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May 30, 2003

U. S. Nuclear Regulatory Commission
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Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
UNION ELECTRIC CO.
TECHNICAL SPECIFICATION BASES REVISION 4

Furnished herewith is the signed original and 10 copies of Revision 4 to the Callaway Plant Technical Specification Bases (TSB) in accordance with 10CFR50.4(b)(6).

Pursuant to 10CFR50.71(e), the TSB has been revised to include all of the changes made to the plant since our revision 3 issue, August 30, 2002 to May 30, 2003.

If there are any questions, please contact us.

Very truly yours,

David Shafer
David Shafer
Acting Manager -
Regulatory Affairs

BFH/

A001

Enclosure: Directions for Replacement Pages

Attachment: Revision 4 to Callaway Plant TSB

STATE OF MISSOURI)
) S S
CITY OF ST. LOUIS)

David Shafer, of lawful age, being first duly sworn upon oath says that he is Manager, Regulatory Affairs (Nuclear) for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By David Shafer
David Shafer
Acting Manager, Regulatory Affairs

SUBSCRIBED and sworn to before me this 30th day of May, 2003

Valerie W. Whitehead

VALERIE W. WHITEHEAD
Notary Public - Notary Seal
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Jefferson County
My Commission Expires: Dec. 10, 2006

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May 30, 2003

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Power Range Neutron Flux (continued)

power range detectors provide input to the Rod Control System and the Steam Generator (SG) Water Level Control System. Therefore, the actuation logic must be able to withstand an input failure to the control system, which may then require the protection function actuation, and a single failure in the other channels providing the protection function actuation. Note that this Function also provides a signal to prevent rod withdrawal prior to initiating a reactor trip. Limiting further rod withdrawal may terminate the transient and eliminate the need to trip the reactor.

a. Power Range Neutron Flux - High

The Power Range Neutron Flux - High trip Function ensures that protection is provided, from all power levels, against a positive reactivity excursion leading to DNB during power operations and will prevent fuel melting, providing protection for the safety limit on linear heat rate. These excursions can be caused by rod withdrawal or reductions in RCS temperature.

The LCO requires all four of the Power Range Neutron Flux - High channels to be OPERABLE (two-out-of-four trip logic). The Trip Setpoint is ≤ 109% RTP.

In MODE 1 or 2, when a positive reactivity excursion could occur, the Power Range Neutron Flux - High trip must be OPERABLE. This Function will terminate the reactivity excursion and shut down the reactor prior to reaching a power level that could damage the fuel. In MODE 3, 4, 5, or 6, the NIS power range detectors cannot detect neutron levels. In these MODES, the Power Range Neutron Flux - High does not have to be OPERABLE because the reactor is shut down and reactivity excursions into the power range are extremely unlikely. Other RTS Functions and administrative controls provide protection against reactivity additions when in MODE 3, 4, 5, or 6.

b. Power Range Neutron Flux - Low

The LCO requirement for the Power Range Neutron Flux - Low trip Function ensures that protection is provided against a positive reactivity excursion from low power or subcritical conditions.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY

b. Power Range Neutron Flux - Low (continued)

The LCO requires all four of the Power Range Neutron Flux - Low channels to be OPERABLE (two-out-of-four trip logic). The Trip Setpoint is ≤ 25% RTP.

In MODE 1, below the Power Range Neutron Flux (P-10 setpoint), and in MODE 2, the Power Range Neutron Flux-Low trip must be OPERABLE. This Function may be manually blocked by the operator when two out of four power range channels are greater than 10% RTP (P-10 setpoint). This Function is automatically unblocked when three out of four power range channels are below the P-10 setpoint. Above the P-10 setpoint, positive reactivity additions are mitigated by the Power Range Neutron Flux-High trip Function.

In MODE 3, 4, 5, or 6, the Power Range Neutron Flux - Low trip Function does not have to be OPERABLE because the reactor is shut down and the NIS power range detectors cannot detect neutron levels in this range. Other RTS trip Functions and administrative controls provide protection against positive reactivity additions or power excursions in MODE 3, 4, 5, or 6.

3. Power Range Neutron Flux Rate

The Power Range Neutron Flux Rate trip uses the same channels as discussed for Function 2 above.

Power Range Neutron Flux - High Positive Rate

The Power Range Neutron Flux - High Positive Rate trip Function ensures that protection is provided against rapid increases in neutron flux that are characteristic of an RCCA drive rod housing rupture and the accompanying ejection of the RCCA. This Function compliments the Power Range Neutron Flux - High and Low Setpoint trip Functions to ensure that the criteria are met for a rod ejection from the power range. This Function also provides protection for the rod withdrawal at power event.

The LCO requires all four of the Power Range Neutron Flux - High Positive Rate channels to be OPERABLE (two-out-of-four trip logic). The Trip Setpoint is ≤ 4.25% RTP with a time constant ≥ 2 seconds.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY

Power Range Neutron Flux - High Positive Rate (continued)

In MODE 1 or 2, when there is a potential to add a large amount of positive reactivity from a rod ejection accident (REA), the Power Range Neutron Flux - High Positive Rate trip must be OPERABLE. In MODE 3, 4, 5, or 6, the Power Range Neutron Flux- High Positive Rate trip Function does not have to be OPERABLE because other RTS trip Functions and administrative controls will provide protection against positive reactivity additions. Also, since only the shutdown banks may be withdrawn in MODE 3, 4, or 5, the remaining complement of control bank worth ensures a sufficient degree of SDM in the event of an REA. In MODE 6, no rods are withdrawn and the SDM is increased during refueling operations. The reactor vessel head is also removed or the closure bolts are detensioned preventing any pressure buildup. In addition, the NIS power range detectors cannot detect neutron levels present in this mode.

4. Intermediate Range Neutron Flux

The Intermediate Range Neutron Flux trip Function ensures that protection is provided against an uncontrolled RCCA bank rod withdrawal accident from a subcritical condition during startup (automatic rod withdrawal is no longer available). This trip Function provides redundant protection to the Power Range Neutron Flux - Low Setpoint trip Function. The NIS intermediate range detectors are located external to the reactor vessel and measure neutrons leaking from the core. The NIS intermediate range detectors do not provide any input to control systems. Note that this Function also provides a signal to prevent rod withdrawal prior to initiating a reactor trip. Limiting further rod withdrawal may terminate the transient and eliminate the need to trip the reactor.

The LCO requires two channels of Intermediate Range Neutron Flux to be OPERABLE. Two OPERABLE channels are sufficient to ensure no single random failure will disable this trip Function (one-out-of-two trip logic). The Trip Setpoint is ≤ 25% RTP.

Because this trip Function is important only during startup, there is generally no need to disable channels for testing while the Function is required to be OPERABLE. Therefore, a third channel is unnecessary.

In MODE 1 below the P-10 setpoint, and in MODE 2 above the P-6 setpoint, when there is a potential for an uncontrolled RCCA bank rod withdrawal accident during reactor startup, the

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY

4. Intermediate Range Neutron Flux (continued)

Intermediate Range Neutron Flux trip must be OPERABLE. Above the P-10 setpoint, the Power Range Neutron Flux - High Setpoint trip and the Power Range Neutron Flux - High Positive Rate trip provide core protection for a rod withdrawal accident. In MODE 2 below the P-6 setpoint, the Source Range Neutron Flux trip Function provides core protection for reactivity accidents. In MODE 3, 4, or 5, the Intermediate Range Neutron Flux trip does not have to be OPERABLE because the control rods must be fully inserted and only the shutdown rods may be withdrawn. The reactor cannot be started up in this condition. The core also has the required SDM to mitigate the consequences of a positive reactivity addition accident. In MODE 6, all rods are fully inserted and the core has a required increased SDM. Also, the NIS intermediate range detectors cannot detect neutron levels present in this MODE.

5. Source Range Neutron Flux

The LCO requirement for the Source Range Neutron Flux trip Function ensures that protection is provided against an uncontrolled RCCA bank rod withdrawal accident from a subcritical condition during startup (automatic rod withdrawal is no longer available). This trip Function provides redundant protection to the Power Range Neutron Flux- Low and Intermediate Range Neutron Flux trip Functions. In MODES 3, 4, and 5, administrative controls also prevent the uncontrolled manual withdrawal of rods. The NIS source range detectors are located external to the reactor vessel and measure neutrons leaking from the core. The NIS source range detectors do not provide any inputs to control systems. The source range trip is the only RTS automatic protection function required in MODES 3, 4, and 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. Therefore, the functional capability at the Trip Setpoint is assumed to be available.

The LCO requires two channels of Source Range Neutron Flux to be OPERABLE. Two OPERABLE channels are sufficient to ensure no single random failure will disable this trip Function. This Function uses one-out-of-two trip logic. The Trip Setpoint is $\leq$ 1.0 E5 cps. The outputs of the Function to RTS logic are not required OPERABLE in MODE 6 or when all rods are fully inserted and the Rod Control System is incapable of rod withdrawal.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.16 (continued)

(c) Any intentional time delay set into the trip circuitry (e.g., undervoltage relay time delay, NLL cards (lag, lead/lag, rate/lag) and NPL cards (PROM logic cards for trip time delay) associated with the OTΔT, OPΔT, and SG low-low level Vessel ΔT (Power-1, Power-2) trip functions, and NLL cards (lead/lag) associated with the low pressurizer pressure reactor trip function) to add margin or prevent spurious trip signals;

(d) For the undervoltage RCP trip function, back EMF delay from the time of the loss of the bus voltage until the back EMF voltage generated by the bus loads has decayed;

(e) The time delay for the reactor trip breakers to open; and

(f) The time delay for the control rod drive stationary gripper coil voltage to decay and the RCCA grippers to mechanically release making the rods free to fall (i.e., gripper release time measured during the performance of SR 3.1.4.3).

For channels that include dynamic transfer functions (e.g., lag, lead/lag, rate/lag, etc.), the response time verification is performed with the time constants set at their nominal values. Time constants are verified during the performance of SR 3.3.1.10 and SR 3.3.1.11. The response time may be verified by a
series of overlapping tests, or other verification (e.g., Ref. 9 and Ref. 15), such that the entire response time is verified.

Response time may be verified by actual response time tests in any series of sequential, overlapping, or total channel measurements, or by the summation of allocated sensor, signal processing, and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor response times may be obtained from:

1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests); (2) inplace, onsite, or offsite (e.g. vendor) test measurements; or (3) utilizing vendor engineering specifications. WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the WCAP. Response time verification for other sensor types must be demonstrated by test.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.16 (continued)

WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. The allocations for sensor, signal conditioning, and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. Specific components identified in References 9 and 15 may be replaced without verification testing. One example where response time could be affected is replacing the sensing assembly of a transmitter.

As appropriate, each channel's response time must be verified every 18 months on a STAGGERED TEST BASIS. Each verification shall include at least one train such that both trains are verified at least once per 36 months. Testing of the final actuation devices (i.e., reactor trip breakers) is included in the verification. Testing of the final actuation devices measures the time delay for the reactor trip breakers to open. The time delay for the control rod drive stationary gripper coil voltage to decay and the RCCA grippers to mechanically release making the rods free to fall (i.e., gripper release time) is measured during the performance of SR 3.1.4.3 which verifies rod drop time from the beginning of decay of stationary gripper coil voltage. For surveillance testing performance, gripper release time is not included in the reactor trip system instrumentation response time testing due to the difficulty in determining the precise point at which the rods are free to fall. SR 3.1.4.3 specifies a readily quantifiable time to use as a separation point for field measurements, i.e., "from the beginning of decay of stationary gripper coil voltage." The rod drop time measurement in SR 3.1.4.3 begins at the time the rod control power cabinet regulator board circuit for a specific rod group is grounded, causing the board to reduce the stationary gripper coil current to zero releasing the rod group. This is essentially the same time at which the reactor trip breaker's opening would interrupt current to the stationary gripper coil. The response time definition, "until loss of stationary gripper coil voltage, " is less quantifiable. However, the definition's provision for overlapping testing allows this testing approach since the total response time is determined. The safety analyses are satisfied as long as both surveillances, response time and rod drop time, are met. Some portions of the response time testing cannot be performed during unit operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this Surveillance when performed at the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.16 (continued)

18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.3.1.16 is modified by a Note stating that neutron detectors are excluded from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response. Response time of the neutron flux signal portion of the channel shall be verified from detector output or input to the first electronic component in the channel.

REFERENCES

1. FSAR, Chapter 7.
2. FSAR, Chapter 15.
3. IEEE-279-1971.
4. 10 CFR 50.49.
5. Callaway OL Amendment No. 17 dated September 8, 1986.
6. Callaway Setpoint Methodology Report, SNP (UE)-565 dated May 1, 1984.
7. Callaway OL Amendment No. 43 dated April 14, 1989.
8. FSAR Section 16.3, Table 16.3-1.
9. WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," January 1996.
10. FSAR Table 15.0-4.
11. WCAP-9226, "Reactor Core Response to Excessive Secondary Steam Releases," Revision 1, January 1978.
12. NRC Generic Letter 85-09 dated May 23, 1985.
13. FSAR Section 15.1.1.
14. RFR - 18637A.

BASES

REFERENCES (continued)

15. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," October 1998.

16. FSAR Section 15.4.6.

Table B 3.3.1-1
(Page 1 of 3)

FUNCTION			NOMINAL TRIP SETPOINT [a]
1.	Manual Reactor Trip		N.A.
2.	Power Range Neutron Flux		
	a.	High	≤ 109% RTP
	b.	Low	≤ 25% RTP
3.	Power Range Neutron Flux Rate - High Positive Rate		≤ 4.25% RTP with time constant ≥ 2 sec.
4.	Intermediate Range Neutron Flux		≤ 25% RTP
5.	Source Range Neutron Flux		≤ 1.0E5 CPS
6.	Overtemperature ΔT		See Table 3.3.1-1 Note 1.
7.	Overpower ΔT		See Table 3.3.1-1 Note 2.
8.	Pressurizer Pressure		
	a.	Low	≥ 1885 psig
	b.	High	≤ 2385 psig
9.	Pressurizer Water Level - High		≤ 92% of instrument span
10.	Reactor Coolant Flow - Low		≥ 90% of loop minimum measured flow (MMF=95,660 gpm)

(continued)

(a) The inequality sign only indicates conservative direction. The as-left value will be within a two-sided calibration tolerance band on either side of the nominal value. This also applies to the Overtemperature ΔT and Overpower ΔT K values per Reference 14.

Table B 3.3.1-1
(Page 2 of 3)

FUNCTION			NOMINAL TRIP SETPOINT [(a)]
11.	Not used.		
12.	Undervoltage RCPs		≥ 10,584 Vac
13.	Underfrequency RCPs		≥ 57.2 Hz
14.	Steam Generator (SG) Water Level Low-Low		
	a.	Steam Generator Water Level Low-Low (Adverse Containment Environment)	≥ 27.0% of narrow range instrument span
	b.	Steam Generator Water Level Low-Low (Normal Containment Environment)	≥ 21.6% of narrow range instrument span
	c.	Vessel ΔT Equivalent including delay timers - Trip Time Delay	
		(1) Vessel ΔT (Power-1)	≤ Vessel ΔT Equivalent to 12.41% RTP (with a time delay ≤ 232 sec.)
		(2) Vessel ΔT (Power- 2)	≤ Vessel ΔT Equivalent to 22.41% RTP (with a time delay ≤ 122 sec.)
	d.	Containment Pressure - Environmental Allowance Modifier	≤ 1.5 psig
15.	Not used.		

(continued)

(a) The inequality sign only indicates conservative direction. The as-left value will be within a two-sided calibration tolerance band on either side of the nominal value. This also applies to the Overtemperature ΔT and Overpower ΔT K values per Reference 14.

Table B 3.3.1-1
(Page 3 of 3)

FUNCTION			NOMINAL TRIP SETPOINT [a]
16.	Turbine Trip		
	a.	Low Fluid Oil Pressure	≥ 598.94 psig
	b.	Turbine Stop Valve Closure	≥ 1% open
17.	Safety Injection (SI) Input from Engineered Safety Feature Actuation System (ESFAS)		N.A.
18.	Reactor Trip System Interlocks		
	a.	Intermediate Range Neutron Flux, P-6	≥ 1.0E-10 amps
	b.	Low Power Reactor Trips Block, P-7	N.A.
	c.	Power Range Neutron Flux, P-8	≤ 48% RTP
	d.	Power Range Neutron Flux, P-9	≤ 50% RTP
	e.	Power Range Neutron Flux, P-10	10% RTP
	f.	Turbine Impulse Pressure, P-13	≤ 10% Turbine Power
19.	Reactor Trip Breakers		N.A.
20.	Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms		N.A.
21.	Automatic Trip Logic		N.A.

(a) The inequality sign only indicates conservative direction. The as-left value will be within a two-sided calibration tolerance band on either side of the nominal value. This also applies to the Overtemperature ΔT and Overpower ΔT K values per Reference 14.

BASES (continued)

REFERENCES

1. FSAR, Section 8.3.1.1.3.
2. FSAR, Chapter 15.
3. Callaway OL Amendment No. 74 dated December 16, 1992.
4. Callaway OL Amendment No. 99 dated April 18, 1995.
5. FSAR Table 16.3-2.
6. NRC Branch Technical Position PSB-1.

B 3.3 INSTRUMENTATION

B 3.3.6 Containment Purge Isolation Instrumentation

BASES

BACKGROUND

Containment purge isolation instrumentation closes the containment isolation valves in the Mini-purge System and the Shutdown Purge System. This action isolates the containment atmosphere from the environment to minimize releases of radioactivity in the event of an accident. The Mini-purge System may be in use during reactor operation and the Shutdown Purge System will be in use with the reactor shutdown.

Containment purge isolation initiates on an automatic or manual safety injection (SI) signal through the Containment Isolation - Phase A Function, or by manual actuation of Phase A Isolation. The Bases for LCO 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," discuss these modes of initiation.

Two gaseous radiation monitoring channels are also provided as input to the containment purge isolation. The two channels measure gaseous radiation in a sample of the containment purge exhaust. Since the purge exhaust monitors constitute a sampling system, various components such as sample line valves and sample pumps are required to support monitor OPERABILITY.

Each of the purge systems has inner and outer containment isolation valves in its supply and exhaust ducts. A high radiation signal from either of the two radiation monitoring channels initiates containment purge isolation, which closes both inner and outer containment isolation valves in the Mini-purge System and the Shutdown Purge System. These systems are described in the Bases for LCO 3.6.3, "Containment Isolation Valves."

APPLICABLE SAFETY ANALYSES

The safety analyses assume that the containment remains intact with penetrations unnecessary for core cooling isolated early in the event. The isolation of the purge valves has not been analyzed mechanistically in the dose calculations, although its rapid isolation is assumed. The containment purge isolation gaseous radiation channels act as backup to the Phase A isolation signal to ensure closing of the purge supply and exhaust valves. In the postulated fuel handling accident, the dose calculations performed in support of Reference 5 (open personnel airlock during CORE ALTERATIONS and during movement of irradiated fuel assemblies within containment) do not assume automatic containment purge isolation (see also the Bases for LCO 3.9.4, "Containment Penetrations"). Containment isolation ensures meeting the containment

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

leakage rate assumptions of the safety analyses, and ensures that the calculated accidental offsite radiological doses are below 10 CFR 100 (Ref. 1) limits.

The containment purge isolation instrumentation satisfies Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

The LCO requirements ensure that the instrumentation necessary to initiate Containment Purge Isolation, listed in Table 3.3.6-1, is OPERABLE.

1. Manual Initiation

The LCO requires two channels OPERABLE. The operator can initiate Containment Purge Isolation at any time by using either of two push buttons in the control room.

The LCO for Manual Initiation ensures the proper amount of redundancy is maintained in the manual actuation circuitry to ensure the operator has manual initiation capability.

Each channel consists of one push button and the interconnecting wiring to the actuation logic cabinet as well as the BOP ESFAS output actuation relays needed to effect a manual containment purge isolation.

2. Automatic Actuation Logic and Actuation Relays (BOP ESFAS)

The LCO requires two trains of Automatic Actuation Logic and Actuation Relays OPERABLE to ensure that no single random failure can prevent automatic actuation of containment purge isolation.

Automatic Actuation Logic and Actuation Relays (BOP ESFAS) consist of the same features and operate in the same manner as described for ESFAS Function 6.c, Auxiliary Feedwater.

3. Containment Purge Exhaust Radiation - Gaseous

The LCO specifies two required Containment Purge Exhaust Radiation – Gaseous channels (GTRE0022 and GTRE0033) to

(continued)

BASES

LCO (continued)

3. Containment Purge Exhaust Radiation - Gaseous (continued)

ensure that the radiation monitoring instrumentation necessary to initiate Containment Purge Isolation remains OPERABLE. For sampling systems, channel OPERABILITY involves more than OPERABILITY of the channel electronics. OPERABILITY also requires correct valve lineups and sample pump operation, as well as detector OPERABILITY, since these supporting features are necessary for trip to occur under the conditions assumed by the safety analyses.

4. Containment Isolation - Phase A

Containment Purge Isolation is also initiated by all Table 3.3.2-1 Functions that initiate Containment Isolation - Phase A. Therefore, the requirements are not repeated in Table 3.3.6-1. Instead, refer to LCO 3.3.2, Function 3.a, for all initiating Functions and requirements.

APPLICABILITY

The Manual Initiation, Automatic Actuation Logic and Actuation Relays (BOP ESFAS), and Containment Purge Exhaust Radiation - Gaseous Functions are required OPERABLE in MODES 1, 2, 3, and 4. The Containment Isolation – Phase A Function is required to be OPERABLE as directed by LCO 3.3.2, Function 3.a. The Containment Purge Manual Initiation Function, is also required OPERABLE during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment. During CORE ALTERATIONS or during movement of irradiated fuel assemblies within containment, automatic actuation functions of the containment purge isolation gaseous radiation channels are not required to be OPERABLE.

The automatic actuation logic and actuation relays for the Containment Purge Exhaust Radiation – Gaseous channels (GTRE0022 and GTRE0033) are not required to be OPERABLE during CORE ALTERATIONS or during the movement of irradiated fuel assemblies within containment, except for those BOP ESFAS output actuation relays needed to effect a manual containment purge isolation. If required, the containment purge isolation can be initiated manually from the control room.

In MODES 1,2,3,4 and the other conditions discussed above, the potential exists for an accident that could release fission product radioactivity into containment. Therefore, the containment purge isolation instrumentation must be OPERABLE in these MODES.

(continued)

BASES

APPLICABILITY (continued)

While in MODES 5 and 6 without CORE ALTERATIONS or irradiated fuel movement within containment in progress, the containment purge isolation instrumentation need not be OPERABLE since the potential for radioactive releases is minimized and operator action is sufficient to ensure post accident offsite doses are maintained within the limits of Reference 1.

ACTIONS

The most common cause of channel inoperability is outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by unit specific calibration procedures. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination is generally made during the performance of a COT, when the process instrumentation is set up for adjustment to bring it within specification. If the measured Trip Setpoint is less conservative than the tolerance specified by the calibration procedure, the channel must be declared inoperable immediately and the appropriate Condition entered.

A Note has been added to the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed in Table 3.3.6-1. The Completion Time(s) of the inoperable channel(s)/ train(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

A.1

Condition A applies to the failure of one containment purge isolation gaseous radiation monitor channel. Since two containment purge exhaust gaseous radiation monitor channels are required to meet single failure criteria, the failed channel must be restored to OPERABLE status. The 4 hours allowed to restore the affected channel is justified by the low likelihood of events occurring during this interval, and recognition that the remaining channel will respond.

B.1

Condition B applies to all Containment Purge Isolation Functions and addresses the train orientation of the BOP ESFAS actuation logic and actuation relays for these Functions. It also addresses the failure of both gaseous radiation monitoring channels, or the inability to restore a single failed gaseous radiation monitoring channel to OPERABLE status in the time allowed for Required Action A.1.

(continued)

BASES

ACTIONS

B.1 (continued)

If one or more trains or manual initiation channels are inoperable, both gaseous radiation monitoring channels are inoperable, or the Required Action and associated Completion Time of Condition A are not met, operation may continue as long as the Required Action to place and maintain containment purge supply and exhaust valves in their closed position is met.

A Note is added stating that Condition B is only applicable in MODE 1, 2, 3, or 4.

C.1 and C.2

Condition C applies to the Manual Initiation Function. If one or more manual initiation channels are inoperable, operation may continue as long as the Required Action to place and maintain containment purge supply and exhaust valves in their closed position is met or the applicable Conditions of LCO 3.9.4, "Containment Penetrations," are met for each valve made inoperable by failure of isolation instrumentation. The Completion Time for these Required Actions is Immediately.

A Note states that Condition C is applicable during CORE ALTERATIONS or during movement of irradiated fuel assemblies within containment.

SURVEILLANCE REQUIREMENTS

A Note has been added to the SR Table to clarify that Table 3.3.6-1 determines which SRs apply to which Containment Purge Isolation Functions.

SR 3.3.6.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.6.1 (continued)

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

The Frequency is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

SR 3.3.6.2

SR 3.3.6.2 is the performance of an ACTUATION LOGIC TEST using the BOP ESFAS automatic tester. The continuity check does not have to be performed, as explained in the Note. This SR is applied to the balance of plant actuation logic and relays that do not have circuits installed to perform the continuity check. This test is required every 31 days on a STAGGERED TEST BASIS. The Frequency is adequate based on industry operating experience, considering instrument reliability and operating history data.

SR 3.3.6.3

A COT is performed every 92 days on each required containment purge exhaust gaseous radiation monitor channel to ensure the channel will perform the intended Function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL OPERATIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The Frequency is based on the staff recommendation for increasing the availability of radiation monitors according to NUREG-1366 (Ref. 2). This test verifies the capability of the instrumentation to provide the containment purge system isolation. The setpoint shall be left within the two-sided calibration tolerance band on either side of the nominal value.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.6.4

SR 3.3.6.4 is the performance of a TADOT. This test is a check of the Manual Initiation Function and is performed every 18 months. Each Manual Initiation channel is tested through the BOP ESFAS logic. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The SR is modified by a Note that excludes verification of setpoints during the TADOT. The channels tested have no setpoints associated with them.

The Frequency is based on the known reliability of the Function and the redundancy available, and has been shown to be acceptable through operating experience.

SR 3.3.6.5

A CHANNEL CALIBRATION is performed every 18 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

The Frequency is based on operating experience and is consistent with the typical industry refueling cycle.

SR 3.3.6.6

SR 3.3.6.6 is the performance of the required response time verification every 18 months on a STAGGERED TEST BASIS on those functions with time limits provided in Reference 3. Each verification shall include at least one train such that both trains are verified at least once per 36 months.

(continued)

BASES (continued)

REFERENCES

1. 10 CFR 100.11.
2. NUREG-1366, July 22, 1993.
3. FSAR Table 16.3-2.
4. Callaway OL Amendment No. 20 dated April 10, 1987.
5. Callaway OL Amendment No. 114 dated July 15, 1996.

B 3.3 INSTRUMENTATION

B 3.3.7 Control Room Emergency Ventilation System (CREVS) Actuation Instrumentation

BASES

BACKGROUND

The CREVS provides an enclosed control room environment from which the unit can be operated following an uncontrolled release of radioactivity. During normal operation, the Control Building Ventilation System provides control room ventilation. Upon receipt of an actuation signal, the CREVS initiates filtered ventilation and pressurization of the control room. This system is described in the Bases for LCO 3.7.10, "Control Room Emergency Ventilation System (CREVS)."

The actuation instrumentation consists of two gaseous radiation channels in the control room air intake. A high radiation signal from either of these channels will initiate both trains of the CREVS. Since the radiation monitors include an air sampling system, various components such as sample line valves and sample pumps are required to support monitor OPERABILITY. The control room operator can also initiate CREVS trains by manual switches in the control room. The CREVS is also actuated by a Phase A Isolation signal, a Fuel Building Ventilation Isolation signal (FBVIS), or a high radiation signal from the containment purge exhaust gaseous radiation channels. The Phase A Isolation Function is discussed in LCO 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation."

APPLICABLE SAFETY ANALYSES

The control room must be kept habitable for the operators stationed there during accident recovery and post accident operations.

The CREVS acts to terminate the supply of unfiltered outside air to the control room, initiate filtration, and pressurize the control room. These actions are necessary to ensure the control room is kept habitable for the operators stationed there during accident recovery and post accident operations by minimizing the radiation exposure of control room personnel.

In MODES 1, 2, 3, and 4, (MODE 4 is subject to LCO 3.3.2, Function 3.a), the gaseous radiation channel actuation of the CREVS is a backup for the Phase A Isolation signal actuation. This ensures initiation of the CREVS during a loss of coolant accident or steam generator tube rupture.

The gaseous radiation channel actuation of the CREVS in MODES 5 and 6 , during CORE ALTERATIONS, or during movement of irradiated fuel assemblies within containment is the primary means to ensure control

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

room habitability in the event of a fuel handling accident inside containment or waste gas decay tank rupture accident. The probability of a waste gas decay tank rupture accident occurring during the period of time outside the Applicability of Functions 1 – 3 of Table 3.3.7-1 is insignificant. There are no safety analyses that take credit for CREVS actuation upon high containment purge exhaust radiation. A FBVIS is credited to protect the control room in the event of a design basis fuel handling accident inside the fuel building.

Sources of control room ventilation isolation signal (CRVIS) initiation which are remote from the Control Room intake louvers are not response time tested. For example, GGRE0027 and GGRE0028, which monitor Fuel Building exhaust are not response time tested. The analysis does credit a FBVIS for actuating a CRVIS following a Fuel Handling Accident in the Fuel Building. Due to the remote location of the Fuel Building exhaust radiation monitors relative to the Control Room intake louvers, the FBVIS will isolate the Control Room prior to the post-accident radioactive plume reaching the Control Room intake louvers.

Similarly, for a LOCA, the analysis credits a time zero Control Room isolation. A Safety Injection signal initiates a Containment Isolation Phase A, which initiates a CRVIS. This function is also credited for isolating the Control Room prior to the post-accident radioactive plume reaching the Control Room intake louvers.

For a Fuel Handling Accident within Containment, GKRE0004 and GKRE0005 are credited for initiating a CRVIS. These monitors are not remote from the Control Room intake louvers. They are downstream of the Control Room intake. Therefore, a specific response time is modeled, and a response time Surveillance Requirement is imposed for this CRVIS function.

The CREVS actuation instrumentation satisfies Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

The LCO requirements ensure that instrumentation necessary to initiate the CREVS is OPERABLE.

1. Manual Initiation

The LCO requires two channels OPERABLE. The operator can initiate the CREVS at any time by using either of two push buttons in the control room.

(continued)

BASES

LCO (continued)

1. Manual Initiation (continued)

The LCO for Manual Initiation ensures the proper amount of redundancy is maintained in the manual actuation circuitry to ensure the operator has manual initiation capability.

Each channel consists of one push button and the interconnecting wiring to the actuation logic cabinet.

2. Automatic Actuation Logic and Actuation Relays (BOP ESFAS)

The LCO requires two trains of Actuation Logic and Relays OPERABLE to ensure that no single random failure can prevent automatic actuation of control room ventilation isolation.

Automatic Actuation Logic and Actuation Relays (BOP ESFAS) consist of the same features and operate in the same manner as described for ESFAS Function 6.c, Auxiliary Feedwater.

3. Control Room Radiation – Control Room Air Intake

The LCO specifies two required Control Room Radiation Monitor – Control Room Air Intake gaseous channels (GKRE0004 and GKRE0005) to ensure that the radiation monitoring instrumentation necessary to initiate the CREVS remains OPERABLE.

For sampling systems, channel OPERABILITY involves more than OPERABILITY of channel electronics. OPERABILITY also requires correct valve lineups and sample pump operation, as well as detector OPERABILITY, since these supporting features are necessary for trip to occur under the conditions assumed by the safety analyses. The required radiation monitors' OPERABILITY is not dependent on forced flow in the control room supply duct. GKRE0004 and GKRE0005 OPERABILITY is not dependent on the status of GKHZ0013D/0057A/0150/0151, SGK02, or CGK01A and B. GKRE0004 and GKRE0005 may be considered OPERABLE with CREVS in the CRVIS mode of operation.

4. Containment Isolation - Phase A

Control Room Ventilation Isolation is also initiated by all Table 3.3.2-1 Functions that initiate Containment Isolation - Phase A.

(continued)

BASES

LCO (continued)

4. Containment Isolation - Phase A (continued)

Therefore, the requirements are not repeated in Table 3.3.7-1. Instead, refer to LCO 3.3.2, Function 3.a, for all initiating Functions and requirements.

5. Fuel Building Exhaust Radiation – Gaseous

Control Room Ventilation Isolation is also initiated by high radiation in the fuel building detected by Fuel Building Exhaust Radiation – Gaseous channels (GGRE0027 and GGRE0028). The requirements are not repeated in Table 3.3.7-1. Instead, refer to LCO 3.3.8 for all initiating Functions and requirements.

APPLICABILITY

The Manual Initiation, Automatic Actuation Logic and Actuation Relays (BOP ESFAS), and Control Room Radiation – Control Room Air Intake Functions must be OPERABLE in MODES 1, 2, 3, 4, 5 and 6, during CORE ALTERATIONS, or during movement of irradiated fuel assemblies within containment. These Functions must be OPERABLE in MODES 5 and 6 for a waste gas decay tank rupture accident, to ensure a habitable environment for the control room operators. During CORE ALTERATIONS or during movement of irradiated fuel assemblies within containment, these Functions assure the generation of a CRVIS on detection of high gaseous activity in the event of a fuel handling accident within containment.

During movement of irradiated fuel assemblies in the fuel building, the Fuel Building Exhaust Radiation – Gaseous channels (GGRE0027 and GGRE0028) assure the generation of a CRVIS on detection of high gaseous activity in the event of a fuel handling accident in the fuel building. Since this FBVIS-initiated CRVIS requires Function 2 of Table 3.3.7-1 to complete the actuation circuit, and since manual CRVIS actuation provides back-up, Functions 1 and 2 of Table 3.3.7-1 must also be OPERABLE during movement of irradiated fuel assemblies in the fuel building.

The Containment Isolation – Phase A Function is required to be OPERABLE as directed by LCO 3.3.2, Function 3.a. The Fuel Building Exhaust Radiation – Gaseous Function is required to be OPERABLE as directed by LCO 3.3.8, Functions 1, 2, and 3.

ACTIONS

The most common cause of channel inoperability is outright failure or drift of the bistable or process module sufficient to exceed the tolerance

(continued)

BASES (continued)

ACTIONS (continued)

allowed by the unit specific calibration procedures. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination is generally made during the performance of a COT, when the process instrumentation is set up for adjustment to bring it within specification. It the measured Trip Setpoint is less conservative than the tolerance specified by the calibration procedure, the channel must be declared inoperable immediately and the appropriate Condition entered.

A Note has been added to the ACTIONS indicating that separate Condition entry is allowed for each Function. The Conditions of this Specification may be entered independently for each Function listed in Table 3.3.7-1 in the accompanying LCO. The Completion Time(s) of the inoperable channel(s)/train(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

Placing a CREVS train(s) in the CRVIS mode of operation isolates the unfiltered outside air intake and unfiltered exhaust dampers, and aligns the system for recirculation of the control room air through HEPA filters and charcoal adsorbers. This mode of operation also initiates pressurization and filtered ventilation of the air supply to the control room. Further discussion of the CRVIS mode of operation may be found in the Bases for LCO 3.7.10, "Control Room Emergency Ventilation System (CREVS)," and in Reference 1.

A.1

Condition A applies to CREVS Functions 1, 2, and 3 (i.e., the actuation logic train Function of the BOP ESFAS, the gaseous radiation monitor channel Function, and the manual initiation channel Function).

If one channel or train is inoperable, or one gaseous radiation monitor channel is inoperable, 7 days are permitted to restore it to OPERABLE status. The 7 day Completion Time is the same as is allowed if one train of the mechanical portion of the system is inoperable. The basis for this Completion Time is the same as provided in LCO 3.7.10. If the channel/train cannot be restored to OPERABLE status, one CREVS train must be placed in the Control Room Ventilation Isolation Signal (CRVIS) mode of operation. This accomplishes the actuation instrumentation Function and places the unit in a conservative mode of operation.

(continued)

BASES (continued)

ACTIONS (continued)

B.1.1, B.1.2, and B.2

Condition B applies to the failure of two CREVS actuation logic trains (BOP ESFAS) or two manual initiation channels. Condition B is modified by a Note stating this Condition is not applicable to Function 3.

Function 3 in Table 3.3.7-1 applies to the Control Room Radiation - Control Room Air Intake gaseous channels. The first Required Action is to place one CREVS train in the CRVIS mode of operation immediately.

This accomplishes the actuation instrumentation Function that has been lost and places the unit in a conservative mode of operation. The applicable Conditions and Required Actions of LCO 3.7.10 must also be entered immediately for one CREVS train made inoperable by the inoperable actuation instrumentation. This ensures appropriate limits are placed upon train inoperability as discussed in the Bases for LCO 3.7.10.

Alternatively, both trains may be placed in the CRVIS mode immediately. This ensures the CREVS function is performed even in the presence of a single failure.

C.1.1, C.1.2, and C.2

Condition C applies to the failure of both gaseous radiation monitoring channels. The first Required Action is to enter the applicable Conditions and Required Actions of LCO 3.7.10 immediately for one CREVS train made inoperable by the inoperable actuation instrumentation. This ensures appropriate limits are placed upon train inoperability as discussed in the Bases for LCO 3.7.10. One CREVS train must also be placed in the CRVIS mode of operation within 1 hour. This accomplishes the actuation instrumentation Function that has been lost and places the unit in a conservative mode of operation. The 1 hour Completion Time allows for activities such as changing sample filters on the OPERABLE channel while in Condition A, which requires entry into Condition C.

Alternatively, both trains may be placed in the CRVIS mode within 1 hour. This ensures the CREVS function is performed even in the presence of a single failure.

D.1 and D.2

Condition D applies when the Required Action and associated Completion Time for Conditions A, B, or C have not been met and the unit is in MODE 1, 2, 3 or 4. The unit must be brought to a MODE in which the

(continued)

BASES

ACTIONS (continued)

D.1 and D.2 (continued)

LCO requirements are not applicable. To achieve this status, the unit must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

E.1 and E.2

Condition E applies when the Required Action and associated Completion Time for Conditions A, B, or C have not been met in MODE 5 or 6, or during CORE ALTERATIONS, or when irradiated fuel assemblies are being moved. Movement of irradiated fuel assemblies and CORE ALTERATIONS must be suspended immediately to reduce the risk of accidents that would require CREVS actuation. This does not preclude movement of a component to a safe position.

SURVEILLANCE REQUIREMENTS

A Note has been added to the SR Table to clarify that Table 3.3.7-1 determines which SRs apply to which CREVS Actuation Functions.

SR 3.3.7.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

The Frequency is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal,

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.7.1 (continued)

but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

Either the RM-11 or RM-23 displays may be used to perform the CHANNEL CHECK for the Control Room Radiation - Control Room Air Intake gaseous channels (GKRE0004 and GKRE0005).

SR 3.3.7.2

A COT is performed once every 92 days on each required control room air intake gaseous radiation monitor channel to ensure the channel will perform the intended function. This test verifies the capability of the instrumentation to provide the CREVS actuation. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL OPERATIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The setpoints shall be left within the two-sided calibration tolerance band on either side of the nominal value. The Frequency is based on the known reliability of the monitoring equipment and has been shown to be acceptable through operating experience.

SR 3.3.7.3

SR 3.3.7.3 is the performance of an ACTUATION LOGIC TEST using the BOP ESFAS automatic tester. The continuity check does not have to be performed, as explained in the Note. This SR is applied to the balance of plant actuation logic and relays that do not have circuits installed to perform the continuity check. This test is required every 31 days on a STAGGERED TEST BASIS. The Frequency is adequate based on industry operating experience, considering instrument reliability and operating history data.

SR 3.3.7.4

SR 3.3.7.4 is the performance of a TADOT. This test is a check of the Manual Initiation Function and is performed every 18 months. Each Manual Initiation channel is tested through the BOP ESFAS logic. A successful test of the required contact(s) of a channel relay may be

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.7.4 (continued)

performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The Frequency is based on the known reliability of the Function and the redundancy available, and has been shown to be acceptable through operating experience. The SR is modified by a Note that excludes verification of setpoints during the TADOT. The channels tested have no setpoints associated with them.

SR 3.3.7.5

A CHANNEL CALIBRATION is performed every 18 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

The Frequency is based on operating experience and is consistent with the typical industry refueling cycle.

SR 3.3.7.6

SR 3.3.7.6 is the performance of the required response time verification every 18 months on a STAGGERED TEST BASIS on those functions with time limits provided in Reference 2. Each verification shall include at least one train such that both trains are verified at least once per 36 months.

SR 3.3.7.6 is modified by a Note stating that the radiation monitor detectors are excluded from ESF RESPONSE TIME testing. The Note is necessary because of the difficulty associated with generating an appropriate radiation monitor detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response. Response time of the channel shall be verified from the detector output or input to the first electronic component in the channel.

continued

BASES (continued)

REFERENCES

1. FSAR Section 7.3.4 and Table 7.3-8.
2. FSAR Table 16.3-2.

B 3.3 INSTRUMENTATION

B 3.3.8 Emergency Exhaust System (EES) Actuation Instrumentation

BASES

BACKGROUND

The EES ensures that radioactive materials in the fuel building atmosphere following a fuel handling accident are filtered and adsorbed prior to exhausting to the environment. The system is described in the Bases for LCO 3.7.13, "Emergency Exhaust System." The system initiates filtered exhaust from the fuel building following receipt of a fuel building ventilation isolation signal (FBVIS), initiated manually or automatically upon a high radiation signal (gaseous).

High gaseous radiation, monitored by two channels, provides an FBVIS. Both EES trains are initiated by high radiation detected by either channel. Each channel contains a gaseous monitor. High radiation detected by either monitor initiates fuel building isolation, starts the EES, and initiates a CRVIS. These actions function to prevent exfiltration of contaminated air by initiating filtered exhaust, which imposes a negative pressure on the fuel building. Since the radiation monitors include an air sampling system, various components such as sample line valves and sample pumps are required to support monitor OPERABILITY. In the FBVIS mode, each train is capable of maintaining the fuel building at a negative pressure of less than or equal to 0.25 inches water gauge relative to the outside atmosphere.

The EES is also actuated in the LOCA (SIS) mode as described in the Bases for LCO 3.3.2, "ESFAS Instrumentation."

APPLICABLE SAFETY ANALYSES

The EES ensures that radioactive materials in the fuel building atmosphere following a fuel handling accident are filtered and adsorbed prior to being exhausted to the environment. This action reduces the radioactive content in the fuel building exhaust following a fuel handling accident so that offsite doses remain within the limits specified in 10 CFR 100 (Ref. 1) and control room habitability is maintained.

The EES actuation instrumentation satisfies Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

The LCO requirements ensure that instrumentation necessary to initiate the EES is OPERABLE.

(continued)

BASES

LCO (continued)

1. Manual Initiation

The LCO requires two channels OPERABLE. The operator can initiate the EES at any time by using either of two push buttons in the control room.

The LCO for Manual Initiation ensures the proper amount of redundancy is maintained in the manual actuation circuitry to ensure the operator has manual initiation capability.

Each channel consists of one push button and the interconnecting wiring to the actuation logic cabinet.

2. Automatic Actuation Logic and Actuation Relays (BOP ESFAS)

The LCO requires two trains of Actuation Logic and Relays OPERABLE to ensure that no single random failure can prevent automatic actuation. This consists of the same features and operates in the same manner as described for ESFAS Function 6.c, Auxiliary Feedwater.

3. Fuel Building Exhaust Radiation - Gaseous

The LCO specifies two required Fuel Building Exhaust Radiation – Gaseous channels (GGRE0027 and GGRE0028) to ensure that the radiation monitoring instrumentation necessary to initiate the FBVIS and CRVIS remains OPERABLE.

For sampling systems, channel OPERABILITY involves more than OPERABILITY of channel electronics. OPERABILITY also requires correct valve lineups, sample pump operation, and detector OPERABILITY, since these supporting features are necessary for actuation to occur under the conditions assumed by the safety analyses. The required radiation monitors remain OPERABLE if one or both Emergency Exhaust System trains are inoperable or following a Fuel Building Ventilation Isolation Signal (FBVIS). Both required radiation monitors remain OPERABLE if the normal Fuel Building exhaust flow is isolated.

The submersion dose rate basis for the nominal Trip Setpoint is specified for the gaseous monitors in the LCO. The nominal Trip Setpoint accounts for instrument uncertainties.

(continued)

BASES (continued)

APPLICABILITY

The manual and automatic EES initiation must be OPERABLE when moving irradiated fuel assemblies in the fuel building to ensure the EES operates to remove fission products associated with a fuel handling accident and isolate control room ventilation.

High radiation initiation of the FBVIS must be OPERABLE during movement of irradiated fuel assemblies in the fuel building to ensure automatic initiation of the EES and a CRVIS when the potential for a fuel handling accident exists.

ACTIONS

The most common cause of channel inoperability is outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by unit specific calibration procedures. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination is generally made during the performance of a COT, when the process instrumentation is set up for adjustment to bring it within specification. If the measured Trip Setpoint is less conservative than the tolerance specified by the calibration procedure, the channel must be declared inoperable immediately and the appropriate Condition entered.

A Note has been added to the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed in Table 3.3.8-1 in the accompanying LCO. The Completion Time(s) of the inoperable channel(s)/train(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

Placing a EES train(s) in the FBVIS mode of operation isolates normal air discharge from the fuel building and initiates filtered exhaust, imposing a negative pressure on the fuel building. Further discussion of the FBVIS mode of operation may be found in the Bases for LCO 3.7.13, "Emergency Exhaust System (EES)," and in Reference 2.

A.1

Condition A applies to the actuation logic train Function of the BOP ESFAS, the gaseous radiation monitor channel Function, and the manual initiation channel Function. Condition A applies to the failure of a single actuation logic train, gaseous radiation monitor channel, or manual initiation channel. If one channel or train is inoperable, or one gaseous radiation monitor channel is inoperable, a period of 7 days is allowed to

(continued)

BASES

ACTIONS

A.1 (continued)

restore it to OPERABLE status. If the channel or train cannot be restored to OPERABLE status, one EES train must be placed in the FBVIS mode of operation and one CREVS train must be placed in the CRVIS mode. This accomplishes the actuation instrumentation Function and places the unit in a conservative mode of operation. The 7 day Completion Time is the same as is allowed if one train of the mechanical portion of the system is inoperable. The basis for this time is the same as that provided in LCO 3.7.13.

B.1.1, B.1.2, and B.2

Condition B applies to the failure of two EES actuation logic trains (BOP ESFAS) or two manual initiation channels. Condition B is modified by a Note stating this Condition is not applicable to Function 3. Function 3 in Table 3.3.8-1 covers the Fuel Building Exhaust Radiation – Gaseous channels. The first Required Action is to place one EES train in the FBVIS mode of operation and one CREVS train in the CRVIS mode of operation immediately. This accomplishes the actuation instrumentation Function that has been lost and places the unit in a conservative mode of operation. The applicable Conditions and Required Actions of LCO 3.7.13 must also be entered immediately for one EES train made inoperable and the applicable Conditions and Required Actions of LCO 3.7.10 must be entered immediately for one CREVS train made inoperable by the inoperable actuation instrumentation. This ensures appropriate limits are placed on train inoperability as discussed in the Bases for LCO 3.7.13 and LCO 3.7.10.

Alternatively, both EES trains may be placed in the FBVIS mode and both CREVS trains in the CRVIS mode immediately. This ensures the EES function is performed even in the presence of a single failure.

C.1.1, C.1.2, and C.2

Condition C applies to the failure of both gaseous radiation monitoring channels. The first Required Action is to enter the applicable Conditions and Required Actions of LCO 3.7.13 immediately for one EES train made inoperable and the applicable Conditions and Required Actions of LCO 3.7.10 must be entered immediately for one CREVS train made inoperable by the inoperable actuation instrumentation. This ensures appropriate limits are placed upon train inoperability as discussed in the Bases for LCO 3.7.13 and LCO 3.7.10. One EES train must also be

(continued)

BASES

ACTIONS

C.1.1, C.1.2, and C.2 (continued)

placed in the FBVIS mode of operation and one CREVS train in the CRVIS mode of operation within 1 hour. This accomplishes the actuation instrumentation Function that has been lost and places the unit in a conservative mode of operation. The 1 hour Completion Time allows for activities such as changing sample filters on the OPERABLE channel while in Condition A, which requires entry into Condition C.

Alternatively, both EES trains may be placed in the FBVIS mode and both CREVS trains in the CRVIS mode within 1 hour. This ensures the EES function is performed even in the presence of a single failure.

D.1

Condition D applies when the Required Action and associated Completion Time for Conditions A, B, or C have not been met and irradiated fuel assemblies are being moved in the fuel building. Movement of irradiated fuel assemblies in the fuel building must be suspended immediately to eliminate the potential for events that could require EES actuation. This does not preclude movement of a fuel assembly to a safe position.

SURVEILLANCE REQUIREMENTS

A Note has been added to the SR Table to clarify that Table 3.3.8-1 determines which SRs apply to which EES Actuation Functions.

SR 3.3.8.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.8.1 (continued)

that the sensor or the signal processing equipment has drifted outside its limit.

The Frequency is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

Either the RM-11 or RM-23 displays may be used to perform the CHANNEL CHECK for the Fuel Building Exhaust Radiation – Gaseous channels (GGRE0027 and GGRE0028).

SR 3.3.8.2

A COT is performed once every 92 days on each required fuel building exhaust gaseous radiation monitor channel to ensure the channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL OPERATIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. This test verifies the capability of the instrumentation to provide the EES actuation. The setpoints shall be left within the two-sided calibration tolerance band on either side of the nominal value. The Frequency of 92 days is based on the known reliability of the monitoring equipment and has been shown to be acceptable through operating experience.

SR 3.3.8.3

SR 3.3.8.3 is the performance of an ACTUATION LOGIC TEST. The actuation logic is tested every 31 days on a STAGGERED TEST BASIS. All possible logic combinations are tested for each protection function. The Frequency is based on the known reliability of the relays and controls and the multichannel redundancy available, and has been shown to be acceptable through operating experience. The SR is modified by a Note stating that the continuity check may be excluded. This SR is applied to the balance of plant actuation logic and relays that do not have circuits installed to perform the continuity check.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.8.4

SR 3.3.8.4 is the performance of a TADOT. This test is a check of the Manual Initiation Function and is performed every 18 months. Each Manual Initiation channel is tested through the BOP ESFAS logic. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The Frequency is based on operating experience and is consistent with the typical industry refueling cycle. The SR is modified by a Note that excludes verification of setpoints during the TADOT. The channels tested have no setpoints associated with them.

SR 3.3.8.5

A CHANNEL CALIBRATION is performed every 18 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. The Frequency is based on operating experience and is consistent with the typical industry refueling cycle.

REFERENCES

1. 10 CFR 100.11.

2. FSAR Section 7.3.3 and Table 7.3-5.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.14 RCS Pressure Isolation Valve (PIV) Leakage

BASES

BACKGROUND

10 CFR 50.2, 10 CFR 50.55a(c), and GDC 55 of 10 CFR 50, Appendix A (Refs. 1, 2, and 3), define RCS PIVs as any two normally closed valves in series within the reactor coolant pressure boundary (RCPB), which separate the high pressure RCS from an attached low pressure system. During their lives, these valves can produce varying amounts of reactor coolant leakage through either normal operational wear or mechanical deterioration. The RCS PIV Leakage LCO allows RCS high pressure operation when leakage through these valves exists in amounts that do not compromise safety.

The PIV leakage limit applies to each individual valve. Leakage through both series PIVs in a line must be included as part of the identified LEAKAGE, governed by LCO 3.4.13, "RCS Operational LEAKAGE." This is true during operation only when the loss of RCS mass through two series valves is determined by a water inventory balance (SR 3.4.13.1). A known component of the identified LEAKAGE before operation begins is the least of the two individual leak rates determined for leaking series PIVs during the required surveillance testing; leakage measured through one PIV in a line is not RCS operational LEAKAGE if the other is leaktight.

Although this specification provides a limit on allowable PIV leakage rate, its main purpose is to prevent overpressure failure of the low pressure portions of connecting systems. The leakage limit is an indication that the PIVs between the RCS and the connecting systems are degraded or degrading. PIV leakage could lead to overpressure of the low pressure piping or components. Failure consequences could be a loss of coolant accident (LOCA) outside of containment, an unanalyzed accident, that could degrade the ability for low pressure injection.

The basis for this LCO is the 1975 NRC "Reactor Safety Study" (Ref. 4) that identified potential intersystem LOCAs as a significant contributor to the risk of core melt. A subsequent study (Ref. 5) evaluated various PIV configurations to determine the probability of intersystem LOCAs.

PIVs are provided to isolate the RCS from the following typically connected systems:

a. Residual Heat Removal (RHR) System;

(continued)

BASES

BACKGROUND (continued)

b. Safety Injection System; and

c. Chemical and Volume Control System.

The PIVs are listed below :

VALVE NUMBER	VALVE SIZE (in.)	FUNCTION	MAXIMUM ALLOWABLE LEAKAGE (gpm)
BB8948A	10	RCS Loop 1 Cold Leg SI Accu Chck	5.0
BB8948B	10	RCS Loop 2 Cold Leg SI Accu Chck	5.0
BB8948C	10	RCS Loop 3 Cold Leg SI Accu Chck	5.0
BB8948D	10	RCS Loop 4 Cold Leg SI Accu Chck	5.0
BB8949B	6	RCS Loop 2 Hot Leg SI/RHR Pump Chck	3.0
BB8949C	6	RCS Loop 3 Hot Leg SI/RHR Pump Chck	3.0
BB8949D	6	RCS Loop 4 Hot Leg SI/RHR Pump Chck	3.0
BB8949E	2	RCS Loop 1 Hot Leg SI/RHR Pump Chck	1.0
BBV0001	1.5	RCS Loop 1 Cold Leg SI/Boron Injection Header Chck	0.75
BBV0022	1.5	RCS Loop 2 Cold Leg SI/Boron Injection Header Chck	0.75
BBV0040	1.5	RCS Loop 3 Cold Leg SI/Boron Injection Header Chck	0.75
BBV0059	1.5	RCS Loop 4 Cold Leg SI/Boron Injection Header Chck	0.75
BBPV8702A	12	RCS Loop 1 Hot Leg to RHR Pumps ISO	5.0
BBPV8702B	12	RCS Loop 4 Hot Leg to RHR Pumps ISO	5.0
EJ8841A	6	RHR TRNS SIS Hot Leg Loop 2 Recirc	3.0
EJ8841B	6	RHR TRNS SIS Hot Leg Loop 3 Recirc	3.0
EJHV8701A	12	RHR Pump A Suction ISO	5.0
EJHV8701B	12	RHR Pump B Suction ISO	5.0
EMV0001	2	SI Pump A Disch to Hot Leg Loop 2 Chck	1.0
EMV0002	2	SI Pump A Disch to Hot Leg Loop 3 Chck	1.0
EMV0003	2	SI Pump B Disch to Hot Leg Loop 1 Chck	1.0
EMV0004	2	SI Pump B Disch to Hot Leg Loop 4 Chck	1.0
EM8815	3	Boron Injection Header CVCS Out Check	1.5
EPV0010	2	SI Pumps to RCS Cold Leg Loop 1 Chck	1.0
EPV0020	2	SI Pumps to RCS Cold Leg Loop 2 Chck	1.0
EPV0030	2	SI Pumps to RCS Cold Leg Loop 3 Chck	1.0
EPV0040	2	SI Pumps to RCS Cold Leg Loop 4 Chck	1.0
EP8818A	6	RHR Pumps to RCS Cold Leg Loop 1 Chck	3.0
EP8818B	6	RHR Pumps to RCS Cold Leg Loop 2 Chck	3.0
EP8818C	6	RHR Pumps to RCS Cold Leg Loop 3 Chck	3.0

(continued)

BASES

BACKGROUND (continued)

available, the Engineered Safety Feature (ESF) buses shed selected loads and are connected to the emergency diesel generators (EDGs). Safeguard loads are then actuated in the programmed time sequence. The time delay associated with diesel starting, sequenced loading, and pump starting determines the time required before pumped flow is available to the core following a LOCA.

The active ECCS components, along with the passive accumulators and the RWST covered in LCO 3.5.1, "Accumulators," and LCO 3.5.4, "Refueling Water Storage Tank (RWST)," provide the cooling water necessary to meet GDC 35 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The LCO helps to ensure that the following acceptance criteria for the ECCS, established by 10 CFR 50.46 (Ref. 2), will be met following a LOCA:

a. Maximum fuel element cladding temperature is ≤ 2200°F;

b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;

c. Maximum hydrogen generation from a zirconium water reaction is ≤ 0.01 times the hypothetical amount generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;

d. Core is maintained in a coolable geometry; and

e. Adequate long term core cooling capability is maintained.

The LCO also limits the potential for a post trip return to power following an MSLB event and ensures that containment temperature limits are met.

Each ECCS subsystem is taken credit for in a large break LOCA event at full power (Refs. 3 and 4). This event establishes the requirement for runout flow for the ECCS pumps, as well as the maximum response time for their actuation. The centrifugal charging pumps and SI pumps are credited in a small break LOCA event. This event establishes the flow and discharge head at the design point for the centrifugal charging pumps. The SGTR and MSLB events also credit the centrifugal charging pumps. The OPERABILITY requirements for the ECCS are based on the following LOCA analysis assumptions:

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

a. A large break LOCA event, with a loss of offsite power and a single failure disabling one ECCS train; and

b. A small break LOCA event, with a loss of offsite power and a single failure disabling one ECCS train.

During the blowdown stage of a LOCA, the RCS depressurizes as primary coolant is ejected through the break into the containment. The nuclear reaction is terminated either by moderator voiding during large breaks or control rod insertion for small breaks. Following depressurization, emergency core cooling water is injected into the cold legs, flows into the downcomer, fills the lower plenum, and refloods the core.

The effects on containment mass and energy releases are accounted for in appropriate analyses (Refs. 3 and 4). The LCO ensures that an ECCS train will deliver sufficient water to match boiloff rates soon enough to minimize the consequences of the core being uncovered following a large LOCA. It also ensures that the centrifugal charging and SI pumps will deliver sufficient water and boron during a small LOCA to maintain core subcriticality. For smaller LOCAs, the centrifugal charging pump delivers sufficient fluid to maintain RCS inventory. For a small break LOCA, the steam generators continue to serve as the heat sink, providing part of the required core cooling.

The safety analyses make assumptions with respect to: (1) both the maximum and minimum total system resistance; (2) both the maximum and minimum branch injection line resistance; and (3) the maximum and minimum ranges of potential pump performance. These resistances and ranges of pump performance are used to calculate the maximum and minimum ECCS flows assumed in the safety analyses.

The CCP minimum flow SR in FSAR Section 16.5 provides the absolute minimum injected flow (at zero RCS pressure) assumed in the safety analyses (305.25 gpm). The maximum total system resistance defines the range of minimum flows (including the minimum flow SR), with respect to pump head, that is assumed in the safety analyses. Therefore, the CCP total system resistance $\left(\left[P_d + \left(Z_d - Z_{RCS}\right)\right]/Q_d^2\right)$ must not be greater than 1.004E-02 ft/gpm^2, where P_d is pump discharge pressure in feet, Z_d is the pump discharge elevation in feet, Z_{RCS} is RCS water level elevation in feet, and Q_d is the total pump flow rate in gpm.

The SI pump minimum flow SR in FSAR Section 16.5 provides the absolute minimum injected flow (at zero RCS pressure) assumed in the

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

safety analyses (455.6 gpm). The maximum total system resistance defines the range of minimum flows, with respect to pump head, that is assumed in the safety analyses. Therefore, the safety injection pump total system resistance $((P_d-P_{RCS})/Q_d^2)$ must not be greater than 0.423E-02 ft/gpm^2, where P_d is pump discharge pressure in feet, P_{RCS} is RCS pressure in feet, and Q_d is the total pump flow rate in gpm.

The CCP maximum total pump flow SR in FSAR Section 16.5 ensures the maximum injection flow limit of 550 gpm is not exceeded. This value of flow is comprised of the total flow to the four branch lines of 461 gpm and a seal injection flow of 87 gpm plus 2 gpm for instrument uncertainties. A best estimate increase of 17 gpm when aligned in the recirculation phase (maximum flow of 567 gpm) is discussed in References 8 and 9.

The SI pump maximum total pump flow SR in FSAR Section 16.5 ensures the maximum injection flow limit of 675 gpm is not exceeded. This value of flow includes a nominal 30 gpm of mini-flow. A best estimate increase of 16 gpm when aligned in the recirculation phase (maximum flow of 691 gpm) is discussed in References 8 and 9.

The test procedure places requirements on instrument accuracy (20 inches of water column for the charging branch lines and 10 inches of water column for the safety injection branch lines) and setting tolerance (30 inches of water column for both the charging and safety injection branch lines) such that branch line flow imbalance remains within the assumptions of the safety analyses.

The maximum and minimum potential pump performance curves, in conjunction with the maximum and minimum flow SRs, the maximum total system resistance, and the test procedure requirements, ensure that the assumptions of the safety analyses remain valid.

The surveillance flow and differential pressure requirements are the Safety Analysis Limits and do not include instrument uncertainties. These instrument uncertainties will be accounted for in the surveillance test procedure to assure that the Safety Analysis Limits are met.

The ECCS trains satisfy Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

In MODES 1, 2, and 3, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

(continued)

BASES

LCO (continued)

In MODES 1, 2, and 3, an ECCS train consists of a centrifugal charging subsystem, an SI subsystem, and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an SI signal and automatically transferring suction to the containment sump.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the four cold leg injection nozzles. Either of the CCPs may be considered OPERABLE with its associated discharge to RCP seal throttle valve, BGHV8357A or BGHV8357B, inoperable. In the long term, the injection flow path may be switched to take its supply from the containment sump and to supply its flow to the RCS hot and cold legs.

During cold leg recirculation operation, the flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

As indicated in Note 1, the SI flow paths may be isolated for 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.14.1. The flow paths are readily restorable from the control room.

As indicated in Note 2, operation in MODE 3 with ECCS pumps made incapable of injecting, pursuant to LCO 3.4.12, "Cold Overpressure Mitigation System (COMS)," is allowed for up to 4 hours or until the temperature of all RCS cold legs exceeds 375°F, whichever comes first. LCO 3.4.12 requires that certain pumps be rendered incapable of injecting at and below the COMS arming temperature and time is needed to restore the pumps to OPERABLE status.

APPLICABILITY

In MODES 1, 2, and 3, the ECCS OPERABILITY requirements for the limiting Design Basis Accident, a large break LOCA, are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The centrifugal charging pump performance is based on a small break LOCA, which establishes the pump performance curve and has less dependence on power (minimum ECCS large break LOCA assumes the same CCP flow rates as the small break LOCA analysis). The SI pump performance requirements are based on a small break LOCA. MODE 2 and MODE 3 requirements are bounded by the MODE 1 analysis.

This LCO is only applicable in MODE 3 and above. The SI signals on low pressurizer pressure and low steam line pressure may be blocked

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2.5 and SR 3.5.2.6 (continued)

receipt of an actual or simulated RWST Level Low-Low-1 Automatic Transfer signal coincident with an SI signal. In addition to testing that automatic function, SR 3.5.2.5 demonstrates that the RWST to RHR pump suction isolation valves (BNHV8812A/B) are capable of automatic closure after the EJHV8811A/B valves are fully open. The valve interlock functions are depicted in Reference 10. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for unplanned plant transients if the Surveillances were performed with the reactor at power. The 18 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of ESF Actuation System testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.7

The correct position of throttle valves in the flow path is necessary for proper ECCS performance. These valves have mechanical stops to allow proper positioning for restricted flow to a ruptured cold leg, ensuring that the other cold legs receive at least the required minimum flow. The 18 month Frequency is based on the same reasons as those stated in SR 3.5.2.5 and SR 3.5.2.6. The ECCS throttle valves are set to ensure proper flow resistance and pressure drop in the piping to each injection point in the event of a LOCA. Once set, these throttle valves are secured with locking devices and mechanical position stops. These devices help to ensure that the following safety analyses assumptions remain valid: (1) both the maximum and minimum total system resistance; (2) both the maximum and minimum branch injection line resistance; and (3) the maximum and minimum ranges of potential pump performance. These resistances and pump performance ranges are used to calculate the maximum and minimum ECCS flows assumed in the LOCA analyses of Reference 3.

SR 3.5.2.8

Periodic inspections of the containment sump suction inlet ensure that it is unrestricted and stays in proper operating condition. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage, on the need to have access to the location, and because of the potential for an unplanned transient if the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2.8 (continued)

Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. FSAR, Sections 6.3 and 15.6.
4. FSAR, Chapter 15, "Accident Analysis."
5. NRC Memorandum to V. Stello, Jr., from R. L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
6. IE Information Notice No. 87-01.
7. RFR-14801A.
8. ULNRC-2535 dated 12-18-91 (for SI and RHR pumps) and ULNRC-04583 dated 12-13-01 (for CCPs).
9. OL Amendment No. 68 dated 3-24-92 (for SI and RHR pumps and OL Amendment No. 150 dated 5-2-02 (for CCPs).
10. FSAR Figure 7.6-3.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.4.2 (continued)

is normally stable and is protected by a low level alarm set above the required water volume, a 7 day Frequency is appropriate and has been shown to be acceptable through operating experience.

SR 3.5.4.3

The boron concentration of the RWST should be verified every 7 days to be within the required limits. This SR ensures that the reactor will remain subcritical following a LOCA. Further, it assures that the resulting sump pH will be maintained in an acceptable range so that boron precipitation in the core will not occur and the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the RWST volume is normally stable, a 7 day sampling Frequency to verify boron concentration is appropriate and has been shown to be acceptable through operating experience.

REFERENCES

1. FSAR, Chapter 6 and Chapter 15.
2. RFR-17070A.
3. FSAR Section 6.2.1.5 and Table 15.6-11.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Seal Injection Flow

BASES

BACKGROUND

This LCO is applicable to Callaway since the plant utilizes the centrifugal charging pumps for safety injection (SI). The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves in that each restricts flow from the centrifugal charging pump header to the Reactor Coolant System (RCS).

The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of ECCS flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during SI.

APPLICABLE SAFETY ANALYSES

All ECCS subsystems are taken credit for in the large break loss of coolant accident (LOCA) at full power (Ref. 1). The LOCA analysis establishes the minimum flow for the ECCS pumps. The centrifugal charging pumps are also credited in the small break LOCA analysis. This analysis establishes the flow and discharge head at the design point for the centrifugal charging pumps. The safety analyses make assumptions with respect to: (1) both the maximum and minimum total system resistance; (2) both the maximum and minimum branch injection line resistance; and (3) the maximum and minimum ranges of potential pump performance. These resistances and ranges of pump performance are used to calculate the maximum and minimum ECCS flows assumed in the safety analyses. The CCP maximum total pump flow SR in FSAR Section 16.5 ensures the maximum injection flow limit of 550 gpm is not exceeded. This value of flow is comprised of the total flow to the four branch lines of 461 gpm and a seal injection flow of 87gpm plus 2 gpm for instrument uncertainties. The Bases for LCO 3.5.2, "ECCS - Operating," contain additional discussion on the safety analyses. The steam generator tube rupture and main steam line break event analyses also credit the centrifugal charging pumps, but are not limiting in their design. Reference to these analyses is made in assessing changes to the Seal Injection System for evaluation of their effects in relation to the acceptance limits in these analyses.

This LCO ensures that seal injection flow will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the centrifugal charging pumps will deliver sufficient water for a small break

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the centrifugal charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory. Seal injection flow satisfies Criterion 2 of 10CFR50.36(c)(2)(ii).

LCO

The intent of the LCO limit on seal injection flow is to make sure that flow through the RCP seal water injection line is low enough to ensure that sufficient centrifugal charging pump injection flow is directed to the RCS via the injection points (Ref. 2).

The LCO is not strictly a flow limit, but rather a flow limit based on a flow line resistance. In order to establish the proper flow line resistance, a pressure and flow must be known. The flow line resistance is established by adjusting the RCP seal water injection throttle valves such that the analyzed ECCS flow to the RCP seals is limited to 89 gpm with one centrifugal charging pump (CCP) operating at 550 gpm on its maximum pump curve. This accident analysis limit is met by positioning the valves so that the flow to the RCP seals is within the limits of Technical Specifications Figure 3.5.5-1 for a given differential pressure between the charging pump discharge header and the RCS pressurizer steam space pressure. The seal injection flow curve is presented with the pressure difference from BGPT0120 to the pressurizer steam space pressure as a function of total seal injection line flow. A flow measurement instrument uncertainty of 0.25 gpm per loop was accounted for in the calculation of the pressure drop from BGPT0120 to the seal injection connection. In addition, 2 psid is added to accommodate instrument uncertainty in the pressure drop measurement. An additional 4 psid has been conservatively added to the required pressure differential to allow for seal injection filter change out. Requiring as an initial condition that the filter used for each surveillance have a differential pressure less than or equal to 4 psid allows for post-surveillance filter change out with no differential pressure restriction. Once set, these throttle valves are secured with locking devices and mechanical position stops. These devices help to ensure that the following safety analyses assumptions remain valid: (1) both the maximum and minimum total system resistance; (2) both the maximum and minimum branch injection line resistance; and (3) the maximum and minimum ranges of potential pump performance. These resistances and pump performance ranges are used to calculate the maximum and minimum ECCS flows assumed in the LOCA analyses of Reference 1. The centrifugal charging pump discharge header pressure remains essentially constant through all the applicable MODES of this LCO. A reduction in RCS pressure would result in more flow being diverted to the RCP seal injection line than at normal operating pressure. The valve settings established at the prescribed differential pressure result in a conservative valve position should RCS pressure decrease.

(continued)

BASES

LCO (continued)

The limit on seal injection flow must be met to render the ECCS OPERABLE. If these conditions are not met, the ECCS flow will not be as assumed in the accident analyses.

APPLICABILITY

In MODES 1, 2, and 3, the seal injection flow limit is dictated by ECCS flow requirements, which are specified for MODES 1, 2, 3, and 4. The seal injection flow limit is not applicable for MODE 4 and lower, however, because high seal injection flow is less critical as a result of the lower initial RCS pressure and decay heat removal requirements in these MODES. Therefore, RCP seal injection flow must be limited in MODES 1, 2, and 3 to ensure adequate ECCS performance.

ACTIONS

A.1

With the seal injection flow exceeding its limit, the amount of charging flow available to the RCS may be reduced. Under this Condition, action must be taken to restore the flow to below its limit. The operator has 4 hours from the time the flow is known to be above the limit to correctly position the manual seal injection throttle valves and thus be in compliance with the accident analysis. The Completion Time minimizes the potential exposure of the plant to a LOCA with insufficient injection flow and provides a reasonable time to restore seal injection flow within limits. This time is conservative with respect to the Completion Times of other ECCS LCOs; it is based on operating experience and is sufficient for taking corrective actions by operations personnel.

B.1 and B.2

When the Required Action cannot be completed within the required Completion Time, a controlled shutdown must be initiated. The Completion Time of 6 hours for reaching MODE 3 from MODE 1 is a reasonable time for a controlled shutdown, based on operating experience and normal cooldown rates, and does not challenge plant safety systems or operators. Continuing the plant shutdown begun in Required Action B.1, an additional 6 hours is a reasonable time, based on operating experience and normal cooldown rates, to reach MODE 4 where this LCO is no longer applicable.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

Verification every 18 months that the manual seal injection throttle valves are adjusted to give a flow within the limit ensures that proper manual seal injection throttle valve position, and hence, proper seal injection flow,

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1 (continued)

is maintained. The seal water injection throttle valves are set to ensure proper flow resistance and pressure drop in the piping to each injection point in the event of a LOCA. The seal injection flow line resistance is established by adjusting the RCP seal water injection throttle valves such that the analyzed ECCS flow to the RCP seals is limited to 89 gpm with one centrifugal charging pump (CCP) operating at 550 gpm on its maximum pump curve. This accident analysis limit is met by positioning the valves so that the flow to the RCP seals is within the limits of Technical Specifications Figure 3.5.5-1 for a given differential pressure between the charging pump discharge header and the RCS pressurizer steam space pressure. The seal injection flow curve is presented with the pressure difference from BGTP0120 to the pressurizer steam space pressure as a function of total seal injection line flow. A flow measurement instrument uncertainty of 0.25 gpm per loop was accounted for in the calculation of the pressure drop from BGPT0120 to the seal injection connection. In addition, 2 psid is added to accommodate instrument uncertainty in the pressure drop measurement. An additional 4 psid has been conservatively added to the required pressure differential to allow for seal injection filter change out. Requiring as an initial condition that the filter used for each surveillance have a differential pressure less than or equal to 4 psid allows for post-surveillance filter change out with no differential pressure restriction.

Once set, these throttle valves are secured with locking devices and mechanical position stops. The Frequency of 18 months is based on engineering judgment and the controls placed on the positioning of these valves. The Frequency has proven to be acceptable through operating experience.

As noted, the Surveillance is not required to be performed until 4 hours after the RCS pressure has stabilized within a ± 20 psig range of normal operating pressure. The RCS pressure requirement is specified since this configuration will produce the required pressure conditions necessary to assure that the manual seal injection throttle valves are set correctly. The exception is limited to 4 hours to ensure that the Surveillance is timely.

REFERENCES

1. FSAR, Sections 6.3 and 15.6.5.
2. 10 CFR 50.46.

BASES

LCO (continued)

closed or closed and have the blind flanges installed. The valves covered by this LCO are listed along with their associated stroke times in the FSAR (Refs. 2 and 6).

The normally closed containment isolation valves are considered OPERABLE when manual valves are closed, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact (except as provided in SR 3.6.3.3 and SR 3.6.3.4 for manual valves and blind flanges opened under administrative control). These passive isolation valves/devices are those listed in References 2 and 6. They include the normally closed, solenoid-operated, automatic containment isolation valves associated with the containment hydrogen monitoring system, which to be considered OPERABLE are maintained closed and secured in the closed position (i.e., deactivated) or are opened only under administrative control.

Purge valves with resilient seals must meet additional leakage rate requirements. The other containment isolation valve leakage rates are addressed by LCO 3.6.1, "Containment," as Type C testing.

This LCO provides assurance that the containment isolation valves and the Containment purge valves will perform their designed safety functions to minimize the loss of reactor coolant inventory and establish the containment boundary during accidents.

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 MODE 5. 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, except for 36 inch Containment Shutdown Purge valve penetration flow paths, to be unisolated intermittently under administrative controls. These administrative controls consist of stationing a dedicated operator 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. Due to the size of the containment purge line penetration and the fact that those penetrations exhaust directly from the containment atmosphere to the environment via the unit vent, the penetration flow path containing these valves may not be opened under administrative controls. A single purge valve in a

(continued)

BASES

ACTIONS (continued)

penetration flow path may be opened to effect repairs to an inoperable valve, as allowed by SR 3.6.3.1.

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

A.1 and A.2

In the event one containment isolation valve in one or more penetration flow paths is inoperable except for Containment Shutdown purge and mini-purge valve leakage not within limit, the affected penetration flow path must be isolated. The method of isolation must include the use of at least one leak rate tested isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve (this includes power operated valves with power removed), a blind flange, and a check valve with flow through the valve secured. (A remote manual valve's Main Control Board power isolate switch may be used to deactivate the valve.) For a penetration flow path isolated in accordance with Required Action A.1, the device used to isolate the penetration should be the closest available one to containment. Required Action A.1 must be completed within 4 hours. The 4 hour Completion Time is reasonable, considering the time required to isolate the penetration and the relative importance of supporting containment OPERABILITY during MODES 1, 2, 3, and 4.

For affected penetration flow paths that cannot be restored to OPERABLE status within the 4 hour Completion Time and that have been isolated in accordance with Required Action A.1, the affected penetration flow paths must be verified to be isolated on a periodic basis. This is necessary to ensure that containment penetrations required to be isolated following an

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

accident and no longer capable of being automatically isolated will be in the isolation position should an event occur. This Required Action does not require any testing or device manipulation. Rather, it involves verification, through a system walkdown (which may include the use of local or remote indicators), that those isolation devices outside containment and capable of being mispositioned are in the correct position. The Completion Time of "once per 31 days for isolation devices outside containment" is appropriate considering the fact that the devices are operated under administrative controls and the probability of their misalignment is low. For the isolation devices inside containment, the time period specified as "prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days" is based on engineering judgment and is considered reasonable in view of the inaccessibility of the isolation devices and other administrative controls that will ensure that isolation device misalignment is an unlikely possibility.

Condition A has been modified by a Note indicating that this Condition is only applicable to those penetration flow paths with two containment isolation values. For penetration flow paths with only one containment isolation value and a closed system, Condition C provides the appropriate actions.

Required Action A.2 is modified by two Notes. Note 1 applies to isolation devices located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned. Therefore, the probability of misalignment of these devices once they have been verified to be in the proper position, is small.

A second Note has been added to Required Action A.2 to provide clarification that the action to periodically verify the affected penetration flow path is isolated may be verified administratively for blind flanges and closed manual valves that are locked, sealed, or otherwise secured. This is acceptable since these were verified to be in the correct position prior to locking, sealing, or securing.

(continued)

BASES

ACTIONS (continued)

B.1

With two containment isolation valves in one or more penetration flow paths inoperable, the affected penetration flow path must be isolated within 1 hour. The method of isolation must include the use of at least one leak rate tested isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve (this includes power operated valves with power removed), and a blind flange. (A remote manual valve's Main Control Board power isolate switch may be used to deactivate the valve.) The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1. In the event the affected penetration is isolated in accordance with Required Action B.1, the affected penetration must be verified to be isolated on a periodic basis per Required Action A.2, which remains in effect. This periodic verification is necessary to assure leak tightness of containment and that penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying each affected penetration flow path is isolated is appropriate considering the fact that the valves are operated under administrative control and the probability of their misalignment is low.

Condition B is modified by a Note indicating this Condition is only applicable to penetration flow paths with two containment isolation values. Condition A of this LCO addresses the condition of one containment isolation value inoperable in this type of penetration flow path.

C.1 and C.2

When one or more penetration flow paths with one containment isolation valve inoperable, the inoperable valve flow path must be restored to OPERABLE status or the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration flow path. Required Action C.1 must be completed within the 72 hour Completion Time. The specified time period is reasonable considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of maintaining containment OPERABILITY during MODES 1, 2, 3, and 4. The closed system must meet the requirements of Reference 2. The Containment Spray System and the ECCS are closed ESF-grade systems outside containment, which meet the requirements of Reference 2, and serve as the second

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

containment isolation barrier (Ref. 7). In the event the affected penetration flow path is isolated in accordance with Required Action C.1, the affected penetration flow path must be verified to be isolated on a periodic basis. This periodic verification is necessary to assure that containment penetrations requiring isolation following an accident are isolated. The Completion Time of once per 31 days for verifying that each affected penetration flow path is isolated is appropriate because the valves are operated under administrative controls and the probability of their misalignment is low.

Condition C is modified by a Note indicating that this Condition is only applicable to those penetration flow paths with only one containment isolation valve and a closed system. This Note is necessary since this Condition is written specifically to address these penetration flow paths. For penetration flow paths with two containment isolation valves, Conditions A and B provide the appropriate Required Actions.

Required Action C.2 is modified by two Notes. Note 1 applies to valves and blind flanges located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned. Therefore, the probability of misalignment of these valves, once they have been verified to be in the proper position is small.

D.1, D.2, and D.3

In the event one or more Containment Shutdown or Mini-Purge valves in one or more penetration flow paths are not within leakage limits, leakage must be reduced to within limits, or the affected penetration flow path must be isolated. The method of isolation must be by the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve or blind flange. A Containment Shutdown Purge or Mini-Purge valve with resilient seals utilized to satisfy Required Action D.1 must have been demonstrated to meet the leakage requirements of SR 3.6.3.6 or SR 3.6.3.7. The specified Completion Time is reasonable, considering that one containment purge valve remains closed so that a gross breach of containment does not exist.

(continued)

BASES

ACTIONS

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

In accordance with Required Action D.2, this penetration flow path must be verified to be isolated on a periodic basis. The periodic verification is necessary to ensure that containment penetrations required to be isolated following an accident, which are no longer capable of being automatically isolated, will be in the isolation position should an event occur. This Required Action does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown (which may include the use of local or remote indicators), that those isolation devices outside containment capable of being mispositioned are in the correct position. For the isolation devices inside containment, the time period specified as "prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days" is based on engineering judgment and is considered reasonable in view of the inaccessibility of the isolation devices and other administrative controls that will ensure that isolation device misalignment is an unlikely possibility.

For the Containment Shutdown or Mini-Purge valve with resilient seal that is isolated in accordance with Required Action D.1, SR 3.6.3.6 or SR 3.6.3.7 must be performed at least once every 92 days. This assures that degradation of the resilient seal is detected and confirms that the leakage rate of the containment purge valve does not increase during the time the penetration is isolated. The normal Frequency for SR 3.6.3.7, 184 days, is based on an NRC initiative, Multi-Plant Action No. B-20 (Ref. 4). Since more reliance is placed on a single valve while in this Condition, it is prudent to perform the SR more often. Therefore, a Frequency of once per 92 days was chosen and has been shown to be acceptable based on operating experience.

Required Action D.2 is modified by two Notes. Note 1 applies to isolation devices located in high radiation areas and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Note 2 applies to isolation devices that are locked, sealed, or otherwise secured in position and allows these devices to be verified closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since the function of locking, sealing, or securing components is to ensure that these devices are not inadvertently repositioned.

E.1 and E.2

If the Required Actions and associated Completion Times are not met, the plant must be brought to a MODE in which the LCO does not apply. To

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1 (continued)

mispositioned are in the correct position. The 31 day Frequency is appropriate because the valves are operated under administrative control. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves and relief valves. Additionally, vent and drain valves are not within the scope of this SR.

This SR is modified by a Note indicating that the SR is not required to be performed for the AFW flow control valves until the AFW system is placed in automatic control or when Thermal Power is above 10% RTP.

In order for the TDAFP and MDAFPs to be OPERABLE while the AFW system is in automatic control or above 10% RTP, the discharge flow control valves (ALHV0005, 6, 7, 8, 9, 10, 11, and 12) shall be in the full open position. The TDAFP and MDAFPs remain OPERABLE with the discharge flow control valves throttled to maintain steam generator levels during plant heatup, cooldown, or if started due to an Auxiliary Feedwater Actuation Signal (AFAS) or manually started in anticipation of an AFAS.

The 31 day Frequency, based on engineering judgment, is consistent with procedural controls governing valve operation, and ensures correct valve positions.

SR 3.7.5.2

Verifying that each AFW pump's developed head at the flow test point is greater than or equal to the required developed head ensures that AFW pump performance has not degraded during the cycle. Flow and differential head are normal tests of centrifugal pump performance required by Section XI of the ASME Code (Ref. 2). Because it is undesirable to introduce cold AFW into the steam generators while they are operating, this testing is performed on recirculation flow. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. Performance of inservice testing discussed in the ASME Code, Section XI (Ref. 2) (only required at 3 month intervals) satisfies this requirement. The test Frequency in accordance with the Inservice Testing Program results in testing each pump once every 3 months, as required by Reference 2.

(continued)

BASES

SURVEILLANCE REQUIREMENT

SR 3.7.5.2 (continued)

The required differential pressure for the AFW pumps when tested in accordance with the Inservice Testing Program is:

a. The acceptance criteria for the MDAFPs have been calculated using a limiting performance curve. The acceptance criteria, given as a table below, have been determined based on the Loss of Normal Feedwater (LONF) or Loss of Non-emergency AC Power (LOAC) events.

MOTOR DRIVEN PUMPS
ACCEPTANCE CRITERIA
(using performance curve)

Recirc. Flow (gpm)	Diff. Pressure (psid)
≤75	≥1529
≤80	≥1533
≤85	≥1537
≤90	≥1540
≤95	≥1544
≤100	≥1548
≤105	≥1552
≤110	≥1555
≤115	≥1559

b. Turbine Driven Pump ≥1610 psid at ≥120 gpm

This SR is modified by a Note indicating that the SR should be deferred until suitable test conditions are established. This deferral is required because there is insufficient steam pressure to perform the test.

SR 3.7.5.3

This SR verifies that AFW can be delivered to the appropriate steam generator in the event of any accident or transient that generates an ESFAS, by demonstrating that each automatic valve in the flow path actuates to its correct position on an actual or simulated actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. 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. The 18 month Frequency is acceptable based on operating experience and the design reliability of the equipment.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.5.3 (continued)

This SR includes the requirement to verify that each AFW motor-operated discharge valve, ALHV0005, 7, 9 and 11, limits the flow from the motor-driven pump to each steam generator to ≤ 300 gpm (Reference 6) and that valves ALHV0030, 31, 32, 33, 34, 35 and 36 actuate to the required position upon receipt of an Auxiliary Feedwater Pump suction Pressure-Low signal.

SR 3.7.5.4

This SR verifies that the AFW pumps will start in the event of any accident or transient that generates an AFAS by demonstrating that each AFW pump starts automatically on an actual or simulated auxiliary feedwater actuation signal. 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.

This SR is modified by a Note. The Note indicates that the SR be deferred until suitable test conditions are established. This deferral is required because there is insufficient steam pressure to perform the test.

SR 3.7.5.5

This SR verifies that the AFW is properly aligned by verifying the flow paths from the CST to each steam generator prior to entering MODE 2 after more than 30 days in MODE 5 or 6.

OPERABILITY of AFW flow paths must be verified before sufficient core heat is generated that would require the operation of the AFW System during a subsequent shutdown. The Frequency is reasonable, based on engineering judgement and other administrative controls that ensure that flow paths remain OPERABLE. To further ensure AFW System alignment, flow path OPERABILITY is verified following extended outages to determine no misalignment of valves has occurred. This SR ensures that the flow path from the CST to the steam generators is properly aligned.

REFERENCES

1. FSAR, Section 10.4.9, Auxiliary Feedwater System.
2. ASME, Boiler and Pressure Vessel Code, Section XI.
3. FSAR, Section 9.3.1, Compressed Air System.

BASES

REFERENCES (continued)	4.	Amendment No. 55 to facility Operating License No. NPF-30, dated 7/27/90.
	5.	FSAR 15.2.8, Feedwater System Pipe Break.
	6.	Request for Resolution (RFR) 21816A.

BASES (continued)

APPLICABLE SAFETY ANALYSES (continued)

coolant accident, fission product release presented in the FSAR, Chapter 15A.3 (Ref. 2).

The worst case single active failure of a component of the CREVS, assuming a loss of offsite power, does not impair the ability of the system to perform its design function.

The CREVS satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

Two independent and redundant CREVS trains are required to be OPERABLE to ensure that at least one is available assuming a single failure disables the other train. Total system failure could result in exceeding a dose of 5 rem to the control room operator in the event of a large radioactive release.

The CREVS is considered OPERABLE when the individual components necessary to limit operator exposure are OPERABLE in both trains. A CREVS train is OPERABLE when the associated:

a. Control Room Air Conditioner, filtration and pressurization fans are OPERABLE;

b. HEPA filters and charcoal adsorbers are not excessively restricting flow, and are capable of performing their filtration functions;

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

In addition, the control room pressure boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.

The LCO is modified by a Note allowing the control room boundary to be opened intermittently under administrative controls. For entry and exit through doors the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for control room isolation is indicated. Plant administrative controls address the breached pressure boundary.

Note that the Control Room Air Conditioning System (CRACS) forms a subsystem to the CREVS. The CREVS remains capable of performing its safety function provided the CRACS air flow path is intact and air circulation can be maintained. Isolation or breach of the CRACS air flow

(continued)

BASES

LCO (continued)	path can also render the CREVS flow path inoperable. In these situations, LCOs 3.7.10 and 3.7.11 may be applicable.

APPLICABILITY

In MODES 1, 2, 3, and 4, CREVS must be OPERABLE to control operator exposure during and following a LOCA or SGTR.

In MODE 5 or 6, the CREVS is required to cope with the design basis release from the rupture of a waste gas decay tank.

During movement of irradiated fuel assemblies, the CREVS must be OPERABLE to cope with the release from a design basis fuel handling accident inside containment or in the fuel building.

ACTIONS

A.1

When one CREVS train is inoperable, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE CREVS train is adequate to perform the control room protection function. However, the overall reliability is reduced because a single failure in the OPERABLE CREVS train could result in loss of CREVS function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and ability of the remaining train to provide the required capability.

B.1

If the control room boundary is inoperable in MODE 1, 2, 3, and 4 such that neither CREVS train can establish the required positive pressure, action must be taken to restore an OPERABLE control room boundary within 24 hours. During the period that the control room boundary is inoperable, appropriate compensatory measures (consistent with the intent GDC 19) should be utilized to protect control room operators from potential hazards such as radioactive contamination, toxic chemicals, smoke, temperature and relative humidity, and physical security. Compensatory measures address entries into Condition B. See also the LCO Bases above. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, the availability of the CREVS to provide a filtered environment (albiet with potential control room inleakage), and the use of compensatory measures. The 24 hour Completion Time is a reasonable time to diagnose, plan, repair, and test most problems with the control room boundary.

(continued)

BASES

ACTIONS (continued)

C.1 and C.2

In MODE 1, 2, 3, or 4, if the inoperable CREVS train or control room boundary cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE that minimizes accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1.1, D.1.2, D.2.1, and D.2.2

In MODE 5 or 6, or during movement of irradiated fuel assemblies, if the inoperable CREVS train cannot be restored to OPERABLE status within the required Completion Time, action must be taken to immediately place the OPERABLE CREVS train in the CRVIS mode. This action ensures that the remaining train is OPERABLE, that no failures preventing automatic actuation will occur, and that any active failure would be readily detected.

Action D.1.2 requires the CREVS train placed in operation be capable of being powered by an emergency power source. This action assures OPERABILITY of the CREVS train in the unlikely event of a Fuel Handling Accident or Decay Tank rupture while shutdown concurrent with a loss of offsite power.

An alternative to Required Actions D.1.1.1 and D.1.2 is to immediately suspend activities that could result in a release of radioactivity that might require isolation of the control room. Required Actions D.2.1 and D.2.2 would place the unit in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

E.1 and E.2

In MODE 5 or 6, or during movement of irradiated fuel assemblies, with two CREVS trains inoperable, action must be taken immediately to suspend activities that could result in a release of radioactivity that might enter the control room. This places the unit in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

(continued)

BASES

ACTIONS (continued)

F.1

If both CREVS trains are inoperable in MODE 1, 2, 3, or 4, for reasons other than an inoperable control room boundary (i.e., Condition B), the CREVS may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.7.10.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not severe, testing each train once every month, by initiating from the control room, flow through the HEPA filters and charcoal adsorbers of both the filtration and pressurization systems, provides an adequate check of this system.

Monthly heater operations dry out any moisture accumulated in the charcoal from humidity in the ambient air. Each pressurization system train must be operated for ≥ 10 continuous hours with the heaters functioning. Functioning heaters will not necessarily have the heating elements energized continuously for 10 hours; but will cycle depending on the air temperature. Each filtration system train need only be operated for ≥ 15 minutes to demonstrate the function of the system. The 31 day Frequency is based on the reliability of the equipment and the two train redundancy availability.

SR 3.7.10.2

This SR verifies that the required CREVS testing is performed in accordance with the Ventilation Filter Testing Program (VFTP).

The CREVS filter tests use the test procedure guidance in 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.

SR 3.7.10.3

This SR verifies that each CREVS train starts and operates on an actual or simulated actuation signal. The actuation signal includes Control Room Ventilation Isolation or Fuel Building Ventilation Isolation. The

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.10.3 (continued)

CREVS train automatically switches on an actual or simulated CRVIS signal into a CRVIS mode of operation with flow through the HEPA filters and charcoal adsorber banks. The Surveillance Requirement also verifies that a control room ventilation isolation signal (CRVIS) will be received by the LOCA sequencer to enable an automatic start of the Diesel Generator loads that are associated with a CRVIS. Verification that these loads will start and operate at the appropriate step in the LOCA sequencer and that other auto-start signals for these loads will be inhibited until the LOCA sequencer is reset is accomplished under Surveillance Requirement SR 3.8.1.12. The Frequency of 18 months is consistent with the typical operating cycle. 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.

SR 3.7.10.4

This SR verifies the integrity of the control room enclosure, and the assumed inleakage rates of the potentially contaminated air. The control room positive pressure, with respect to the outside atmosphere, is periodically tested to verify proper functioning of the CREVS. During the CRVIS mode of operation, the CREVS is designed to pressurize the control room $\geq$ 0.125 inches water gauge positive pressure with respect to the outside atmosphere in order to prevent unfiltered inleakage. The CREVS is designed to maintain this positive pressure with one train. The Frequency of 18 months on a STAGGERED TEST BASIS is consistent with the guidance provided in NUREG-0800 (Ref. 4).

REFERENCES

1. FSAR, Section 6.4, Habitability Systems.
2. FSAR, Chapter 15A.3, Control Room Radiological Consequences Calculation Models.
3. Regulatory Guide 1.52, Rev. 2, Design, Testing, and Maintenance Criteria for Atmospheric Cleanup System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants.
4. NUREG-0800, Section 6.4, Rev. 2, July 1981, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.
5. Procedure EDP-ZZ-04107, HVAC Pressure Boundary and Watertight Door Control.

B 3.7 PLANT SYSTEMS

B 3.7.11 Control Room Air Conditioning System (CRACS)

BASES

BACKGROUND

The CRACS provides temperature control for the control room.

The CRACS consists of two independent and redundant trains that provide cooling of recirculated control room air. Each train consists of a prefilter, self-contained refrigeration system (using essential service water as a heat sink), centrifugal fans, instrumentation, and controls to provide for control room temperature control. The CRACS is a subsystem to the CREVS, described in LCO 3.7.10, providing air temperature control for the control room.

The CRACS is an emergency system, which also operates during normal unit operations. A single train will provide the required temperature control to maintain the control room ≤ 84°F. The CRACS operation in maintaining the control room temperature is discussed in the FSAR, Section 9.4.1 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The design basis of the CRACS is to maintain the control room temperature for 30 days of continuous occupancy.

The CRACS components are arranged in redundant, safety related trains. During normal or emergency operations, the CRACS maintains the temperature ≤ 84°F. A single active failure of a component of the CRACS, with a loss of offsite power, does not impair the ability of the system to perform its design function. Redundant detectors and controls are provided for control room temperature control. The CRACS is designed in accordance with Seismic Category I requirements. The CRACS is capable of removing sensible and latent heat loads from the control room, which include consideration of equipment heat loads and personnel occupancy requirements, to ensure equipment OPERABILITY.

The CRACS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two independent and redundant trains of the CRACS are required to be OPERABLE to ensure that at least one is available, assuming a single failure disabling the other train. Total system failure could result in the equipment operating temperature exceeding limits in the event of an accident.

(continued)

B 3.7 PLANT SYSTEMS

B 3.7.12 Not used.

B 3.7 PLANT SYSTEMS

B 3.7.13 Emergency Exhaust System (EES)

BASES

BACKGROUND

The Emergency Exhaust System serves both the auxiliary building and the fuel building. Following a safety injection signal (SIS), safety related dampers isolate the auxiliary building, and the Emergency Exhaust System exhausts potentially contaminated air due to leakage from ECCS systems. The Emergency Exhaust System also can filter airborne radioactive particulates from the area of the fuel pool following a fuel handling accident.

The Emergency Exhaust System consists of two independent and redundant trains. Each train consists of a heater, a prefilter, a high efficiency particulate air (HEPA) filter bank, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan. Ductwork, dampers, and instrumentation also form part of the system. A second bank of HEPA filters follows the adsorber section to collect carbon fines.

The Emergency Exhaust System is on standby for an automatic start following receipt of a fuel building ventilation isolation signal (FBVIS) or a safety injection signal (SIS). Initiation of the SIS mode of operation takes precedence over any other mode of operation. In the SIS mode, the system is aligned to exhaust the auxiliary building. The instrumentation associated with actuation of the SIS mode of operation is addressed in LCO 3.3.2, ESFAS Instrumentation.

Upon receipt of a fuel building ventilation isolation signal generated by gaseous radioactivity monitors in the fuel building exhaust line, normal air discharges from the building are terminated, the fuel building is isolated, the stream of ventilation air discharges through the system filter trains, and a control room ventilation isolation signal (CRVIS) is generated. The instrumentation associated with actuation of the FBVIS mode of operation is addressed in LCO 3.3.8, EES Actuation Instrumentation.

The Emergency Exhaust System is discussed in the FSAR, Sections 6.5.1, 9.4.2, 9.4.3, and 15.7.4 (Refs. 1, 2, 3 and 4 respectively) because it may be used for normal, as well as post accident, atmospheric cleanup functions.

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The Emergency Exhaust System design basis is established by the consequences of two Design Basis Accidents (DBAs), which are a loss of coolant accident (LOCA) and a fuel handling accident (FHA). The analysis of the fuel handling accident, given in Reference 4, 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) and Containment Spray System during the recirculation mode are filtered and adsorbed by the Emergency Exhaust System. The DBA analysis of the fuel handling accident and of the LOCA assumes that only one train of the Emergency Exhaust System 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 fuel building is determined for a fuel handling accident and for a LOCA. These assumptions and the analysis follow the guidance provided in Regulatory Guides 1.4 (Ref. 6) and 1.25 (Ref. 5).

The Emergency Exhaust System satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

Two independent and redundant trains of the Emergency Exhaust System 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 auxiliary building or fuel building exceeding regulatory release limits in the event of a LOCA or fuel handling accident.

In MODES 1, 2, 3 and 4 the Emergency Exhaust System (EES) is considered OPERABLE when the individual components necessary to control releases from the auxiliary building are OPERABLE in both trains (i.e., the components required for the SIS mode of operation and the auxiliary building pressure boundary). During movement of irradiated fuel assemblies in the fuel building, the EES is considered OPERABLE when the individual components necessary to control releases from the fuel building are OPERABLE in both trains (i.e. the components required for the FBVIS mode of operation and the fuel building pressure boundary). An Emergency Exhaust System train is considered OPERABLE when its associated:

a. Fan is OPERABLE;

(continued)

BASES

LCO (continued)

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

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

The LCO is modified by a Note allowing the auxiliary or fuel building boundary to be opened intermittently under administrative controls. For entry and exit through doors the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for auxiliary or fuel building isolation is indicated. Plant administrative controls address the breached pressure boundary.

APPLICABILITY

In MODE 1, 2, 3, or 4, the Emergency Exhaust System is required to be OPERABLE to support the SIS mode of operation 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 Emergency Exhaust System is not required to be OPERABLE since the ECCS is not required to be OPERABLE.

During movement of irradiated fuel in the fuel building, the Emergency Exhaust System is required to be OPERABLE to support the FBVIS mode of operation to alleviate the consequences of a fuel handling accident.

The Applicability is modified by a Note. The Note clarifies the Applicability for the two safety-related modes of operation of the Emergency Exhaust System, i.e., the Safety Injection Signal (SIS) mode and the Fuel Building Ventilation Isolation Signal (FBVIS) mode. The SIS mode which aligns the system to the auxiliary building is applicable when the ECCS is required to be OPERABLE. In the FBVIS mode the system is aligned to the fuel building. This mode is applicable while handling irradiated fuel in the fuel building.

ACTIONS

A.1

With one Emergency Exhaust System train inoperable in MODE 1, 2, 3, or 4, action must be taken to restore OPERABLE status within 7 days. During this period, the remaining OPERABLE train is adequate to perform the Emergency Exhaust System function. This condition only applies to the EES components required to support the SIS mode of operation. The 7 day Completion Time is based on the risk from an event occurring

(continued)

BASES

ACTIONS

A.1 (continued)

requiring the inoperable Emergency Exhaust System train, and the remaining Emergency Exhaust System train providing the required protection.

B.1

If the auxiliary building boundary is inoperable in MODE 1, 2, 3, and 4 such that neither EES train can establish the required negative pressure, action must be taken to restore an OPERABLE auxiliary building boundary within 24 hours. During the period that the auxiliary building boundary is inoperable, appropriate compensatory measures (consistent with the intent, as applicable, of GDC 19, 60, 61, 63, 64, and 10CFR Part 100) should be utilized to protect plant personnel from potential hazards such as radioactive contamination and physical security. Compensatory measures address entries into Condition B. See also the LCO Bases above. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, the availability of the EES to provide a filtered environment (albiet with potential auxiliary building exfiltration), and the use of compensatory measures. The 24 hour Completion Time is a reasonable time to diagnose, plan, repair, and test most problems with the auxiliary building boundary.

C.1 and C.2

In MODE 1, 2, 3, or 4, when Required Action A.1 or B.1 cannot be completed within the associated Completion Time, or when both Emergency Exhaust System trains are inoperable for reasons other than due to an inoperable auxiliary building boundary (i.e., Condition B), the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in MODE 3 within 6 hours, and in MODE 5 within 36 hours. This condition only applies to the EES components required to support the SIS mode of operation. The Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1 and D.2

With one Emergency Exhaust System train inoperable, during movement of irradiated fuel assemblies in the fuel building, the OPERABLE Emergency Exhaust System train must be started in the FBVIS mode immediately or fuel movement suspended. This action ensures that the remaining train is OPERABLE, that no undetected failures preventing

(continued)

BASES

ACTIONS

D.1 and D.2 (continued)

system operation will occur, and that any active failure will be readily detected. This condition only applies to the EES components required to support the FBVIS mode of operation.

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

E.1

When two trains of the Emergency Exhaust System are inoperable during movement of irradiated fuel assemblies in the fuel building, 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 building. This does not preclude the movement of fuel to a safe position. This condition only applies to the EES components required to support the FBVIS mode of operation, including the fuel building pressure boundary.

SURVEILLANCE REQUIREMENTS

SR 3.7.13.1

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, by initiating from the Control Room flow through the HEPA filters and charcoal adsorbers, provides an adequate check on this system.

Monthly heater operation dries out any moisture accumulated in the charcoal from humidity in the ambient air. Each Emergency Exhaust System train must be operated for ≥ 10 continuous hours with the heaters functioning. Functioning heaters would not necessarily have the heating elements energized continuously for 10 hours, but will cycle depending on the temperature. The 31 day Frequency is based on the known reliability of the equipment and the two train redundancy available. This SR can be satisfied with the EES in the SIS or FBVIS lineup during testing.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.13.2

This SR verifies that the required Emergency Exhaust System filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The Emergency Exhaust System filter tests are in accordance with Regulatory Guide 1.52 (Ref. 7). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal. Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.13.3

This SR verifies that each Emergency Exhaust System train starts and operates on an actual or simulated actuation signals. These actuation signals include a Safety Injection Signal (applicable in MODE 1, 2, 3 and 4) and high radiation signal from the Fuel Building Exhaust Radiation – Gaseous channels (applicable during movement of irradiated fuel in the fuel building). The 18 month Frequency is consistent with the typical operating cycle. 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.

During emergency operations the Emergency Exhaust System will automatically start in either the SIS or FBVIS lineup depending on the initiating signal. In the SIS lineup, the fans operate with dampers aligned to exhaust from the Auxiliary Building and prevent unfiltered leakage. In the FBVIS lineup, which is initiated on a high radiation signal from the Fuel Building Exhaust Radiation – Gaseous channels, the fans operate with the dampers aligned to exhaust from the Fuel Building to prevent unfiltered leakage. Normal exhaust air from the Fuel Building is continuously monitored by radiation detectors. One detector output will automatically align the Emergency Exhaust System in the FBVIS mode of operation. This surveillance requirement demonstrates that each Emergency Exhaust System train can be automatically started and properly configured to the FBVIS or SIS alignment, as applicable, upon receipt of an actual or simulated SIS signal and an FBVIS signal. It is not required that each Emergency Exhaust System train be started from both actuation signals during the same surveillance test provided each actuation signal is tested independently within the 18 month test frequency.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.13.4

This SR verifies the integrity of the auxiliary building enclosure. The ability of the auxiliary building to maintain negative pressure with respect to potentially uncontaminated adjacent areas is periodically tested to verify proper function of the Emergency Exhaust System. During the SIS mode of operation, the Emergency Exhaust System is designed to maintain a slight negative pressure in the auxiliary building, to prevent unfiltered leakage. The Emergency Exhaust System is designed to maintain a negative pressure ≥ 0.25 inches water gauge with respect to atmospheric pressure at the flow rate specified in the VFTP. The Frequency of 18 months is consistent with the guidance provided in NUREG-0800, Section 6.5.1 (Ref. 7).

SR 3.7.13.5

This SR verifies the integrity of the fuel building enclosure. The ability of the fuel building to maintain negative pressure with respect to potentially uncontaminated adjacent areas is periodically tested to verify proper function of the Emergency Exhaust System. During the FBVIS mode of operation, the Emergency Exhaust System is designed to maintain a slight negative pressure in the fuel building, to prevent unfiltered leakage. The Emergency Exhaust System is designed to maintain a negative pressure ≥ 0.25 inches water gauge with respect to atmospheric pressure at the flow rate specified in the VFTP. The Frequency of 18 months is consistent with the guidance provided in NUREG-0800, Section 6.5.1 (Ref. 7).

REFERENCES

1. FSAR, Section 6.5.1, Engineered Safety Features (ESF) Filter Systems.
2. FSAR, Section 9.4.2, Fuel Building HVAC.
3. FSAR, Section 9.4.3, Auxiliary Building HVAC.
4. FSAR, Section 15.7.4, Fuel Handling Accidents.
5. Regulatory Guide 1.25, Rev. 0, 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. Regulatory Guide 1.4, Rev. 2, Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident from Pressurized Water Reactors.

(continued)

BASES

REFERENCES (continued)

7. Regulatory Guide 1.52 (Rev. 2), Design, Testing and Maintenance Criteria for Atmospheric Cleanup System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants.

8. NUREG-0800, Section 6.5.1, Rev. 2, July 1981, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.

9. Procedure EDP-ZZ-04107, HVAC Pressure Boundary and Watertight Door Control.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.4

This SR provides verification that the fuel oil transfer pump starts on low level in the day tank standpipe to automatically maintain the day tank fuel oil level above the DG fuel headers. The minimum fuel oil free surface elevation is required to be at least 130 inches above the baseline of the diesel generator skid. The transfer pump start/stop setpoints are controlled to maintain level in the standpipe in order to ensure there is sufficient fuel to meet the 12 second start requirement for the DG. This level also ensures adequate fuel oil for a minimum of 1 hour of DG operation at full load plus 10%.

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

SR 3.8.1.5

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

SR 3.8.1.6

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.6 (continued)

The Frequency for this SR is 31 days.

SR 3.8.1.7

See SR 3.8.1.2.

SR 3.8.1.8 Not Used

SR 3.8.1.9 Not Used

SR 3.8.1.10

This Surveillance demonstrates the DG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The DG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the DG experiences following a full load rejection and verifies that the DG does not trip upon loss of the load. These acceptance criteria provide for DG damage protection. While the DG is not expected to experience this transient during an event and continues to be available, this response ensures that the DG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing must be performed using a power factor ≥ 0.8 and ≤ 0 9. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience.

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

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

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B 3.9 REFUELING OPERATIONS

B 3.9.4 Containment Penetrations

BASES

BACKGROUND

During CORE ALTERATIONS or 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 10 CFR 50 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 CORE ALTERATIONS or movement of irradiated fuel assemblies within containment and if closed, the containment equipment hatch must be held in place by at least four bolts. Alternatively, the equipment hatch can be open provided it can be installed with a minimum of four bolts holding it in place. 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." The personnel air lock is nominally a right circular cylinder, approximately 10 ft in diameter with a door at each end. The emergency air lock is approximately 5 ft 9 in inside diameter with a 2 ft 6 in door at each end. 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

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BASES

BACKGROUND (continued)

doors of an air lock to remain open for extended periods when frequent containment entry is necessary. During CORE ALTERATIONS or *movement of irradiated fuel assemblies within* containment, containment closure is required under administrative controls. The door interlock mechanism may remain disabled; however, one personnel air lock door and one emergency air lock door must be capable of being closed.

The requirements for containment penetration closure ensure that a release of fission product radioactivity within containment will be restricted from escaping to the environment. The closure restrictions are sufficient to restrict fission product radioactivity release from containment due to a fuel handling accident during refueling.

The Containment Purge System includes two subsystems. The Shutdown Purge subsystem includes a 36 inch supply penetration and a 36 inch exhaust penetration. The second subsystem, a minipurge system, includes an 18 inch supply penetration and an 18 inch exhaust penetration. During MODES 1, 2, 3, and 4, the two valves in each of the Shutdown Purge supply and exhaust penetrations are secured in the closed position or blind flanged. The two valves in each of the two minipurge penetrations can be opened intermittently, but are closed automatically by the Engineered Safety Features Actuation System (ESFAS). Neither of the subsystems is subject to a Specification in MODE 5 or MODE 6 excluding CORE ALTERATIONS or movement of irradiated fuel in containment.

In MODE 6, large air exchanges are necessary to conduct refueling operations. The Shutdown purge system is used for this purpose, and all four valves are capable of being closed by the ESFAS in accordance with LCO 3.3.6, "Containment Purge Isolation Instrumentation," during CORE ALTERATIONS or movement of irradiated fuel in containment.

Typically the minipurge system is not used in MODE 6.

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 (such as a valve, flange, or penetration sealing mechanism) for the other containment penetrations during fuel movements.

"Direct access from the containment atmosphere" is defined as: The

(continued)

BASES

BACKGROUND (continued)

action of the containment atmosphere proceeding from containment to the outside atmosphere without deviation or interruption and having no impairing element.

APPLICABLE SAFETY ANALYSES

During CORE ALTERATIONS or 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). The fuel handling accident (in containment) analyzed in Reference 2 consists of dropping a single irradiated fuel assembly onto other irradiated fuel assemblies. The requirements of LCO 3.9.7, "Refueling Pool Water Level," and the minimum decay time of 100 hours prior to CORE ALTERATIONS ensure 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.

Containment penetrations satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

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 containment purge penetrations and the personnel air lock, the emergency air lock, and the equipment hatch, which must be capable of being closed. For the OPERABLE containment purge penetrations, this LCO ensures that these penetrations are isolable by the Containment Purge Isolation System to ensure that releases through the valves are terminated, such that radiological doses are within the acceptance limit. During CORE ALTERATIONS or during movement of irradiated fuel assemblies within containment, Containment Purge Isolation valves are OPERABLE if they are capable of being closed by manual actuation. For the containment personnel air lock and emergency air lock, one air lock door must be capable of being closed. Thus both containment personnel air lock and emergency air lock doors may be open during movement of irradiated fuel assemblies within containment or CORE ALTERATIONS, provided an air lock door for each air lock is capable of being closed. Administrative controls ensure that 1) appropriate personnel are aware that both personnel air lock and emergency air lock doors are open, 2) a specified individual(s) is designated and available to close the air lock(s)

(continued)

BASES

LCO (continued)

following a required evacuation of containment, and 3) any obstruction(s) (e.g. cables and hoses) that could prevent closure of an open air lock can be quickly removed (Ref. 1).

The containment equipment hatch may be open during movement of irradiated fuel assemblies within containment or CORE ALTERATIONS provided the hatch is capable of being closed and the water level in the refueling pool is maintained in accordance with FSAR Section 16.9.4 or TS 3.9.7. FSAR 16.9.4 requires that at least 23 feet of water is maintained over the top of the irradiated fuel assemblies within the reactor pressure vessel while in MODE 6 and during movement of control rods within the reactor pressure vessel. TS 3.9.7 requires the refueling pool water level to be maintained ≥ 23 feet above the top of the reactor vessel flange during the movement of irradiated fuel assemblies within containment.

Administrative controls include 1) appropriate personnel are aware of the open status of the containment during movement of irradiated fuel assemblies within containment or CORE ALTERATIONS, 2) specified individuals are designated and readily available to close the containment equipment hatch following an evacuation that would occur in the event of a fuel handling accident, and 3) any obstructions (e.g., cables and hoses) that would prevent rapid closure of the containment equipment hatch can be quickly removed. Administrative controls also ensure that during CORE ALTERNATIONS or during the movement of irradiated fuel assemblies within containment and when the containment equipment hatch is open, the Containment Purge and Exhaust System is in service; the trip setpoint function for the purge radiation monitor detectors GTRE0022 and GTR0033 is bypassed; and the requirements of TS LCO 3.3.7, CREVS Actuation Instrumentation, are met as directed by Table 3.3.7-1.

To support the accident analyses and dose consequences for the postulated fuel handling accident (FHA) inside containment and to isolate containment, closure of the containment equipment hatch is required in the event of the postulated FHA inside containment. Closure is defined as the containment equipment hatch installed with four bolts.

Off-Normal plant procedure dictate the Control Room response to a Fuel Handling Accident and direct the operators to manually initiate a Control Room Ventilation Isolation. The Containment Purge and Exhaust System is not secured until the containment equipment hatch, the emergency LCO airlock, and the personnel airlock are closed. The following sequence of actions occur:

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BASES

LCO
(continued)

<u>If the Equipment Hatch is open at the time of the FHA inside containment:</u>

- *Manually initiate CRVIS*
- *Close* Containment Hatches in the following order:
    - Equipment Hatch
    - Emergency Airlock
    - Personnel Airlock
- Following closure of the Personnel Airlock, Manually Initiate CPIS

<u>If the Equipment Hatch is closed at the time of the FHA inside containment</u>:

- Manually initiate CRVIS
- Close Containment Hatches in the following order:
    - Emergency Airlock
    - Personnel Airlock
- Following closure of the Personnel Airlock, Manually Initiate CPIS

Continued service of the Containment Purge and Exhaust System during the time interval between the fuel handling accident in containment and closure of the containment equipment hatch, the emergency airlock, and the personnel airlock will not result in any decrease or increase of calculated radiological consequences determined by the Licensing Bases radiological consequences analyses. It ensures that all post-accident releases are monitored.

In addition, Section 3.8.2.1.1 of the FSAR states that the containment equipment hatch missile shield (missile shield) is provided to protect the containment equipment hatch. Normally, the containment equipment hatch and the missile shield are closed during core alterations or during movement of irradiated fuel inside containment. However, when the containment equipment hatch is open under administrative controls, the missile shield is not required to be closed.

When severe weather conditions are within the plant monitoring radius and for thunderstorms or tornadoes that are determined to be moving toward the plant, the missile shield is required to be closed for protection against weather generated missiles being propelled inside containment. Plant administrative control require that containment equipment hatch is

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BASES

LCO (continued)

installed (with four bolts) upon the arrival of threatening weather conditions that could generate missiles.

The administrative controls also require that the missile shield is positioned to provide adequate protection. The containment equipment hatch is closed from inside containment and the missile shield is closed from outside containment. The containment equipment hatch and the missile shield are not interlocked, so that closure sequence is not a factor. The containment equipment hatch and the missile shield closing may be sequenced at the same time.

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 CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, and 2) specified individuals are designated and readily available to isolate the flow path in the event of a fuel handling accident (Ref. 4).

APPLICABILITY

The containment penetration requirements are applicable during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment because this is when there is a potential for a fuel handling accident. Proper installation and removal of the upper internals with irradiated fuel in the reactor vessel does not constitute a CORE ALTERATION or a movement of irradiated fuel. Therefore, this LCO is not applicable during installation and removal of the reactor vessel upper internals.

In MODES 1, 2, 3, and 4, containment penetration requirements are addressed by LCO 3.6.1, "Containment." In MODES 5 and 6, when CORE ALTERATIONS or movement of irradiated fuel assemblies within containment are 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 and A.2

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 Purge Isolation System not capable of automatic actuation when the isolation valves are open, the unit must be placed in a condition where the isolation function is not needed. This is accomplished by

(continued)

BASES

ACTIONS

A.1 and A.2 (continued)

immediately suspending CORE ALTERATIONS and 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 isolation 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 purge isolation signal.

The Surveillance is performed every 7 days during CORE ALTERATIONS or 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. 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 fission product radioactivity to the outside atmosphere.

SR 3.9.4.2

This Surveillance demonstrate that the necessary hardware, tools, and equipment are available to install the equipment hatch. The equipment hatch is provided with a set of hardware, tools, and equipment for moving the hatch from its storage location and installing it in the opening. The required set of hardware, tools, and equipment shall be inspected to ensure that they can perform the required functions.

The Surveillance is performed every 7 days during CORE ALTERATIONS or movement of irradiated fuel assemblies within the containment. The Surveillance interval is selected to be commensurate with the normal duration of the time to complete the fuel handling operations. The Surveillance is modified by a Note that only requires that the Surveillance be met for an open equipment hatch. If the equipment hatch is installed in its opening, the availability of the means to install the hatch is not required. The 7 day Frequency is adequate considering that the hardware, tools, and equipment are dedicated to the equipment hatch and not used for any other function.

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.4.3

This Surveillance demonstrates that each containment purge isolation valve actuates to its isolation position on manual initiation The 18 month Frequency maintains consistency with other similar ESFAS instrumentation and valve testing requirements. In LCO 3.3.6, the Containment Purge Isolation instrumentation requires a CHANNEL CHECK every 12 hours, an ACTUATION LOGIC TEST every 31 days on a STAGGERED TESTS BASIS, and a COT every 92 days to ensure the channel OPERABILITY during MODES 1, 2, 3, and 4. Every 18 months a TADOT and a CHANNEL CALIBRATION are performed. The system actuation response time is demonstrated every 18 months on a STAGGERED TEST BASIS. SR 3.6.3.5 demonstrates that the isolation time of each valve is in accordance with the Inservice Testing Program requirements. These Surveillances will ensure that the valves are capable of being manually closed after a postulated fuel handling accident to limit a release of fission product radioactivity from the containment.

REFERENCES

1. Amendment 114 to Facility Operating License No. NPF-30, Callaway Unit 1, dated July 15, 1996.
2. FSAR, Section 15.7.4.
3. NUREG-0800, Section 15.7.4, Rev. 1, July 1981.
4. Amendment 138 to Facility Operating License No. NPF-30, Callaway Unit 1, dated September 26, 2000.