BASES (continued)

APPLICABLE SAFETY ANALYSES

The LCO limits on the specific activity of the reactor coolant ensures that the resulting 2 hour doses at the site boundary and Main Control Room accident doses will not exceed the appropriate 10 CFR 100 dose guideline limits and 10 CFR 50, Appendix A, GDC 19 dose guideline limits following a SGTR or MSLB accident. The SGTR and MSLB safety analysis (Ref. 2) assumes the specific activity of the reactor coolant at the LCO limit and an existing reactor coolant steam generator (SG) tube leakage rate of 150 gallons per day (GPD). The safety analysis assumes the specific activity of the secondary coolant at its limit of 0.1 μCi/gm DOSE EQUIVALENT I-131 from LCO 3.7.14, "Secondary Specific Activity."

The analysis for the SGTR and MSLB accidents establish the acceptance limits for RCS specific activity. Reference to these analyses is used to assess changes to the unit that could affect RCS specific activity, as they relate to the acceptance limits.

The analyses are for two cases of reactor coolant specific activity. One case assumes specific activity at 0.265 μCi/gm DOSE EQUIVALENT I-131 with an iodine spike immediately after the accident that increases the iodine activity in the reactor coolant by a factor of 500 times the iodine production rate necessary to maintain a steady state iodine concentration of 0.265 μCi/gm DOSE EQUIVALENT I-131. The second case assumes the initial reactor coolant iodine activity at ~~21~~ **14** μCi/gm DOSE EQUIVALENT I-131 due to a pre-accident iodine spike caused by an RCS transient. In both cases, the noble gas activity in the reactor coolant equals the LCO limit of 100/ $\bar{E}$ μCi/gm for gross specific activity.

The analysis also assumes a loss of offsite power at the same time as the SGTR and MSLB event. The SGTR causes a reduction in reactor coolant inventory. The reduction initiates a reactor trip from a low pressurizer pressure signal or an RCS overtemperature ΔT signal. The MSLB results in a reactor trip due to low steam pressure.

The coincident loss of offsite power causes the steam dump valves to close to protect the condenser. The rise in pressure in the ruptured SG discharges radioactively contaminated steam to the atmosphere through the SG power operated relief valves and the main steam safety valves. The unaffected SGs remove core decay heat by venting steam to the atmosphere until the cooldown ends.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis shows the radiological consequences of an SGTR and MSLB accident are within the appropriate 10 CFR 100 and 10 CFR 50, Appendix A, GDC 19 dose guideline limits. Operation with iodine specific activity levels greater than the LCO limit is permissible, if the activity levels do not exceed ~~21~~ **14** μCi/gm DOSE EQUIVALENT I-131, in the applicable specification, for more than 48 hours. The safety analysis has concurrent and pre-accident iodine spiking levels up to ~~21~~**14** μCi/gm DOSE EQUIVALENT I-131.

The limits on RCS specific activity are also used for establishing standardization in radiation shielding and plant personnel radiation protection practices.

RCS specific activity satisfies Criterion 2 of the NRC Policy Statement.

LCO

The specific iodine activity is limited to 0.265 μCi/gm DOSE EQUIVALENT I-131, and the gross specific activity in the reactor coolant is limited to the number of μCi/gm equal to 100 divided by $\bar{E}$ (average disintegration energy of the sum of the average beta and gamma energies of the coolant nuclides). The limit on DOSE EQUIVALENT I-131 ensures the 2 hour thyroid dose to an individual at the site boundary and accident dose to personnel in the Main Control Room during the Design Basis Accident (DBA) will be within the allowed thyroid dose. The limit on gross specific activity ensures the 2 hour whole body dose to an individual at the site boundary and accident dose to personnel in the Main Control Room during the DBA will be within the allowed whole body dose.

The SGTR and MSLB accident analysis (Ref. 2) shows that the 2 hour site boundary dose levels and Main Control Room accident dose are within acceptable limits. Violation of the LCO may result in reactor coolant radioactivity levels that could, in the event of a SGTR or MSLB, lead to site boundary doses that exceed the 10 CFR 100 dose guideline limits, or Main Control Room accident dose that exceed the 10 CFR 50, Appendix A, GDC 19 dose limits.

(continued)

BASES (continued)

APPLICABILITY

In MODES 1 and 2, and in MODE 3 with RCS average temperature ≥ 500°F, operation within the LCO limits for DOSE EQUIVALENT I-131 and gross specific activity are necessary to contain the potential consequences of an accident to within the acceptable Main Control Room and site boundary dose values.

For operation in MODE 3 with RCS average temperature < 500°F, and in MODES 4 and 5, the release of radioactivity in the event of a SGTR is unlikely since the saturation pressure of the reactor coolant is below the lift pressure settings of the main steam safety valves.

ACTIONS

A.1 and A.2

With the DOSE EQUIVALENT I-131 greater than the LCO limit, samples at intervals of 4 hours must be taken to demonstrate that the limit of ~~21~~ **14** μCi/gm is not exceeded. The Completion Time of 4 hours is required to obtain and analyze a sample. Sampling is done to continue to provide a trend.

The DOSE EQUIVALENT I-131 must be restored to within limits within 48 hours. The Completion Time of 48 hours is required, if the limit violation resulted from normal iodine spiking.

A Note permits the use of the provisions of LCO 3.0.4.c. This allowance permits entry into the applicable MODE(S) while relying on the ACTIONS. This allowance is acceptable due to the significant conservatism incorporated into the specific activity limit, the low probability of an event which is limiting due to exceeding this limit, and the ability to restore transient specific activity excursions while the plant remains at, or proceeds to power operation.

(continued)

BASES

ACTIONS (continued)

B.1 and B.2

With the gross specific activity in excess of the allowed limit, an analysis must be performed within 4 hours to determine DOSE EQUIVALENT I-131. The Completion Time of 4 hours is required to obtain and analyze a sample.

The change within 6 hours to MODE 3 and RCS average temperature < 500°F lowers the saturation pressure of the reactor coolant below the setpoints of the main steam safety valves and prevents venting the SG to the environment in an SGTR event. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 below 500°F from full power conditions in an orderly manner and without challenging plant systems.

C.1

If a Required Action and the associated Completion Time of Condition A is not met or if the DOSE EQUIVALENT I-131 is greater than ~~21~~ **14** μCi/gm, the reactor must be brought to MODE 3 with RCS average temperature < 500°F within 6 hours. The Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 below 500°F from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.16.1

SR 3.4.16.1 requires performing a gamma isotopic analysis as a measure of the gross specific activity of the reactor coolant at least once every 7 days. While basically a quantitative measure of radionuclides with half lives longer than 15 minutes, excluding iodines, this measurement is the sum of the degassed gamma activities and the gaseous gamma activities in the sample taken. This Surveillance provides an indication of any increase in gross specific activity.

Trending the results of this Surveillance allows proper remedial action to be taken before reaching the LCO limit under normal operating conditions. The Surveillance is applicable in MODES 1 and 2, and in MODE 3 with T_{avg} at least 500°F. The 7-day Frequency considers the unlikelihood of a gross fuel failure during the time.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

Satisfactory leakage rate test results are a requirement for the establishment of containment OPERABILITY.

The containment satisfies Criterion 3 of the NRC Policy Statement.

LCO

Containment OPERABILITY is maintained by limiting leakage to ≤ 1.0 L_a, except prior to the first start up after performing a required Containment Leakage Rate Testing Program leakage test. At this time, applicable leakage limits must be met.

Compliance with this LCO will ensure a containment configuration, including equipment hatches, that is structurally sound and that will limit leakage to those leakage rates assumed in the safety analysis.

Individual leakage rates specified for the containment air lock (LCO 3.6.2), purge valves with resilient seals, and Shield Building containment bypass leakage (LCO 3.6.3) are not specifically part of the acceptance criteria of 10 CFR 50, Appendix J, Option B. Therefore, leakage rates exceeding these individual limits only result in the containment being inoperable when the leakage results in exceeding the acceptance criteria of Appendix J, Option B.

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material into containment. In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, containment is not required to be OPERABLE in MODE**S** 5 **and 6** to prevent leakage of radioactive material from containment. ~~The requirements for containment during MODE 6 are addressed in LCO 3.9.4, "Containment Penetrations."~~

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The DBAs that result in a significant release of radioactive material within containment are a loss of coolant accident and a rod ejection accident (Ref. 2). In the analysis of each of these accidents, it is assumed that containment is OPERABLE such that release of fission products to the environment is controlled by the rate of containment leakage. The containment was designed with an allowable leakage rate (L_a) of 0.25% of containment air weight per day (Ref. 2), at the calculated peak containment pressure of 15.0 psig. This allowable leakage rate forms the basis for the acceptance criteria imposed on the SRs associated with the air locks.

The containment air locks satisfy Criterion 3 of the NRC Policy Statement.

LCO

Each containment air lock forms part of the containment pressure boundary. As part of containment pressure boundary, the air lock safety function is related to control of the containment leakage rate resulting from a DBA. Thus, each air lock's structural integrity and leak tightness are essential to the successful mitigation of such an event.

Each air lock is required to be OPERABLE. For the air lock to be considered OPERABLE, the air lock interlock mechanism must be OPERABLE, the air lock must be in compliance with the Type B air lock leakage test, and both air lock doors must be OPERABLE. The interlock allows only one air lock door of an air lock to be opened at one time. This provision ensures that a gross breach of containment does not exist when containment is required to be OPERABLE. Closure of a single door in each air lock is sufficient to provide a leak tight barrier following postulated events. Nevertheless, both doors are kept closed when the air lock is not being used for normal entry into and exit from containment.

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment. In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, the containment air locks are not required in MODE**S** 5 **and 6** to prevent leakage of radioactive material from containment. ~~The requirements for the containment air locks during MODE 6 are addressed in LCO 3.9.4, "Containment Penetrations."~~

(continued)

BASES (continued)

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment. In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, the containment isolation valves are not required to be OPERABLE in MODES 5 and 6. ~~The requirements for containment isolation valves during MODE 6 are addressed in LCO 3.9.4, "Containment Penetrations."~~

ACTIONS

The ACTIONS are modified by a Note allowing penetration flow paths, to be unisolated intermittently under administrative controls. These administrative controls consist of stationing a dedicated operator (licensed or unlicensed) at the valve controls, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for containment isolation is indicated. For valve controls located in the control room, an operator (other than the Shift Operations Supervisor (SOS), ASOS, or the Operator at the Controls) may monitor containment isolation signal status rather than be stationed at the valve controls. Other secondary responsibilities which do not prevent adequate monitoring of containment isolation signal status may be performed by the operator provided his/her primary responsibility is rapid isolation of the penetration when needed for containment isolation. Use of the Unit Control Room Operator (CRO) to perform this function should be limited to those situations where no other operator is available.

A second Note has been added to provide clarification that, for this LCO, separate Condition entry is allowed for each penetration flow path. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable containment isolation valve. Complying with the Required Actions may allow for continued operation, and subsequent inoperable containment isolation valves are governed by subsequent Condition entry and application of associated Required Actions.

The ACTIONS are further modified by third Note, which ensures appropriate remedial actions are taken, if necessary, if the affected systems are rendered inoperable by an inoperable containment isolation valve.

In the event the isolation valve leakage results in exceeding the overall containment leakage rate, Note 4 directs entry into the applicable Conditions and Required Actions of LCO 3.6.1.

BASES

BACKGROUND (continued)

When the HMS is initiated, the ignitor elements are energized and heat up to a surface temperature ≥ 1700°F. At this temperature, they ignite the hydrogen gas that is present in the airspace in the vicinity of the ignitor. The HMS depends on the dispersed location of the ignitors so that local pockets of hydrogen at increased concentrations would burn before reaching a hydrogen concentration significantly higher than the lower flammability limit. Hydrogen ignition in the vicinity of the ignitors is assumed to occur when the local hydrogen concentration reaches a minimum 5.0 volume percent (v/o).

APPLICABLE SAFETY ANALYSES

The HMS causes hydrogen in containment to burn in a controlled manner as it accumulates following a degraded core accident (Ref. 3). Burning occurs at the lower flammability concentration, where the resulting temperatures and pressures are relatively benign. Without the system, hydrogen could build up to higher concentrations that could result in a violent reaction if ignited by a random ignition source after such a buildup.

The hydrogen ignitors are not included for mitigation of a Design Basis Accident (DBA) because an amount of hydrogen equivalent to that generated from the reaction of 75% of the fuel cladding with water is far in excess of the hydrogen calculated for the limiting DBA loss of coolant accident (LOCA). ~~The hydrogen concentration resulting from a DBA can be maintained less than the flammability limit using the hydrogen recombiners.~~ The hydrogen ignitors~~, however,~~ have been shown by probabilistic risk analysis to be a significant contributor to limiting the severity of accident sequences that are commonly found to dominate risk for plants with ice condenser containments. As such, the hydrogen ignitors are considered to be risk significant in accordance with the NRC Policy Statement.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.13.3

Verification, by visual inspection, after each opening of a personnel access door or equipment hatch that it has been closed makes the operator aware of the importance of closing it and thereby provides additional assurance that divider barrier integrity is maintained while in applicable MODES.

SR 3.6.13.4

Not used.~~The divider barrier seal can be field spliced for repair purposes utilizing a cold bond procedure rather than the original field splice technique of vulcanization. However, the cold bond adhesive, which works in conjunction with a bolt array to splice the field joint, could not be heat aged to 40 years plant life prior to acceptability testing. Prolonged exposure to the elevated temperatures required for heat aging the seal material was destructive to the adhesive. The seal material was heat aged to 40 years equivalent age, and the entire joint assembly was irradiated to 40 year normal operation plus accident integrated dose. Conducting periodic peel tests on the test specimens provides assurance that the adhesive has not degraded in the containment environment. The Frequencies of 18 months for the first two outages after fabrication of the joint, followed by 18 months if the peel length is greater than 1/2" and 36 months if the peel length is less than or equal to 1/2" is based upon the original vendor's recommendation which is based upon baseline examination of the strength of the adhesive. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.~~

SR 3.6.13.5

Visual inspection of the seal around the perimeter provides assurance that the seal is properly secured in place. The Frequency of 18 months was developed considering such factors as the inaccessibility of the seals and absence of traffic in their vicinity, the strength of the bolts and mechanisms used to secure the seal, and the plant conditions needed to perform the SR. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. Watts Bar FSAR, Section 6.2, “Containment Systems.”

B 3.7 PLANT SYSTEMS

B 3.7.7 Component Cooling System (CCS)

BASES

BACKGROUND

The CCS provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, the CCS also provides this function for various non-essential components, as well as the spent fuel storage pool. The CCS serves as a barrier to the release of radioactive byproducts between potentially radioactive systems and the Essential Raw Cooling Water (ERCW) System, and thus to the environment.

The CCS is arranged as two independent, full-capacity cooling trains, Train A and Train B. Train A in Unit 2 is served by CCS Hx B and CCS pump 2A-A. Pump 2B-B, which is actually Train B equipment, is also normally aligned to the Train A header in Unit 2. However, pump 2B-B can be realigned to Train B on loss of Train A.

Train B is served by CCS Hx C. Normally, only CCS pump C-S is aligned to the Train B header since few non-essential, normally-operating loads are assigned to Train B. However, pump 2B-B can be realigned to the Train B header on a loss of the C-S pump.

Each safety related train is powered from a separate bus. An open surge tank in the system provides pump trip protective functions to ensure that sufficient net positive suction head is available. The pump in each train is automatically started on receipt of a safety injection signal, and all non-essential components will be manually isolated.

CCS Pump 1B-B may be substituted for CCS Pump C-S supplying the Unit 2 CCS Train B header provided the OPERABILITY requirements are met.

Additional information on the design and operation of the system, along with a list of the components served, is presented in the FSAR, Section 9.2.2 (Ref. 1). The principal safety related function of the CCS is the removal of decay heat from the reactor via the Residual Heat Removal (RHR) System. This may be during a normal or post accident cooldown and shutdown.

(continued)

BASES

LCO (continued)

c. **If CCS Pump 1B-B is substituted for CCS Pump C-S supplying the Unit 2 CCS Train B header, CCS Pump 1B-B is only considered OPERABLE when aligned to the CCS Train B header and operating.**

The isolation of CCS from other components or systems not required for safety may render those components or systems inoperable but does not affect the OPERABILITY of the CCS.

CCS Pump 1B-B only receives a safety injection (SI) signal from Unit 1. If CCS Pump 1B-B is in a standby mode and is aligned as a substitute for CCS Pump C-S, then Unit 2 CCS train B will not be operable. Conversely, if CCS Pump 1B-B is operating and aligned as a substitute for CCS Pump C-S supplying the CCS Train B header, then Unit 2 CCS Train B is OPERABLE. The presence of an SI signal in Unit 2 will have no effect on CCS Pump 1B-B and the pump will continue to operate. In the event of a loss of offsite power, with or without an SI signal present, CCS Pump 1B-B will be automatically sequenced onto its respective diesel and continue to perform its required safety function.

APPLICABILITY

In MODES 1, 2, 3, and 4, the CCS is a normally operating system, which must be prepared to perform its post accident safety functions, primarily RCS heat removal, which is achieved by cooling the RHR heat exchanger.

In MODE 5 or 6, the OPERABILITY requirements of the CCS are determined by the systems it supports.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.7.4

This SR verifies proper automatic operation of the CCS pumps on an actual or simulated actuation signal. The CCS is a normally operating system that cannot be fully actuated as part of routine testing during normal operation. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

This SR does not apply to CCS Pump 1B-B when substituted for CCS Pump C-S to establish operability of Unit 2 CCS Train B. CCS Pump 1B-B does not receive an SI actuation signal from Unit 2. If it is operating and aligned as a substitute for CCS Pump C-S supplying the CCS Train B header, the presence of an SI signal in Unit 2 will have no effect on CCS Pump 1B-B and the pump will continue to perform its required safety function. In the event of a loss of offsite power, with or without an SI signal present, CCS Pump 1B-B will be automatically sequenced onto its respective diesel and continue to perform its required safety function.

SR 3.7.7.5

This SR assures the operability of Unit 2 CCS Train B when CCS Pump 1B-B is substituted for CCS Pump C-S. Since CCS Pump 1B-B does not receive an SI actuation signal from Unit 2, by verifying the pump is aligned and operating, assurance is provided that Unit 2 CCS Train B will be operable in the event of a Unit 2 SI actuation.

REFERENCES

1. Watts Bar FSAR, Section 9.2.2, "Component Cooling System."
2. Watts Bar Component Cooling System Description, N3-70-4002.

B 3.7 PLANT SYSTEMS

B 3.7.12 Auxiliary Building Gas Treatment System (ABGTS)

BASES

BACKGROUND

The ABGTS filters airborne radioactive particulates ~~from the area of the fuel pool following a fuel handling accident and~~ from the area of active Unit 2 ECCS components and Unit 2 penetration rooms following a loss of coolant accident (LOCA).

The ABGTS consists of two independent and redundant trains. Each train consists of a heater, a prefilter, moisture separator, a high efficiency particulate air (HEPA) filter, two activated charcoal adsorber sections for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation also form part of the system. A second bank of HEPA filters follows the adsorber section to collect carbon fines and provide backup in case the main HEPA filter bank fails. The downstream HEPA filter is not credited in the analysis. The system initiates filtered ventilation of the Auxiliary Building Secondary Containment Enclosure (ABSCE) exhaust air following receipt of a Phase A containment isolation signal ~~or a high radiation signal from the spent fuel pool area~~.

The ABGTS is a standby system, not used during normal plant operations. During emergency operations, the ABSCE dampers are realigned and ABGTS fans are started to begin filtration. Air is exhausted from the Unit 2 ECCS pump rooms, Unit 2 penetration rooms, and fuel handling area through the filter trains. The prefilters or moisture separators remove any large particles in the air, and any entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal adsorbers.

~~The plant design basis requires that when moving irradiated fuel in the Auxiliary Building and/or Containment with the Containment open to the Auxiliary Building ABSCE spaces, a signal from the spent fuel pool radiation monitors 0-RE-90-102 and -103 will initiate a Containment Ventilation Isolation (CVI) in addition to their normal function. In addition, a signal from the containment purge radiation monitors 1-RE-90-130 and -131 or other CVI signal will initiate that portion of the ABI normally initiated by the spent fuel pool radiation monitors. Additionally, a Containment Isolation Phase A (SI signal) from the operating unit, high temperature in the Auxiliary Building air intakes, or manual ABI~~

(continued)

BACKGROUND (continued)

~~will cause a CVI signal in the refueling unit. In the case where the containment of both units is open to the Auxiliary Building spaces, a CVI in one unit will initiate a CVI in the other unit in order to maintain those spaces open to the ABSCE. Therefore, the containment ventilation instrumentation must remain operable when moving irradiated fuel in the Auxiliary Building if the containment air locks, penetrations, equipment hatch, etc. are open to the Auxiliary Building ABSCE spaces. In addition, the ABGTS must remain operable if these containment penetrations are open to the Auxiliary Building during movement of irradiated fuel inside containment.~~

The ABGTS is discussed in the FSAR, Sections 6.5.1, 9.4.2, 15.0, and 6.2.3 (Refs. 1, 2, 3, and 4, respectively).

APPLICABLE SAFETY ANALYSES

The ABGTS design basis is established by the consequences of the limiting Design Basis Accident (DBA), which is a **LOCA.** ~~fuel handling accident. The analysis of the fuel handling accident, given in Reference 3, assumes that all fuel rods in an assembly are damaged.~~ The analysis of the LOCA assumes that radioactive materials leaked from the Emergency Core Cooling System (ECCS) are filtered and adsorbed by the ABGTS. The DBA analysis of the fuel handling accident assumes that only one train of the ABGTS is functional due to a single failure that disables the other train. The accident analysis accounts for the reduction in airborne radioactive material provided by the one remaining train of this filtration system. The amount of fission products available for release from the ABSCE is determined for a ~~fuel handling accident and for a~~ LOCA. ~~The assumptions and the analysis for a fuel handling accident follow the guidance provided in Regulatory Guide 1.25 (Ref. 5) and NUREG/CR-5009 (Ref. 10).~~ The assumptions and analysis for a LOCA follow the guidance provided in Regulatory Guide 1.4 (Ref. ~~6~~**5**).

The ABGTS satisfies Criterion 3 of the NRC Policy Statement.

~~When moving irradiated fuel inside containment or in the Auxiliary Building with containment air locks or penetrations open to the Auxiliary Building ABSCE spaces, or when moving fuel in the Auxiliary Building with the containment equipment hatch open, the provisions to initiate a CVI from the spent fuel pool radiation monitors and to initiate an ABI (i.e., the portion of an ABI normally initiated by the spent fuel pool radiation monitors) from a CVI, including a CVI initiated by the containment purge monitors, in the event of a fuel handling accident (FHA) must be in place and functioning. Additionally, a Containment Isolation Phase A (SI signal) from the operating unit, high~~

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

~~temperature in the Auxiliary Building air intakes, or manual ABI will cause a CVI signal in the refueling unit. The containment equipment hatch cannot be open when moving irradiated fuel inside containment in accordance with Technical Specification 3.9.4.~~

~~The ABGTS is required to be operable during movement of irradiated fuel in the Auxiliary Building during any mode and during movement of irradiated fuel in the Reactor Building when the Reactor Building is established as part of the ABSCE boundary (see TS 3.3.8, 3.7.12, & 3.9.4). When moving irradiated fuel inside containment, at least one train of the containment purge system must be operating or the containment must be isolated. When moving irradiated fuel in the Auxiliary Building during times when the containment is open to the Auxiliary Building ABSCE spaces, containment purge can be operated, but operation of the system is not required. However, whether the containment purge system is operated or not in this configuration, all containment ventilation isolation valves and associated instrumentation must remain operable. This requirement is necessary to ensure a CVI can be accomplished from the spent fuel pool radiation monitors in the event of a FHA in the Auxiliary Building. Additionally, a Containment Isolation Phase A (SI signal) from the operating unit, high temperature in the Auxiliary Building air intakes, or manual ABI will cause a CVI signal in the refueling unit. In the case where the containment of both units is open to the Auxiliary Building spaces, a CVI in one unit will initiate a CVI in the other unit in order to maintain those spaces open to the ABSCE.~~

LCO

Two independent and redundant trains of the ABGTS are required to be OPERABLE to ensure that at least one train is available, assuming a single failure that disables the other train, coincident with a loss of offsite power. Total system failure could result in the atmospheric release from the ABSCE exceeding the 10 CFR 100 (Ref. ~~7~~**6**) limits in the event of a ~~fuel handling accident or~~ LOCA.

The ABGTS is considered OPERABLE when the individual components necessary to control exposure in the ~~fuel handling b~~**Auxiliary B**uilding are OPERABLE in both trains. An ABGTS train is considered OPERABLE when its associated:

a. Fan is OPERABLE;

b. HEPA filter and charcoal adsorber are not excessively restricting flow, and are capable of performing their filtration function; and

(continued)

LCO (continued)

c. Heater, moisture separator, ductwork, valves, and dampers are OPERABLE, and air circulation can be maintained.

APPLICABILITY

In MODE 1, 2, 3, or 4, the ABGTS is required to be OPERABLE to provide fission product removal associated with ECCS leaks due to a LOCA and leakage from containment and annulus.

In MODE 5 or 6, the ABGTS is not required to be OPERABLE since the ECCS is not required to be OPERABLE. ~~During movement of irradiated fuel in the fuel handling area, the ABGTS is required to be OPERABLE to alleviate the consequences of a fuel handling accident. See additional discussion in the Background and Applicable Safety Analysis sections.~~

ACTIONS

A.1

With one ABGTS train inoperable, action must be taken to restore OPERABLE status within 7 days. During this period, the remaining OPERABLE train is adequate to perform the ABGTS function. The 7-day Completion Time is based on the risk from an event occurring requiring the inoperable ABGTS train, and the remaining ABGTS train providing the required protection.

B.1 and B.2

~~In MODE 1, 2, 3, or 4, w~~**W**hen Required Action A.1 cannot be completed within the associated Completion Time, or when both ABGTS trains are inoperable, the plant must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be placed in MODE 3 within 6 hours, and in MODE 5 within 36 hours. The Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

C.1 and C.2

When Required Action A.1 cannot be completed within the required Completion Time, during movement of irradiated fuel assemblies in the fuel handling area, the OPERABLE ABGTS train must be started immediately or fuel movement suspended. This action ensures that the remaining train is OPERABLE, that no undetected failures preventing system operation will occur, and that any active failure will be readily detected.

If the system is not placed in operation, this action requires suspension of fuel movement, which precludes a fuel accident. This does not preclude the movement of fuel assemblies to a safe position.

D.1

When two trains of the ABGTS are inoperable during movement of irradiated fuel assemblies in the fuel handling area, action must be taken to place the unit in a condition in which the LCO does not apply. Action must be taken immediately to suspend movement of irradiated fuel assemblies in the fuel handling area. This does not preclude the movement of fuel to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.12.1

Standby systems should be checked periodically to ensure that they function properly. As the environmental and normal operating conditions on this system are not severe, testing each train once every month provides an adequate check on this system.

Monthly heater operation dries out any moisture accumulated in the charcoal from humidity in the ambient air. The system must be operated for ≥ 10 continuous hours with the heaters energized. The 31-day Frequency is based on the known reliability of the equipment and the two train redundancy available.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.12.2

This SR verifies that the required ABGTS testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The ABGTS filter tests are in accordance with Regulatory Guide 1.52 (Ref. 8). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.12.3

This SR verifies that each ABGTS train starts and operates on an actual or simulated actuation signal. The 18-month Frequency is consistent with Reference ~~8~~7.

SR 3.7.12.4

This SR verifies the integrity of the ABSCE. The ability of the ABSCE to maintain negative pressure with respect to potentially uncontaminated adjacent areas is periodically tested to verify proper function of the ABGTS. During the post accident mode of operation, the ABGTS is designed to maintain a slight negative pressure in the ABSCE, to prevent unfiltered LEAKAGE. The ABGTS is designed to maintain a negative pressure between -0.25 inches water gauge and -0.5 inches water gauge (value does not account for instrument error) with respect to atmospheric pressure at a nominal flow rate ≥ 9300 cfm and ≤ 9900 cfm. The Frequency of 18 months is consistent with the guidance provided in NUREG-0800, Section 6.5.1 (Ref. ~~9~~8).

An 18-month Frequency (on a STAGGERED TEST BASIS) is consistent with Reference ~~8~~7.

REFERENCES

1. Watts Bar FSAR, Section 6.5.1, "Engineered Safety Feature (ESF) Filter Systems."
2. Watts Bar FSAR, Section 9.4.2, "Fuel Handling Area Ventilation System."
3. Watts Bar FSAR, Section 15.0, "Accident Analysis."

(continued)

BASES

REFERENCES (continued)

4. Watts Bar FSAR, Section 6.2.3, "Secondary Containment Functional Design."

~~5. Regulatory Guide 1.25, March 1972, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors."~~

~~6~~5. Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors."

~~7~~6. Title 10, Code of Federal Regulations, Part 100.11, "Determination of Exclusion Area, Low Population Zone, and Population Center Distance."

~~8~~7. Regulatory Guide 1.52 (Rev. 2), "Design, Testing and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmospheric Cleanup System Air Filtration and Adsorption Units of Light-Water Cooled Nuclear Power Plants."

~~9~~8. NUREG-0800, Section 6.5.1, "Standard Review Plan," Rev. 2, "ESF Atmosphere Cleanup System," July 1981.

~~10. NUREG/CR-5009, "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors," U. S. Nuclear Regulatory Commission, February 1988.~~

B 3.7 PLANT SYSTEMS

B 3.7.13 Fuel Storage Pool Water Level

BASES

BACKGROUND

The minimum water level in the fuel storage pool meets the assumptions of iodine decontamination factors following a fuel handling accident. The specified water level shields and minimizes the general area dose when the storage racks are filled to their maximum capacity. The water also provides shielding during the movement of spent fuel.

A general description of the fuel storage pool design is given in the FSAR, Section 9.1.2 (Ref. 1). A description of the Spent Fuel Pool Cooling and Cleanup System is given in the FSAR, Section 9.1.3 (Ref. 2). The assumptions of the fuel handling accident are given in the FSAR, Section ~~15.4.5~~**15.5.6** (Ref. 3).

APPLICABLE SAFETY ANALYSES

The minimum water level in the fuel storage pool meets the assumptions of the fuel handling accident described in Regulatory Guide ~~1.25 (Ref. 4)~~**1.183 (Ref. 4.) The Total Effective Dose Equivalent (TEDE) for control room occupants, individuals at the exclusion area boundary, and individuals within the low population zone will remain within 10 CFR 50.67 (Ref. 5) and Regulatory Position C.4.4 of Regulatory Guide 1.183 for a fuel handling accident.** ~~The resultant 2 hour thyroid dose per person at the exclusion area boundary is a small fraction of the 10 CFR 100 (Ref. 5) limits.~~

According to Reference ~~4~~3, there is 23 ft of water between the top of the damaged fuel bundle and the fuel pool surface during a fuel handling accident. With 23 ft of water, the assumptions of Reference 4 can be used directly. In practice, this LCO preserves this assumption for the bulk of the fuel in the storage racks. In the case of a single bundle dropped and lying horizontally on top of the spent fuel racks; however, there may be < 23 ft of water above the top of the fuel bundle and the surface, indicated by the width of the bundle. To offset this small non-conservatism, the analysis assumes that all fuel rods fail, although analysis shows that only the first few rows fail from a hypothetical maximum drop.

The fuel storage pool water level satisfies Criterion 2 of the NRC Policy Statement.

(continued)

BASES (continued)

REFERENCES

1. Watts Bar FSAR, Section 9.1.2, "Spent Fuel Storage."

2. Watts Bar FSAR, Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System."

3. Watts Bar FSAR, Section ~~15.4.5~~, "Fuel Handling Accident."

4. ~~Regulatory Guide 1.25, March 1972, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors."~~**Regulatory Guide 1.183, "Alternate Source Terms for Evaluation Design Basis Accidents at Nuclear Power Reactors", July 2000.**

5. ~~Title 10, Code of Federal Regulations, Part 100.11, "Determination of Exclusion Area, Low Population Zone, and Population Center Distance."~~**Title 10, Code of Federal Regulations, 10 CFR 50.67, "Accident Source Term."**

B 3.7 PLANT SYSTEMS

B 3.7.15 Spent Fuel Assembly Storage

BASES

BACKGROUND

The spent fuel pool contains flux trap rack modules with 1386 storage positions ~~and~~ **that** are designed to accommodate **new** fuel with **a maximum** enrichment **of 4.95 ± 0.05 weight percent U-235 and fuel of various initial enrichments when stored in accordance with paragraph 4.3.1.1 in Section 4.3, Fuel Storage.**~~as high as 3.8 weight percent U-235 without restrictions. Storage of fuel assemblies with enrichment between 3.8 and 5.0 weight percent requires either fuel burnup in accordance with paragraph 4.3.1.1 or placement in storage locations which have face adjacent storage cells containing either water or fuel assemblies with accumulated burnup of at least 20.0 MWD/KgU in accordance with Specification 4.3.1.1.~~

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design is based on the use of unborated water, which maintains the storage racks in a subcritical condition during normal operation with the racks fully loaded. The double contingency principle discussed in ANSI N-16.1-1975, and the April 1978 NRC letter (Reference 1) allows credit for soluble boron under other abnormal or accident conditions, since only a single accident need be considered at one time. For example, an abnormal scenario could be associated with the improper loading of a relatively high enrichment, low exposure fuel assembly. This could potentially increase the criticality of the storage racks. To mitigate these postulated criticality-related events, boron is dissolved in the pool water. Safe operation of the spent fuel storage design with no movement of assemblies may therefore be achieved by controlling the location of each assembly in accordance with the accompanying LCO. Prior to movement of an assembly in the pool, it is necessary to perform SR 3.9.9.1.

(continued)

BACKGROUND

125 V Vital DC Electrical Power Subsystem (continued)

Additionally, battery boards I, II, III, and IV have manual access to the fifth vital battery system. The fifth 125V DC Vital Battery System is intended to serve as a replacement for any one of the four 125V DC vital batteries during their testing, maintenance, and outages with no loss of system reliability under any mode of operation.

Each of the vital DC electrical power subsystems provides the control power for its associated Class 1E AC power load group, 6.9 kV switchgear, and 480 V load centers. The vital DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses. Additionally, they power the emergency DC lighting system.

The vital DC power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution System - Operating," and LCO 3.8.10, "Distribution Systems - Shutdown."

Each vital battery has adequate storage capacity to carry the required load continuously for at least 4 hours in the event of a loss of all AC power (station blackout) without an accident or for 30 minutes with an accident considering a single failure. Load shedding of non-required loads will be performed to achieve the required coping duration for station blackout conditions.

Each 125 VDC vital battery is separately housed in a ventilated room apart from its charger and distribution centers, except for Vital Battery V. 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 the vital DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles, de-rated for minimum ambient temperature and the 100% design demand. ~~The voltage limit is 2.13 V per cell, which corresponds to a total minimum voltage output of 128 V per battery (132 V for Vital Battery V).~~ The criteria for sizing large lead storage batteries are defined in IEEE-485 (Ref. 5).

(continued)

BACKGROUND

125 V Vital DC Electrical Power Subsystem (continued)

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open cell voltage of 2.07 Volts per cell (Vpc). For a 58 cell battery (DG battery), the total minimum output voltage is 120 V; for a 60 cell battery (vital battery) the total minimum output voltage is 124 V; and for a 62 cell battery (5th vital battery), the total minimum output voltage is 128 V. The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged, the battery cell will maintain approximately 97% of its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance, however, is obtained by maintaining a float voltage from 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge.

Each Vital DC electrical power 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 also has sufficient capacity to restore the battery bank from the design minimum charge to its fully charged state within 12 hours (with accident loads being supplied) following a 30 minute AC power outage and in approximately 36 hours (while supplying normal steady state loads following a 2 hour AC power outage), (Ref. 6).

The battery charger is normally in the float-charge mode. Float-charge is the condition in which the charger is supplying the connected loads and the battery cells are receiving adequate current to optimally charge the battery. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Lead calcium batteries have recharge efficiencies of greater than 91%, so once at least 110% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by

(continued)

direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery.

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BASES (continued)

LCO

Four 125V vital DC electrical power subsystems, each vital subsystem channel consisting of a battery bank, associated battery charger and the corresponding control equipment and interconnecting cabling supplying power to the associated DC bus within the channel; and four DG DC electrical power subsystems each consisting of a battery, a battery charger, and the corresponding control equipment and interconnecting cabling 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 (A00) or a postulated DBA. Loss of any DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4).

An OPERABLE vital DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC buses.

The LCO is modified by **three**~~a~~ Note**s**. ~~The~~ Note **1** indicates that Vital Battery V may be substituted for any of the required vital batteries. However, the fifth battery cannot be declared OPERABLE until it is connected electrically in place of another battery and it has satisfied applicable Surveillance Requirements. **Note 2 indicate that spare vital chargers 6-S, 7-S, 8-S, or 9-S may be substituted for required vital chargers. Note 3 indicate that spare DG chargers 1A1, 1B1, 2A1, or 2B1 may be substituted for required DG chargers. However, the spare charger(s) cannot be declared OPERABLE until it is connected electrically in place of another charger, and it has satisfied applicable Surveillance Requirements.**

APPLICABILITY

The four vital DC electrical power sources and four DG DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe plant operation and to ensure that:

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

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

The DC electrical power requirements for MODES 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources - Shutdown."

(continued)

ACTIONS

A.1

Condition A represents one vital channel 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 plant, minimizing the potential for complete loss of DC power to the affected train. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system train.

If one of the required vital DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger(s), or inoperable battery charger and associated inoperable battery), the remaining vital 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 of the OPERABLE subsystem would, however, result in a situation where the ability of the 125V DC electrical power subsystem to support its required ESF function is not assured, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 8) and reflects a reasonable time to assess plant status as a function of the inoperable vital DC electrical power subsystem and, if the vital DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe plant shutdown.

ACTIONS (continued)

B.1 and B.2

If the inoperable vital DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the plant to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 8).

C.1

Condition C represents one DG with a loss of ability to completely respond to an event. Since a subsequent single failure on the opposite train could result in a situation where the required ESF function is not assured, continued power operation should not exceed 2 hours. The 2 hour time limit is consistent with the allowed time for an inoperable vital DC electrical power subsystem.

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~~D.1~~

~~If the DG DC electrical power subsystem cannot be restored to OPERABLE status in the associated Completion Time, the associated DG may be incapable of performing its intended function and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions for an inoperable DG, LCO 3.8.1, "AC Sources - Operating."~~

ACTIONS

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

Conditions A and E represent one channel with one battery charger inoperable (e.g., the voltage limit of SR 3.8.4.1 or SR 3.8.4.2 is not maintained). The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Actions A.1 and E.1 require that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the battery will be restored to its recharged condition from any discharge that might have occurred due to the charger inoperability.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus, there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

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ACTIONS

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

If battery terminal float voltage cannot be restored to greater than or equal to the minimum established float voltage within 2 hours, and the charger is not operating in the current-limiting mode, a faulty charger is indicated. A faulty charger that is incapable of maintaining established battery terminal float voltage does not provide assurance that it can revert to and operate properly in the current limit mode that is necessary during the recovery period following a battery discharge event that the DC system is designed for.

If the charger is operating in the current limit mode after 2 hours, that is an indication that the battery is partially discharged and its capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours.

Required Actions A.2 and E.2 require that the battery float current be verified less than or equal to 2 amps for the vital battery and less than or equal to 1 amp for the DG battery. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it is now fully capable of supplying the maximum expected load requirement. The 2 amp value for the vital battery and the 1 amp value for the DG battery are based on returning the battery to 98% charge and assume a 2% design margin for the battery. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 2 amps for the vital battery or 1 amp for the DG battery, then this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Actions A.3 and E.3 limit the restoration time for the inoperable battery charger to 72 hours. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

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ACTIONS (continued)

B.1 and F.1

Conditions B and F represent one channel (subsystem) with one battery inoperable. With one battery inoperable, the DC bus is being supplied by the OPERABLE battery charger. Any event that results in a loss of the AC bus supporting the battery charger will also result in loss of DC to that subsystem. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash circuits, AC load shed and diesel generator output circuit breakers, etc.) will likely rely upon the battery. In addition, any DC load transients that are beyond the capability of the battery charger and normally require the assistance of the battery will not be able to be brought online. The 2 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific Completion Times.

C.1 and G.1

Conditions C and G represent a loss of one DC electrical power subsystem 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 subsystem. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution subsystem.

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ACTIONS (continued)

D.1 and D.2

If one of the required DC electrical power subsystems is inoperable for reasons other than Conditions A or B for the vital batteries or Conditions E or F for the DG DC electrical power subsystem, 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 could, however, result in the loss of the minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed 2 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. If the inoperable Vital DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the plant to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref.8).

H.1

If the DG DC electrical power subsystem cannot be restored to OPERABLE status in the associated Completion Time, the associated DG may be incapable of performing its intended function and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions for an inoperable DG, LCO 3.8.1, "AC Sources-Operating."

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SURVEILLANCE REQUIREMENTS

SR 3.8.4.1 and SR 3.8.4.2

Verifying battery terminal voltage while on float charge for the batteries helps to ensure the effectiveness of the **battery chargers, which support** ~~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 **while supplying the continuous steady state loads of the associated DC subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer. For example, the minimum nominal terminal voltage for the 5th Vital Battery is 136 V (62 cells times 2.20 Vpc); the minimum nominal terminal voltage for the vital batteries is 132 V (60 cells times 2.20 Vpc); and the minimum nominal terminal voltage for the DG batteries is 128 V (58 cells times 2.20 Vpc). These voltage levels maintain the battery plates in a condition that supports maintaining the grid life.**

The voltage requirements **listed above** are based on the critical design voltage of the battery and are consistent with the initial voltages assumed in the battery sizing calculations. The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. 9).

~~SURVEILLANCE REQUIREMENTS (continued)~~

SR 3.8.4.3

Verifying that for the vital batteries that the alternate feeder breakers to each required battery charger is open ensures that independence between the power trains is maintained. The 7 day Frequency is based on engineering judgment, is consistent with procedural controls governing breaker operation, and ensures correct breaker position.

SR 3.8.4.4

This SR demonstrates that the DG 125V DC distribution panel and associated charger are functioning properly, with all required circuit breakers closed and buses energized from normal power. The 7 day Frequency takes into account the redundant DG capability and other indications available in the control room that will alert the operator to system malfunctions.

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SR 3.8.4.5 and SR 3.8.4.6

Visual inspection to detect corrosion of the battery cells and connections, or measurement of the resistance of each inter-cell, inter-rack, inter-tier, 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.

SR 3.8.4.7

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.

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SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.8, SR 3.8.4.9 and SR 3.8.4.10

Visual inspection and resistance measurements of inter-cell, inter-rack, inter-tier, and terminal connections provide an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anti-corrosion 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 3.8.4.8. For the purposes of trending, inter-cell (vital and DG batteries) and inter-tier (vital and DG batteries) connections are measured from battery post to battery post. Inter-rack (vital batteries), inter-tier (DG Batteries), and terminal connections (vital and DG batteries) are measured from terminal lug to battery post.

The connection resistance limits for SR 3.8.4.9 and SR 3.8.4.10 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.

SR 3.8.4.11

This SR requires that each vital battery charger be capable of recharging its associated battery from a capacity or service discharge test while supplying normal loads, or alternatively, operating at current limit for a minimum of 4 hours at a nominal 125 VDC. These requirements are based on the design capacity of the chargers (Ref. 4) and their performance characteristic of current limit operation for a substantial portion of the recharge period. Battery charger output current is limited to 110% to 125% of the 200 amp-rated output. Recharging the battery or testing for a minimum of 4 hours is sufficient to verify the output capability of the charger can be sustained, that current limit adjustments are properly set and that protective devices will not inhibit performance at current limit settings. According to Regulatory Guide 1.32 (Ref. 6), 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 plant during these demand occurrences. Verifying the capability of the charger to operate in a sustained current limit condition ensures that these requirements can be satisfied.

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SURVEILLANCE REQUIREMENTS

SR 3.8.4.11 (continued)

The Surveillance Frequency is acceptable, given the plant 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 may perturb the electrical distribution system and challenge safety systems. This Surveillance is normally performed during MODES 5 and 6 since it would require the DC electrical power subsystem to be inoperable during performance of the test. However, this Surveillance may be performed in MODES 1, 2, 3, or 4 provided the Vital Battery V is substituted in accordance with LCO Note 1. Credit may be taken for unplanned events that satisfy this SR. Examples of unplanned events may include:

1) Unexpected operational events which cause the equipment to perform the function specified by this Surveillance, for which adequate documentation of the required performance is available; and

2) Post-corrective maintenance testing that requires performance of this Surveillance in order to restore the component to OPERABLE, provided the maintenance was required, or performed in conjunction with maintenance required to maintain OPERABILITY or reliability.

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.12

This SR requires that each diesel generator battery charger be capable of recharging its associated battery from a capacity or service discharge test while supplying normal loads. This requirement is based on the design capacity of the chargers (Ref. 13) and their performance characteristic of current limit operation for a substantial portion of the recharge period. Battery charger output current is limited to a maximum of 140% of the 20 amp-rated output. Recharging the battery verifies the output capability of the charger can be sustained, that current limit adjustments are properly set and that protective devices will not inhibit performance at current limit settings. According to Regulatory Guide 1.32 (Ref. 6), 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 plant during these demand occurrences. Verifying the capability of the charger to operate in a sustained current limit condition ensures that these requirements can be satisfied.

The Surveillance Frequency is acceptable, given the plant 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.

For the DG DC electrical subsystem, this Surveillance may be performed in MODES 1, 2, 3, or 4 in conjunction with LCO 3.8.1.B since the DG DC electrical power subsystem supplies loads only for the inoperable diesel generator and would not otherwise challenge safety systems supplied from vital electrical distribution systems. Additionally, credit may be taken for unplanned events that satisfy this SR. Examples of unplanned events may include:

1) Unexpected operational events which cause the equipment to perform the function specified by this Surveillance, for which adequate documentation of the required performance is available; and

2) Post-corrective maintenance testing that requires performance of this Surveillance in order to restore the component to OPERABLE, provided the maintenance was required, or performed in conjunction with maintenance required to maintain OPERABILITY or reliability.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.13

A battery service test is a special test of 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 worst case design duty cycle requirements based on References 10 and 12.

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 6) and Regulatory Guide 1.129 (Ref. 11), which state that the battery service test should be performed during refueling operations or at some other outage, with intervals between tests, not to exceed 18 months.

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

A modified discharge test is a test of the battery capacity 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.

The reason for Note 2 is that performing the Surveillance may perturb the vital electrical distribution system and challenge safety systems. However, this Surveillance may be performed in MODES I, 2, 3, or 4 provided that Vital Battery V is substituted in accordance with LCO Note 1. For the DG DC electrical subsystem, this surveillance may be performed in MODES I, 2, 3, or 4 in conjunction with LCO 3.8.1.B since the supplied loads are only for the inoperable diesel generator and would not otherwise challenge safety system loads which are supplied

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.13 (continued)

from vital electrical distribution systems. Additionally, credit may be taken for unplanned events that satisfy this SR. Examples of unplanned events may include:

1) Unexpected operational events which cause the equipment to perform the function specified by this Surveillance, for which adequate documentation of the required performance is available; and

2) Post-corrective maintenance testing that requires performance of this Surveillance in order to restore the component to OPERABLE, provided the maintenance was required, or performed in conjunction with maintenance required to maintain OPERABILITY or reliability.

SR 3.8.4.14

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.

A battery modified performance discharge test is described in the Bases for SR 3.8.4.13. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.14; however, only the modified performance discharge test may be used to satisfy SR 3.8.4.14 while satisfying the requirements of SR 3.8.4.13 at the same time.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 9) and IEEE-485 (Ref. 5). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer 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.

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.4.14 (continued)

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 rating. Degradation is indicated, according to IEEE-450 (Ref. 9), 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 rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 9).

This SR is modified by a Note. The reason for the Note is that performing the Surveillance may perturb the vital electrical distribution system and challenge safety systems. However, this Surveillance may be performed in MODES I, 2, 3, or 4 provided that Vital Battery V is substituted in accordance with the LCO Note. For the DG DC electrical subsystem, this surveillance may be performed in MODES I, 2, 3, or 4 in conjunction with LCO 3.8.1.B since the supplied loads are only for the inoperable diesel generator and would not otherwise challenge safety system loads which are supplied from vital electrical distribution systems. Additionally, credit may be taken for unplanned events that satisfy this SR. Examples of unplanned events may include:

1) Unexpected operational events which cause the equipment to perform the function specified by this Surveillance, for which adequate documentation of the required performance is available; and

2) Post-corrective maintenance testing that requires performance of this Surveillance in order to restore the component to OPERABLE, provided the maintenance was required, or performed in conjunction with maintenance required to maintain OPERABILITY or reliability.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.5 and SR 3.8.4.6

These SRs verify the design capacity of the vital and DG battery chargers. According to Regulatory Guide 1.32 (Ref. 6), the battery charger supply is recommended 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 recharged state, irrespective of the status of the unit during these demand occurrences. Verifying the capability of the charger to operate in a sustained current limit condition ensures that these requirements can be satisfied.

The SRs provide two options. One option requires that each vital battery charger be capable of supplying 200 amps (20 amps for the DG battery charger) at the minimum established float voltage for 4 hours. Recharging the battery or testing for a minimum of 4 hours is sufficient to verify the output capability of the charger can be sustained, that current limit adjustments are properly set and that protective devices will not inhibit performance at current limit settings.

The other option requires that each battery charger be capable of recharging the battery after a service test coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these demands occur). This level of loading may not normally be available following the battery service test and will need to be supplemented with additional loads. The duration for this test may be longer than the charger sizing criteria since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is ≤ 2 amps for the vital batteries and ≤ 1 amp for the DG batteries.

The Surveillance Frequency is acceptable, given the plant 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.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.7

A battery service test is a special test of 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 worst case design duty cycle requirements based on References 10 and 12.

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref.6) and Regulatory Guide 1.129 (Ref.11), which state that the battery service test should be performed during refueling operations or at some other outage, with intervals between tests, not to exceed 18 months.

This SR is modified by two Notes. Note 1 allows the performance of a modified performance discharge test in lieu of a service test. The modified performance discharge test 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.

Note 2 allow the plant to take credit for unplanned events that satisfy this SR. Examples of unplanned events may include:

1) **Unexpected operational events which cause the equipment to perform the function specified by this Surveillance, for which adequate documentation of the required performance is available; and**

2) **Post corrective maintenance testing that requires performance of this Surveillance in order to restore the component to OPERABLE, provided the maintenance was required, or performed in conjunction with maintenance required to maintain OPERABILITY or reliability.**

(continued)

BASES (continued)

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 17, "Electric Power System."

2. Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," U.S. Nuclear Regulatory Commission, March 10, 1971.

3. IEEE-308-1971, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations," Institute of Electrical and Electronic Engineers.

4. Watts Bar FSAR, Section 8.3.2, "DC Power System."

5. IEEE-485-1983, "Recommended Practices for Sizing Large Lead Storage Batteries for Generating Stations and Substations," Institute of Electrical and Electronic Engineers.

6. Regulatory Guide 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants," February 1977, U.S. Nuclear Regulatory Commission.

7. Watts Bar FSAR, Section 15, "Accident Analysis" and Section 6 "Engineered Safety Features."

8. Regulatory Guide 1.93, "Availability of Electric Power Sources," U.S. Nuclear Regulatory Commission, December 1974.

9. ~~IEEE-450-1980/1995, "IEEE Recommended Practice for Maintenance Testing and Replacement of Large Lead Storage Batteries for Generating Stations and Subsystems," Institute of Electrical and Electronic Engineers.~~**IEEE-450-2002, "IEEE Recommended Practice for Maintenance, Testing and Replacement of Vented Lead - Acid Batteries for Stationary Applications," Institute of Electrical and Electronics Engineers, Inc.**

10. ~~TVA Calculation WBN EEB-MS-TI11-0003, "125 VDC Vital Battery and Charger Evaluation."~~**TVA Calculation EDQ00023620070003, "125V DC Vital Battery System Analysis"**

11. Regulatory Guide 1.129, "Maintenance Testing and Replacement of Large Lead Storage Batteries for Generating Stations and Subsystems," U.S. Nuclear Regulatory Commission, February 1978.

12. TVA Calculation WBN EEB-EDQ00023620070003, "125V DC Vital Battery System Analysis."

13. Watts Bar FSAR, Section 8.3.1, "AC Power System."

BASES (continued)

LCO

The 125V Vital DC electrical power subsystems, each vital subsystem channel consisting of a battery bank, associated battery charger, and the corresponding control equipment and interconnecting cabling within the channel; and the DG DC electrical power subsystems, each consisting of a battery, a battery charger, and the corresponding control equipment and interconnecting cabling, are required to be OPERABLE to support required trains of the distribution systems required OPERABLE by LCO 3.8.10, "Distribution Systems - Shutdown" and the required DGs required OPERABLE by LCO 3.8.2, "AC Sources - Shutdown." As a minimum, one vital DC electrical power train (i.e., Channels I and III, or II and IV) and two DG DC electrical power subsystems (i.e., 1A-A and 2A-A or 1B-B and 2B-B) shall be OPERABLE. This ensures the availability of sufficient DC electrical power sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

The LCO is modified by ~~a~~**three** Notes. ~~The~~ Note **1** indicates that Vital Battery V may be substituted for any of the required vital batteries. However, the fifth battery cannot be declared OPERABLE until it is connected electrically in place of another battery and it has satisfied applicable Surveillance Requirements. **Note 2 indicates that spare vital chargers 6-S, 7-S, 8-S, or 9-S may be substituted for required vital chargers. Note 3 indicates that spare DG chargers 1A1, 1B1, 2A1, or 2B1 may be substituted for required DG chargers. However, the spare charger(s) cannot be declared OPERABLE until it is(are) connected electrically in place of another charger, and it has satisfied applicable Surveillance Requirements.**

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies, provide assurance that:

a. Required features needed to mitigate a fuel handling accident are available;
b. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and
c. Instrumentation and control capability is available for monitoring and maintaining the plant in a cold shutdown condition or refueling condition.

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

(continued)

ACTIONS

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

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 vital 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 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.

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 vital DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

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

B.1

If ~~the~~ **one or more** DG DC electrical power subsystem cannot be restored to OPERABLE status in the associated Completion Time, the associated DG may be incapable of performing its intended function and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions for an inoperable DG, LCO 3.8.2, “AC Sources - Shutdown.”

BASES (continued)

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.~~14~~7. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

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

REFERENCES

1. Watts Bar FSAR, Section 15, “Accident Analysis” and Section 6, “Engineered Safety Features.”
2. Watts Bar FSAR, Section 8.0, “Electric Power.”

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery ~~Cell~~ Parameters

BASES

BACKGROUND

This LCO delineates the limits on **battery float current,** electrolyte temperature, **electrolyte** level, **and cell** float voltage~~, and specific gravity~~ for the 125V vital DC electrical power subsystem and **the** diesel generator (DG) 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." **Additional controls for various battery parameters are also provided in Specification 5.7.2.21, "Battery Monitoring and Maintenance Program."**

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open cell voltage of 2.07 Volts per cell (Vpc). For a 58 cell battery (DG battery), the total minimum output voltage is 120 V; for a 60 cell battery (vital battery), the total minimum output voltage is 124 V; and for a 62 cell battery, (5^{th} vital battery), the total minimum output voltage is 128 V. The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged, the battery cell will maintain approximately 97% of its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance, however, is obtained by maintaining a float voltage from 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge as discussed in FSAR, Chapter 8 (Ref. 4).

(continued)

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Section 6 (Ref. 1) and Section 15 (Ref. 1), assume Engineered Safety Feature systems are OPERABLE. The vital DC electrical power system provides normal and emergency DC electrical power for the emergency auxiliaries, and control and switching during all MODES of operation. The DG battery systems provide DC power for the DGs.

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 plant. This includes maintaining at least one train of DC sources OPERABLE during accident conditions, in the event of:

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 the Criterion 3 of the NRC Policy Statement.

LCO

Battery ~~cell~~ parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. ~~Electrolyte~~**Battery parameter** limits are conservatively established, allowing continued DC electrical system function even with ~~Category A and B~~ limits not met. **Additional controls for various battery parameters are also provided in Specification 5.7.2.21, "Battery Monitoring and Maintenance Program."**

APPLICABILITY

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

BASES (continued)

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, 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 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 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 cells. One hour is considered a reasonable amount of time to perform the required verification.

Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at 7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the normal Frequency of pilot cell surveillances.

Continued operation 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.

(continued)

~~ACTIONS (continued)~~

~~B.1~~

~~With one or more batteries with one or more battery cell parameters outside the Category C limits for any connected cell, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding vital DC or DG 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 for the vital batteries or 50°F for DG batteries, are also cause for immediately declaring the associated vital DC or DG DC electrical power subsystem inoperable.~~

ACTIONS

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

If one required vital battery or one required DG battery has one or more cell voltage < 2.07 V, the battery is considered degraded. Within 2 hours, verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage (SR 3.8.4.1 or SR 3.8.4.2) and of the overall battery state of charge by monitoring the battery float charge current (SR 3.8.6.1 or SR 3.8.6.2). This assures that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one battery < 2.07 V and continued operation is permitted for a limited period up to 24 hours.

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1, SR 3.8.6.1, SR 3.8.4.2, or SR 3.8.6.2 acceptance criteria does not result in this Required Action not met. However, if one of the SRs is failed, the appropriate Condition(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 or SR 3.8.6.2 is failed, then there is not assurance that there is still sufficient battery capacity to perform the intended function and the battery must be declared inoperable immediately.

B.1, B.2, D.1, and D.2

One required vital battery with float current > 2 amps or one required DG battery with float current > 1 amp indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours, verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage.

(continued)

ACTIONS

B.1, B.2, D.1, and D.2 (continued)

If the terminal voltage is found to be less than the minimum established float voltage, there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. Conditions A and C address charger inoperability. If the charger is operating in the current limit mode after 2 hours, that is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Actions B.2 and C.2). The battery must therefore be declared inoperable.

If the float voltage is found to be satisfactory, but there are one or more battery cells with float voltage less than 2.07 V, the associated "OR" statement in Condition H is applicable and the battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than 2.07 V, there is good assurance that, within 12 hours, the battery will be restored to its recharged condition (Required Actions B.2 and C.2) from any discharge that might have occurred due to a temporary loss of the battery charger.

A discharged battery with float voltage (the charger setpoint) across its terminals indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its recharged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus, there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

If the condition is due to one or more cells in a low voltage condition but still greater than 2.07 V and float voltage is found to be satisfactory, this is not indication of a substantially discharged battery and 12 hours is a reasonable time prior to declaring the battery inoperable.

Since Required Actions B.1 and C.1 only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.4.2 acceptance criteria does not result in the Required Action not met.

However, if SR 3.8.4.1 or SR 3.8.4.2 is failed, the appropriate Condition(s), depending on the cause of the failure, is entered.

(continued)

ACTIONS (continued)

E.1, E.2, and E.3

With one required vital or DG battery with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days, the minimum established design limits for electrolyte level must be re-established.

With electrolyte level below the top of the plates, there is a potential for dryout and plate degradation. Required Actions E.1 and E.2 address this potential as well as provisions in Specification 5.7.2.21.b, "Battery Monitoring and Maintenance Program." They are modified by a Note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours, level is required to be restored to above the top of the plates. The Required Action E.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.7.2.21.b item to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from IEEE Standard 450. They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the battery may have to be declared inoperable and the affected cell(s) replaced.

F.1

With one required vital or DG battery with pilot cell temperature less than the minimum established design limits, 12 hours is allowed to restore the temperature to within limits. A low electrolyte temperature limits the current and power available. Since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended function and the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not met.

(continued)

BASES

ACTIONS (continued)

G.1

With more than one required vital or more than one required DG batteries with battery parameters not within limits as specified in Conditions A through F there is not sufficient assurance that battery capacity has not been affected to the degree that the batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved, this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer Completion Times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one subsystem within 2 hours.

H.1

With one or more batteries with any battery parameter outside the allowances of the Required Actions for Condition A, B, C, D, E, F or G, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding battery must be declared inoperable. Additionally, discovering one or more batteries with one or more battery cells float voltage less than 2.07 V and float current greater than 2 amps for the vital batteries or 1 amp for the DG batteries indicates that the battery capacity may not be sufficient to perform the intended functions. Under these conditions, the battery must be declared inoperable immediately.

(continued)

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.8.6.1~~

~~This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 2), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.~~

~~SR 3.8.6.2~~

~~The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 2). In addition, within 24 hours of a battery discharge < 110 V (113.5V for Vital Battery V or 106.5 V for DG batteries) or a battery overcharge > 150 V (155 V for Vital Battery V or 145 V for DG batteries), 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 (113.5 V for Vital Battery V or 106.5 V for DG batteries), do not constitute a battery discharge provided the battery terminal voltage and float current return to pre-transient values. This inspection is also consistent with IEEE-450 (Ref. 2), 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.~~

~~SR 3.8.6.3~~

~~This Surveillance verification that the average temperature of representative cells is ≥ 60°F for the vital batteries and ≥ 50°F for the DG batteries, is consistent with a recommendation of IEEE-450 (Ref. 2), that states that the temperature of electrolytes in representative cells should be determined on a quarterly basis.~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.3 (continued)

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.

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. 2), 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 suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 2) 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 the recommendations of IEEE-450 (Ref. 2), which states that prolonged operation of cells < 2.13 V can reduce the life expectancy of cells.

The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer 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. 2), the specific gravity readings are based on a temperature of 77°F (25°C).

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.3 (continued)

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.

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

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer fully charged, nominal specific gravity) with the average of all connected cells > 1.205 (0.010 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.

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. 2), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.

The Category C 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.

(continued)

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.8.6.3 (continued)~~

~~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 for vital batteries and < 1.0 amps for DG batteries. This current provides, in general, an indication of overall battery condition.~~

~~Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charger current is an acceptable alternative to specific gravity measurement for determining the state of charge. This phenomenon is discussed in IEEE-450 (Ref. 2). Footnote (c) to Table 3.8.6-1 allows the float charge current to be used as an alternate to specific gravity for up to 31 days following a battery recharge. Within 31 days, each connected cell's specific gravity must be measured to confirm the state of charge. Following a minor battery recharge (such as equalizing charge that does not follow a deep discharge), specific gravity gradients are not significant, and confirming measurements may be made in less than 31 days.~~

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1 and SR 3.8.6.2

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The equipment used to monitor float current must have the necessary accuracy and resolution to measure electrical currents in the expected range. The float current requirements are based on the float current indicative of a charged battery. The 7 day Frequency is consistent with IEEE-450 (Ref. 2).

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1 or SR 3.8.4.2. When this float voltage is not maintained, the Required Actions of LCO 3.8.4 ACTION A or E are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of 2 amps for the vital battery and 1 amp for the DG battery is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.3 and SR 3.8.6.6

Optimal long term battery performance is obtained by maintaining float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer which is 2.20 Vpc. This corresponds to a terminal voltage of 128 V for the DG batteries, 132 V for vital batteries I through IV and 136 V for vital battery V. The specified float voltage provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.7.2.21. SRs 3.8.6.3 and 3.8.6.6 require verification that the cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V.

The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 2).

SR 3.8.6.4

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The minimum design electrolyte level is the minimum level indication mark on the battery cell jar. The Frequency is consistent with IEEE-450 (Ref. 2).

SR 3.8.6.5

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 60 °F for vital batteries and 50 °F for DG batteries). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperature lower than assumed in battery sizing calculations will not ensure battery capacity is sufficient to perform its design function. The Frequency is consistent with IEEE-450 (Ref. 2).design requirements.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.7

A battery performance discharge test is a test of battery capacity using constant current. The test is intended to determine overall battery degradation due to age and usage.

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.6.7; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.7.

A modified performance test is a test of the battery capacity 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 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.

It may consist of just two rates; for instance the one minute rate 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 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 must 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.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 2) and IEEE-485 (Ref. 3). These references recommend 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. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.7 (continued)

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. 2), 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. 2).

This SR is modified by a Note. The reason for the Note is to allow the plant to take credit for unplanned events that satisfy this SR. Examples of unplanned events may include:

1. **Unexpected operational events which cause the equipment to perform the function specified by this Surveillance for which adequate documentation of the required performance is available; and**
2. **Post corrective maintenance testing that requires performance of this Surveillance in order to restore the component to OPERABLE, provided the maintenance was required, or performed in conjunction with maintenance required to maintain OPERABILITY or reliability.**

REFERENCES

1. Watts Bar FSAR, Section 15, "Accident Analysis," and Section 6, "Engineered Safety Features."
2. ~~IEEE-450-1980/1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Generating Stations and Substations."~~**IEEE Std 450-2002, "IEEE Recommended Practice for Maintenance, Testing and Replacement of Vented Lead - Acid Batteries for Stationary Applications," Institute of Electrical and Electronics Engineers, Inc.**
3. **IEEE Std 485-1983, "IEEE Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations," The Institute of Electrical and Electronics Engineers, Inc.**
4. **Watts Bar FSAR, Section 8, "Electric Power."**

BASES

B 3.9 REFUELING OPERATIONS

B 3.9.4 Containment PenetrationsTHIS SECTION NOT USED

BASES

BACKGROUND

During movement of irradiated fuel assemblies within containment, a release of fission product radioactivity within containment will be restricted from escaping to the environment when the LCO requirements are met. In MODES 1, 2, 3, and 4, this is accomplished by maintaining containment OPERABLE as described in LCO 3.6.1, "Containment." In MODE 6, the potential for containment pressurization as a result of an accident is not likely; therefore, requirements to isolate the containment from the outside atmosphere can be less stringent. The LCO requirements are referred to as "containment closure" rather than "containment OPERABILITY." Containment closure means that all potential escape paths are closed or capable of being closed. Since there is no potential for containment pressurization, the Appendix J leakage criteria and tests are not required.

The containment serves to contain fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10 CFR 100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

The containment equipment hatch, which is part of the containment pressure boundary, provides a means for moving large equipment and components into and out of containment. During movement of irradiated fuel assemblies within containment, the equipment hatch must be held in place by at least four bolts. Good engineering practice dictates that the bolts required by this LCO be approximately equally spaced.

The containment air locks, which are also part of the containment pressure boundary, provide a means for personnel access during MODES 1, 2, 3, and 4 unit operation in accordance with LCO 3.6.2, "Containment Air Locks." Each air lock has a door at both ends. The doors are normally interlocked to prevent simultaneous opening when containment OPERABILITY is required. During periods of unit shutdown when containment closure is not required, the door interlock mechanism may be disabled, allowing both doors of an air lock to remain open for extended periods when frequent containment entry is necessary. During

(continued)

BASES

BACKGROUND (continued)

movement of irradiated fuel assemblies within containment, containment closure is required; therefore, the door interlock mechanism may remain disabled, but one air lock door must always remain capable of being closed.

The requirements for containment penetration closure ensure that a release of fission product radioactivity within containment will be restricted to within regulatory limits.

The Reactor Building Purge Ventilation System operates to supply outside air into the containment for ventilation and cooling or heating, to equalize internal and external pressures, and to reduce the concentration of noble gases within containment prior to and during personnel access. The supply and exhaust lines each contain two isolation valves. Because of their large size, the 24-inch containment lower compartment purge valves are physically restricted to ≤ 50 degrees open. The Reactor Building Purge and Ventilation System valves can be opened in MODES 5 and 6, but are closed automatically by the Engineered Safety Features Actuation System (ESFAS). In MODE 6, large air exchanges are necessary to conduct refueling operations. The normal 24-inch purge system is used for this purpose. The ventilation system must be either isolated or capable of being automatically isolated upon detection of high radiation levels within containment.

The other containment penetrations that provide direct access from containment atmosphere to outside atmosphere must be isolated on at least one side. Isolation may be achieved by an OPERABLE automatic isolation valve, or by a manual isolation valve, blind flange, or equivalent. Equivalent isolation methods must be approved and may include use of a material that can provide a temporary, atmospheric pressure, ventilation barrier for the other containment penetrations during fuel movements (Ref. 1). Closure by other valves or blind flanges may be used if they are similar in capability to those provided for containment isolation. These may be constructed of standard materials and may be justified on the basis of either normal analysis methods or reasonable engineering judgment (Ref. 4).

APPLICABLE SAFETY ANALYSES

During movement of irradiated fuel assemblies within containment, the most severe radiological consequences result from a fuel handling accident. The fuel handling accident is a postulated event that involves damage to irradiated fuel (Ref. 2). Fuel handling accidents, analyzed in Reference 2, include dropping a single irradiated fuel assembly and handling tool or a heavy object onto other irradiated fuel assemblies.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	The requirements of LCO 3.9.7, "Refueling Cavity Water Level," in conjunction with a minimum decay time of 100 hours prior to irradiated fuel movement with containment closure capability ensures that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are well within the guideline values specified in 10 CFR 100. Standard Review Plan, Section 15.7.4, Rev. 1 (Ref. 3), defines "well within" 10 CFR 100 to be 25% or less of the 10 CFR 100 values. The acceptance limits for offsite radiation exposure will be 25% of 10 CFR 100 values or the NRC staff approved licensing basis (e.g., a specified fraction of 10 CFR 100 limits). Containment penetrations satisfy Criterion 3 of the NRC Policy Statement.
LCO	This LCO limits the consequences of a fuel handling accident in containment by limiting the potential escape paths for fission product radioactivity released within containment. The LCO requires any penetration providing direct access from the containment atmosphere to the outside atmosphere to be closed except for the OPERABLE Reactor Building Purge and Ventilation System penetrations, and the containment personnel airlocks. For the OPERABLE Reactor Building Purge and Ventilation System penetrations, this LCO ensures that these penetrations are isolable by the Containment Ventilation Isolation System. The OPERABILITY requirements for this LCO ensure that the automatic purge and exhaust valve closure times specified in the FSAR can be achieved and, therefore, meet the assumptions used in the safety analysis to ensure that releases through the valves are terminated, such that radiological doses are within the acceptance limit. The containment personnel airlock doors may be open during movement of irradiated fuel in the containment provided that one door is capable of being closed in the event of a fuel handling accident and provided that ABGTS is OPERABLE in accordance with TS 3.7.12. Should a fuel handling accident occur inside containment, one personnel airlock door will be closed following an evacuation of containment. The LCO is modified by a Note allowing penetration flow paths with direct access from the containment atmosphere to the outside atmosphere to be unisolated under administrative controls. Administrative controls ensure that 1) appropriate personnel are aware of the open status of the penetration flow path during movement of irradiated fuel assemblies within containment; 2) specified individuals are designated and readily available to isolate the flow path in the event of a fuel handling accident;

(continued)

BASES

LCO (continued)	3) penetration flow paths, penetrating the Auxiliary Building Secondary Containment Enclosure (ABSCE) boundary, are limited to less than the ABSCE breach allowance; and 4) the ABGTS is OPERABLE in accordance with TS 3.7.12. Operability of ABGTS is required to alleviate the consequences of an FHA inside containment resulting in leakage of airborne radioactive material past the open airlock or penetration flow paths prior to their closure.
APPLICABILITY	The containment penetration requirements are applicable during movement of irradiated fuel assemblies within containment because this is when there is a potential for the limiting fuel handling accident. In MODES 1, 2, 3, and 4, containment penetration requirements are addressed by LCO 3.6.1. In MODES 5 and 6, when movement of irradiated fuel assemblies within containment is not being conducted, the potential for a fuel handling accident does not exist. Therefore, under these conditions no requirements are placed on containment penetration status.
ACTIONS	A.1 If the containment equipment hatch, air locks, or any containment penetration that provides direct access from the containment atmosphere to the outside atmosphere is not in the required status, including the Containment Ventilation Isolation System not capable of automatic actuation when the purge and exhaust valves are open, the unit must be placed in a condition where the isolation function is not needed. This is accomplished by immediately suspending movement of irradiated fuel assemblies within containment. Performance of these actions shall not preclude completion of movement of a component to a safe position.
SURVEILLANCE REQUIREMENTS	SR 3.9.4.1 This Surveillance demonstrates that each of the containment penetrations required to be in its closed position is in that position. The Surveillance on the open purge and exhaust valves will demonstrate that the valves are not blocked from closing. Also the Surveillance will demonstrate that each valve operator has motive power, which will ensure that each valve is capable of being closed by an OPERABLE automatic containment ventilation isolation signal.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.4.1 (continued)

The Surveillance is performed every 7 days during movement of irradiated fuel assemblies within containment. The Surveillance interval is selected to be commensurate with the normal duration of time to complete fuel handling operations. A surveillance before the start of refueling operations will provide two or three surveillance verifications during the applicable period for this LCO. As such, this Surveillance ensures that a postulated fuel handling accident that releases fission product radioactivity within the containment will not result in a release of significant fission product radioactivity to the environment in excess of those recommended by Standard Review Plan Section 15.7.4 (Ref. 3).

SR 3.9.4.2

This Surveillance demonstrates that each containment purge and exhaust valve actuates to its isolation position on manual initiation or on an actual or simulated high radiation signal. The 18 month Frequency maintains consistency with other similar ESFAS instrumentation and valve testing requirements. LCO 3.3.6, "Containment Ventilation Isolation Instrumentation," requires a CHANNEL CHECK every 12 hours and a COT every 92 days to ensure the channel OPERABILITY during refueling operations. Every 18 months, a CHANNEL CALIBRATION is performed. The system actuation response time is demonstrated every 18 months, during refueling, on a STAGGERED TEST BASIS. SR 3.6.3.4 demonstrates that the isolation time of each valve is in accordance with the Inservice Testing Program requirements. These Surveillances performed during MODE 6 will ensure that the valves are capable of closing after a postulated fuel handling accident to limit a release of fission product radioactivity from the containment.

REFERENCES

1. "Use of Silicone Sealant to Maintain Containment Integrity - ITS," GPU Nuclear Safety Evaluation SE-0002000-001, Rev. 0, May 20, 1988.
2. Watts Bar FSAR, Section 15.4.5, "Fuel Handling Accident."
3. NUREG-0800, Standard Review Plan, Section 15.7.4, "Radiological Consequences of Fuel Handling Accidents," Rev. 1, July 1981.
4. Generic Letter 88-17, "Loss of Decay Heat Removal."

B 3.9 REFUELING OPERATIONS

B 3.9.7 Refueling Cavity Water Level

BASES

BACKGROUND	The movement of irradiated fuel assemblies within containment requires a minimum water level of 23 ft above the top of the reactor vessel flange. During refueling, this maintains sufficient water level in the containment, refueling canal, fuel transfer canal, refueling cavity, and spent fuel pool. Sufficient water is necessary to retain iodine fission product activity in the water in the event of a fuel handling accident (Refs. 1 and ~~2~~**5**). Sufficient iodine activity would be retained to limit offsite doses from the accident to ~~≤ 25% of 10 CFR 100 limits, as provided by the guidance of Reference 3~~**the limits defined in 10 CFR 50.67 (Ref. 4) and Regulatory Position C.4.4 of Regulatory Guide 1.183 (Ref. 5)**.
APPLICABLE SAFETY ANALYSES	During movement of irradiated fuel assemblies, the water level in the refueling canal and the refueling cavity is an initial condition design parameter in the analysis of a fuel handling accident in containment~~, as postulated by Regulatory Guide 1.25 (Ref. 1)~~. A minimum water level of 23 ft (Regulatory Position ~~C.1.c~~**2** of ~~Ref. 1~~**Appendix B to Regulatory Guide 1.183**) allows **an overall iodine**~~a~~ decontamination factor of ~~100~~**200** ~~(Regulatory Position C.1.g of Ref. 1)~~ to be used in the accident analysis ~~for iodine~~. This relates to the assumption that 99% of the total iodine released from the pellet to cladding gap of all the dropped fuel assembly rods is retained by the refueling cavity water. The fuel pellet to cladding gap is assumed to contain **8% of the I-131,** 10% of the **Kr-85, and 5% of the other noble gases and iodines from the total fission product inventory in accordance with Regulatory Position of Regulatory Guide 1.183**~~total fuel rod iodine inventory (Ref. 1) except for I-131 which is assumed to be 12% (Ref. 6)~~. The fuel handling accident analysis inside containment is described in Reference ~~2~~**1**. With a minimum water level of 23 ft and a minimum decay time of 100 hours prior to fuel handling, the analysis and test programs demonstrate that the iodine release due to a postulated fuel handling accident is adequately captured by the water and offsite doses are maintained within allowable limits (Refs. 4 and 5). Refueling cavity water level satisfies Criterion 2 of the NRC Policy Statement.

(continued)

BASES (continued)

LCO

A minimum refueling cavity water level of 23 ft above the reactor vessel flange is required to ensure that the radiological consequences of a postulated fuel handling accident inside containment are within acceptable limits, as provided by the guidance of Reference ~~3~~**2**.

APPLICABILITY

LCO 3.9.7 is applicable when moving irradiated fuel assemblies within containment. The LCO minimizes the possibility of a fuel handling accident in containment that is beyond the assumptions of the safety analysis. If irradiated fuel assemblies are not present in containment, there can be no significant radioactivity release as a result of a postulated fuel handling accident. Requirements for fuel handling accidents in the spent fuel pool are covered by LCO 3.7.13, "Fuel Storage Pool Water Level."

ACTIONS

A.1

With a water level of < 23 ft above the top of the reactor vessel flange, all operations involving movement of irradiated fuel assemblies within the containment shall be suspended immediately to ensure that a fuel handling accident cannot occur. The suspension of fuel movement shall not preclude completion of movement of a component to a safe position.

A.2

In addition to immediately suspending movement of irradiated fuel, actions to restore refueling cavity water level must be initiated immediately.

SURVEILLANCE REQUIREMENTS

SR 3.9.7.1

Verification of a minimum water level of 23 ft above the top of the reactor vessel flange ensures that the design basis for the analysis of the postulated fuel handling accident during refueling operations is met. Water at the required level above the top of the reactor vessel flange limits the consequences of damaged fuel rods that are postulated to result from a fuel handling accident inside containment (Ref. ~~2~~**1**).

The Frequency of 24 hours is based on engineering judgment and is considered adequate in view of the large volume of water and the normal procedural controls of valve positions, which make significant unplanned level changes unlikely.

(continued)

BASES (continued)

REFERENCES

~~1.~~ ~~Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors," U.S. Nuclear Regulatory Commission, March 23, 1972.~~

~~2~~**1**. Watts Bar FSAR, Section 15.4.5, "Fuel Handling Accident."

~~3~~**2**. NUREG-0800, "Standard Review Plan," Section 15.7.4, "Radiological Consequences of Fuel-Handling Accidents," U.S. Nuclear Regulatory Commission.

~~4~~**3**. Title 10, Code of Federal Regulations, Part 20.1201(a), (a)(1), and (2)(2), "Occupational Dose Limits for Adults."

4~~5~~. ~~Malinowski, D. D., Bell, M. J., Duhn, E., and Locante, J., WCAP-7828, Radiological Consequences of a Fuel Handling Accident, December 1971.~~**Title 10, Code of Federal Regulations, 10 CFR 50.67, Accident Source Term."**

5~~6~~. ~~NUREG/CR-5009, "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors," U. S. Nuclear Regulatory Commission, February 1988.~~**Regulatory Guide 1.183, "Alternate Source Terms for Evaluation Design Basis Accidents at Nuclear Power Reactors," July 2000.**

B 3.9 REFUELING OPERATIONS

B 3.9.8 ~~Reactor Building Purge Air Cleanup Units~~**THIS SECTION NOT USED**

~~BASES~~

~~BACKGROUND~~

~~The Reactor Building Purge Air Cleanup Units are an engineered safety feature of the Reactor Building Purge Ventilation System which is a non-safety feature ventilation system. The air cleanup units contain prefilters, HEPA filters, 2-inch-thick charcoal adsorbers, housings and ductwork. Anytime fuel handling operations are being carried on inside the primary containment, either the containment ventilation will be isolated or the Reactor Building Purge air cleanup units will be OPERABLE (Ref. 1).~~

~~The Reactor Building Purge Ventilation System provides mechanical ventilation of the primary containment, the instrument room located within the containment, and the annulus. The system is designed to supply fresh air for breathing and contamination control to allow personnel access for maintenance and refueling operations. The exhaust air is filtered by the Reactor Building Purge Air Cleanup Units to limit the release of radioactivity to the environment.~~

~~The containment upper and lower compartments are purged with fresh air by the Reactor Building Purge Ventilation System before occupancy. The annulus can be purged with fresh air during reactor shutdown or at times when the annulus vacuum control system of the Emergency Gas Treatment System is shut down. The instrument room is purged with fresh air during operation of the Reactor Building Purge Ventilation System or is separately purged by the Instrument Room Purge Subsystem. All purge ventilation functions are non-safety related.~~

~~The Reactor Building Purge Ventilation System is sized to provide adequate ventilation for personnel to perform work inside the primary containment and the annulus during all normal operations. In the event of a fuel handling accident, the Reactor Building Purge Ventilation System is isolated. The Reactor Building Purge Air Cleanup Units are always available as passive inline components to perform their function immediately after a fuel handling accident to process activity contained in exhaust air before it reaches the outside environment.~~

~~(continued)~~

BASES

BACKGROUND (continued)

The Primary containment exhaust is monitored by a radiation detector which provides automatic containment purge ventilation system isolation upon detecting the setpoint radioactivity in the exhaust air stream. The containment purge ventilation isolation valves will be automatically closed upon the actuation of a Containment Vent Isolation (CVI) signal whenever the primary containment is being purged during normal operation or upon manual actuation from the Main Control Room (Ref. 2). Requirements for Containment Vent Isolation Instrumentation are covered by LCO 3.3.6.

APPLICABLE SAFETY ANALYSES

The Reactor Building Purge Ventilation System air cleanup units ensure that the release of radioactivity to the environment is limited by cleaning up containment exhaust during a fuel handling accident before the containment purge exhaust valves are isolated. Reactor Building Purge Ventilation System filter efficiency is one of the inputs for the analysis of the environmental consequences of a fuel handling accident. Containment isolation can only result in smaller releases of radioactivity to the environment (Ref. 1). The Containment Vent Isolation System ensures that the containment vent and purge penetrations will be automatically isolated upon detection of high radiation levels within the containment (Ref. 2). Containment Vent Isolation Instrumentation is addressed by LCO 3.3.6.

The Reactor Building Purge Air Cleanup Units satisfy Criterion 3 of the NRC Policy Statement.

In addition, during movement of irradiated fuel in the Auxiliary Building when containment is open to the Auxiliary Building spaces, a high radiation signal from the spent fuel pool accident radiation monitors , a Containment Isolation Phase A (SI signal) from the operating unit, high temperature in the Auxiliary Building air intakes, or manual ABI will initiate a CVI. In the case where the containment of both units is open to the Auxiliary Building spaces, a CVI in one unit will initiate a CVI in the other unit in order to maintain those spaces open to the ABSCE.

LCO

The safety function of the Reactor Building Purge Air Cleanup Unit is related to the initial control of offsite radiation exposures resulting from a fuel handling accident inside containment. During a fuel handling accident inside containment, the Reactor Building Purge Air Cleanup Unit provides a filtered path for cleaning up any air leaving the containment until the containment ventilation is isolated.

(continued)

BASES

LCO (continued)

The plant design basis requires that when moving irradiated fuel in the Auxiliary Building and/or Containment with the Containment open to the Auxiliary Building ABSCE spaces, a signal from the spent fuel radiation monitors 0-RE-90-102 and -103 will initiate a CVI in addition to their normal function. In addition, a signal from the containment purge radiation monitors 2-RE-90-130, and -131 or other CVI signal will initiate that portion of the ABI normally initiated by the spent fuel pool radiation monitors. Additionally, a Containment Isolation Phase A (SI signal) from the operating unit, high temperature in the Auxiliary Building air intakes, or manual ABI will cause a CVI signal in the refueling unit. Therefore, the containment ventilation instrumentation must remain operable when moving irradiated fuel in the Auxiliary Building if the containment air locks, penetrations, equipment hatch, etc. are open to the Auxiliary Building ABSCE spaces. In addition, the ABGTS must remain operable if these containment penetrations are open to the Auxiliary Building during movement of irradiated fuel in side containment. In the case where the containment of both units is open to the Auxiliary Building spaces, a CVI in one unit will initiate a CVI in the other unit in order to maintain those spaces open to the ABSCE.

APPLICABILITY

An initial assumption in the analysis of a fuel handling accident inside containment is that the accident occurs while irradiated fuel is being handled. Therefore, LCO 3.9.8 is applicable only at this time. See additional discussion in the Applicable Safety Analysis and LCO sections.

ACTIONS

A.1 and A.2

If one Reactor Building Purge Air Cleanup Unit is inoperable, that air cleanup unit must be isolated. This places the system in the required accident configuration, thus allowing refueling to continue after verifying the remaining air cleanup unit is aligned and OPERABLE.

The immediate Completion Time is consistent with the required times for actions to be performed without delay and in a controlled manner.

(continued)

BASES

ACTIONS (continued)

B.1

With two Reactor Building Purge Air Cleanup Units inoperable, movement of irradiated fuel assemblies within containment must be suspended. This precludes the possibility of a fuel handling accident in containment with both Reactor Building Purge Air Cleanup Units inoperable. Performance of this action shall not preclude moving a component to a safe position.

The immediate Completion Time is consistent with the required times for actions to be performed without delay and in a controlled manner.

SURVEILLANCE REQUIREMENTS

SR 3.9.8.1

The Ventilation Filter Testing Program (VFTP) encompasses the Reactor Building Purge Air Cleanup Unit filter tests in accordance with Regulatory Guide 1.52 (Ref. 3). The VFTP includes testing the performance of the HEPA filter, charcoal adsorber efficiency, minimum flow rate, and the physical properties of the activated charcoal. Specific test Frequencies and additional information are discussed in detail in the VFTP.

REFERENCES

1. Watts Bar FSAR, Section 15.5.6, "Environmental Consequences of a Postulated Fuel Handling Accident."

2. Watts Bar FSAR, Section 9.4.6, "Reactor Building Purge Ventilating System."

3. Regulatory Guide 1.52 (Rev. 02), "Design, Testing and Maintenance Criteria for Post-Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants."

B 3.9 REFUELING OPERATIONS

B 3.9.10 Decay Time

BASES

BACKGROUND

Section 15.5.6 of the Watts Bar FSAR (Ref. 1) defines the assumptions of the fuel handling accident radiological analysis, including a minimum decay time for irradiated fuel assemblies prior to movement. This assumption ensures that the inventory of radioactive isotopes is at a level that supports the safety analysis assumptions.

To ensure that irradiated fuel assemblies have decayed for the appropriate period of time, a limitation is established to require the reactor core to be subcritical for a time period at least equivalent to the minimum decay time assumption in the fuel handling analysis prior to allowing irradiated fuel to be moved.

Given that no irradiated fuel assembly will be moved outside of the containment until the minimum decay time requirement is met, this requirement also ensures that any irradiated fuel assemblies that are moved outside of the containment meet the decay time assumption in the radiological analysis of the fuel handling accident.

APPLICABLE SAFETY ANALYSES

The radiological analysis of the fuel handling accident (Ref. 1) assumes a minimum decay time prior to movement of irradiated fuel assemblies. The requirements of LCO 3.3.7, "Control Room Emergency Ventilation System (CREVS) Actuation Instrumentation," LCO 3.7.10, "Control Room Emergency Ventilation System (CREVS)," LCO 3.7.11, "Control Room Emergency Air Temperature Control System (CREATCS)," and LCO 3.9.7, "Refueling Cavity Water Level," in conjunction with a minimum decay time of 100 hours prior to irradiated fuel movement ensures that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are within the requirements of 10 CFR 50.67 (Ref. 2) and Regulatory Position C.4.4 of Regulatory Guide 1.183 (Ref. 3).

The decay time satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

(continued)

BASES (continued)

LCO	A minimum decay time of 100 hours is required prior to moving irradiated fuel assemblies within containment. This preserves an assumption in the fuel handling accident analysis (Ref. 1), and ensures that the radiological consequences of a postulated fuel handling accident inside containment are within acceptable limits.
APPLICABILITY	This LCO applies during movement of irradiated fuel assemblies within the containment, since the potential for a release of fission products exists.
ACTIONS	A.1 When the initial conditions for prevention of an accident cannot be met, steps should be taken to preclude the accident from occurring. When the reactor is subcritical for < 100 hours, movement of irradiated fuel assemblies within containment must be suspended. This action precludes the possibility of a fuel handling accident in containment. This action does not preclude moving a fuel assembly to a safe position. The immediate Completion Time is consistent with the required times for actions to be performed without delay and in a controlled manner.
SURVEILLANCE REQUIREMENTS	TSR 3.9.10.1 This SR verifies that the reactor has been subcritical for at least 100 hours prior to moving irradiated fuel assemblies by confirming the date and time of subcriticality. This ensures that any irradiated fuel assemblies have decayed for at least 100 hours prior to movement. The Frequency of "Prior to movement of irradiated fuel in the containment" is appropriate, because it ensures that the decay time requirement has been met just prior to moving the irradiated fuel.

(continued)

BASES (continued)

REFERENCES	1. Watts Bar FSAR, Section 15.5.6, "Environmental Consequences of a Postulated Fuel Handling Accident."
	2. Title 10, Code of Federal Regulations, 10 CFR 50.67, "Accident Source Term."

ATTACHMENT 3

WBN Unit 2 TS and TSB Developmental Revision H
(Optical Media Storage)