Enclosure 2

MFN 09-003

DCD Markups for

RAI Numbers 16.2-126 S01, 16.2-173, 16.2-175, 16.2-177, 16.2-178, 16.2-181, and 16.2-185

DCD Markups for

RAI 16.2-126 S01

Table 16.0-2-H (page 2 of 2)
COL - Holder Open Items

COL Item	Description	Reviewer's Note
3.8.1-1	Acceptance criteria for battery charger testing.	Provide acceptance criteria for battery charger testing consistent with battery size.
3.8.1-2	Acceptance criteria for verification that battery is fully charged.	Provide acceptance criteria for verification that battery is fully charged consistent with battery manufacturer recommendations. Use of float current monitoring option requires that battery manufacturer confirm acceptability and acceptance criteria and that battery capacity includes margin for state of charge uncertainty.
3.8.1-3	Use of a modified performance test for verification of battery capacity	Provide requirements for use of a modified performance test for verification of battery capacity consistent with battery manufacturer recommendations.
3.8.1-4	Battery Cell Parameters	Provide battery cell parameters consistent with manufacturer specifications.
3.8.1-5	Battery margin for aging factor and state of charge uncertainty.	Provide battery margin including aging factor and state of charge uncertainty.
3.8.3-1	Acceptance criteria for verification that battery is fully charged.	Provide acceptance criteria for verification that battery is fully charged consistent with battery manufacturer recommendations. Use of float current monitoring option requires that battery manufacturer confirm acceptability and acceptance criteria and that battery capacity includes margin for state of charge uncertainty.
3.8.3-2	Use of a modified performance test for verification of battery capacity	Provide requirements for use of a modified performance test for verification of battery capacity consistent with battery manufacturer recommendations.
3.8.3-3	Battery Cell Parameters	Provide battery cell parameters consistent with manufacturer specifications.
3.8.3-4	Battery margin for aging factor and state of charge uncertainty.	Provide battery margin including aging factor and state of charge uncertainty.
3.9.5-1	Minimum CRD accumulator pressure	Provide minimum CRD accumulator pressure that supports maximum scram time assumption.
5.5.10-1	Battery Cell Parameters	Provide battery cell parameters consistent with manufacturer specifications.

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Enclosure 2

DCD Markups for

RAI 16.2-173

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.3.1	----------------------------- - NOTE - Only required to be met in MODE 5 and in MODE 6 prior to removal of the reactor pressure vessel head. ----------------------------- Perform applicable LCO 3.5.1, "Automatic Depressurization System (ADS) - Operating," SRs for ADS valves required for relief capacity equivalent to 6 depressurization valves (DPVs).	In accordance with applicable SRs
SR 3.5.3.21	Verify water level in each GDCS pool is ≥ 6.5 meters (21.3 feet).	24 hours
SR 3.5.3.32	Verify suppression pool level is ≥ 5.4 meters (213 inches).	24 hours
SR 3.5.3.3	----------------------------- - NOTE - 1. Only required to be met in MODE 5 and in MODE 6 prior to removal of the reactor pressure vessel head. 2. Only required to be met for safety relief valves (SRVs) as required to support relief capacity equivalent to 6 depressurization valves (DPVs). ----------------------------- Verify SRV accumulator supply pressure is ≥ 1.13 MPaG (164 psig).	31 days

SURVEILLANCE		FREQUENCY
SR 3.5.3.4	-- **- NOTE -** Not required to be met for one actuator intermittently disabled under administrative controls. -- Verify continuity of two actuators associated with DC and Uninterruptible AC Electrical Power Distribution Divisions required by LCO 3.8.7, "Distribution Systems - Shutdown," for each required GDCS valve and for ADS valves required to support relief capacity equivalent to 6 DPVs.	31 days
SR 3.5.3.5	-- **- NOTE -** 1. For ADS valves, only required to be met in MODE 5 and in MODE 6 prior to removal of the reactor pressure vessel head. 2. Valve actuation may be excluded. -- Verify each required GDCS valve and ADS valve required to support relief capacity equivalent to 6 DPVs actuates on an actual or simulated automatic initiation signal.	24 months

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.3 GDCS - Shutdown

BASES

BACKGROUND

A description of the ADS is provided in the Bases for LCO 3.5.1, "Automatic Depressurization System (ADS) - Operating." A description of the GDCS is provided in the Bases for LCO 3.5.2, "Gravity-Driven Cooling System (GDCS) - Operating."

In MODES 5 and 6, GDCS is used to provide additional water inventory inside the containment to respond to a loss of decay heat removal capability or a loss of reactor coolant inventory. Loss of decay heat removal capability could result from the unavailability of both Reactor Water Cleanup/Shutdown Cooling loops, loss of reactor component cooling water or plant service water systems, or loss of preferred power. Loss of reactor coolant inventory could result from pipe breaks in the RCS associated with maintenance or refueling, misalignment of systems connected to the RCS, or leakage during replacement of control rod drive assemblies.

GDCS pools with a minimum combined volume within the limit specified and the suppression pool provide additional water inventory to support decay heat removal for an extended period and makeup to respond to a loss of reactor coolant inventory.

ADS supports the GDCS function by providing a vent path that is adequate to maintain the RPV close to containment pressure following loss of decay heat removal capability. The number of ADS valves required to support GDCS is a function of core decay heat load.

APPLICABLE SAFETY ANALYSES

Three GDCS pools and the suppression pool provide sufficient inventory when in MODES 5 and 6 to respond to a loss of non-safety-related decay heat removal capability for 72 hours without reliance on the Isolation Condenser System (Ref. 2). Three GDCS pools and the suppression pool also provide additional water inventory inside the containment or a loss of reactor coolant inventory (Ref. 1). Three injection subsystem branch lines (i.e. one from each GDCS pool) and one equalizing train are required to supply the required makeup. ADS capacity equivalent to ~~four~~ six depressurization valves (DPVs), which is

BASES

APPLICABLE SAFETY ANALYSES (continued)

sufficient to maintain the RPV close to containment pressure following a LOCA or loss of decay heat removal capability is required to support GDCS injection.

The GDCS satisfies Criterion 3 of 10 CFR 50.36(d)(2)(ii).

LCO

This LCO requires two injection subsystem branch lines associated with each of the three GDCS pools (i.e., six injection subsystem branch lines) and two equalizing subsystem trains. Additionally, to support OPERABILITY of the required GDCS subsystems, ~~this LCO requires~~ OPERABILITY of ADS valves (i.e., DPVs or SRVs or a combination of each) with relief capacity equivalent to six DPVs is required. These requirements ensure that the water inventory in three GDCS pools and the suppression pool will be injected in the event of any single failure.

OPERABILITY of each required squib-actuated GDCS valve and each required ADS valve requires OPERABILITY of two safety-related actuators associated with DC and Uninterruptible AC Electrical Power Distribution Divisions required by LCO 3.8.7, "Distribution Systems - Shutdown."

APPLICABILITY

Two injection subsystem branch lines associated with each of the three GDCS pools, two equalizing subsystem trains, and ADS valves with relief capacity equivalent to six DPVs are required to be OPERABLE in MODES 5 and 6 to assure adequate coolant inventory and sufficient heat removal capability for the irradiated fuel in the core in response to a loss of decay heat removal capability, a LOCA, or an inadvertent draindown of the RPV. These requirements are not applicable when the buffer pool gate is removed and water level is above the specified level over the top of the reactor pressure vessel flange because of the additional inventory available when in this configuration.

BASES

ACTIONS (continued)

E.1 and E.2

If the LCO is not met for reasons other than Condition A, B, or C, action must be initiated to provide at least two methods of injecting the minimum specified volume of water into the RPV. In addition, LCO requirements must be met within 72 hours. This Completion Time is based on engineering judgment considering the low probability of an event requiring GDCS injection when in this Condition.

Alternate sources and methods for water injection are identified in the plant's Abnormal and Emergency Operating Procedures. The method used to provide water for core flooding is based on plant conditions.

F.1 and F.2

If Required Actions and associated Completion Times are not met, the water inventory available for injection may not be sufficient to respond to a loss of decay heat removal capability, LOCA, or inadvertent vessel draindown. Therefore, actions to suspend operations with a potential for draining the reactor vessel (OPDRVs) must be initiated immediately to minimize the probability of a vessel draindown. Actions must continue until OPDRVs are suspended. In addition, action must be initiated immediately to establish reactor building refueling and pool area HVAC subsystem (REPAVS) and contaminated area HVAC subsystem (CONAVS) area isolation boundary. This can be accomplished by isolating the REPAVS and CONAVS dampers or verifying the automatic capability of the respective exhaust high radiation function. This action is needed to establish appropriate compensatory measures for a potential loss of decay heat removal as a result of an inadvertent draindown event. The Completion Times are based on engineering judgment considering the need for prompt action to mitigate the consequences of a potential loss of decay heat removal capability, LOCA, or inadvertent vessel draindown .

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.5.3.1~~

~~This SR verifies that ADS capacity sufficient to allow GDCS injection following a LOCA or loss of decay heat removal is OPERABLE. This SR is met by requiring that LCO 3.5.1 SRs are met for ADS valves (i.e., DPVs or SRVs or a combination of each) that provide ADS relief capacity equivalent to six DPVs. The Frequency requires that the applicable SRs be performed at the Frequencies specified in the applicable SRs.~~

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.5.3.1 is modified by a Note that states this SR is required only in MODE 5 and in MODE 6 prior to removal of the reactor pressure vessel head. ADS is not required for GDCS injection following removal of the reactor pressure vessel head.~~

SR 3.5.3.~~2~~1

This SR requires verification every 24 hours that the water level in each of the GDCS pools is within the specified limit. This SR ensures adequate inventory is maintained in the containment to respond to a loss of decay heat removal capability or a loss of reactor coolant due to a LOCA or inadvertent draining of the RPV.

The 24 hour Frequency is acceptable because highly reliable GDCS pool low level alarms will provide prompt notification of an abnormal level in any of the GDCS pools.

SR 3.5.3.~~3~~2

This SR requires verification every 24 hours that suppression pool level is sufficient to support the required operation of the GDCS equalizing trains in response to loss of decay heat removal capability, LOCA, or inadvertent vessel draindown. The 24 hour Frequency is acceptable because suppression pool low level alarms will provide prompt notification of an abnormal level in the suppression pool.

SR 3.5.3.3

This SR requires periodic verification that the supply pressure to required SRV accumulators is greater than or equal to the specified limit. An accumulator on each SRV provides pneumatic pressure for ADS valve actuation. The SRV accumulator capacity is sufficient for one actuation following a failure of the gas supply to the accumulator.

SR 3.5.3.3 is modified by two Notes. Note 1 states that this SR is only required to be met in MODE 5 and in MODE 6 prior to removal of the reactor pressure vessel head. ADS is not required for GDCS injection following removal of the reactor pressure vessel head. Note 2 states that the SRV accumulator supply pressure is only required to be met for SRVs that are credited with meeting the necessary relief capacity equivalent to 6 depressurization valves (DPVs).

The 31 day Frequency is acceptable because low pressure alarms provide prompt notification of an abnormal pressure in the accumulator supply.

SR 3.5.3.4

This SR requires verification every 31 days of the continuity of two safety-related actuators associated with DC and Uninterruptible AC Electrical Power Distribution Divisions required by LCO 3.8.7, "Distribution Systems - Shutdown.," ~~for each squib-actuated GDCS valve.~~ for each required GDCS and for ADS valves required to support relief capacity equivalent to 6 DPVs The 31 day Frequency is acceptable because either of the two safety-related actuators in each valve is capable of actuating the associated GDCS or ADS valve. Additionally, an alarm will provide prompt notification of loss of circuit continuity.

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note that continuity is not required to be met for one required actuator intermittently disabled under administrative controls. This allows the continuity monitor to be tested and allows surveillance and maintenance with the assurance that the valve will not be opened inadvertently. The operation of the disable switch in either division does not disable the GDCS because the valve will still be opened by the squib initiator in the other division.

SR 3.5.3.5

This SR requires verification every 24 months that that each required GDCS valve and ADS valve required to support relief capacity equivalent to 6 DPVs actuates on an actual or simulated automatic initiation signal. The LOGIC SYSTEM FUNCTIONAL TEST in LCO 3.3.5.2 overlaps this SR to provide complete testing of the assumed safety function.

This SR is modified by two Notes. Note 1 states that for ADS valves this SR is only required to be met in MODE 5 and in MODE 6 prior to removal of the reactor pressure vessel head. ADS is not required for GDCS injection following removal of the reactor pressure vessel head. Note 2 excludes valve actuation as a requirement for this SR to be met. OPERABILITY of required squib-actuated valves is verified by continuity tests and the Inservice Test Program for squib-actuated valves. Required SRVs are tested in accordance with the Inservice Test Program.

BASES

The 24 month Frequency for performing this SR is based on the need to perform this SR under the conditions that apply during a plant outage and the potential for an unplanned transient if the SR were performed with the reactor at power. Operating experience has shown that these components usually pass the SR when performed once per the 24 month refueling interval.

REFERENCES

1. Chapter 6.

2. Chapter 15.

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DCD Markups for

RAI 16.2-175

3.6 CONTAINMENT SYSTEMS

3.6.1.1 Containment

LCO 3.6.1.1 Containment shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Containment inoperable.	A.1 Restore containment to OPERABLE status.	1 hour
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	AND	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.1.1.1	Perform required visual examinations and leakage rate testing except for containment air lock testing, in accordance with Containment Leakage Rate Testing Program.	In accordance with Containment Leakage Rate Testing Program
SR 3.6.1.1.2	Verify combined feedwater flow isolation valve pathway inleakage is < ~~0.~~900 cc per min (0.238 gpm) when tested at ≥ 450 and ≤ 500 kPa (≥ 66 and ≤ 73 psi).	24 months

MFN 09-003
Enclosure 2

DCD Markups for

RAI 16.2-177

SURVEILLANCE		FREQUENCY
SR 3.6.1.3.7	Verify each automatic CIV actuates to the isolation position on an actual or simulated isolation signal.	24 months
SR 3.6.1.3.8	Verify a representative sample of reactor instrumentation line EFCVs actuate on a simulated instrument line break to restrict flow.	24 months
SR 3.6.1.3.9	Verify combined MSIV leakage rate through all four main steam lines is ≤ 1.57 E-03 standard m^3/sec (200 scfh) when tested at ≥ 0.5 P_a.	In accordance with the Containment Leakage Rate Testing Program
SR 3.6.1.3.10	Verify the combined feedwater isolation valve leakage rate for through both feedwater lines is ≤ 7.00E-04 standard m^3/min (2.47E-02 scfm) when tested at P_a.	In accordance with the Containment Leakage Rate Testing Program

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.1.3.8

This SR requires periodic verification that for a representative sample of reactor instrumentation line EFCVs each reduces flow on a simulated line break. This SR provides assurance that the instrumentation line EFCVs will perform to increase margin to predicted radiological consequences during the postulated instrumentation line break event evaluated in Reference 3.

This 24 month Frequency was developed to be consistent with the normal refueling interval. This interval will allow the SR to be performed during a plant outage because of the potential for an unplanned plant transient if the SR is performed with the reactor at power.

SR 3.6.1.3.9

This SR requires periodic verification that the leakage rate through each main steam line is within the specified limit when tested at ~~0.5~~ ≥ P_a. ~~The reduced test pressure is an exemption to 10 CFR 50, Appendix J (Ref. 6) as presented in Reference 4.~~ The analyses in Reference 3 are based on the specified leakage limit.

The MSIV leakage rate must be verified at a frequency in accordance with Containment Leakage Rate Testing Program. These periodic testing requirements verify that the containment leakage rate does not exceed the leakage rate assumed in the safety analyses in Reference 3. Maintaining the MSIVs OPERABLE requires compliance with requirements of 10 CFR 50, Appendix J (Ref. 6), as modified by approved exemptions.

SR 3.6.1.3.10

This SR requires periodic verification that the combined feedwater isolation valves leakage rates for both feedwater line leakage paths is within limits. The leakage rates must be verified in accordance with Containment Leakage Rate Testing Program. These periodic testing requirements verify that the containment leakage rate does not exceed the leakage rate assumed in the safety analyses in References 3 and 4. Maintaining the combined feedwater line leakage paths OPERABLE requires compliance with requirements of 10 CFR 50, Appendix J (Ref. 6), as modified by approved exemptions, which are identified in the Containment Leakage Rate Testing Program.

DCD Markups for

RAI 16.2-178

B 3.6 CONTAINMENT SYSTEMS

B 3.6.1.3 Containment Isolation Valves (CIVs)

BASES

BACKGROUND

The function of CIVs is to limit fission-product release during and following postulated Design Basis Accidents (DBAs) to values less than 10 CFR 52.47(a)(2)(iv) (Ref. 1) off-site dose limits and GDC 19 control room dose limits (Ref. 2). The OPERABILITY requirements for CIVs help ensure that adequate containment leaktightness is maintained during and after an accident by minimizing potential leakage paths to the environment. Containment isolation, within the time limits specified for those isolation valves designed to close automatically, ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the DBA analyses. Therefore, the OPERABILITY requirements provide assurance that containment leakage rates assumed in the safety analyses will not be exceeded.

Containment isolation devices are either passive or active (automatic). Passive devices include manual valves, deactivated automatic valves secured in their closed position (including check valves with flow through the valve secured), blind flanges, and closed systems. Active devices include check valves and automatic valves designed to close following an accident without operator's action.

Two barriers in series are provided for each penetration so that no single credible failure or malfunction of an active component can result in a loss of isolation (and possibly loss of containment integrity) or leakage that exceeds limits assumed in the safety analyses. The ESBWR design does not credit any closed system inside containment as a containment barrier.

Main Steam Isolation Valves (MSIVs) and main steamline (MSL) drain isolation valves are actuated by the Reactor Trip and Isolation Function (RTIF) portion of the Leak Detection and Isolation System (LD&IS) as described in Bases for LCO 3.3.6.1, "Main Steam Isolation Valve (MSIV) Instrumentation," and LCO 3.3.6.2, "Main Steam Isolation Valve (MSIV) Actuation." Each MSIV is equipped with two safety-related solenoids (i.e., the safety-related actuators). Both MSIV safety-related actuators must de-energize to close the MSIV.

Automatic containment isolation valves (other than MSIVs and MSL drain isolation valves) are actuated by the Safety System Logic and Control/Engineered Safety Features (SSLC/ESF) portion of LD&IS as described in Bases for LCO 3.3.6.3, "Isolation Instrumentation," and LCO 3.3.6.4, "Isolation Actuation."

DCD Markups for

RAI 16.2-181

3.6 CONTAINMENT SYSTEMS

3.6.3.1 Reactor Building (Contaminated Area Ventilation Subsystem (CONAVS) Area)

LCO 3.6.3.1 The Reactor Building (CONAVS area) shall be OPERABLE.

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

ACTIONS

- NOTES -

1. Penetration flow paths Reactor Building (CONAVS area) boundary may be opened intermittently under administrative controls.

2. Separate Condition entry is allowed for each penetration flow path.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more penetration flow paths with one Reactor Building (CONAVS area) boundary isolation damper inoperable.	A.1 Isolate the affected flow path by use of at least one closed and de-activated automatic damper, closed manual damper, or blind flange.	7 days
	AND	
	A.2 Verify the affected penetration flow path is isolated.	Once per 31 days
B. One or more penetration flow paths with two Reactor Building (CONAVS area) boundary isolation dampers inoperable.	B.1 Isolate the affected flow path by use of at least one closed and de-activated automatic damper, closed manual damper, or blind flange.	48 hours

DCD Markups for

RAI 16.2-185

BASES

REFERENCES

1. Section 4.3.3.
2. Section 4.6.1.
3. Section 5.2.2.
4. ~~Section 15.3.~~ Chapter 15.

BASES

BACKGROUND (continued)

Class 1E 120 VAC and 250 VDC electrical systems. Adequate functioning of the SLC System requires only one of the two injection valves open in each SLC train.

Each SLC train includes two injection squib valves, which are arranged in parallel. Actuation of either injection squib valve provides the required flow path for injection of the associated SLC train. Each of the injection squib valves are equipped with two safety-related squib initiators that are actuated by the safety-related Safety System Logic and Control (SSLC) described in the Bases for LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," and LCO 3.3.5.2, "Emergency Core Cooling System (ECCS) Actuation."

Each SLC train includes two, normally open, accumulator isolation valves, which are arranged in series, and close on a low accumulator level signal from any two of the four SLC accumulator level sensors associated with each accumulator. Closure of either accumulator isolation valve is sufficient to prevent the injection of nitrogen from the accumulator into the RPV. The normally open accumulator isolation valves receive an open signal to support the ECCS injection function.

Actuation power to each of the safety-related actuators on each SLC injection squib valve is supplied from a different division of the DC and Uninterruptible AC Electrical Power Distribution. As such, at least one safety-related actuator in each SLC injection squib valve will be associated with DC and Uninterruptible AC Electrical Power Distribution Divisions required by LCO 3.8.6, "Distribution Systems - Operating."

SLC is designed to ensure that no single active component failure will cause inadvertent initiation or prevent initiation and successful operation.

APPLICABLE SAFETY ANALYSES

The ECCS function of the SLC System is automatically initiated as described in the Bases for LCO 3.3.5.1. During a LOCA, SLC provides makeup water to the RPV to ensure the core is cooled (Ref. 2). The injection of sodium pentaborate is also credited for buffering the pH in containment pools following a LOCA (Ref. 3).

The SLC System injects borated water into the reactor core to compensate for all of the various reactivity effects that could occur during plant operation. To meet this objective, a quantity of isotopically enriched

BASES

APPLICABLE SAFETY ANALYSES (continued)

sodium pentaborate solution (SPBS) is injected, which produces the equivalent shutdown capability as concentration of 760 ppm of natural, nonenriched SPBS in the reactor core at 20°C (68°F). The volume and concentration limits are calculated such that the required concentration is achieved accounting for dilution in the RPV with the reactor water level conservatively taken at the elevation of the bottom edge of the main steamlines. This result is then increased by a factor of 1.25 to provide a 25% general margin to discount potential nonuniformities of the mixing process within the reactor (Ref. ~~2~~4). That result is then increased by a factor of 1.15 to provide a further margin of 15% to discount potential dilution by the RWCU/SDC system when activated in the shutdown cooling mode.

The SLC System satisfies Criteria 3 and 4 of 10 CFR 50.36(d)(2)(ii).

LCO

The OPERABILITY of the SLC System provides backup capability for reactivity control independent of normal reactivity control provisions provided by the control rods. In addition, the SLC System provides makeup water to the RPV to mitigate the consequences of a LOCA. For ATWS requirements, the OPERABILITY of the SLC System is based on the conditions of the borated solution in each accumulator and the availability of a pressurized accumulator and a flow path from each accumulator to the RPV, including the OPERABILITY of the instrumentation and valves. For a LOCA, the volume of water in both SLC accumulators is necessary for makeup and core cooling.

Two SLC trains are required to be OPERABLE, each containing two OPERABLE injection squib valves and two OPERABLE accumulator isolation valves in the open position and associated piping, valves, and instruments and controls to ensure an OPERABLE flow path.

OPERABILITY of each injection squib valve requires OPERABILITY of one safety-related actuator associated with DC and Uninterruptible AC Electrical Power Distribution Divisions required by LCO 3.8.6. OPERABILITY of each accumulator isolation valve requires OPERABILITY of safety-related closing actuators and safety-related opening actuators associated with DC and Uninterruptible AC Electrical Power Distribution Divisions required by LCO 3.8.6.

BASES

APPLICABILITY

In MODES 1 and 2, the SLC System is needed for its reactor shutdown capability. Reactor shutdown capability is not required in MODES 3, 4 and 5 because the reactor mode switch is in shutdown and control rods cannot be withdrawn because a control rod block is applied. When a control rod block is not applied, LCO 3.10.3, “Control Rod Withdrawal – Shutdown,” and LCO 3.10.4, “Control Rod Withdrawal - Cold Shutdown,” in conjunction with LCO 3.1.1, "SHUTDOWN MARGIN," provide adequate controls to ensure the reactor remains subcritical.

In MODES 1, 2, 3, and 4, the ECCS function of SLC System is required to provide additional inventory for RPV water makeup and core cooling.

ACTIONS

[A.1

COL 16.0-1-A 3.1.7-1

If the concentration of sodium pentaborate in solution in one or more accumulators is not within limits, the concentration must be restored to within limits in 72 hours. For ATWS mitigation the plant design also includes, alternate rod insertion (ARI), fine motion control rod drive run-in, and a feedwater runback features as described in Reference ~~3~~5. These additional features provide ATWS mitigation capability when the concentration of sodium pentaborate in solution is not within limits. Because of the low probability of an ATWS event, the additional ATWS mitigation features, and the fact that SLC System capability still exists for vessel injection under these conditions, the allowed Completion Time of 72 hours is acceptable and provides adequate time to restore concentration to within limits.]

B.1

With one injection squib valve flow path in one or more trains inoperable, the squib valve flow path(s) must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE squib valve flow paths are adequate to perform the shutdown function. However, the overall reliability is reduced because a single failure in the remaining OPERABLE squib valve flow paths could result in reduced SLC System capability. The 7 day Completion Time is based on engineering judgment considering the availability of one OPERABLE flow path in each train that is capable of performing the intended SLC System function and the low probability of a Design Basis Accident (DBA) or transient occurring during this period.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by a Note that excludes valve actuation. This is acceptable because SLC valves are subject to the Inservice Test Program.

SR 3.1.7.8

This SR requires a CHANNEL CALIBRATION of the accumulator level instrumentation channels that actuate SLC accumulator isolation on low level. CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies that the channel responds to the measured parameters within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to the required nominal trip setpoint within the "as-left tolerance" to account for instrument drifts between successive calibrations consistent with the methods and assumptions required by the Setpoint Control Program. The Frequency is based upon the assumption of a 24-month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

SR 3.1.7.9

This Surveillance ensures that there is a functioning flow path for the boron solution from the accumulator to the RPV. The Surveillance may be performed in overlapping steps, provided the entire flow path is verified within the specified Frequency. The flow path may be verified by flow tests using demineralized water to prevent injecting boron into the RPV, or a combination of flushing, visual inspection, or boroscopic inspection.

This SR is accompanied by a Note that excludes squib valve actuation as a requirement for this SR to be met. This is acceptable because squib valves are flanged, allowing access to both sides of the valves for verification that the flow path is free of obstructions. The squib valves are tested under the ASME OM Code and are included in the Inservice Testing Program (Ref. 46).

Each SLC train includes two parallel flow paths, each controlled by an injection squib valve. The Frequency, 24 months on a STAGGERED TEST BASIS for each flow path, ensures that the flow path tested every 24 months is alternated so that each flow path is tested every 96 months.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The 24 month Frequency is necessary because of the need to perform this Surveillance during a plant outage. The 24 month Frequency is acceptable because of the low probability that the piping will be blocked due to precipitation of the boron from solution. The saturation temperature of the solution is less than 15.5°C (60°F) (Ref. ~~2~~4) and requirements in SR 3.1.7.2 conservatively ensure that that the SPBS remains above saturation temperature. Additionally, the SLC mixing pump and sample connection may be used to verify flow through the outlet of the accumulator.

SR 3.1.7.10

Enriched sodium pentaborate solution is made by mixing granular, enriched sodium pentaborate with water. Isotopic tests on the granular sodium pentaborate to verify the actual B-10 enrichment must be performed prior to addition to the SLC accumulator to ensure that the proper B-10 atom percent is being used.

REFERENCES

1. 10 CFR 50.62.

2. Section 6.3.3.

3. Section 15.4.4.

~~2~~4. Section 9.3.5.

~~3~~5. Section 7.8.1.1.

~~4~~6. Section 3.9.6.1.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.1 Safety Relief Valves (SRVs)

BASES

BACKGROUND

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Ref. 1) requires the Reactor Pressure Vessel be protected from overpressure during upset conditions by self-actuated safety valves. As part of the nuclear pressure relief system, the size and number of SRVs are selected such that peak pressure in the nuclear system will not exceed the ASME Code limits for the reactor coolant pressure boundary (RCPB). The ESBWR steam relief capacity is designed to satisfy both ASME Code Service Level B (upset) overpressure protection, and Service Level C (emergency) design service limits (Ref. 2). This LCO addresses only those requirements for operability of the vessel overpressure protection that satisfy the Service Level B pressure limits.

The SRVs are located on the main steam lines between the reactor vessel and the first isolation valve within the drywell. In the safety mode, the direct action of the steam pressure in the main steam lines will act against a spring-loaded disk that will pop open when the valve inlet pressure exceeds the spring force and the frictional forces acting against the inlet steam pressure at the main or pilot disk.

APPLICABLE SAFETY ANALYSES

The overpressure protection system must accommodate the most severe pressure transient. Evaluations have determined that the most severe Service Level B pressure transient is the closure of all main steam isolation valves (MSIVs) followed by reactor scram on high neutron flux (i.e., failure of the direct scram associated with MSIV position) (Ref. ~~2~~3). The analysis results demonstrate that the design capacity of one SRV is capable of maintaining reactor pressure below the ASME Code limit of 110% of vessel design pressure, i.e., 110% x 8.62 MPaG (1250 psig) = 9.48 MPaG (1375 psig). This LCO helps to ensure that the acceptance limit of 9.48 MPaG (1375 psig) is met during the design basis event.

From an overpressure standpoint, the design basis events are bounded by the MSIV closure with flux scram event described above. Reference ~~3~~ 4 discusses additional events that are expected to actuate the SRVs.

Safety/relief valves satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii).

BASES

ACTIONS (continued)

The 14-day Completion Time to restore the inoperable required SRV to OPERABLE status is based on the relief capability of the remaining SRV, the low probability of an event requiring SRV actuation, and a reasonable time to complete the Required Action.

B.1

If the Required Action and associated Completion Time of Condition A cannot be met, or with less than the minimum number of required SRVs OPERABLE, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status the plant must be brought to at least MODE 3 within 12 hours and MODE 5 within 36 hours. The Completion Time is reasonable, based on plant design, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This Surveillance demonstrates that the required SRVs will open at the pressures assumed in the safety analysis of Reference 2.

The demonstration of the SRV safety mode lift settings is a bench test and must be performed during shutdown. The SRV setpoint is ± 3% for OPERABILITY and the valves are reset to ± 1% during the Surveillance.

The Frequency of this SR is in accordance with the Inservice Testing Program.

REFERENCES

1. ASME, Boiler and Pressure Vessel Code, Section III.

2. Section 5.2.2.

3. ~~Chapter~~ Section 15.5.1.

4. Section 15.5.4

BASES

REFERENCES

1. Chapter Section 5.4.6.

2. Chapter 6.Section 6.3.3.

3. Chapter 7.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note that continuity is not required to be met for one required actuator intermittently disabled under administrative controls. This allows the continuity monitor to be tested and allows surveillance and maintenance with the assurance that the valve will not be opened inadvertently. The operation of the disable switch in either division does not disable the ICS valve because the valve will still be opened by the actuator in the other division.

SR 3.5.5.4

This SR requires verification every 24 months that each ICS subcompartment manual isolation valve is locked open. This SR is necessary to ensure that the full volume of water in the IC/PCC pools is available to each condenser. If this SR is not met, the associated ICS loop may not be capable of performing its design functions. The 24 month Frequency for this SR is based on engineering judgment and is acceptable because the manual isolation valves between the IC/PCC pool and the ICS subcompartments are locked open and maintained in their correct position under administrative controls.

SR 3.5.5.5

This SR requires verification every 24 months that the ICS actuates on an actual or simulated automatic initiation signal. The ICS is required to actuate automatically to perform its design function. This Surveillance test verifies that the automatic initiation logic will cause the ICS to operate as designed when a system initiation signal (actual or simulated) is received. The LOGIC SYSTEM FUNCTIONAL TEST performed in LCO 3.3.5.4 overlaps this Surveillance to provide complete testing of the assumed ICS function.

The 24 month Frequency for performing this SR is acceptable based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the SR were performed with the reactor at power.

REFERENCES

1. ~~Chapter~~ Section 5.4.6.