTS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME	
B. Required Action and associated Completion Time of Condition A not met. OR One or pilot cell or more batteries with average electrolyte temperature of the representative cells < [60] 66 °F. OR One or more batteries with one or more battery cell parameters not within Category C values. Table 3.8.6-1	B.1 Declare associated battery inoperable.	Immediately	3.7.4.B 30 3.7.4.C 3.7.4.C 53

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY	
SR 3.8.6.1	Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	7 days	4.6.2.5

(continued)

SR 3.8.6.2	Verify electrolyte temperature of the pilot cell is ≥ 60°F.	31 days	4.6.2.8 30

CTS

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY	
SR 3.8.6.~~[2]~~ 3 Verify battery cell parameters meet Table 3.8.6-1 Category B limits.	92 days **AND** Once within 24 hours after a battery discharge < ~~[110]~~ V **AND** Once within 24 hours after a battery overcharge > ~~[150]~~ 145 V	4.6.2.7
SR 3.8.6.~~3~~ 4 Verify average electrolyte temperature of representative cells is ≥ ~~[60]~~ 60 °F.	92 days	4.6.2.6

Table 3.8.6-1 (page 1 of 1)
Battery Cell Surveillance Requirements

CTS

PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE LIMITS FOR EACH CONNECTED CELL	
Electrolyte Level	> Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	> Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	Above top of plates, and not overflowing	Table 4.6-1
Float Voltage	≥ 2.13 V	≥ 2.13 V	> 2.07 V	Table 4.6-1
Specific Gravity[(b)(c)]	≥ ~~[1.200]~~ 1.195	≥ ~~[1.195]~~ 1.190 AND Average of all connected cells > ~~[1.205]~~ 1.195	Not more than 0.020 below average connected cells AND Average of all connected cells ≥ ~~[1.195]~~ 1.190	Table 4.6-1

(a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum during equalizing charges provided it is not overflowing.

(b) Corrected for electrolyte temperature ~~and level. Level correction is not required, however, when battery charging is < [2] amps when on float charge.~~ 54

(c) A battery charging current of < ~~[2]~~ amps when on float charge is acceptable for meeting specific gravity limits following a battery recharge, for a maximum of ~~[7]~~ days. When charging current is used to satisfy specific gravity requirements, specific gravity of each connected cell shall be measured prior to expiration of the ~~[7]~~ day allowance.

CTS

NA

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters—Operating

LCO 3.8.7 The required Red Train ~~[A]~~ and Green Train ~~[B]~~ inverters shall be OPERABLE.

-----------------------------NOTE-----------------------------

~~[One/~~~~two~~~~]~~ inverter~~[s]~~ may be disconnected from ~~[its/~~~~their~~~~]~~ associated DC bus for ≤ 2~~0~~ hours to perform ~~an equalizing charge on [its/their] associated [common] battery,~~ load transfer to or from the swing inverter, provided: 45

a. The associated 120V AC vital bus~~(es)~~ ~~[is/~~~~are~~~~]~~ energized from ~~[its/~~~~their~~~~] [Class 1E constant voltage source~~ alternate ~~transformers] [inverter using internal~~ AC source~~]~~; and

b. All other 120 V AC vital buses are energized from their associated OPERABLE inverters.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ~~{required}~~ inverter inoperable. OR Two required inverters in the same electrical power distribution subsystem inoperable.	A.1 ---------NOTE--------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating" with any 120 VAC vital bus de-energized. ----------------------- Restore inverter to OPERABLE status.	~~24~~ 72 hours

edit

65

AN0-295

(continued)

CTS
N/A

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	~~6~~ hours 12 36 hours

36

3.8.7-01

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.7.1 Verify correct inverter voltage, ~~[~~frequency,~~]~~ and alignment to required ~~AC~~ 120 VAC vital buses.	7 days

edit

CTS

3.8.8-01

NA

3.8 ELECTRICAL POWER SYSTEMS

3.8.8 Inverters—Shutdown

LCO 3.8.8 One ~~Inverters~~ shall be OPERABLE ~~to support the onsite Class 1E AC vital bus electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."~~ 56 edit

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

AND-365

ACTIONS

NOTE
LCO 3.0.3 is not applicable 55

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ~~or more~~ ~~[required]~~ ~~inverters~~ inverter inoperable.	~~A.1 Declare affected required feature(s) inoperable.~~	~~Immediately~~ 56
	~~OR~~	
	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	A.3 ~~Initiate action to suspend operations involving positive reactivity additions.~~ Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration	Immediately 62
	AND	
		(continued)

3.8.8-01

AND-365

CTS

NA

3.8 ELECTRICAL POWER SYSTEMS

3.8.8 Inverters—Shutdown

56 edit

LCO 3.8.8 One ~~Inverters~~ Inverter shall be OPERABLE to support the onsite Class 1E ~~AC~~ 120 VAC vital bus electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems—Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

NOTE
LCO 3.0.3 is not applicable

55

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ~~or more~~ ~~[required]~~ ~~inverters~~ inverter inoperable.	~~A.1 Declare affected required feature(s) inoperable.~~	~~Immediately~~
	~~OR~~	
	A.~~2~~1.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.~~2~~1.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration	A.~~2~~1.3 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND	
		(continued)

56

62

3.8.8-01

CTS

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A ~~2~~ 1.4 Initiate action to restore required inverters to OPERABLE status.	Immediately

NA

<INSERT 3.8-39A>

57

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.8.1	Verify correct inverter voltage~~,~~ ~~[frequency,]~~ and alignments to required ~~AC~~ 120 VAC vital buses.	7 days

edit

<INSERT 3.8-39A>

3.8.8-01

AND		
A.1.5	Enter applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System," for LTOP features made inoperable by Condition A.	Immediately

CTS

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems—Operating

LCO 3.8.9 Two ~~Train A and Train B~~ AC, DC, and 120 VAC ~~AC~~ vital bus electrical power distribution subsystems shall be OPERABLE. edit 3.7.1.B

APPLICABILITY: MODES 1, 2, 3, and 4. 3.7.1 3.7.2.A

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME	
A. One or more AC electrical power distribution subsystem(s) inoperable.	A.1 Restore AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours AND 16 hours from discovery of failure to meet LCO	47 3.7.2.D NA
B. One or more 120 VAC ~~AC~~ vital bus electrical power distribution subsystems inoperable.	B.1 Restore 120 VAC ~~AC~~ vital bus electrical power distribution subsystem(s) to OPERABLE status.	8 ~~2~~ hours AND 16 hours from discovery of failure to meet LCO	13 edit 3.7.2.D 35 NA 47
C. One or more DC electrical power distribution subsystem(s) inoperable.	C.1 Restore DC electrical power distribution subsystem(s) to OPERABLE status.	8 ~~2~~ hours AND 16 hours from discovery of failure to meet LCO	47 3.7.2.F 13 NA

(continued)

CTS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME	
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	~~6~~ 12 hours 36 hours	36 3.7.2.A 3.7.2.D 3.7.2.F 3.7.2.A 3.7.2.D 3.7.2.F
E. Two or more electrical power inoperable distribution subsystems that result in a loss of function.	E.1 Enter LCO 3.0.3	Immediately	3.7.2.A 47

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. 120 VAC	7 days	NA edit 43

3.8.9-03

3.8.10-01

CTS
NA

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems—Shutdown

LCO 3.8.10 The necessary portion of AC, DC, and ~~AC~~ 120 VAC vital bus electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE. edit 61

<INSERT 3.8-42A>

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

AND-365

ACTIONS
------NOTE------
LCO 3.0.3 is not applicable
55

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required AC, DC, or ~~AC~~ 120 VAC vital bus electrical power distribution subsystems inoperable.	A.1 Declare associated supported required feature(s) inoperable.	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	AND	
	A.2.3 ~~Initiate action to suspend operations involving positive reactivity additions.~~ Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	AND	
		(continued)

edit

62

<INSERT 3.8-42A>

3.8.10-01 by the following specifications:

LCO 3.3.9, "Source Range Neutron Flux,"
LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits,"
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"
LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled,"
LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System,"
LCO 3.7.9, "Control Room Emergency Ventilation System (CREVS),"
LCO 3.7.10, "Control Room Emergency Air Conditioning System (CREACS),"
LCO 3.7.12, "Fuel Handling Area Ventilation System (FHAVS),"
LCO 3.9.2, "Nuclear Instrumentation," for one monitor,
LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation - High Water Level," and
LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation - Low Water Level."

3.8.10-01

CTS
N/A

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.4 Initiate actions to restore required AC, DC, and AC vital bus electrical power distribution subsystems to OPERABLE status. 120 VAC	Immediately
	AND	
	A.2.5 Declare associated required decay heat removal subsystem(s) inoperable and not in operation.	Immediately

edit

57

<INSERT 3.8-43A>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.10.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems. 120 VAC	7 days

edit

43

<INSERT 3.8-43A>

3.8.10-01

	AND		
	A.2.6	Enter applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System," for LTOP features made inoperable by Condition A.	Immediately

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.1 AC Sources—Operating

BASES

BACKGROUND

The unit Class 1E AC Electrical Power Distribution System AC sources consist of the offsite power sources (preferred power sources, normal and alternate(s)) and the onsite standby power sources (~~Train A and Train B~~ diesel generators (DGs)). As required by ~~10 CFR 50, Appendix A,~~ GDC 17 (Ref. 1), the design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered ~~Safety Feature~~ (ESF) systems.

emergency
edit
51
edit
SAR, Section 1.4
Safeguards

INSERT B 3.8-1A

The onsite Class 1E AC Distribution System is divided into redundant load groups (trains) so that the loss of any one group does not prevent the minimum safety functions from being performed. Each train has connections to two preferred offsite power sources and a single DG.

27

five
offsite
either the startup transformers or the unit

Offsite power is supplied to the unit switchyard(s) from the transmission network by [two] transmission lines. From the switchyard(s), two electrically and physically separated circuits provide AC power, through ~~step down station~~ auxiliary transformer(s), to the 4.16 kV ESF buses. A detailed description of the offsite power network and the circuits to the Class 1E ESF buses is found in the FSAR, Chapter [8] (Ref. 2).

27

~~An offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E ESF bus(es).~~

27

With an engineered safeguards actuation system (ESAS) signal present,

placed in

Certain required unit loads are ~~returned to~~ service in a predetermined sequence ~~in order to prevent overloading the transformer supplying offsite power to the onsite Class 1E Distribution System.~~ Within [1 minute] after the initiating signal is received, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe condition are ~~returned to~~ service ~~via the load sequencer.~~

in

by the load sequencing timers

1

The onsite standby power source for each 4.16 kV ESF bus is a dedicated DG. DGs [11] and [12] are dedicated to ESF buses [11] and [12], respectively. A DG starts

A3 A4

(continued)

<INSERT B3.8-1A>

During typical on-line operation, power for unit equipment is provided from the unit auxiliary transformer. When the unit is off-line, unit equipment is typically powered from a startup transformer or from the unit auxiliary transformer back fed from the 500 kV switchyard. A unit trip (i.e., generator lockout) initiates an automatic transfer to an offsite power circuit (i.e., typically startup transformer No. 1). Startup transformer No. 2 is normally not selected for automatic transfer since it is the backup for both Unit 1 and Unit 2. In the event of a loss of offsite power to the startup transformer, an undervoltage condition trips its associated bus feeder breakers. When the startup transformer bus feeder breakers open, the bus feeder breakers for the alternate startup transformer automatically close (if available) provided the generator lockout relays have not been reset. If the power source is transferred to startup transformer No. 2, sufficient loads are automatically shed to avoid a degraded voltage condition (since startup transformer No. 2 is not sufficient to simultaneously provide power for full loading from both units.)

<INSERT B3.8-2A below>

However, the "intended service" rating provided by the manufacturer is 2750 kW. This is the value used in postulated DG loading evaluations (Ref. 2).

BASES

an applicable Engineered Safeguards Actuation System (ESAS)

BACKGROUND (continued)

automatically on ~~a Reactor Coolant System (RCS) pressure~~ signal or on an ESF bus degraded voltage or undervoltage signal (~~refer to~~ See LCO 3.3.5, "Engineered ~~Safety Features~~ Safeguards Actuation System (ESFAS) Instrumentation" and LCO 3.3.8, "~~Emergency~~ Diesel Generator (EDG) Loss of Power Starts (LOPS)"). After the DG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with an ~~safety injection (SI)~~ ESAS signal. The DGs will also start and operate in the standby mode without tying to the ESF bus on an SI signal alone. Following the trip of offsite power, ~~a sequencer~~ an undervoltage signal strips nonpermanent loads from the ESF bus. When the DG is tied to the ESF bus, loads are then sequentially connected to its respective ESF bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG by automatic load application.

Safeguards (26) edit
ESAS (26)
timers (1)
ing timers
their

In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

concurrent

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the DG in the process. Within (1) minute after the initiating signal is received, all loads needed to recover the unit or maintain it in a safe condition are returned to service.

by the load sequencing timers, (1)

Ratings for ~~Train A and Train B~~ DGs satisfy the ~~requirements~~ of Regulatory Guide 1.9 (Ref. 3). The continuous service rating of each DG is ~~[7000]~~ kW with [10]% overload permissible for up to 2 hours in any 24 hour period. The ESF loads that are powered from the 4.16 kV ESF buses are listed in Reference 2.

emergency
load 2
guidance
edit
2600
INSERT B3.8-2A from above (27)

3.8.1-08

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the FSAR, ~~Chapter [6] (Ref. 4) and~~ Chapter [15] (Ref. 5), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, RCS, and

14
4
edit
edit
Reactor Coolant System (RCS)

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

reactor building ~~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~~ "Reactor Building Systems." edit edit

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This results in maintaining at least one train of the onsite or offsite AC sources OPERABLE during accident conditions ~~in the event of~~: that consider 33

a. An assumed loss of all offsite power or all onsite AC power; and

b. A worst-case single failure.

3.8.1-09 In MODES 3 and 4, the AC sources satisfy Criterion 4 of 10 CFR 50.36.

In MODES 1 and 2, The AC sources satisfy Criterion 3 of ~~NRC Policy Statement~~ 10 CFR 50.36 (Ref. 5). 52

LCO

Two qualified circuits between the offsite transmission network and the onsite Class 1E Electrical Power Distribution System and separate and independent (emergency DGs 1 and 2) DGs for each ES train ensure availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an ~~anticipated operational occurrence (AOO)~~ abnormality or a postulated DBA. edit 26 3.8.1-05

Qualified offsite circuits are those that are described in the FSAR and are part of the licensing basis for the unit.

~~In addition, one required automatic load sequencer per train must be OPERABLE.~~ 1

Each required offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the ES~~F~~ buses.

INSERT B3.8-3A

~~Offsite circuit #1 consists of Safeguards Transformer B, which is supplied from Switchyard Bus B, and is fed through breaker 52-3 powering the ESF transformer XNB01, which, in turn, powers the #1 ESF bus through its normal feeder breaker. Offsite circuit #2 consists of the Startup Transformer, which is normally fed from the Switchyard Bus A, and is fed through breaker PA 0201 powering the ESF~~ 27

(continued)

<INSERT B3.8-3A>

3.8.1-11 The power sources for the two required offsite power circuits shall consist of:

a. Startup Transformer No. 1 and its 22 kV supply from the switchyard bus tie autotransformer, or the Unit Auxiliary Transformer and its supply from the switchyard bus tie autotransformer via the 22 kV overhead swing leads, and

b. Startup Transformer No. 2 and its supply from the 161 kV switchyard ring bus.

An offsite circuit includes the necessary breakers and equipment to properly align the circuit and transmit power from the transmission line source to a single 4160 V ES bus. One offsite source shall be capable of supplying 4160 V ES bus A3 via 4160 V bus A1 and the second offsite source shall be capable of supplying 4160 V ES bus A4 via 4160 V bus A2, at a minimum. Either source may be used to supply either ES bus. If bus A1 or A2 is not capable of supplying Bus A3 or A4, respectively, one of the offsite circuits must be considered inoperable.

One required offsite source shall be capable of accepting emergency loads in an automatic transfer. Reference 1 requires one circuit to be available within a few seconds following a LOCA to assure that core cooling, reactor building integrity, and other vital safety functions are maintained. The other required offsite source may be configured for manual transfer. In the event Startup Transformer No. 2 is configured for automatic transfer, the selective load-shed features for automatic shedding of loads to avoid a degraded voltage condition shall be OPERABLE.

For the offsite AC sources, separation and independence are maintained to the extent practical. An offsite source may be connected to more than one ES bus and not violate the separation criteria provided each OPERABLE required offsite source is capable of being aligned (manually or automatically, as appropriate) so that it is separate and independent of the other required offsite source.

When the main generator is synchronized to the 500 kV system, AC power for the ES loads may be supplied from either the Unit Auxiliary Transformer, Startup Transformer No. 1, Startup Transformer No. 2, or a combination of these transformers concurrently sharing the load. Power from the Unit Auxiliary Transformer is not credited with meeting the requirements of LCO 3.8.1.a since it cannot function under all conditions (i.e., following a turbine trip) except when connected in the alternate configuration described above. However, powering the ES buses from the Unit Auxiliary Transformer is permitted during normal unit operation.

BASES

LCO (continued)

~~transformer, which, in turn, powers the #2 ESF bus through its normal feeder breaker.~~ (27)

(DG1 and DG2)

Each DG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ES~~F~~ bus on detection of bus undervoltage. This will be accomplished within ~~[10]~~ seconds. (15) Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and continue to operate until offsite power can be restored to the ES~~F~~ buses. ~~These capabilities are required to be met from a variety of initial conditions, such as DG in standby with the engine hot and DG in standby with the engine at ambient conditions.~~ (15) ~~Additional DG capabilities must be demonstrated to meet required Surveillances, e.g., capability of the DG to revert to standby status on an ECCS signal while operating in parallel test mode.~~ (21)

3.8.1-07

Proper sequencing of loads, ~~(~~including tripping of non-essential loads,~~)~~ is a required function for DG OPERABILITY. (1)

<INSERT B3.8-4A>

The AC sources in one train must be separate and independent (to the extent possible) of the AC sources in the other train. For the DGs, separation and independence are complete.

~~For the offsite AC sources, separation and independence are to the extent practical. [A circuit may be connected to more than one ESF bus, with fast-transfer capability to the other circuit OPERABLE, and not violate separation criteria.~~ (27) ~~A circuit that is not connected to an ESF bus is required to have OPERABLE fast-transfer interlock mechanisms to at least two ESF buses to support OPERABILITY of that circuit.]~~ (27)

This LCO does not apply to the Alternate AC DG nor to the security DG.

APPLICABILITY

The AC sources ~~[and sequencers]~~ are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that: (1)

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

(continued)

3.8.2-07

<INSERT B3.8-4A>

Should the time intervals between two or more loads be reduced such that the interval is less than that assumed in the SAR, the associated diesel generator is considered to be inoperable. If one or more time delays is inoperable (i.e., the associated component fails to load) then the associated component is considered inoperable, and the appropriate Condition for that component is entered.

BASES

APPLICABILITY (continued)

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

The AC power requirements for MODES 5 and 6 are ~~covered in LCO 3.8.2, "AC Sources—Shutdown."~~ addressed by the definition of OPERABILITY for each required supported load. 17

ACTIONS

A.1

3.8.1-06

To ensure a highly reliable power source remains with one offsite circuit inoperable, it is necessary to verify the OPERABILITY of the remaining required offsite circuit on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a second required circuit fails SR 3.8.1.1, the second offsite circuit is inoperable, and Condition C, for two offsite circuits inoperable, is entered. edit 27

<INSERT B3.8-5A>

~~Reviewer's Note: The turbine driven auxiliary feedwater pump is only required to be considered a redundant required feature, and, therefore, required to be determined OPERABLE by this Required Action, if the design is such that the remaining OPERABLE motor or turbine driven auxiliary feedwater pump(s) is not by itself capable (without any reliance on the motor driven auxiliary feedwater pump powered by the emergency bus associated with the inoperable diesel generator) of providing 100% of the auxiliary feedwater flow assumed in the safety analysis.~~ 27

A.2

Required Action A.2, which only applies if the train cannot be powered from an offsite source, is intended to provide assurance that an event coincident with a single failure of the associated DG will not result in a complete loss of safety function of critical redundant required features. These features are powered from the redundant AC electrical power train. ~~This includes motor driven emergency feedwater pumps. Single train systems, such as turbine driven emergency feedwater pumps, may not be included.~~ 27

(continued)

<INSERT B3.8-5A>

The Completion Time provides for a prompt confirmation of the OPERABILITY of the remaining offsite circuit. This is considered to be acceptable because of other indications which are available in the control room for loss of the remaining offsite circuit.

BASES

ACTIONS

A.2 (continued)

The Completion Time for Required Action A.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. The train has no offsite power available to supply~~ing~~ it s loads; and 27

b. A required feature on the other train is inoperable.

If at any time during the existence of Condition A (one offsite circuit inoperable) a redundant required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering no offsite power to one train of the onsite Class 1E Electrical Power Distribution System coincident with one or more inoperable required support or supported features, or both, that are associated with the other train that has offsite power, results in starting the Completion Times for the Required Action. Twenty-four hours is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

The remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to ~~Train A and Train B~~ both trains of the onsite Class 1E Distribution System. The 24 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 24 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period. edit

A.3

~~According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition A for a period that should not exceed 72 hours.~~ 27 With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the

(continued)

BASES

ACTIONS

A.3 (continued)

potential for a loss of offsite power is increased, with attendant potential for a challenge to the unit safety systems. In this Condition, however, the remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System.

The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action A.3 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DG is inoperable and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to 7 days ~~72 hours~~. This could lead to a total of ~~144 hours~~ 10 days, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable, the circuit restored OPERABLE, and an additional ~~72 hours~~ 7 days (for a total of ~~6~~ 17 days) allowed prior to complete restoration of the LCO. The ~~6~~ 10 day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between the 72 hour and ~~6~~ 10 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met. 2

As in Required Action A.2, 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 that the LCO was initially not met, instead of at the time Condition A was entered. 63

<INSERT B3.8-7A> →

B.1

To ensure a highly reliable power source remains with an inoperable DG, it is necessary to verify the availability of

(continued)

ANO-363

<INSERT B3.8-7A>

Required Action A.3 has been modified by a Note extending the allowable outage time for Startup Transformer No. 2 only, for up to 30 days. The 30-day allowance is permitted not more than once in any 10-year period, which is considered sufficient for proper maintenance of the transformer. The 30-day window should permit extensive preplanned preventative maintenance without placing either unit in an action statement of short duration and would allow both units to be operating during such maintenance. Because this allowance assumes parts are prestaged, appropriate personnel are available, and proper contingencies have been established, it is not intended to be used for an unexpected loss of the transformer. Pre-established contingencies will consider the projected stability of the offsite electrical grid, the atmospheric stability projected for the maintenance window, the ability to adequately control other ongoing plant maintenance activities that coincide with the window, projected flood levels, and the availability of all other power sources. Since a station blackout is the most affected event that could occur when power sources are inoperable, the steam driven emergency feedwater pump will also be maintained available during the evolution.

3.8.1-06

BASES

ACTIONS

B.1 (continued)

the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions and Required Actions must then be entered.

INSERT B3.8-8A

27

~~Reviewer's Note: The turbine driven auxiliary feedwater pump is only required to be considered a redundant required feature, and, therefore, required to be determined OPERABLE by this Required Action, if the design is such that the remaining OPERABLE motor or turbine driven auxiliary feedwater pump(s) is not by itself capable (without any reliance on the motor driven auxiliary feedwater pump powered by the emergency bus associated with the inoperable diesel generator) of providing 100% of the auxiliary feedwater flow assumed in the safety analysis.~~

27

B.2

Required Action B.2 is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related trains. ~~This includes motor driven emergency feedwater pumps. Single train systems, such as turbine driven emergency feedwater pumps, are not included.~~ Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has an inoperable DG.

27

The Completion Time for Required Action B.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A required feature on the other train is inoperable.

(continued)

<INSERT B3.8-8A>

The Completion Time provides for a prompt confirmation of the OPERABILITY of the remaining offsite circuit. This is considered to be acceptable because of other indications, which are available in the control room for monitoring the status of the remaining offsite circuit.

BASES

ACTIONS

B.2 (continued)

If at any time during the existence of this Condition (one DG inoperable) a required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering one required DG inoperable coincident with one or more inoperable required support or supported features, or both, that are associated with the OPERABLE DG, results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

In this Condition, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single-failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DG(s). If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other DG(s), the other DG(s) would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists and Required Action B.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that DG. the edit

(continued)

BASES

ACTIONS

B.3.1 and B.3.2 (continued)

In the event the inoperable DG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the ~~[plant corrective action]~~ condition reporting program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B. 26

According to Generic Letter 84-15 (Ref. ~~7~~ 6), ~~[24]~~ hours is reasonable to confirm that the OPERABLE DG(s) is not affected by the same problem as the inoperable DG.

B.4

~~According to Regulatory Guide 1.93 (Ref. 6),~~ operation may continue in Condition B for a period that should not exceed ~~72 hours.~~ 7 days. 2

In Condition B, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The ~~72 hour~~ 7 day Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action B.4 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 72 hours. This could lead to a total of ~~144 hours~~ 10 days, since initial failure to meet the LCO, to restore the DG. At this time, an offsite circuit could again become inoperable, the DG restored OPERABLE, and an additional 72 hours (for a total of 6 days) allowed prior to complete restoration of the LCO. The 6 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Condition A and Condition B are entered concurrently. The "AND" connector between the ~~72 hour~~ 7 day and 6 10 day Completion Times 13 10 2

(continued)

BASES

ACTIONS

B.4 (continued)

means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action B.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition B was entered.

C.1 and C.2

Required Action C.1, which applies when two offsite circuits are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions. The Completion Time for this failure of redundant required features is reduced to 12 hours from that allowed for one train without offsite power (Required Action A.2). The rationale for the reduction to 12 hours is that ~~Regulatory Guide 1.93 (Ref. 6) allows~~ a Completion Time of 24 hours is allowed for two required offsite circuits inoperable, based upon the assumption that two complete safety trains are OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case, and a shorter Completion Time of 12 hours is appropriate. These features are powered from redundant AC Safety trains. ~~This includes motor driven auxiliary feedwater pumps. Single train features, such as turbine driven auxiliary pumps, are not included in the list.~~ 27 27

The Completion Time for Required Action C.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. All required offsite circuits are inoperable; and

b. A required feature is inoperable.

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

If at any time during the existence of Condition C (two offsite circuits inoperable) and a required feature becomes inoperable, this Completion Time begins to be tracked. edit

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition C for a period that should not exceed 24 hours. This level of degradation means that the offsite electrical power system does not have the capability to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources. 27

Because of the normally high availability of the offsite sources, this level of degradation may appear to be more severe than other combinations of two AC sources inoperable that involve one or more DGs inoperable. However, two factors tend to decrease the severity of this level of degradation:

a. The configuration of the redundant AC electrical power system that remains available is not susceptible to a single bus or switching failure; and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite AC source.

With both of the required offsite circuits inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst-case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

~~According to Reference 6,~~ With the available offsite AC sources, two less than required by the LCO, operation may 27

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation would continue in accordance with Condition A.

D.1 and D.2

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it were inoperable resulting in de-energization. Therefore, the Required Actions of Condition D are modified by a Note to indicate that when Condition D is entered with no AC source to any train (one or more trains), the Conditions and Required Actions for LCO 3.8.~~9~~ 6 "Distribution Systems—Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of one offsite circuit and one DG without regard to whether a train is de-energized. LCO 3.8.~~9~~ 6 provides the appropriate restrictions for a de-energized train. edit edit

~~According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition D for a period that should not exceed 12 hours.~~ 27

In Condition D, individual redundancy is lost in both the offsite electrical power system and the onsite AC electrical power system. ~~Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition C (loss of both required offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure.~~ 27 The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES

ACTIONS (continued)

E.1

With Train A and Train B DGs inoperable, there are no remaining standby AC sources. Thus, with an assumed loss of offsite electrical power, insufficient standby AC sources are available to power the minimum required ESF functions. Since the offsite electrical power system is the only source of AC power for this level of degradation, the risk associated with continued operation for a very short time could be less than that associated with an immediate controlled shutdown (the immediate shutdown could cause grid instability, which could result in a total loss of AC power). Since any inadvertent generator trip could also result in a total loss of offsite AC power, however, the time allowed for continued operation is severely restricted. The intent here is to avoid the risk associated with an immediate controlled shutdown and to minimize the risk associated with this level of degradation.

~~According to Reference 6,~~ with both DGs inoperable, operation may continue for a period that should not exceed 2 hours.

1

F.1

The sequencer(s) is an essential support system to [both the offsite circuit and the DG associated with a given ESF bus]. [Furthermore, the sequencer is on the primary success path for most major AC electrically powered safety systems powered from the associated ESF bus.] Therefore, loss of an [ESF bus sequencer] affects every major ESF system in the [division]. The [12] hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining sequencer OPERABILITY. This time period also ensures that the probability of an accident (requiring sequencer OPERABILITY) occurring during periods when the sequencer is inoperable is minimal.

This Condition is preceded by a Note that allows the Condition to be deleted if the unit design is such that any sequencer failure mode will only affect the ability of the associated DG to power its respective safety loads under any conditions. Implicit in this Note is the concept that the Condition must be retained if any sequencer failure mode results in the inability to start all or part of the safety

(continued)

BASES

ACTIONS

~~F.1 (continued)~~

~~loads when required, regardless of power availability, or results in overloading the offsite power circuit to a safety bus during an event thereby causing its failure. Also implicit in the Note is that the Condition is not applicable to any train that does not have a sequencer.~~

1

F ~~G~~.1 and F ~~G~~.2

If the inoperable AC electrical power sources 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.

12 edit

G ~~H~~.1

Condition G ~~H~~ corresponds to a level of degradation in which all redundancy in the AC electrical power supplies has been lost. At this severely degraded level, any further losses in the AC electrical power system will cause a loss of function. Therefore, no additional time is justified for continued operation. The unit is required by LCO 3.0.3 to commence a controlled shutdown.

SURVEILLANCE REQUIREMENTS

3.8.1-08

3.8.1-16

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with SAR Section 1.4 ~~10 CFR 50, Appendix A,~~ GDC 18 (Ref. 4 ~~8~~). Periodic component tests are supplemented by extensive functional tests during ~~refueling~~ outages (under simulated accident conditions). ~~The SRs for demonstrating the OPERABILITY of the DGs are in accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3), Regulatory Guide 1.108 (Ref. 9), and Regulatory Guide 1.137 (Ref. 10), as addressed in the FSAR.~~

51

27

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

is applicable

3750

"ready to load," a

Where the SRs discussed herein specify ~~voltage and frequency tolerances, the following is applicable. The~~ minimum ~~steady state~~ output voltage of ~~[3740]~~ V ~~is~~ 90% of the nominal 4160 V output voltage. This value, ~~which is specified in ANSI C84.1 (Ref. 11),~~ allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90% or 3600 V. It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 90% of name plate rating. ~~The specified maximum steady state output voltage of [4756] V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the DG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3).~~

INSERT B 3.8-16A

40

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their preferred power source, and that appropriate independence of offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

SR 3.8.1.2 ~~and SR 3.8.1.7~~

3

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to maintain the unit in a safe shutdown condition.

To minimize the wear on moving parts that do ~~not~~ this get lubricated when the engine is not running, ~~these~~ SR~~s~~ ~~are~~ is modified by a Note ~~(Note 2 for SR 3.8.1.2)~~ to indicate that ~~all~~ DG starts for ~~these~~ this Surveillance~~s~~ may be preceded by an

edit

(continued)

<INSERT B3.8-16A>

The required minimum frequency for loading of the DG is 58.8 Hz (derived from Safety Guide 9); however, this value is not routinely monitored to be within limit within 15 seconds. Meeting minimum frequency is expected prior to the DG voltage reaching the required minimum. This is administratively confirmed on an 18 month interval.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.2 ~~and SR 3.8.1.7~~ (continued) 3

engine prelube period and followed by a warmup period prior to loading ~~by an engine prelube period~~. with application of the Note edit

For the purposes of SR 3.8.1.2 ~~and SR 3.8.1.7~~ testing, the DGs are started from standby conditions. Standby conditions for a DG means that the diesel engine ~~coolant and~~ oil ~~are~~ is being continuously circulated and temperature is being maintained consistent with manufacturer recommendations. 3 27

INSERT B 3.8-17A

~~In order to reduce stress and wear on diesel engines, some manufacturers recommend a modified start in which the starting speed of DGs is limited, warmup is limited to this lower speed, and the DGs are gradually accelerated to synchronous speed prior to loading. This is the intent of Note 3, which is only applicable when such modified start procedures are recommended by the manufacturer.~~ 3

SR 3.8.1.~~7~~ 2 requires that, ~~at a 184 day Frequency,~~ "ready-to-load" conditions (i.e. minimum the DG starts from standby conditions and achieves ~~required~~ voltage) ~~and frequency~~ within ~~10~~ 15 seconds. The ~~10~~ 15 second start requirement supports the assumptions of the design basis LOCA analysis in the UFSAR, Chapter ~~15~~ 14 (Ref. 5). 3 15 40

~~The 10 second start requirement is not applicable to SR 3.8.1.2 (see Note 3) when a modified start procedure as described above is used. If a modified start is not used, the 10 second start requirement of SR 3.8.1.7 applies.~~ 3

~~Since SR 3.8.1.7 requires a 10 second start, it is more restrictive than SR 3.8.1.2, and it may be performed in lieu of SR 3.8.1.2. This is the intent of Note 1 of SR 3.8.1.2.~~

The ~~normal~~ 31 day Frequency for SR 3.8.1.2 ~~(see Table 3.8.1-1, "Diesel Generator Test Schedule," in the accompanying LCO)~~ is consistent with Regulatory Guide 1.9 (Ref. ~~3~~ 5). ~~The 184 day Frequency for SR 3.8.1.7 is a reduction in cold testing consistent with Generic Letter 84-15 (Ref. 7). These Frequencies~~ provide adequate assurance of DG OPERABILITY, while minimizing degradation resulting from testing. 4 3

(continued)

<INSERT B3.8-17A>

The signal initiating the start of the DG is varied from one test to another (start with handswitch at control room panel and at DG local control panel) to verify all starting circuits are OPERABLE.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.3

full rated

This Surveillance verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting load ~~greater than or equal to the equivalent of the maximum expected accident loads~~. A minimum run time of 60 minutes ~~is required to~~ stabilizes engine temperatures, while minimizing the time that the DG is connected to the offsite source.

INSERT B3.8-18A

ensures

41

edit

~~Although no power factor requirements are established by this SR, the DG is normally operated at a power factor between [0.8 lagging] and [1.0]. The [0.8] value is the design rating of the machine, while the [1.0] is an operational limitation [to ensure circulating currents are minimized]. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.~~

27

41

The ~~normal~~ 31 day Frequency for this Surveillance ~~(Table 3.8.1-1) is consistent with Regulatory Guide 1.9 (Ref. 3).~~

provides adequate assurance of DG OPERABILITY, while minimizing degradation resulting from testing.

4

27

3.8.1-25

This SR is modified by four Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary transients (e.g., because of changing bus loads) do not invalidate this test. ~~Similarly, momentary power factor transients above the limit will not invalidate the test.~~ Note 3 indicates that this Surveillance should be conducted on only one DG at a time in order to avoid common cause failures that might result from offsite circuit or grid perturbations. Note 4 stipulates a prerequisite requirement for performance of this SR. A successful DG start must precede this test to credit satisfactory performance.

5

edit

27

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the engine mounted day tank ~~[and engine mounted tank]~~ is ~~at or above the level at which fuel oil is automatically added~~ being properly maintained. The level is expressed as an equivalent volume in gallons, and is

6

27

(continued)

<INSERT B3.8-18A>

3.8.1-15, 3.8.1-24

The load test is conducted at 90 to 100 percent of the continuous rating, which is considered to be 90 to 100 percent of the intended service rating, or ≥ 2475 kW and ≤ 2750 kW. These parameter values contain all necessary allowances for instrument uncertainty. No additional allowances for instrument uncertainty are required to be incorporated in the implementing procedures.

BASES

AND-237

SURVEILLANCE REQUIREMENTS

SR 3.8.1.4 (continued)

selected to ensure adequate fuel oil ~~for a minimum of 1 hour of DG operation at full load plus 10%.~~ 27

, when combined with the volume contained in one fuel oil storage tank, for not less than 3.5 days operation of one DG loaded to full capacity (Ref. 2).

The 31 day Frequency is adequate to assure that a sufficient supply of fuel oil is available, since low level alarms are provided and unit operators would be aware of any large uses of fuel oil during this period.

3.8.1-19

SR 3.8.1.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil day ~~[and engine mounted]~~ tanks once every 92 ~~[31]~~ days eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and from breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137 (Ref. 10). This SR is for preventive maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during the performance of this Surveillance. 6

SR 3.8.1.6

This Surveillance demonstrates that each required fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, and the fuel delivery piping is not obstructed ~~, and the controls and control systems for automatic fuel transfer systems are OPERABLE~~. 27

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.6 (continued)

The ~~Frequency for this SR is variable, depending on individual system design, with up to a [92] day interval. The [92] day Frequency corresponds to the testing requirements for pumps as contained in the ASME Code, Section XI (Ref. 12); however, the~~ design of the fuel transfer systems is such that pumps ~~will~~ operate automatically or must be started manually in order to maintain an adequate volume of fuel oil in the day ~~[and engine mounted]~~ tanks during ~~or following~~ monthly DG testing. ~~In such a case,~~ Therefore, a 31 day Frequency is ~~appropriate. Since proper operation of fuel transfer systems is an inherent part of DG OPERABILITY, the Frequency of this SR should be modified to reflect individual designs.~~ specified to correspond to the interval for DG testing.

~~SR 3.8.1.7~~

~~See SR 3.8.1.2.~~

SR 3.8.1.9

Transfer of each [4.16 kV ESF bus] power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. ~~The~~ <INSERT B3.8-20A> [18 month] Frequency of the Surveillance ~~is based on engineering judgment~~ takes into consideration the unit conditions required to perform the Surveillance (i.e., during refueling shutdown), and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the [18 month] Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by a Note. The reason for the Note is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. <INSERT B3.8-20B> ~~Credit may be taken for unplanned events that satisfy this SR.~~

3.8.1-19

3.8.1-21

27 27 3 27 26 64 8

(continued)

<INSERT B3.8-20A>

3.8.1-03, 3.8.1-28

Reference 1 requires that only one of the two offsite power circuits be capable of automatic transfer. The second (alternate) circuit must be capable of manual transfer, as a minimum. Typically, startup transformer No. 1 is aligned for automatic transfer and startup transformer No. 2 is aligned to allow manual transfer. In this alignment, the Surveillance verifies the automatic transfer of loads to startup transformer No. 1 and the manual transfer of loads to startup transformer No. 2. In the event that startup transformer No. 2 is aligned for automatic transfer and startup transformer No. 1 is aligned for manual transfer, the Surveillance verifies the automatic transfer of loads to startup transformer No. 2 and the manual transfer of loads to startup transformer No. 1.

For startup transformer No. 2, this test also demonstrates the selective load shedding interlock function. (Note: This load shedding function is only required when startup transformer no. 2 is selected for automatic transfer.) These features provide protection of required equipment from a sustained degraded grid voltage situation.

The

3.8.1-21 **<INSERT B3.8-20B>**

This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODES 1 or 2. Risk insights or deterministic methods may be used for this assessment.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.9

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. For the CR-3 emergency DGs, the largest single load is 616 kW (HPI pump). After performance of SR 3.8.1.17, the diesel load is reduced to approximately 1200 kW and allowed to run at this load for 3 to 5 minutes. The load is then reduced to ≥ 616 kW and the DGs output breaker is opened. Verification that the DG did not trip is made. This Surveillance may be accomplished by:

a. Tripping the DG output breaker with the DG carrying greater than or equal to its associated single largest post-accident load while paralleled to offsite power, or while solely supplying the bus; or

b. Tripping its associated single largest post-accident load with the DG solely supplying the bus.

As required by IEEE-308 (Ref. 13), the load rejection test is acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint, or 15% above synchronous speed, whichever is lower.

The time, voltage, and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The [3] seconds specified is equal to 60% of a typical 5 second load sequence interval associated with sequencing of the largest load. The voltage and frequency specified are consistent with the design range of the equipment powered by the DG. SR 3.8.1.9.a corresponds to the maximum frequency excursion, while SR 3.8.1.9.b and SR 3.8.1.9.c are steady state voltage and frequency values to which the system must recover to following load rejection. The [18 month] Frequency is consistent with the recommendation of Regulatory Guide 1.108 (Ref. 9).

9

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.9 (continued)

This SR is modified by a Note. The reason for the Note is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. Credit may be taken for unplanned events that satisfy this SR. In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, Note 2 requires that, if synchronized to offsite power, testing must be performed using a power factor ≤ [0.9]. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience.

[Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.]

9

SR 3.8.1.10

This Surveillance demonstrates the DG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The DG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the DG experiences following a full load rejection and verifies that the DG will not trip upon loss of the load. These

9

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.10 (continued)

acceptance criteria provide DG damage protection. While the DG is not expected to experience this transient during an event and continues to be available, this response ensures that the DG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

9

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing must be performed using a power factor ≤ [0.9]. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience.

The [18 month] Frequency is consistent with the recommendation of Regulatory Guide 1.108 (Ref. 9) and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note. The reason for the Note is that during operation with the reactor critical, performance of this SR could cause perturbation to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems.

Credit may be taken for unplanned events that satisfy this SR.

Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.

(continued)

BASES

3.8.1-19

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.~~11~~ 8

27

~~As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(1),~~ this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including shedding of the non-essential loads and energization of the emergency buses and respective loads from the DG. It further demonstrates the capability of the DG to automatically achieve the "ready to load" condition (i.e., minimum required voltage) ~~and frequency~~ within the specified time. 40

The DG auto-start time of ~~10~~ 15 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability has been achieved.

The requirement to verify the connection and power supply of permanent and auto-connected loads, e.g. the running service water pump(s), is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads can not actually be connected or loaded without undue hardship or potential for undesired operation. ~~For instance, Emergency Core Cooling Systems (ECCS) injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or decay heat removal (DHR) systems performing a DHR function are not desired to be realigned to the ECCS mode of operation.~~ In lieu of actual demonstration of connection and loading of loads during this test, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified. edit 27 1

3.8.1-29

3.8.1-07 <INSERT B3.8-24A>

The Frequency of [18 months] ~~is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(1),~~ takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. 27

(continued)

3.8.2-07

<INSERT B3.8-24A>

If the component start time delays are outside of those assumed by the SAR, component OPERABILITY and DG OPERABILITY must be evaluated.

3.8.1-19

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.~~11~~ 8 (continued)

This SR is modified by ~~two~~ a Note~~s~~. The reason for the Note ~~1~~ 9 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine ~~coolant and~~ oil continuously circulated and temperature maintained consistent with manufacturer recommendations. ~~The reason for Note 2 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.~~ ~~Credit may be taken for unplanned events that satisfy this SR.~~

edit

27

7

8

~~SR 3.8.1.12~~

~~This Surveillance demonstrates that the DG automatically starts and achieves the required voltage and frequency within the specified time ([10] seconds) from the design basis actuation signal (LOCA signal) and operates for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability. SR 3.8.1.12.d and SR 3.8.1.12.e ensure that permanently connected loads and emergency loads are energized from the offsite electrical power system on an ESF signal without loss of offsite power.~~

~~The requirement to verify the connection of permanent and auto-connected loads is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads can not actually be connected or loaded without undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or DHR systems performing a DHR function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.~~

10

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.12 (continued)

The Frequency of [18 months] takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with the expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the [18 month] Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations. The reason for Note 2 is that during operation with the reactor critical, performance of this Surveillance could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. Credit may be taken for unplanned events that satisfy this SR.

10

SR 3.8.1.13

This Surveillance demonstrates that DG noncritical protective functions (e.g., high jacket water temperature) are bypassed on a loss of voltage signal concurrent with an ESF actuation test signal, and critical protective functions (engine overspeed, generator differential current[, low lube oil pressure, high crankcase pressure, and start failure relay]) trip the DG to avert substantial damage to the DG unit. The noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The [18 month] Frequency is based on engineering judgment, taking into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has

11

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.13 (continued)

shown that these components usually pass the SR when performed at the [18 month] Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

11

The SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required DG from service. Credit may be taken for unplanned events that satisfy this SR.

Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.

15

SR 3.8.1.14

Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(3), requires demonstration once per 18 months that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ [2] hours of which is at a load equivalent to 110% of the continuous duty rating and the remainder of the time at a load equivalent to the continuous duty rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.14 (continued)

In order to ensure that the DG is tested under load conditions that are as close to design conditions as possible, testing must be performed using a power factor of ≤ [0.9]. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections, in accordance with vendor recommendations, in order to maintain DG OPERABILITY.

The [18 month] Frequency is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 7), paragraph 2.a.(3), takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with expected fuel cycle lengths.

This Surveillance is modified by two Notes. Note 1 states that momentary transients due to changing bus loads do not invalidate this test. Similarly, momentary power factor transients above the power factor limit will not invalidate the test. The reason for Note 2 is that during operation with the reactor critical, performance of this Surveillance could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. Credit may be taken for unplanned events that satisfy this SR.

15

SR 3.8.1.15

This Surveillance demonstrates that the diesel engine can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within [10 seconds]. The [10 second] time is derived from the requirements of the accident analysis to respond to a design basis large break LOCA. The [18 month] Frequency is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(5).

This SR is modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. The load band is provided to avoid routine overloading of the DG. Routine overloads may result in more frequent teardown

15

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.15 (continued)

inspections, in accordance with vendor recommendations, in order to maintain DG OPERABILITY. The requirement that the diesel has operated for at least [2] hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Momentary transients due to changing bus loads do not invalidate this test. Note 2 allows all DG starts to be preceded by an engine prelube period to minimize wear and tear on the diesel during testing.

15

SR 3.8.1.16

15

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(6), this Surveillance ensures that the manual synchronization and automatic load transfer from the DG to the offsite source can be made and the DG can be returned to ready to load status when offsite power is restored. It also ensures that the auto-start logic is reset to allow the DG to reload if a subsequent loss of offsite power occurs. The DG is considered to be in ready to load status when the DG is at rated speed and voltage, the output breaker is open and can receive and auto-close signal on bus undervoltage, and the load sequence timers are reset.

The Frequency of [18 months] is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(6), and takes into consideration unit conditions required to perform the Surveillance.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.17

21

Demonstration of the test mode override ensures that the DG availability under accident conditions will not be compromised as the result of testing and the DG will automatically reset to ready to load operation if a LOCA actuation signal is received during operation in the test

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.17 (continued)

mode. Ready to load operation is defined as the DG running at rated speed and voltage with the DG output breaker open. These provisions for automatic switchover are required by IEEE-308 (Ref. 13), paragraph 6.2.6(2).

The requirement to automatically energize the emergency loads with offsite power is essentially identical to that of SR 3.8.1.12. The intent in the requirement associated with SR 3.8.1.17.b is to show that the emergency loading was not affected by the DG operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The [18 month] Frequency is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(8), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.

21

SR 3.8.1.18

Under accident [and loss of offsite power] conditions loads are sequentially connected to the bus by the [automatic load sequencer]. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The [10]% load sequence time interval tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses.

1

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.~~18~~ (continued)

~~The Frequency of [18 months] is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(2), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.~~ 1

~~This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.~~ 7 ~~Credit may be taken for unplanned events that satisfy this SR.~~ 8

~~Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:~~

~~a. Performance of the SR will not render any safety system or component inoperable;~~

~~b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and~~

~~c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.~~ 7

3.8.1-19

SR 3.8.1.~~19~~ 9

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and ~~containment~~ reactor building design limits are not exceeded. edit

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.~~11~~ 7, during a loss of offsite power actuation test signal in conjunction with an ESF actuation signal. In lieu of actual demonstration of connection and loading of loads, during this test, testing that adequately shows the capability of the DG system to perform these 27

INSERT B3.8-31A

3.8.1-29

(continued)

3.8.1-07 3.8.1-29 3.8.1-19

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.~~19~~ 9 (continued)

functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified. 27 1

<INSERT B3.8-32A>

The Frequency of {18 months} 9 takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of {18 months}.

This SR is modified by ~~two~~ a Note~~s~~. The reason for the Note ~~1~~ is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs ~~must be~~ are started from standby conditions, that is, with the engine ~~coolant and~~ oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. ~~The reason for Note 2 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.~~ edit 27 7 8

with application of the Note

~~SR 3.8.1.20~~

~~This Surveillance demonstrates that the DG starting independence has not been compromised. Also, this Surveillance demonstrates that each engine can achieve proper speed within the specified time when the DGs are started simultaneously.~~

~~The 10 year Frequency is consistent with the recommendations of Regulatory Guide 1.108 (Ref. 9).~~

~~This SR is modified by a Note. The reason for the Note is to minimize wear on the DG during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated, and temperature maintained consistent with manufacturer recommendations.~~ 10

(continued)

3.8.2-07

<INSERT B3.8-32A>

Should the time intervals between two or more loads be reduced such that the interval is less than that assumed in the SAR, the associated DG is conservatively considered to be inoperable unless an evaluation of the condition shows the loading of the DG, with the reduced time interval, to be acceptable. If one or more time delays is inoperable (i.e., the associated component fails to load) or the time interval between two or more loads is greater than assumed in the SAR, then the associated component is considered inoperable, and the appropriate Condition for that component is entered.

BASES

SURVEILLANCE REQUIREMENTS (continued)

4

Diesel Generator Test Schedule

The DG test schedule (Table 3.8.1-1) implements the recommendations of Revision 3 to Regulatory Guide 1.9 (Ref. 3). The purpose of this test schedule is to provide timely test data to establish a confidence level associated with the goal to maintain DG reliability above 0.95 per demand.

According to Regulatory Guide 1.9, Revision 3 (Ref. 3), each DG should be tested at least once every 31 days. Whenever a DG has experienced 4 or more valid failures in the last 25 valid tests, the maximum time between tests is reduced to 7 days. Four failures in 25 valid tests is a failure rate of 0.16, or the threshold of acceptable DG performance, and hence may be an early indication of the degradation of DG reliability. When considered in the light of a long history of tests, however, 4 failures in the last 25 valid tests may only be a statistically probable distribution of random events. Increasing the test Frequency will allow for a more timely accumulation of additional test data upon which to base judgment of the reliability of the DG. The increased test Frequency must be maintained until seven consecutive, failure free tests have been performed.

The Frequency for accelerated testing is 7 days, but no less than 24 hours. Tests conducted at intervals of less than 24 hours may be credited for compliance with Required Actions. However, for the purpose of re-establishing the normal 31-day Frequency, a successful test at an interval of less than 24 hours should be considered an invalid test and not count towards the seven consecutive failure free starts, and the consecutive test count is not reset.

A test interval in excess of 7 days (or 31 days, as appropriate) constitutes a failure to meet the SRs and results in the associated DG being declared inoperable. It does not, however, constitute a valid test or failure of the DG, and any consecutive test count is not reset.

REFERENCES

1. ~~10 CFR 50, Appendix A~~, GDC 17. SAR, Section 1.4 H-51
2. ~~FSAR, Chapter [8]~~. P 6 6

(continued)

"Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants,"

BASES

REFERENCES (continued)

3. Regulatory Guide 1.9, Rev. ~~[3]~~, ~~[date]~~. July 1993. edit

4. ~~FSAR, Chapter [6].~~

~~5.~~ 4. FSAR, Chapter ~~[15]~~ 14. edit

~~6. Regulatory Guide 1.93, Rev. [0], [date].~~

5. 10 CFR 50.36.

~~7.~~ 6. Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability," July 2, 1984 (OCWA078423). edit

~~8.~~ 7. ~~10 CFR 50, Appendix A, GDC 18.~~ SAR, Section 1.4 51

~~9. Regulatory Guide 1.108, Rev. [1], [August 1977].~~ 27

~~10.~~ 8. Regulatory Guide 1.137, Rev. ~~[ ], [date]~~ 1, October 1979. edit

~~11. ANSI C84.1-1982.~~

~~12. ASME, Boiler and Pressure Vessel Code, Section XI.~~

~~13. IEEE Standard 308-[1978].~~ 27

52

38.1-19

3.8.2-01

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources—Shutdown

BASES

BACKGROUND <INSERT B3.8-35A>

~~A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources—Operating."~~ 60

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 5 and 6 and during movement of irradiated fuel assemblies ensures that:

a. The unit can be maintained in MODES 5 or 6 ~~the shutdown or refueling condition~~ for extended periods; edit

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

c. Adequate AC electrical power is provided to mitigate a ~~events~~ postulated ~~during shutdown, such as a~~ fuel handling accident. 58

In general, when the unit is shut down, the Technical Specifications 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 many Design Basis Accidents (DBAs) that are analyzed in MODES 1 and 2 ~~, 3, and 4~~ have no specific analyses in MODES 5 and 6. Worst-case bounding events are deemed not credible in MODES 3, 4, 5, and 6 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. edit edit

During MODES 1 and 2 ~~, 3, and 4~~ various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in edit

(continued)

<INSERT B3.8-35A>

3.8.2-01

The unit shutdown Electrical Power Distribution System AC sources consist of the offsite power sources (preferred power sources, normal and alternates) and the onsite standby power sources (emergency diesel generators (DGs) and the Alternate AC (AAC) DG).

Offsite power is supplied to the unit switchyard from the transmission network by five transmission lines. From the switchyard, two electrically and physically separated offsite circuits provide AC power, through either the startup transformers or the unit auxiliary transformer, to the 4.16 kV ES buses. ES buses A3 and A4 may be cross-tied during operation in shutdown conditions. A description of the offsite power network and the circuits to the Class 1E ES buses is found in the SAR, Chapter 8 (Ref. 1).

When the unit is off-line, unit equipment is typically powered from a startup transformer or from the unit auxiliary transformer back fed from the 500 kV switchyard. If the power source is transferred to startup transformer No. 2, sufficient loads are automatically shed or procedurally limited to avoid a degraded voltage condition (since startup transformer No. 2 is not sufficient to simultaneously provide power for full loading from both units.)

The normal onsite standby power source for each 4.16 kV ES bus is a dedicated DG. DGs 1 and 2 are dedicated to ES buses A3 and A4, respectively. ES buses A3 and A4 may be cross-tied during operation in shutdown conditions. Ratings for emergency DGs 1 and 2 satisfy the guidance of Regulatory Guide 1.9 (Ref. 2). The continuous service rating of each DG is 2600 kW with 10% overload permissible for up to 2 hours in any 24 hour period. However, the "intended service" rating provided by the manufacturer is 2750 kW. This is the value used in postulated DG loading evaluations (Ref. 3).

The AAC DG is an additional onsite power source. The AAC DG was installed to meet the requirements of 10 CFR 50.63(c)(iii)(2) (Ref. 4). The AAC DG and its associated power supply system is designed to provide vital and non-vital 4160 V power to either ANO-1, ANO-2, or both units simultaneously. The design considerations for the AAC DG assumed the engine would be started from the control room and be at rated speed and voltage within 10 minutes after the onset of a station blackout condition. The AAC DG has a continuous rating of 4400 kW at 4160 V. The machines prime rating, which equates to a 2 hour rating is 4840 kW (110% of the continuous rating) (Ref. 5).

3.8.2-01

BASES

APPLICABLE SAFETY ANALYSES (continued)

recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are ~~generally~~ planned and administratively controlled. Relaxations from MODE 1, 2, 3, and 4 LCO (3.8.1) requirements are acceptable during shutdown MODES based on: edit edit

a. The fact that time in an outage is limited. ~~This is a risk prudent goal as well as a utility economic consideration~~; edit

b. Requiring appropriate (which) compensatory measures for certain conditions. ~~These~~ may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both; edit

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems; ~~and~~

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODE 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event ~~.~~; and 58

<INSERT B3.8-36A>

In the event of an accident during shutdown, this LCO ensures the capability to support systems necessary to avoid immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite diesel generator (DG) power. 52

<INSERT B3.8-36B> ~~The AC sources satisfy Criterion 3 of the NRC Policy Statement.~~

LCO

One offsite circuit capable of supplying the onsite Class 1E power distribution subsystem(s) of LCO 3.8.10, "Distribution Systems—Shutdown," ensures that all required loads are powered from offsite power. An OPERABLE DG, associated with a distribution system train required to be OPERABLE by LCO 3.8.10, ensures a diverse power source is available to provide electrical power support, assuming a loss of the offsite circuit. Together, OPERABILITY of the required

(continued)

3.8.2-01

<INSERT B3.8-36A>

e. The unit, while in a shutdown condition, can not affect the power grid in a manner that would result in a loss of offsite power due to a turbine trip.

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 generally viewed not to be a significant concern during shutdown MODES due to the 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 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 tasks 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.

<INSERT B3.8-36B>

In MODES 5 and 6, the AC sources satisfy Criterion 4 of 10 CFR 50.36 (Ref. 6). During handling of irradiated fuel, the AC sources satisfy Criterion 3 of 10 CFR 50.36.

3.8.2-01

BASES

LCO (continued)

offsite circuit and DG ensures the availability of sufficient AC sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents). a 58

The qualified offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the Engineered Safety Feature (ESF) bus(es). Qualified offsite circuits are those that are described in the FSAR and are part of the licensing basis for the unit. Safeguards edit edit

INSERT B3.8-37A

~~Offsite circuit #1 consists of Safeguards Transformer B, which is supplied from Switchyard Bus B, and is fed through breaker 52-3 powering the ESF transformer XNB01, which, in turn, powers the #1 ESF bus through its normal feeder breaker. The second offsite circuit consists of the Startup Transformer, which is normally fed from the Switchyard Bus A, and is fed through breaker PA 0201 powering the ESF transformer, which, in turn, powers the #2 ESF bus through its normal feeder breaker.~~ 60

~~The DG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage. This sequence must be accomplished within [10] seconds. The DG must be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with the engine hot and DG in standby at ambient conditions.~~ 60

~~Proper sequencing of loads, including tripping of non-essential loads, is a required function for DG OPERABILITY.~~ edit

~~In addition, proper sequencer operation is an integral part of offsite circuit OPERABILITY since its inoperability impacts on the ability to start and maintain energized loads required OPERABLE by LCO 3.8.10.~~ 1

It is acceptable for trains to be cross tied during shutdown conditions, allowing a single offsite power circuit to supply ~~all~~ the required ~~trains~~ equipment. edit

INSERT B3.8-37B 60

(continued)

3.8.2-01

<INSERT B3.8-37A>

One offsite circuit consists of startup transformer No. 1, its supply from the switchyard bus tie autotransformer, either the 4160 V bus A1 or A2, and the feeder breaker providing power to the required 4160 V ES bus(es). An alternative for this offsite circuit consists of the unit auxiliary transformer, its supply from the switchyard bus tie autotransformer and the overhead swing leads, either the 4160 V bus A1 or A2, and the feeder breaker providing power to the required 4160 V ES bus(es). A second offsite circuit consists of startup transformer No. 2, its supply from the switchyard ring bus, either the 4160 V bus A1 or A2, and the feeder breaker providing power to the required 4160 V ES bus(es). Another alternative for the above described offsite circuits consists of the unit auxiliary transformer, its supply from the 500 kV switchyard via backfeed through the main transformer (with the main generator disconnects removed), either the 4160 V bus A1 or A2, and the feeder breaker providing power to the required 4160 V ES bus(es). An offsite circuit includes the necessary breakers and equipment to properly align the circuit from the transmission line sources to the required 4160 V ES bus(es). Only one of the possible offsite circuits is "required" provided it can supply the required Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10. If a single offsite circuit cannot provide all the required distribution subsystem(s), a second offsite circuit is also "required."

<INSERT B3.8-37B>

The DG (DG 1, DG 2, or AAC DG) must be capable of being started, accelerating to rated speed and voltage, and being connected to its respective ES bus on determination of a loss of offsite power. The DG must be capable of accepting all required loads, and must continue to operate until offsite power can be restored to the ES buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with the engine hot and DG in standby at ambient conditions.

It is acceptable for trains to be cross tied during shutdown conditions, allowing a single onsite power source to supply the required equipment.

3.8.2-01

BASES (continued)

APPLICABILITY

The AC sources required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies in either the reactor building or fuel handling area provide assurance that:

a. Systems to provide adequate ~~coolant inventory makeup~~ decay heat removal are available for the irradiated fuel assemblies in the core;

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

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~~ MODE 5 or 6.

28

edit

The AC power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.1.

55

ANO-365

<INSERT B3.8-38A>

ACTIONS

A.1

An offsite circuit would be considered inoperable if it were not available to one required ES~~F~~ train. Although two trains ~~are~~ may be required by LCO 3.8.10, the one train with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS and fuel movement. By the allowance of the option to declare features inoperable with no offsite power available, appropriate restrictions will be implemented in accordance with the affected required features LCO's ACTIONS.

edit

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4

With the offsite circuit not available to all required trains, the option would still exist to declare all required features inoperable. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With the required DG inoperable, the minimum required diversity of AC

(continued)

3.8.2-01

<INSERT B3.8-38A>

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, 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 5 or 6, LCO would not specify an action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

3.8.2-01

In both the reactor building and the fuel handling area

BASES

ACTIONS

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4
(continued)

power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and ~~operations involving positive reactivity additions. The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory provided the required SDM is maintained.~~ 28 62

<INSERT B3.8-39A>

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

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

Pursuant to LCO 3.0.6, the Distribution System's ACTIONS are not entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A are modified by a Note to indicate that when Condition A is entered with no AC power to any required ES~~F~~ bus, the ACTIONS for LCO 3.8.10 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit, whether or not a train is de-energized. LCO 3.8.10 provides the appropriate restrictions for the situation involving a de-energized train.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, 3, and 4. SR 3.8.1.~~8~~ 7 is not required 12

<INSERT B 3.8-39B>

(continued)

3.8.2-01

<INSERT B3.8-39A>

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that which would be required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

<INSERT B3.8-39B>

SR 3.8.1.4 is not required to be met since crediting manual start of the required DG provides sufficiently opportunity to ensure that the fuel oil transfer system is operating properly.

3.8.2-01

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1 (continued)

to be met since only one offsite circuit is required to be OPERABLE. ~~SR 3.8.1.6 is not required to be met because the required OPERABLE DG(s) is not required to undergo periods of being synchronized to the offsite circuit. SR 3.8.1.9 is excepted because starting independence is not required with the DG(s) that is not required to be OPERABLE.~~ <INSERT B3.8-40A> (12)

This SR is modified by ~~a~~ two Note~~s~~. The reason for the Note (1) is to preclude requiring the OPERABLE DG~~(s)~~ from being paralleled with the offsite power network or otherwise rendered inoperable during performance of SRs, and to preclude deenergizing a required 4160 V ES~~F~~ bus or disconnecting a required offsite circuit during performance of this SR~~s~~. With limited AC sources available, a single event could compromise both the required circuit and the DG. It is the intent that ~~these~~ this SR~~s~~ must still be capable of being met, but actual performance is not required during periods when the DG and offsite circuit ~~is~~ are required to be OPERABLE. <INSERT B 3.8-40B> Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR. edit edit edit (12) (60)

REFERENCES

~~None.~~ 1. 10 CFR 50.36 (52)

3.8.2-01

<INSERT B3.8-40A>

SR 3.8.1.8 and SR 3.8.1.9 are not required to be met because they provide testing of the engineered safeguards actuation system signals which are not required to be OPERABLE except in MODES 1, 2, 3 and 4. Automatic actuation and loading of the DGs is not assumed in MODES 5 and 6.

<INSERT B3.8-40B>

When Note 1 is considered, SR 3.8.2.1 requires the following:

SR 3.8.1.1 must be performed and met,
SR 3.8.1.2 must be performed and met,
SR 3.8.1.3 must be met, but does not have to be performed,
SR 3.8.1.4 does not have to be performed or met,
SR 3.8.1.5 must be performed and met,
SR 3.8.1.6 must be performed and met,
SR 3.8.1.7 does not have to be performed or met,
SR 3.8.1.8 does not have to be performed or met, and
SR 3.8.1.9 does not have to be performed or met.

Note 2 exempts the 15 second start acceptance criteria for SR 3.8.1.2. In MODES 5 and 6, there is sufficient time to manually start a DG in the event the offsite power source is lost. The required DG must be capable of being started from standby conditions and achieving ready-to-load conditions. Although the time to reach ready-to-load conditions is not a part of the acceptance criteria, this time is trended to help determine if a condition exists that is degrading the starting capabilities of the DG.

 25

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.3 Diesel Fuel Oil~~, Lube Oil,~~ and Starting Air

BASES

BACKGROUND

3.5 fuel oil

Each diesel generator (DG) is provided with ~~a~~ storage ~~tank~~ ~~having a fuel oil~~ capacity sufficient to operate that diesel for a period of ~~7~~ days while the DG is supplying maximum post loss of coolant accident load demand discussed in the UFSAR, Section ~~[9.5.4.2]~~ (Ref. 1). The maximum load demand is calculated using the assumption that at least two DGs are initially available. This onsite fuel oil capacity is sufficient to operate the DGs for longer than the time needed to replenish the onsite supply from outside sources. 8.3 29

Fuel oil is transferred from either storage tank to either day tank by either ~~of two~~ transfer pump~~s~~ (one pump is associated with each storage tank). Redundancy of pumps and piping precludes the failure of one pump, or the rupture of any pipe, valve or tank to result in the loss of more than one DG. All required outside tanks, pumps, and piping are located underground. 29 29

For proper operation of the standby DGs, it is necessary to ensure the proper quality of the fuel oil. Regulatory Guide 1.137 (Ref. 2) addresses the recommended fuel oil practices ~~as supplemented by ANSI N195 (Ref. 3)~~. The fuel oil properties governed by these SRs are the water and sediment content, the kinematic viscosity, specific gravity (or API gravity), and impurity level. See Specification 5.5.13, "Diesel Fuel Oil Testing Program," for details. 29 29

~~The DG lubrication system is designed to provide sufficient lubrication to permit proper operation of its associated DG under all loading conditions. The system is required to circulate the lube oil to the diesel engine working surfaces and to remove excess heat generated by friction during operation. Each engine oil sump contains an inventory capable of supporting a minimum of [7] days of operation. [The onsite storage in addition to the engine oil sump is sufficient to ensure 7 days of continuous operation.] This supply is sufficient to allow the operator to replenish lube oil from outside sources.~~ 25

Each DG has ~~an~~ a designed air start system ~~with~~ consisting of two redundant banks of two tanks (receivers) each. One bank of two tanks contains adequate capacity (i.e., design margin) for five successive start attempts on the DG without recharging the air start receiver~~(s)~~. 29

(continued)

3.8.3-01

 25

BASES (continued)

APPLICABLE SAFETY ANALYSES

INSERT B3.8-42A

The ~~initial conditions of~~ applicable Design Basis Accident (DBA) and transient analyses ~~in the FSAR, Chapter [6] (Ref. 4) and Chapter [15] (Ref. 5), assume Engineered Safety Feature (ESF) systems are OPERABLE. The DGs are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that 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.~~ 29

Since diesel fuel oil ~~lube oil,~~ and the air start subsystem support the operation of the standby AC power sources, they satisfy Criterion 3 of ~~the NRC Policy Statement.~~ 10 CFR 50.36 (Ref. 3). 25 52

LCO

Stored diesel fuel oil is required to have sufficient supply for ~~7~~ 3.5 days of full load operation. It is also required to meet specific standards for quality. ~~Additionally, sufficient lube oil supply must be available to ensure the capability to operate at full load for 7 days. This requirement, in conjunction with an ability to obtain replacement supplies within 7 days,~~ supports the availability of DGs required to shut down the reactor and to maintain it in a safe condition for an ~~anticipated operational occurrence (AOO)~~ abnormality or a postulated DBA with loss of offsite power. DG day tank fuel requirements, as well as transfer capability from the storage tank to the day tank, are addressed in LCO 3.8.1~~, "AC Sources - Operating,"~~ and LCO 3.8.2~~, "AC Sources - Shutdown"~~. 29 26 edit

The starting air system is required to have a minimum capacity for five successive DG start attempts without recharging the air start receivers.

3.8.3-02

APPLICABILITY

The AC sources (LCO 3.8.1 and LCO 3.8.2) are required to ensure the availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an ~~AOO~~ abnormality or a postulated DBA. Since stored diesel fuel oil ~~lube oil~~ and the starting air subsystem support LCO 3.8.1 and LCO 3.8.2, stored diesel fuel oil ~~lube oil,~~ 25

(continued)

<INSERT B3.8-42A>

... for the Diesel Fuel Oil and Starting Air systems are the same as for the DGs which they support. See the appropriate discussions in the Bases for LCO 3.8.1, "AC Sources - Operating" and LCO 3.8.2, "AC Sources – Shutdown."

3.8.3-01

 25

BASES

APPLICABILITY (continued)

and starting air are required to be within limits when the associated DG is required to be OPERABLE.

ACTIONS

The ACTIONS Table is modified by a Note indicating that separate Condition entry is allowed for each DG. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable DG subsystem. Complying with the Required Actions for one inoperable DG subsystem may allow for continued operation, and subsequent inoperable DG subsystem(s) are governed by separate Condition entry and application of associated Required Actions.

A.1

of 20,000 gallons (i.e., 138 inches)

required

In this Condition, the ~~7 day~~ fuel oil supply for a DG is not available. However, the Condition is restricted to fuel oil level reductions, that maintain at least a 6 day supply. 3 29

of 17,140 gallons (i.e., 118 inches).

These circumstances may be caused by events, such as full load operation required after an inadvertent start while at minimum required level~~; or feed and bleed operations, which may be necessitated by increasing particulate levels or any number of other oil quality degradations~~. This restriction allows sufficient time for obtaining the requisite replacement volume and performing the analyses required prior to addition of fuel oil to the tank. A period of 48 hours is considered sufficient to complete restoration of the required level prior to declaring the DG inoperable. This period is acceptable based on the remaining capacity (> 6 days), the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period. 34 3 29

B.1

~~With lube oil inventory < 500 gal, sufficient lube oil to support 7 days of continuous DG operation at full load conditions may not be available. However, the Condition is restricted to lube oil volume reductions that maintain at least a 6 day supply. This restriction allows sufficient time to obtain the requisite replacement volume. A period of 48 hours is considered sufficient to complete restoration~~ 25

(continued)

BASES

ACTIONS

~~B.1 (continued)~~ 25

~~of the required volume prior to declaring the DG inoperable. This period is acceptable based on the remaining capacity (> 6 days), the low rate of usage, the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period.~~

B ~~C~~.1

This Condition is entered as a result of a failure to meet the acceptance criterion of Specification 5.5.13.c ~~SR 3.8.3.5~~. Normally, trending of particulate levels allows sufficient time to correct high particulate levels prior to reaching the limit of acceptability. Poor sample procedures (bottom sampling), contaminated sampling equipment, and errors in laboratory analysis can produce failures that do not follow a trend. Since the presence of particulates does not mean failure of the fuel oil to burn properly in the diesel engine, particulate concentration is unlikely to change significantly between Surveillance Frequency intervals, and proper engine performance has been recently demonstrated (within 31 days), it is prudent to allow a brief period prior to declaring the associated DG inoperable. The 7 day Completion Time allows for further evaluation, resampling, and re-analysis of the DG fuel oil. edit

C ~~D~~.1

With the new 2 fuel oil properties defined in the Bases for SR 3.8.3.~~4~~ not within the required limits, a period of 30 days is allowed for restoring the stored fuel oil properties. This period provides sufficient time to test the stored fuel oil to determine that the new fuel oil, when mixed with previously stored fuel oil, remains acceptable, or to restore the stored fuel oil properties. This restoration may involve feed and bleed procedures, filtering, or combinations of these procedures. Even if a DG start and load was required during this time interval and the fuel oil properties were outside limits, there is a high likelihood that the DG would still be capable of performing its intended function.

(continued)

 25

BASES

3.8.3-02

ACTIONS (continued)

D ~~F~~.1

With starting air receiver pressure < ~~225~~ 175 psig in the required receivers, sufficient capacity for five successive DG start attempts does not exist. However, as long as the receiver pressure is ~~≥ 125~~ ≥ 158 psig, there is adequate capacity for at least one start attempt, and the DG can be considered OPERABLE while the air receiver pressure is restored to the required limit. A period of 48 hours is considered sufficient to complete restoration to the required pressure prior to declaring the DG inoperable. This period is acceptable based on the remaining air start capacity, the fact that ~~most~~ the credited DG start ~~s~~ ~~are~~ is accomplished on the first attempt, and the low probability of an event during this brief period. 42

E ~~G~~.1

With a required Required Action and associated Completion Time not met, or one or more DGs with fuel oil, ~~lube oil,~~ or starting air subsystem not within limits for reasons other than addressed by Conditions A through ~~F~~ D, the associated DG may be incapable of performing its intended function and must be immediately declared inoperable. 42 25

AND-238

SURVEILLANCE REQUIREMENTS

SR 3.8.3.1

This SR provides verification 3.5 that there is an 3.5 adequate inventory of fuel oil in the storage tanks, when combined with the volume contained in the DG Fuel oil day tanks, to support each DG's operation for ~~7~~ days at full load. The ~~7~~ day period is sufficient time to place the unit in a safe shutdown condition and to bring in replenishment fuel from an offsite location. An indicated tank level of 138 inches of fuel oil assures the required volume of 20,000 gallons for tanks T-57A and T-57B. The 31 day Frequency is adequate to ensure that a sufficient supply of fuel oil is available, since low level alarms are provided and unit operators would be aware of any large uses of fuel oil during this period. 29

~~SR 3.8.3.2~~

~~This Surveillance ensures that sufficient lube oil inventory is available to support at least 7 days of full load~~ 25

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.3.2 (continued)~~

~~operation for each DG. The [500] gal requirement is based on the DG manufacturer consumption values for the run time of the DG. Implicit in this SR is the requirement to verify the capability to transfer the lube oil from its storage location to the DG, when the DG lube oil sump does not hold adequate inventory for 7 days of full load operation without the level reaching the manufacturer recommended minimum level.~~

~~A 31 day Frequency is adequate to ensure that a sufficient lube oil supply is onsite, since DG starts and run time are closely monitored by the unit staff.~~ 25

SR 3.8.3.~~3~~ 2

The tests ~~listed below~~ of fuel oil prior to addition to the storage tanks are a means of determining whether new fuel oil is of the appropriate grade and has not been contaminated with substances that would have an immediate, detrimental impact on diesel engine ~~combustion~~ operation. If results from these tests are within acceptable limits, the fuel oil may be added to the storage tanks without concern for contaminating the entire volume of fuel oil in the storage tanks. These tests are to be conducted prior to adding the new fuel to the storage tank(s), but in no case is the time between ~~receipt~~ sampling (and associated results) of new fuel and ~~conducting the tests~~ addition of new fuel oil to the storage tank(s) to exceed 31 days. The tests, limits, and applicable ASTM Standards for the tests listed in Specification 5.5.13, "Diesel Fuel Oil Testing Program," are as follows: 29

a. Sample the new fuel oil in accordance with ASTM D4057-[~~ ~~] 88 (Ref. ~~5~~ 4);

b. Verify in accordance with the tests specified in ASTM D975-[~~ ~~] 81 (Ref. ~~6~~) that the sample has:
1. an absolute specific gravity at 60/60°F of ≥ 0.83 and ≤ 0.89 or an API gravity at 60°F of ≥ 27° and ≤ 39°,
2. a kinematic viscosity at 40°C of ≥ 1.9 centistokes and ≤ 4.1 centistokes, ~~and~~
3. a flash point of ≥ 125°F; ~~and~~
4. water and sediment within limits.

~~c. Verify that the new fuel oil has a clear and bright appearance with proper color when tested in accordance with ASTM D4176-[ ] (Ref. 6).~~ 29

(continued)

H 25

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.3.2 (continued)

Failure to meet any of the above limits is cause for rejecting the new fuel oil, but does not represent a failure to meet the LCO ~~concern~~ since the fuel oil is not added to the storage tanks. edit

further

~~Within 31 days~~ following the initial new fuel oil sample, ~~the~~ fuel oil is analyzed to establish that the other properties specified in Table 1 of ASTM D975-[81] (Ref. 4) are met for new fuel oil when tested in accordance with ASTM D975-[81] (Ref. 4), except that the analysis for sulfur may be performed in accordance with ASTM D1552-[90] (Ref. 4) or ASTM D2622-[87] (Ref. 4). The 31 day period is acceptable because the fuel oil properties of interest, even if they were not within stated limits, would not have an immediate effect on DG operation. This Surveillance ensures the availability of high quality fuel oil for the DGs. edit 29

new

<INSERT B 3.8-47A>

Fuel oil degradation during long term storage shows up as an increase in particulate, due mostly to oxidation. The presence of particulate does not mean the fuel oil will not burn properly in a diesel engine. The particulate can cause fouling of filters and fuel oil injection equipment, however, which can cause engine failure.

Particulate concentrations should be determined in accordance with ASTM D2276-[78], Method A (Ref. 4). This method involves a gravimetric determination of total particulate concentration in the fuel oil and has a limit of 10 mg/l. It is acceptable to obtain a field sample for subsequent laboratory testing in lieu of field testing. ~~For those designs in which the total stored fuel oil volume is contained in two or more interconnected tanks, each tank must be~~ considered and tested separately. edit

15 diesel fuel oil

The Frequency of this test takes into consideration fuel oil degradation trends that indicate that particulate concentration is unlikely to change significantly between Frequency intervals.

(continued)

<INSERT B3.8-47A>

These additional analyses are required by Specification 5.5.13, "Diesel Fuel Oil Testing Program," to be performed within 31 days following sampling and addition. This 31 days is intended to assure: 1) that the sample taken is not more than 31 days old at the time of adding the fuel oil to the storage tank, and 2) that the results of a new fuel oil sample (sample obtained prior to addition but not more than 31 days prior to) are obtained within 31 days after addition. For circumstances where multiple fuel oil additions are made within a short period of time, the samples taken for each batch added to the storage tank can be composited for a single follow-up analysis.

25

3.8.3-02

3.8.3-01

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.3.~~4~~ 3

This Surveillance ensures that, without the aid of the refill compressor, sufficient air start capacity for each DG is available. The system design requirements provide for a minimum of ~~[five]~~ engine start cycles without recharging. [A start cycle is defined by the DG vendor, but usually is measured in terms of time (seconds of cranking) or engine cranking speed.] The pressure specified in this SR is intended to reflect the lowest value at which the ~~[five]~~ starts can be accomplished. 29

The 31 day Frequency takes into account the capacity, capability, redundancy, and diversity of the AC sources and other indications available in the control room, including alarms, to alert the operator to below normal air start pressure.

SR 3.8.3.~~5~~ 4

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel storage tanks once every ~~[31]~~ days eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and from breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137 (Ref. 2). This SR is for preventive maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during performance of the Surveillance.

~~SR 3.8.3.6~~

~~Draining of the fuel oil stored in the supply tanks, removal of accumulated sediment, and tank cleaning are~~ ~~required~~ recommended ~~at~~ 20

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.3.6 (continued)~~

~~10 year intervals by Regulatory Guide 1.137 (Ref. 2), paragraph 2.f. This SR also requires the performance of the ASME Code, Section XI (Ref. 8), examinations of the tanks. To preclude the introduction of surfactants in the fuel oil system, the cleaning should be accomplished using sodium hypochlorite solutions, or their equivalent, rather than soap or detergents. This SR is for preventive maintenance. The presence of sediment does not necessarily represent a failure of this SR, provided that accumulated sediment is removed during performance of the Surveillance.~~ 20

3.8.3-01

REFERENCES

1. FSAR, Section ~~[9.5.4.2]~~ 8.3.
2. Regulatory Guide 1.137.
3. ~~ANSI N195-1976, Appendix B.~~
4. ~~FSAR, Chapter [6].~~
5. ~~FSAR, Chapter [15].~~
4 ~~6~~. ASTM Standards: D4057-88; D975-81; D4176-86; D1552-90; D2622-87; D2276-88, Method A.
7. ~~ASTM Standards, D975, Table 1.~~
8. ~~ASME, Boiler and Pressure Vessel Code, Section XI.~~

3. 10 CFR 50.36. 52

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources—Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and ~~preferred AC~~ 120 VAC vital bus power (via inverters). As required by ~~10 CFR 50, Appendix A~~ SAR, Section 1.4, GDC 17 (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The DC electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

edit

51

The {125/~~250~~} VDC electrical power system consists of two (Red Train and Green Train) independent and redundant safety related Class 1E DC electrical power subsystems ~~(Train A and Train B)~~. Each subsystem consists of ~~two~~ one 125 VDC batter~~ies~~y ~~[each battery [50% capacity)]~~, the associated battery charger~~(s)~~ for each battery, and all the associated control equipment and interconnecting cabling.

~~The 250 VDC source is obtained by use of the two 125 VDC batteries connected in series.~~ Additionally, there is {one} spare battery charger per subsystem, which provides backup service in the event that a ~~the preferred~~ battery charger is out of service. If the spare battery charger is substituted ~~for one of the preferred battery chargers,~~ then the requirements of independence and redundancy between subsystems are maintained.

During inservice normal operation, ~~the~~ each {125/~~250~~} VDC ~~load~~ subsystem is powered from the battery charger~~s~~ with the batter~~ies~~y floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batter~~ies~~y. This results in a discharge of the associated battery (and may affect both the system and cell parameters).

30

The Red Train ~~A~~ and Green Train ~~B~~ DC electrical power subsystems provide the control power for its associated Class 1E AC power load group, ~~{~~4.16~~}~~ kV switchgear, and ~~{~~480~~}~~ V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the 120 VAC ~~AC~~ vital buses.

edit

(continued)

BASES

BACKGROUND (continued)

The DC power distribution system is described in more detail in Bases for LCO 3.8.[9] "Distributions System—Operating," ~~and for LCO 3.8.10, "Distribution Systems—Shutdown."~~ (6) (17)

Each battery has adequate storage capacity to carry the required load continuously for at least 2 hours ~~and~~ to ~~perform three complete cycles of intermittent~~ loads discussed in the FSAR, Chapter [8] (Ref. 4). in addition / supplying power for the operation of momentary / during the 2 hour period as (30)

Each 125/~~250~~ VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E subsystems, such as batteries, battery chargers, or distribution panels.

The batteries for Red Train ~~A~~ and Green Train ~~B~~ DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. ~~Battery size is based on 125% of required capacity and, after selection of an available commercial battery, results in a battery capacity in excess of 150% of required capacity. The voltage limit is 2.13 V per cell, which corresponds to a total minimum voltage output of 128 V per battery discussed in the FSAR, Chapter [8] (Ref. 4). The criteria for sizing large lead storage batteries are defined in IEEE-485 (Ref. 5).~~ <INSERT B3.8-51A> (30)

3.8.4-04a

Each ~~Train A and Train B DC electrical power~~ battery charger subsystem has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger is also ~~has~~ designed with sufficient capacity to restore the battery from the design minimum charge to its fully charged state ~~within 24 hours~~ while supplying normal steady state loads. ~~discussed in the FSAR, Chapter [8] (Ref. 4).~~ (30)

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, ~~Chapter [6] (Ref. 6) and~~ Chapter ~~[15]~~ 14 (Ref. 6), assume that Engineered ~~Safety Feature~~ Safeguards (ESF) systems are OPERABLE. The DC electrical power system (6) edit

(continued)

3.8.4-04a

<INSERT B3.8-51A>

The Red Train and Green Train batteries are C&D type LCR-21 (58 cell). This size of battery was required before the black battery was added because of the large non-1E lift oil and seal oil pump motors fed from the 1E batteries. The LCR-21 batteries have 10 positive plates and with the present loads the calculated positive plate requirement for the Red Train battery is 6 and for the Green Train battery is 5 (this includes temperature correction for 60° F and 1.25 for end-of-life). This provides an approximate 65% design margin for Red Train battery and an approximate 100% design margin for the Green Train battery. IEEE 485 (Ref. 5) recommends a 10-15% design margin. IEEE 485 is used as a reference in the battery sizing calculation which is the document, along with the battery test procedure, used to determine that the batteries are adequately sized.

BASES

APPLICABLE SAFETY ANALYSES (continued)

provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation.

3.8.4-05

The OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the DC sources OPERABLE during accident conditions ~~in the event of~~: that consider — 33

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst-case single failure.

In MODES 3 and 4, the DC sources satisfy Criterion 4 of 10 CFR 50.36.

In MODES 1 and 2, ~~The DC sources satisfy~~ Criterion 3 of ~~the NRC Policy Statement~~. 10 CFR 50.36 (Ref. 7). — 52

LCO

The DC electrical one power subsystems one of two, each subsystem consisting of ~~two~~ batteries, battery chargers ~~for each battery~~ and the corresponding control equipment and interconnecting cabling supplying power to the associated bus within the train are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an ~~anticipated operational occurrence (AOO)~~ abnormality or a postulated DBA. Loss of any train DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4). — 30 — 26

3.8.4-06

An OPERABLE DC electrical one of its power subsystem requires ~~all~~ the associated ~~required~~ batteries and respective chargers to be operating and connected to the associated DC bus(es). to be OPERABLE and connected to the associated DC bus — 30

APPLICABILITY

The DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and 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~~ abnormalities and — 26

(continued)

BASES

APPLICABILITY (continued)

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

The DC electrical power requirements for MODES 5 and 6 are addressed ~~in the Bases for LCO 3.8.5, "DC Sources—Shutdown."~~ by the definition of OPERABILITY for each required supported load 17

ACTIONS

A.1

Condition A represents one train with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected train. The 2 8 hour limit is consistent with the allowed time for an inoperable DC distribution system train. edit 13

If one of the required DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger~~(s)~~, or inoperable battery charger(s) and associated inoperable battery), the remaining DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst-case single failure would, however, result in the complete loss of the remaining 250/125 VDC electrical power subsystems with attendant loss of ESF functions, continued power operation should not exceed 2 8 hours. The 2 hour Completion Time ~~is based on Regulatory Guide 1.93 (Ref. 8) and~~ reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown. edit 13

B.1 and B.2

If the inoperable DC electrical power 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 12 hours and to MODE 5 36

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

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~~ unit systems. ~~The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 8).~~ 30

edit

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge ~~for the batteries~~ helps to ensure the effectiveness of the charging system and the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery ~~(or battery cell)~~ and maintain the battery ~~(or a battery cell)~~ in a fully charged state. The voltage requirements are based on the nominal design voltage of the battery (2.15 V per cell average) and are consistent with ~~the initial voltages assumed in the battery sizing calculations~~ IEEE-450 (Ref. 7). The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. ~~9~~ 8).

edit

edit

edit

edit

~~SR 3.8.4.2~~

~~Visual inspection to detect corrosion of the battery cells and connections, or measurement of the resistance of each intercell, interrack, intertier, and terminal connection, provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.~~

~~The limits established for this SR must be no more than 20% above the resistance as measured during installation or not above the ceiling value established by the manufacturer.~~

~~The Surveillance Frequency for these inspections, which can detect conditions that can cause power losses due to resistance heating, is 92 days. This Frequency is considered acceptable based on operating experience related to detecting corrosion trends.~~ 14

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.3

Visual inspection of the battery cells, cell plates, and battery racks provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.

[The 12 month Frequency for this SR is consistent with IEEE-450 (Ref. 9), which recommends detailed visual inspection of cell condition and rack integrity on a yearly basis.]

14

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of intercell, interrack, intertier, and terminal connections provide an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anticorrosion material is used to help ensure good electrical connections and to reduce terminal deterioration. The visual inspection for corrosion is not intended to require removal of and inspection under each terminal connection. The removal of visible corrosion is a preventive maintenance SR. The presence of visible corrosion does not necessarily represent a failure of this SR provided visible corrosion is removed during performance of SR 3.8.4.4.

14

[Reviewer's Note: The requirement to verify that terminal connections are clean and tight applies only to nickel cadmium batteries as per IEEE Standard P1106, "IEEE Recommended Practice for Installation, Maintenance, Testing and Replacement of Vented Nickel - Cadmium Batteries for Stationary Applications." This requirement may be removed for lead acid batteries.]

The connection resistance limits for SR 3.8.4.5 shall be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by the manufacturer.

[The Surveillance Frequencies of [12] months is consistent with IEEE-450 (Ref. 9), which recommends cell to cell and terminal connection resistance measurement on a yearly basis.]

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~SR 3.8.4.6~~

~~This SR requires that each battery charger be capable of supplying [400] amps and [250/125] V for ≥ [8] hours. These requirements are based on the design capacity of the chargers (Ref. 4). According to Regulatory Guide 1.32 (Ref. 10), the battery charger supply is required to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure that these requirements can be satisfied.~~

~~The Surveillance Frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these [18 month] intervals. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.~~

~~This SR is modified by a Note. The reason for the Note is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.~~

48

SR 3.8.4.~~7~~ 2

edit

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

edit

The Surveillance Frequency of ~~[18 months]~~ 9 is consistent with ~~the recommendations of Regulatory Guide 1.32 (Ref. 10) and Regulatory Guide 1.129 (Ref. 11), which state~~ considerations that the battery service test should be performed during refueling ~~operations~~ outages or at some other outage~~, with intervals between tests not to exceed [18 months]~~.

30

edit

~~This SR is modified by two Notes. Note 1 allows the performance of a~~ modified performance discharge test may be performed in lieu of a service test ~~once per 60 months~~.

19

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.~~7~~ 2 (continued) edit

The modified performance discharge test (Ref. 7) is a simulated duty cycle consisting of just two rates; the one minute rate published for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a rated one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test. edit

A modified performance discharge test is a test of the battery capacity, as found, and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test and the test discharge rate must envelope the duty cycle of the service test if the modified performance discharge test is performed in lieu of a service test. 30 edit 3-24-08

~~The reason for Note 2 is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.~~ 7 8

SR 3.8.4.~~8~~ 3 edit

A battery performance discharge test is a test of constant current capacity of a battery, ~~normally done in the as found condition,~~ after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage (Ref. 8). 30 edit

A battery modified performance discharge test is described in the Bases for SR 3.8.4.~~7~~ 2. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.~~8~~ 3; however, only the modified performance discharge test may be used to satisfy edit edit

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.3 (continued)

SR 3.8.4.2 while satisfying the requirements of SR 3.8.4.2 at the same time.

edit
edit

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 8) ~~and IEEE-485 (Ref. 5). These~~, which ~~references~~ recommends that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

edit

The Surveillance Frequency for this test is normally 60 months. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's ratings. Degradation is indicated, according to IEEE-450 (Ref. 8), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is > [10%] below the manufacturer's rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 8).

edit
8
30

~~This SR is modified by a Note. The reason for the Note is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.~~

7
8

REFERENCES

"Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," edit

1. ~~10 CFR 50, Appendix A, GDC 17.~~ SAR, Section 1.4 51
2. Regulatory Guide 1.6, March ~~10,~~ 1971.
3. IEEE-308-~~1978~~ 1971, "Criteria for Class 1E Power Systems for Nuclear Power Generating Stations." edit
4. ~~F~~SAR, Chapter ~~[8]~~. 30
5. IEEE-485-[1983], June 1983.

(continued)

BASES

REFERENCES (continued)

~~6. FSAR, Chapter [6].~~

6. ~~7.~~ ~~U~~FSAR, Chapter ~~[18]~~ 14.

7. 10 CFR 50.36.

~~8. Regulatory Guide 1.93, December 1974.~~

8. ~~9~~. IEEE-450-~~[1987]~~ 1995, "Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications."

~~10. Regulatory Guide 1.32, February 1977.~~

~~11. Regulatory Guide 1.129, December 1974.~~

52

edit

3.8.5-01

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 (DBA) and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [14] (Ref. 2), assume that Engineered Safety Feature (ESF) systems are OPERABLE.~~ The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching ~~during all MODES of operation~~ fuel handling.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident ~~analyses~~ and the requirements for the supported systems' OPERABILITY. 58

~~The OPERABILITY of the minimum DC electrical power sources during MODES 5 and 6 and during movement of irradiated fuel assemblies ensures that:~~

~~a. The unit 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 a fuel handling accident.~~ 56

<INSERT B3.8-60A>

AND-325

~~The DC sources satisfy Criterion 3 of the NRC Policy Statement.~~ 52

<INSERT B3.8-60B>

LCO

One ~~The~~ DC electrical one power subsystem~~s~~, ~~each subsystem~~ consisting of ~~two~~ batter~~ies~~, one battery charger ~~per battery~~, and the corresponding control equipment and interconnecting cabling within the train, ~~are~~ is required to be 56 30 56

(continued)

3.8.5-01

<B3.8-60A>

In general, when the unit is shutdown, the Technical Specifications 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 many Design Basis Accidents (DBAs) that are analyzed in MODES 1 and2 have no specific analyses in MODES 3, 4, 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 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 generally viewed not to be a significant concern during shutdown MODES due to the 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 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 tasks 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.

<B3.8-60B>

In MODES 5 and 6, the DC Sources satisfy Criterion 4 of 10 CFR 50.36 (Ref. 1). During handling of irradiated fuel, the DC sources satisfy Criterion 3 of 10 CFR 50.36.

3.8.5-01

BASES

LCO (continued)

OPERABLE to support ~~required~~ one train~~s~~ of the distribution systems required OPERABLE by LCO 3.8.10, "Distribution Systems—Shutdown." This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents). <INSERT B3.8-61A> 56 30

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies in either the reactor building or fuel handling area, provide assurance that: 30

a. Required features to provide adequate ~~coolant inventory makeup~~ decay heat removal are available for the irradiated fuel assemblies in the core; 59

b. Required features needed to mitigate a fuel handling accident are available; 30

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~~ MODE 5 or 6. edit

The DC electrical power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.4.

ANO-365

ACTIONS

<INSERT B3.8-61B>

A.1, A.2.1, A.2.2, A.2.3, and A.2.4 55

<INSERT B3.8-61C>

ANO-325

~~If two trains are required by LCO 3.8.10, the remaining train with DC power available may be capable of supporting sufficient systems to allow continuation of CORE ALTERATIONS and fuel movement. By allowing the option to declare required features inoperable with the associated DC power source(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. In many instances this option may involve undesired administrative efforts. Therefore, the~~ 56

(continued)

3.8.5-01

<INSERT B3.8-61A>

An OPERABLE DC electrical power subsystem requires the associated battery to be OPERABLE and connected to the associated DC bus and one of its respective chargers to be OPERABLE and capable of being connected to the associated DC bus.

<INSERT B3.8-61B>

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, 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 5 or 6, LCO would not specify an action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

<INSERT B3.8-61C>

With the required DC electrical subsystem inoperable (e.g., inoperable battery, no OPERABLE battery charger, or both) there may be insufficient capability to mitigate the consequences of a fuel handling accident. Therefore, conservative actions must be taken

3.8.5-01

In both the reactor building and the fuel handling area

BASES

ACTIONS

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

~~allowance for sufficiently conservative actions is made~~ (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions). ~~The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required SDM is maintained.~~ 56 30 62

<INSERT B3.8-62A>

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize 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 unit safety systems. 56 57

<INSERT B3.8-62B>

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 unit safety systems may be without sufficient power. edit

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

~~SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.8. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.~~ 14

<INSERT B3.8-62C>

This SR is modified by its 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. edit

<INSERT B3.8-62D> 14

(continued)

3.8.5-01

<INSERT B3.8-62A>

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that which would be required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

<INSERT B3.8-62B>

Notwithstanding performance of the above conservative Required Actions, a required low temperature overpressure protection (LTOP) system feature may be inoperable. In this case, Required Actions A.1.1 through A.1.4 do not adequately address the concerns relating to LTOP. Pursuant to LCO 3.0.6, the LTOP ACTIONS would not be entered. Therefore, Required Action A.1.5 is provided to direct entry into the appropriate LTOP Conditions and Required Actions, which results in taking the appropriate LTOP actions.

<INSERT B3.8-62C>

SR 3.8.5.1 requires the DC Sources to be capable of meeting the requirements of SR 3.8.4.1 through SR 3.8.4.3.

<INSERT B3.8-62D>

during periods when the DC Source is required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.4 for discussion of each SR.

When the Note is considered, SR 3.8.5.1 requires the following for an OPERABLE DC Source:

SR 3.8.4.1 must be performed and met,
SR 3.8.4.2 must be met, but does not have to be performed, and
SR 3.8.4.3 must be met, but does not have to be performed.

As an example, typical operation during a refueling shutdown (in MODES 5 and 6) requires only one OPERABLE battery and charger. However, the SRs with an 18 month Frequency which are not required to be performed on the OPERABLE battery should be conducted on each battery during that portion of the refueling shutdown that it is not required to be OPERABLE so that the SRs are current when it is time to enter MODES 1, 2, 3, and 4. This is to allow continued OPERABILITY of the battery during MODES 5 and 6 even if the Frequency for SR 3.8.4.2 or SR 3.8.4.3 is not met.

3.8.5-01

BASES (continued)

REFERENCES
1. ~~FSAR, Chapter [6].~~
2. ~~FSAR, Chapter [14].~~

10 CFR 50.36

52

3.8.6-01

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 power source 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 the U FSAR, ~~Chapter [6] (Ref. 1) and~~ Chapter [15] (Ref. 1), assume Engineered Safe~~ty Features~~guards systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation. 30 14

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. This includes maintaining at least one train of DC sources OPERABLE during accident conditions ~~in the event of~~ that consider: 33

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst-case single failure.

Battery cell parameters satisfy Criterion 3 of ~~the NRC Policy Statement~~ 10 CFR 50.36 (Ref. 2). 52

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 abnormality ~~anticipated operational occurrence~~ or a postulated DBA. The ~~Electrolyte~~ limits are conservatively established, allowing continued DC electrical system function even with Category A and B limits not met. 26 edit

(continued)

BASES (continued)

to be within limits

APPLICABILITY

The battery cell parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery ~~electrolyte is~~ cell parameters are only required to be within limits when the DC power source is required to be OPERABLE. ~~Refer to~~ See the Applicability discussion in Bases for LCO 3.8.4 and LCO 3.8.5.

edit

49

INSERT B3.8-65A

ACTIONS

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

With 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 in the accompanying LCO, 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 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 will provide a quick representative 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.

edit

edit

Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to within the Category A and B limits, the battery will still be capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because ~~specific gravity~~ parameter 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 7 day intervals until the parameters are restored to within Category A and B limits. This periodic verification is consistent with the ~~normal Frequency of pilot cell Surveillances.~~ increased potential to exceed these battery cell parameter limits during these conditions.

edit

edit

edit

edit

(continued)

<INSERT B3.8-65A>

The ACTIONS Table is modified by a Note which indicates that separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable DC subsystem. Complying with the Required Actions for one inoperable DC subsystem may allow for continued operation, and subsequent inoperable DC subsystem(s) are governed by separate Condition entry and application of associated Required Actions.

BASES

ACTIONS

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

Continued operation is only permitted for 31 days before battery cell parameters must be restored to within Category ~~A and B~~ limits. With the 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 prior to declaring the battery inoperable.

B.1

With one or more batteries with one or more battery cell parameters outside the Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement ~~is not assured~~ and the corresponding DC electrical power subsystem must be declared inoperable. Additionally, other potentially extreme conditions, such as ~~not completing~~ the Required Actions ~~of Condition A within the required~~ Completion Time or average electrolyte temperature ~~of representative~~ cells falling below 60°F, are also cause for immediately declaring the associated DC electrical power subsystem inoperable.

may not be available

Therefore, the battery must be immediately declared inoperable

and associated

of Condition A not met

pilot cell or

edit

edit

30

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 3), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.

level and

edit

30

INSERT FROM PAGE B 3.8-67

SR 3.8.6.~~2~~ 3

The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 3). In addition, within 24 hours of a battery discharge < [110] V or a battery overcharge > ~~[150]~~ V, the battery must be demonstrated to meet Category B limits. Transients, such as motor starting transients, which may momentarily cause battery voltage to drop to ≤ [110] V, do not constitute a battery discharge

145

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.~~2~~ 3 (continued)

provided battery terminal voltage and float current return to pre-transient values. This inspection is also consistent with IEEE-450 (Ref. 3), which recommends special inspections following a severe discharge or overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such discharge or overcharge.

MOVE & INSERT on PAGE B 3.8-66

2 and SR 3.8.6.4

SR 3.8.6.~~4~~

This Surveillance verification that the pilot cell and the average temperature of representative cells is ≥ ~~60~~ °F is consistent with a recommendation of IEEE-450 (Ref. 3), which states that the temperature of electrolytes in the pilot cell should be determined at least once per month and that the temperature in representative cells (~10% of all connected 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 recommendations.

edit

edit

30

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 designated 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 recommendations and are consistent with the guidance in IEEE-450 (Ref. 3), with the extra ¼ inch allowance above the high water level indication for operating margin to account for temperatures and charge effects. In addition to this allowance, footnote (a) to Table 3.8.6-1 permits the electrolyte level to be above the specified maximum level during equalizing charge, provided it is not overflowing. These limits ensure that the plates

edit

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

suffer no physical damage and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 3) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on a recommendation of IEEE-450 (Ref. 3), which states that prolonged operation of cells < 2.13 V can reduce the life expectancy of cells.

3.8.6-02

The Category A limit specified for specific gravity for each pilot cell is ≥ ~~1.200~~ 1.195 (~~0.015~~ 0.020 below the manufacturer 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. 3), the specific gravity readings are based on a temperature of 77°F (25°C). 30

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.~~ 54

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

3.8.6-02

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~~ 1.190 (~~0.020~~ 0.025 below the manufacturer fully charged, nominal specific gravity) with the average of all connected cells > ~~1.205~~ 1.195 (~~0.010~~ 0.020 below the manufacturer fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell will not mask overall degradation of the battery. 30

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function 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 limits specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limits for float voltage is based on IEEE-450 (Ref. 3), 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.

3.8.6-03

0.025 1.190

The Category C limits of average specific gravity ≥ ~~[1.195]~~ is based on manufacturer recommendations ~~(0.020~~ below the manufacturer 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 the effect of a highly charged or new cell does not mask overall degradation of the battery. 30

(b) and (c)

~~The~~ footnotes to Table 3.8.6-1 are applicable to Category A, B, and C specific gravity. Footnote (b) to Table 3.8.6-1 requires the above mentioned correction for electrolyte level and temperature, ~~with the exception that level correction is not required when battery charging current is < [2] amps on float charge. This current provides, in general, an indication of overall battery condition.~~ edit 54

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 charger current is an acceptable alternative to specific gravity measurement for determining the state of charge. This phenomenon is discussed in IEEE-450 (Ref. 3). Footnote (c) to Table 3.8.6-1 allows the float charge current to be used as an alternate to specific gravity for

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

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 ~~that~~ than ~~[~~7~~]~~ days. edit

~~Reviewer's Note: The value of [2] amps used in footnote (b) and (c) is the nominal value for float current established by the battery vendor as representing a fully charged battery with an allowance for overall battery condition.~~ edit

REFERENCES

1. ~~F~~SAR, Chapter ~~[6].~~ 14. edit
2. ~~FSAR, Chapter [15].~~ 10 CFR 50.36. 52
3. IEEE-450-~~[1980].~~ 1995, "Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications." edit

INSERT B3.8-71A

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters—Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the ~~AC~~ 120 VAC vital buses because of the stability and reliability they achieve. The function of the inverter is to provide AC electrical power to the vital bus. The inverters ~~can be~~ are normally powered from ~~an internal AC source/rectifier or from the station battery. The station battery~~ provides an uninterruptible power source for the safety significant instrumentation and controls, ~~for~~ including the Reactor Protection System (RPS), ~~and~~ the Engineered ~~Safety Feature~~ Safeguards Actuation System (ESFAS), and the Emergency Feedwater Initiation and Control (EFIC) System. Specific details on inverters and their operating characteristics are found in SAR, Chapter [8] (Ref. 1). edit 31

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the SAR, ~~Chapter [6] (Ref. 2), and~~ Chapter [14] (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the ~~RPS and ESFAS~~ safety significant instrumentation and controls so that the fuel, Reactor Coolant System, and ~~containment~~ reactor building 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~~ Reactor Building Systems." edit edit edit edit edit edit

INSERT B 3.8-71B

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining ~~required~~ AC vital buses OPERABLE during accident conditions ~~in the event of~~ that consider: 33

a. An assumed loss of all offsite AC electrical power or all onsite AC electrical power; and

b. A worst-case single failure.

Inverters are a part of the distribution system and, as such, satisfy Criterion 3 of ~~the NRC Policy Statement.~~ 10 CFR 50.36 (Ref. 3) in MODES 1 and 2. 52

In MODES 3 and 4, the inverters satisfy Criterion 4 of 10CFR50.36.

3.8.7-03

(continued)

<INSERT B3.8-71A>

3.8.7-02 ... the 125 VDC Electrical Power System. The inverters ...

<INSERT B3.8-71B>

Additionally, there are two swing inverters (one per train) which provide backup service in the event that an inverter is out of service. If the swing inverter is placed in service, requirements of independence and redundancy between trains are maintained.

BASES (continued)

LCO

The inverters ensure the availability of AC electrical power for the systems instrumentation required to shut down the reactor and maintain it in a safe condition after an abnormality ~~anticipated operational occurrence (AOO)~~ or a postulated DBA. 26

Maintaining the required inverters OPERABLE ensures that the redundancy incorporated into the design of the ~~RPS and ESFAS~~ safety significant instrumentation and controls is maintained. The four required inverters ~~(two per train)~~ ensure an uninterruptible supply of ~~AC~~ 120 VAC electrical power to the vital buses even if the 4.16 kV safety buses are de-energized. 31 edit

OPERABLE inverters require the associated 120 VAC vital bus to be powered by the inverter with output voltage ~~and frequency~~ within tolerances, and power input to the inverter from the Electrical Power System with associated OPERABLE ~~a 125 VDC~~ station battery. ~~Alternatively, power supply may be from an internal AC source via rectifier as long as the station battery is available as the uninterruptible power supply.~~ 31

This LCO is modified by a Note that allows one ~~two~~ required 120 VAC inverter ~~s~~ to be disconnected from ~~a common battery~~ its associated DC bus for ≤ 2 hours to allow load transfer to or from the swing inverter ~~≤ 24 hours~~, if the vital bus ~~(es)~~ is powered from an alternate ~~Class 1E constant voltage transformer or inverter using internal~~ AC source during the period and all other inverters are operable. ~~This allows an equalizing charge to be placed on one battery. If the inverters were not disconnected, the resulting voltage condition might damage the inverter(s). These provisions minimize the loss of equipment that would occur in the event of a loss of offsite power. The 24 hour time period for the allowance minimizes the time during which a loss of offsite power could result in the loss of equipment energized from the affected AC vital bus while taking into consideration the time required to perform an equalizing charge on the battery bank.~~ 45

~~The intent of this Note is to limit the number of inverters that may be disconnected. Only those inverters associated with the single battery undergoing an equalizing charge may be disconnected. All other inverters must be aligned to their associated batteries, regardless of the number of inverters or unit design.~~

(continued)

BASES (continued)

APPLICABILITY

The inverters 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~~ abnormalities; and ⊢26

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

Inverter requirements for MODES 5 and 6 are ~~covered in the Bases for LCO 3.8.8, "Inverters—Shutdown."~~ addressed by the definition of OPERABILITY for each required supported load ⊢17

3.8.7-06 ANO-295

ACTIONS

A.1

With a required inverter inoperable or two inverters in the same electrical distribution subsystem inoperable, ~~its~~ the associated ~~AC~~ 120 VAC vital bus ~~becomes inoperable until it is [manually] re-energized from its [Class 1E constant voltage source transformer or inverter using internal AC source].~~ is automatically transferred to its alternate AC source and remains OPERABLE. In the event the automatic transfer fails, and the associated 120 VAC vital bus is deenergized, the 120 VAC vital bus is considered to be inoperable. ⊢65 ⊢31

For this reason, a Note has been included in Condition A requiring entry into the Conditions and Required Actions of LCO 3.8.9, "Distribution Systems—Operating." This ensures the vital bus is re-energized within 2 8 hours. Required Action A.1 allows ~~24~~ 72 hours to fix the inoperable inverter and return it to service. The ~~24~~ 72 hour limit ~~is based upon engineering judgment, taking~~ takes into consideration the time required to repair an inverter and the additional risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the ~~AC~~ 120 VAC vital bus is powered from its ~~constant voltage~~ alternate AC source, it is relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible inverter source to the ~~AC~~ 120 VAC vital buses is the preferred source for powering instrumentation trip setpoint devices. ⊢13 ⊢65 ⊢26 edit ⊢31 edit

B.1 and B.2

If the ~~inoperable devices or components cannot be restored to OPERABLE status within the required~~ Required Action and associated Completion Time are not met, the edit

(continued)

BASES

ACTIONS

B.1 and B.2 (continued) 12

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. H 36

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and ~~AC~~ 120 VAC vital buses energized from the inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation ~~of the RPS and ESFAS~~ connected to the ~~AC~~ 120 VAC vital buses. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions. edit edit

3.8.7-01

REFERENCES

1. ~~F~~SAR, Chapter ~~[8]~~ 8. edit
2. ~~FSAR, Chapter [8].~~ edit
2 ~~3~~. ~~F~~SAR, Chapter ~~[14]~~ 14. edit
3. 10 CFR 50.36. H 52

3.8.8-01

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Inverters—Shutdown

BASES

BACKGROUND

A description of the inverters is provided in the Bases for LCO 3.8.7, "Inverters—Operating."

APPLICABLE SAFETY ANALYSES

~~The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [14] (Ref. 2), assume Engineered Safety Feature systems are OPERABLE.~~ The DC to AC inverters are designed to provide the required capacity, capability, ~~redundancy,~~ and reliability to ensure the availability of necessary power to ~~the Reactor Protection System and Engineered Safety Features Actuation System (ESFAS)~~ Safety Significant instrumentation and controls ~~so that the fuel, Reactor Coolant System, and containment design limits are not exceeded~~. (31)

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

The OPERABILITY of the minimum inverters to each ~~AC~~ required 120 VAC vital bus during ~~MODES 5 and 6~~ MODE 5 or 6 ensures that: edit

a. The unit 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 available to mitigate ~~events~~ a postulated ~~during shutdown, such as a~~ fuel handling accident. edit (56)

AND-325 <INSERT B3.8-75A>

In MODES 5+6 the inverters ~~were previously identified as~~ are part of the distribution system and, as such, satisfy Criterion ~~3~~ 4 of ~~the NRC Policy Statement.~~ 10 CFR 50.36 (Ref. 1). (52)

During handling of irradiated fuel, the inverters satisfy Criterion 3 of 10 CFR 50.36.

(continued)

3.8.8-01

<B3.8-75A>

In general, when the unit is shutdown, the Technical Specifications 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 many Design Basis Accidents (DBAs) that are analyzed in MODES 1 and2 have no specific analyses in MODES 3, 4, 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 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 generally viewed not to be a significant concern during shutdown MODES due to the 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 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 tasks 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.

3.8.8-01

BASES (continued)

LCO

~~The inverters ensure the availability of electrical power for the instrumentation for systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA.~~ The ~~battery powered~~ inverter~~s~~ provide~~s~~ uninterruptible supply of AC electrical power to ~~the AC~~ its 120 VAC vital bus~~es~~ even if the 4.16 kV safety buses are de-energized. ~~OPERABILITY of the inverters requires that the vital bus be powered by the inverter.~~ This ensures the availability of sufficient inverter power sources to operate the unit in a safe manner and to mitigate the consequences of a postulated ~~events during shutdown (e.g.,~~ fuel handling accident~~s)~~.

56 edit 31

<INSERT B3.8-76A>

APPLICABILITY

The inverter~~s~~ required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies in either the reactor building or fuel handling area provide~~s~~ assurance that:

56 31

a. Systems to provide adequate ~~coolant inventory makeup~~ decay heat removal are available for the irradiated fuel in the core;

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

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~~ MODE 5 or 6. edit

Inverter requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.7.

ANO-365 <INSERT B3.8-76B> 55

ACTIONS

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

ANO-325 <INSERT B3.8-76C> 56

~~If two trains are required by LCO 3.8.10, "Distribution Systems—Shutdown," the remaining OPERABLE inverters may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for positive reactivity~~

(continued)

3.8.8-01

<INSERT B3.8-76A>

An OPERABLE inverter must be supplied power from its associated Class 1E battery, and supplying the associated AC vital bus with acceptable output AC voltage.

<INSERT B3.8-76B>

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, 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 5 or 6, LCO would not specify an action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

<INSERT B3.8-76C>

With the required inverter inoperable, there may be insufficient capability to mitigate the consequences of a fuel handling accident. Therefore, conservative actions must be taken (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions

3.8.8-01

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, and A.2.4 (continued) 56

<INSERT B 3.8-77A>

~~additions. The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required SDM is maintained. By the allowance of the option to declare required features inoperable with the associated inverter(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCOs' 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, and operations involving positive reactivity additions).~~ 62

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 inverter~~s~~ and to continue this action until restoration is accomplished in order to provide the necessary inverter power to the unit safety systems. 56 57

<INSERT B 3.8-77B>

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required inverter~~s~~ should be completed as quickly as possible in order to minimize the time the unit safety systems may be without power or powered from ~~a~~ the alternate AC ~~constant voltage~~ source ~~transformer~~. edit

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and ~~AC~~ 120 VAC vital buses energized from the inverter. The verification of proper voltage ~~and frequency~~ output ensures that the required power is readily available for the instrumentation connected to the ~~AC~~ 120 VAC vital buses. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions. edit 31 edit

(continued)

3.8.8-01

<INSERT B3.8-77A>

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that which would be required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

<INSERT B3.8-77B>

Notwithstanding performance of the above conservative Required Actions, a required low temperature overpressure protection (LTOP) system feature may be inoperable. In this case, Required Actions A.1.1 through A.1.4 do not adequately address the concerns relating to LTOP. Pursuant to LCO 3.0.6, the LTOP ACTIONS would not be entered. Therefore, Required Action A.1.5 is provided to direct entry into the appropriate LTOP Conditions and Required Actions, which results in taking the appropriate LTOP actions.

3.8.8-01

BASES (continued)

REFERENCES

1. ~~FSAR, Chapter [6].~~ 10 CFR 50.36.
~~2. FSAR, Chapter [14].~~

52

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems—Operating

BASES

BACKGROUND

120 VAC edit

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. edit

120 VAC

Safeguards

Each 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~~ two ~~one separate and independent~~ offsite sources 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."~~ (32)

as described in the Bases for LCO 3.8.1, "AC Sources - Operating."

3.8.9-16

The secondary AC electrical power distribution system for each train includes the safety related load centers, and motor control centers, ~~and distribution panels~~ shown in Table B 3.8.9-1. (32)

<INSERT B3.8-79A>

distribution panels

3.8.9-06

The 120 VAC vital ~~buses~~ Subsystem ~~train~~ 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.~~ (32)

Upon loss of the inverter DC supply, or in the event of an inverter failure, a static transfer switch automatically transfers the 120 VAC vital load to an AC supply from an ES motor control center

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.

(continued)

3.8.9-16

<INSERT B3.8-79A>

Motor control center B55 is fed from motor control center B56. These motor control centers are swing components, in that motor control center B56 may be energized from either load center B5 or load center B6. Normally, motor control center B56, and thus B55, are energized from load center B6. However, this alignment may be switched to energize these motor control centers from load center B5, if needed to support the configuration of the unit.

BASES (continued)

APPLICABLE SAFETY ANALYSES

edit

edit

The initial conditions of Design Basis Accident (DBA) and transient analyses in the ~~F~~SAR, ~~Chapter [6] (Ref. 1) and~~ Chapter~~s~~ [14] (Ref. ~~2~~ 1), assume ES~~F~~ 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 ES~~F~~ 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."

120 VAC

reactor building

edit

edit

"Reactor Building

120 VAC

edit

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 unit. This includes maintaining power distribution systems OPERABLE during accident conditions ~~in the event of~~: that consider 33

a. An assumed loss of all offsite power or all onsite AC electrical power; and

b. A worst-case single failure.

In MODES 1 and 2,

~~The~~ the distribution systems satisfy Criterion 3 of ~~the NRC Policy Statement.~~ 10 CFR 50.36 (Ref. 2). 52

In MODES 3 and 4, the distribution systems satisfy Criterion 4 of 10 CFR 50.36.

3.8.9-07

LCO

The required power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and ~~AC~~ 120 VAC 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. edit 26 edit

abnormality

120 VAC

Maintaining the ~~Train A and Train B~~ AC, DC, and ~~AC~~ vital bus electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ES~~F~~ 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. 32

(continued)

BASES

3.8.9-06 3.8.9-09

LCO (continued)

OPERABLE AC electrical power distribution subsystems and 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 120 VAC vital bus electrical power distribution subsystems require the associated ~~buses~~ distribution panels 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~~ from its alternate AC source. ⊢ 32 edit ⊢ 32 ⊢ 32 edit

In addition, Cross-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 Cross-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. edit

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~~ abnormalities or abnormal transients; and ⊢ 26 edit

b. Adequate core cooling is provided, and ~~containment~~ reactor building 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."

3.8.9-10

(continued)

BASES (continued)

ACTIONS

A.1 OPERABLE portions of the may be

With one or more required AC electrical power distribution subsystems inoperable, the remaining AC electrical power distribution subsystem(s) ~~to 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, and motor control centers~~, and distribution panels~~ must be restored to OPERABLE status within 8 hours.

47 edit

32

edit

Condition A worst case 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
8 up to 2 hours. This could lead to a total of 10 hours, 16 13
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.

maybe electrical power distribution subsystems 47

B.1 or more 120 VAC 35

With one ~~required~~ AC vital bus inoperable, the remaining OPERABLE AC vital bus~~es~~ ~~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~~.

portions of the 120 VAC

subsystem(s)

120 VAC edit

8 13

affected bus(es) 32

AC source. from its alternate

or more 120 VAC subsystem(s) edit

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 ~~non~~interruptible 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.

alternate 47

un-

subsystem(s) subsystem(s).

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:

8 13 8

(continued)

BASES

ACTIONS

B.1 (continued)

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

b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without adequate vital AC 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~~ 8 hour Completion Time ~~takes into~~ account the importance to safety of restoring the ~~AC~~ 120 VAC vital bus subsystem(s) to OPERABLE status, the redundant capability afforded by the other OPERABLE vital bus~~es~~ subsystem, and the low probability of a DBA occurring during this period. 13 edit

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, 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~~ 16 hours, since initial failure of the LCO, to restore the 120 VAC vital bus ~~distribution system~~ subsystem(s). At this time, an AC train could again become inoperable, and 120 VAC vital bus ~~distribution~~ subsystem(s) restored OPERABLE. This could continue indefinitely. 13

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

(continued)

BASES

ACTIONS (continued)

C.1 one or more — may be — OPERABLE portions of the — 47

subsystems — 32

With DC ~~buses 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] 8 hours by powering the bus from the associated battery ~~or charger~~ — one of the two associated — 13, 47

or more DC subsystem(s)

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~~ 8 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~~ 8 hours, is acceptable because of: — 13

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).~~ — 13

(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 16 hours, 16 13
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
12 at least MODE 3 within 6 hours and to MODE 5 within 36
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 47

(continued)

BASES

ACTIONS

E.1 (continued)

continued operation. LCO 3.0.3 must be entered immediately to commence a controlled shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

This Surveillance verifies that the ~~[required]~~ AC, DC, and ~~AC~~ 120 VAC 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~~ 120 VAC vital bus electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

edit

43

edit

3.8.9-03

REFERENCES

~~1. FSAR, Chapter [6].~~

1. ~~2.~~ ~~F~~SAR, Chapter ~~[~~14~~]~~.

~~3. Regulatory Guide 1.93, December 1974.~~

2. 10 CFR 50.36.

edit

13

52

Table B 3.8.9-1 (page 1 of 1)
AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	Red TRAIN ~~A~~*	Green TRAIN ~~B~~*
AC safety buses	~~[4160 V]~~ ~~[480 V]~~ ~~[480 V]~~ [1~~20 V~~]	~~[ES~~ Bus~~]~~ ~~[NB01]~~ A3 Load Center~~s~~ ~~[NG01, NG03]~~ B5 Motor Control Centers ~~[NG01A, NG01I, NG01B, NG03C, NG03I, NG03D]~~ B51, B52, B53, B57 ~~Distribution Panels [NP01, NP03]~~	~~[ES~~ Bus~~]~~ ~~[NB02]~~ A4 Load Center~~s~~ ~~[NG02, NG04]~~ B6 Motor Control Centers ~~[NG02A, NG02I, NG02B, NG04C, NG04I, NG04D]~~ BC1, BC2, B63, B65, B56** and B55 ~~Distribution Panels [NP02, NP04]~~
DC buses	~~[125 V]~~	Bus ~~[NK01]~~ D01 Bus ~~[NK03]~~ RA1 Distribution Panel~~s~~ ~~[NK41, NK43, NK51]~~ D11	Bus ~~[NK02]~~ D02 Bus ~~[NK04]~~ RA2 Distribution Panel~~s~~ ~~[NK42, NK44, NK52]~~ D21
120 VAC vital ~~buses~~ distribution panels	~~[120 V]~~	Panel ~~Bus~~ ~~[NN01]~~ RS1 ~~Bus~~ ~~[NN03]~~ RS3	Panel ~~Bus~~ ~~[NN02]~~ RS2 ~~Bus~~ ~~[NN04]~~ RS4

32

* Each train of the AC and DC electrical power distribution systems is a subsystem.

** Swing bus (normally associated with Green Train). Bus B55 is Powered from bus B56.

3.8.9-06

3.8.9-16

3.8.10-01

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.10 Distribution Systems—Shutdown

BASES

BACKGROUND

120 VAC

A description of the AC, DC and ~~AC~~ vital bus electrical power distribution systems is provided in the Bases for LCO 3.8.9, "Distribution Systems—Operating."

edit

APPLICABLE SAFETY ANALYSES

~~The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [14] (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE.~~ The AC, DC, and ~~AC~~ 120 VAC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, ~~redundancy,~~ and reliability to ensure the availability of necessary power to ES~~F~~ systems~~, so that the fuel, Reactor Coolant System, and containment design limits are not exceeded~~.

58

~~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 the requirements for the supported systems' OPERABILITY.~~

120 VAC

The OPERABILITY of the minimum AC, DC, and ~~AC~~ vital bus electrical power distribution subsystems during MODES 5 and 6, and during movement of irradiated fuel assemblies ensures that:

edit

MODE 5 or 6

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

edit

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

(a)

c. Adequate power is provided to mitigate ~~events~~ postulated ~~during shutdown, such as a~~ fuel handling accident.

58

In MODES 5+6 → The AC and DC electrical power distribution systems satisfy Criterion ~~3~~ 4 of ~~the NRC Policy Statement~~ 10 CFR 50.36 (Ref. 1).

52

During handling of irradiated fuel, the AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36

(continued)

3.8.10-01

BASES (continued)

<INSERT B3.8-90A>

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 required features. This LCO ~~explicitly~~ requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of required systems, equipment, and components – all specifically addressed in each LCO and implicitly required via the definition of OPERABILITY. (61) edit

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

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies in either the reactor building or fuel handling area, provide assurance that: (32)

a. Systems to provide adequate ~~coolant inventory makeup~~ decay heat removal are available for the irradiated fuel in the core;

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

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~~ MODES 5 or 6. edit

The AC, DC, and ~~AC~~ 120 VAC vital bus electrical power distribution subsystem requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.9. edit

(continued)

3.8.10-01

<INSERT B3.8-90A>

LCO 3.3.9, "Source Range Neutron Flux," LCO 3.3.16, "RCS Pressure and Temperature (P/T) Limits," LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled," LCO 3.4.11, "Low Temperature Overpressure (LTOP) Protection System," LCO 3.7.9, "Control Room Emergency Ventilation System (CREVS)," LCO 3.7.10, "Control Room Emergency Air Conditioning System (CREACS)," LCO 3.7.12, "Fuel Handling Area Ventilation System (FHAVS)," LCO 3.9.2, "Nuclear Instrumentation" (for one monitor only), LCO 3.9.4, "Deacy Heat Removal (DHR) and Coolant Circulation," and LCO 3.9.5, "Deacy Heat Removal (DHR) and Coolant Circulation - Low Water Level,"

3.8.10-01

AWO-365

BASES (continued)

55

57

ACTIONS <INSERT B3.8-91A>

A.1, A.2.1, A.2.2, A.2.3, A.2.4, ~~and~~ A.2.5, A.2.6

Although redundant required features may require redundant trains of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem train may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS and fuel movement. 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 subsystems 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 both the containment and the fuel handling area and operations involving positive reactivity additions). 32 62

<INSERT B3.8-91B>

Suspension of these activities does 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 unit safety systems.

Notwithstanding performance of the above conservative Required Actions, a required decay heat removal (DHR) subsystem or a required low temperature overpressure protection (LTOP) system feature may be inoperable. In this case, Required Actions A.2.1 through A.2.~~5~~ 4 do not adequately address the concerns relating to coolant circulation, ~~and~~ heat removal and LTOP. Pursuant to LCO 3.0.6, the DHR ACTIONS and LTOP ACTIONS would not be entered. Therefore, Required Action A.2.~~6~~ 5 is provided to direct declaring DHR inoperable, which results in taking the appropriate DHR actions and Required Action A.2.6 is provided to direct entry into the appropriate LTOP Conditions and Required Actions, which results in taking the appropriate LTOP actions. edit 57 edit

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 unit safety systems may be without power.

(continued)

3.8.10-01

<B3.8-91A>

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, 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 5 or 6, LCO would not specify an action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

<INSERT B3.8-91B>

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that which would be required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

3.8.10-01

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.10.1

required

120 VAC

This Surveillance verifies that the AC, DC, and AC vital bus electrical power distribution subsystems are functioning properly, with ~~all~~ the buses energized. ~~The verification of proper voltage availability on 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.~~ The 7 day Frequency takes into account the capability of the electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

edit

43

REFERENCES

1. ~~FSAR, Chapter [6].~~
2. ~~FSAR, Chapter [14].~~

10 CFR 50.36.

edit

52