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NUCLEAR ENERGY INSTITUTE

Anthony R. Pietrangelo
SENIOR DIRECTOR, RISK REGULATION
NUCLEAR GENERATION

September 9, 2005

Mr. T. R. Tjader, Senior Reactor Engineer
Technical Specifications Section
Reactor Operations Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Tjader:

Enclosed are four copies of WCAP-16294-NP (Non-Proprietary), Rev. 0, "Risk-Informed Evaluation of Changes to Technical Specification Required Action Endstates for Westinghouse NSSS PWRs." This document is provided to NRC for review and approval, and provides the technical justification for risk informed technical specification initiative 1 for Westinghouse NSSS PWRs. It also includes markups of the affected NUREG-1431 tech specs and bases. It is our understanding that due to the generic nature of this initiative, there are no NRC review fees associated with review of the topical.

The technical specification traveler associated with WCAP-16294-NP will be prepared after the NRC initiates their review of the topical.

Please contact me at (202) 739-8081, or Biff Bradley (202) 739-8083 if you have any questions.

Sincerely,

Anthony R. Pietrangelo

Anthony R. Pietrangelo

Enclosure:

c: Ms. Patricia Coates, NRC
Mr. Jack Stringfellow, SNOC
Mr. Wes Sparkman, SNOC
Mr. Tom Laubham, Westinghouse
Mr. Jim Andrachek, Westinghouse
Mr. Ken Vavrek, Westinghouse
Technical Specification Task Force

Westinghouse Non-Proprietary Class 3

WCAP-16294-NP

August 2005

Risk-Informed Evaluation of Changes to Technical Specification Required Action Endstates for Westinghouse NSSS PWRs

Westinghouse

WESTINGHOUSE NON-PROPRIETARY CLASS 3

WCAP-16294-NP

Risk-Informed Evaluation of Changes to Technical Specification Required Action Endstates for Westinghouse NSSS PWRs

R. L. Haessler
Reliability and Risk Assessment

J. D. Andrachek
Plant Operations Group

G. R. André
Reliability and Risk Assessment

August 2005

Approved: Official record electronically approved in EDMS
G. G. Ament, Manager
Reliability and Risk Assessment

Work Performed Under Shop Order MUHP-3015

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

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The purpose of the following tables is solely for the identification of the WOG members that may have access to WCAP-16294-NP.

Westinghouse Owners Group
Member Participation* for WOG Project/Task MUHP-3015

Utility Member	Plant Site(s)	Participant Yes	Participant No
AmerenUE	Callaway (W)	✓	
American Electric Power	D.C. Cook 1 & 2 (W)	✓	
Arizona Public Service	Palo Verde Unit 1, 2, & 3 (CE)		✓
Constellation Energy Group	Calvert Cliffs 1 & 2 (CE)		✓
Constellation Energy Group	Ginna (W)	✓	
Dominion Connecticut	Millstone 2 (CE)		✓
Dominion Connecticut	Millstone 3 (W)	✓	
Dominion VA	North Anna 1 & 2, Surry 1 & 2 (W)	✓	
Duke Energy	Catawba 1 & 2, McGuire 1 & 2 (W)	✓	
Entergy Nuclear Northeast	Indian Point 2 & 3 (W)	✓	
Entergy Operations South	Arkansas 2, Waterford 3 (CE)		✓
Exelon Generation Co. LLC	Braidwood 1 & 2, Byron 1 & 2 (W)	✓	
FirstEnergy Nuclear Operating Co	Beaver Valley 1 & 2 (W)	✓	
Florida Power & Light Group	St. Lucie 1 & 2 (CE)		✓
Florida Power & Light Group	Turkey Point 3 & 4, Seabrook (W)	✓	
Nuclear Management Company	Prairie Island 1 & 2, Point Beach 1 & 2, Kewaunee (W)	✓	
Nuclear Management Company	Palisades (CE)		✓
Omaha Public Power District	Fort Calhoun (CE)		✓
Pacific Gas & Electric	Diablo Canyon 1 & 2 (W)	✓	
Progress Energy	Robinson 2, Shearon Harris (W)	✓	
PSEG – Nuclear	Salem 1 & 2 (W)	✓	
Southern California Edison	SONGS 2 & 3 (CE)		✓
South Carolina Electric & Gas	V.C. Summer (W)	✓	
South Texas Project Nuclear Operating Co.	South Texas Project 1 & 2 (W)	✓	
Southern Nuclear Operating Co.	Farley 1 & 2, Vogtle 1 & 2 (W)	✓	
Tennessee Valley Authority	Sequoyah 1 & 2, Watts Bar (W)	✓	
TXU Power	Comanche Peak 1 & 2 (W)	✓	
Wolf Creek Nuclear Operating Co.	Wolf Creek (W)	✓	

Note:
* Project participants as of the date the final deliverable was completed. On occasion, additional members will join a project. Please contact the WOG Program Management Office to verify participation before sending this document to participants not listed above.

Westinghouse Owners Group
International Member Participation* for WOG Project/Task MUHP-3015

Utility Member	Plant Site(s)	Participant	
		Yes	No
British Energy	Sizewell B	✓	
Electrabel (Belgian Utilities)	Doel 1, 2 & 4, Tihange 1 & 3	✓	
Kansai Electric Co., LTD	Mihama 1, Ohi 1 & 2, Takahama 1	✓	
Korea Hydro & Nuclear Power Corp.	Kori 1, 2, 3 & 4 Yonggwang 1 & 2 (W)	✓	
Korea Hydro & Nuclear Power Corp.	Yonggwang 3, 4, 5 & 6 Ulchin 3, 4 & 5 (CE)		✓
Nuklearna Electrarna KRSKO	Krsko	✓	
Nordostschweizerische Kraftwerke AG (NOK)	Beznau 1 & 2 (W)	✓	
Ringhals AB	Ringhals 2, 3 & 4	✓	
Spanish Utilities	Asco 1 & 2, Vandellos 2, Almaraz 1 & 2	✓	
Taiwan Power Co.	Maanshan 1 & 2	✓	
Electricite de France	54 Units	✓	

Note:

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LIST OF ACRONYMS

AFW	Auxiliary Feedwater
CCP	Centrifugal Charging Pump
CCW	Component Cooling Water
CDF	Core Damage Frequency
CDP	Core Damage Probability
CI	Containment Isolation
CREATCS	Control Room Emergency Air Temperature Control System
CREFS	Control Room Emergency Filtration System
CRMP	Configuration Risk Management Program
CS	Containment Spray
CVCS	Chemical and Volume Control System
DG	Diesel Generator
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generators
EFW	Emergency Feedwater
ESF	Engineered Safety Feature
ESFAS	Engineered Safety Features Actuation System
FBACS	Fuel Building Air Cleanup System
FW	Feedwater
HELB	High Energy Line Break
HEPA	High Efficiency Particulate Air
ICS	Iodine Cleanup System
IE	Initiating Event
LCO	Limiting Condition for Operation
LERF	Large Early Release Frequency
LERP	Large Early Release Probability
LOCA	Loss of Coolant Accident
LOSP	Loss of Offsite Power
MD	Motor-driven
MFW	Main Feedwater
NSSS	Nuclear Steam Supply System
PIV	Pressure Isolation Valve
POS	Plant Operating State
PRA	Probabilistic Risk Assessment
PREACS	Pump Room Exhaust Air Cleanup System (or Penetration Room Exhaust Air Cleanup System)
QS	Quench Spray
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RPS	Reactor Protection System
RS	Recirculation Spray
RWST	Refueling Water Storage Tank

LIST OF ACRONYMS (cont.)

SBACS	Shield Building Air Cleanup System
SBO	Station Blackout
SG	Steam Generator
SGTR	Steam Generator Tube Rupture
SI	Safety Injection
SSPS	Solid State Protection System
SW	Service Water
SWS	Service Water System
TD	Turbine-driven
UHS	Ultimate Heat Sink
WOG	Westinghouse Owners Group

EXECUTIVE SUMMARY

The Westinghouse Owners Group (WOG) has undertaken a risk-informed program to evaluate the endstates that the Technical Specification Actions require the unit to be placed in if the Required Action and associated Completion Time are not met. The Technical Specifications contained in NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 3, were reviewed to determine the Actions for which changes to the endstates are proposed. The endstates are currently defined based on transitioning the unit to a Mode or condition in which the Technical Specification Limiting Condition for Operation (LCO) is not applicable. Mode 5 is the current endstate for LCOs that are applicable in Modes 1 through 4.

The risk of the transition from Mode 1 to Mode 4 or Mode 5 depends on the equipment that is operable. For example, the transition from Mode 4 to Mode 5 can introduce additional risk since it is required to re-align the unit from steam generator cooling to residual heat removal, or shutdown, cooling. During this re-alignment, there is an increased potential for loss of shutdown cooling and loss of inventory events. In addition, decay heat removal following a loss of offsite power event in Mode 5 is dependent on AC power for shutdown cooling, whereas, in Mode 4 the turbine-driven auxiliary feedwater pump will be available. Therefore, transitioning to Mode 5 may not always be the appropriate endstate from a risk perspective.

The purpose of this program is to evaluate and identify the appropriate endstate for a number of Technical Specification Required Actions based on the risk of transitioning the unit from Mode 1 to the lower Modes. Mode 4 is justified as an acceptable alternate endstate to Mode 5.

The proposed changes to the Technical Specification endstates will also reduce the amount of time a unit is shutdown to restore inoperable equipment. The time reduction comes from not requiring a cooldown to Mode 5 and subsequent heat up from Mode 5.

A risk-informed approach, consistent with Regulatory Guides 1.174 and 1.177 (References 1 and 2, respectively) is used in this evaluation. The risk associated with the transition from Mode 1 to Modes 4 and 5, and then returning to Mode 1 operation, is assessed both qualitatively and quantitatively. In addition to assessing the risk impact, the impacts on defense-in-depth and safety margins are also considered.

The Required Actions in the Technical Specifications listed in Table 2-1 are been evaluated for a change in endstate from Mode 5 to Mode 4. The general qualitative evaluation of the plant operating states concludes that there are advantages in risk and in defense-in-depth when the unit remains in Mode 4 rather than continuing to cool down to Mode 5. Technical Specification-specific evaluations demonstrate that there is less risk for the unit if the endstates for these Technical Specifications are changed from Mode 5 to Mode 4. The probabilistic risk assessment model used for the quantitative evaluations is described and shown to be representative of all Westinghouse NSSS units. The results of sensitivity cases support the conclusion that there is less risk associated with a cooldown to Mode 4 than there is for a cooldown to Mode 5. These conclusions are also supported by the Tier 2 assessment and the qualitative assessment of external events.

The evaluations presented and their associated conclusions support changing the endstate from Mode 5 to Mode 4 for the Technical Specifications listed in Table 2-1. Markups of the changes to the NUREG-1431 Technical Specifications and Bases are presented in Appendix B.

1 INTRODUCTION

The Westinghouse Owners Group (WOG) has undertaken a risk-informed program to evaluate the endstates that the Technical Specification Actions require the unit to be placed in if the Required Action and associated Completion Time are not met. The Technical Specifications contained in NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 3, were reviewed to determine the Actions for which changes to the endstates are proposed. The endstates are currently defined based on transitioning the unit to a Mode or condition in which the Technical Specification Limiting Condition for Operation (LCO) is not applicable. Mode 5 is the current endstate for LCOs that are applicable in Modes 1 through 4.

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2 TECHNICAL SPECIFICATIONS AND CHANGE REQUEST

The Technical Specification Required Action endstates evaluated for the endstate change are contained in NUREG-1431, "Standard Technical Specifications for Westinghouse Plants" (Reference 3). Technical Specification number, title, Condition, current endstate, and the proposed endstate are provided in Table 2-1.

Table 2-1 Proposed Changes to Endstates

Technical Specification/ Condition	Title	Current Endstate	Proposed Endstate
3.3.2-B	ESFAS Instrumentation	5	4
3.3.2-C	ESFAS Instrumentation	5	4
3.3.2-K	ESFAS Instrumentation	5	4
3.3.7-C	Control Room Emergency Filtration System Actuation Instrumentation	5	4
3.3.8-D	Fuel Building Air Cleanup System Actuation Instrumentation	5	4
3.4.13-B	RCS Operational Leakage	5	4
3.4.14-B	RCS Pressure Isolation Valve Leakage	5	4
3.4.15-E	RCS Leakage Detection Instrumentation	5	4
3.5.3-C	Emergency Core Cooling System - Shutdown	5	4
3.5.4-C	Refueling Water Storage Tank	5	4
3.6.1-B	Containment (Atmospheric, Subatmospheric, Ice Condenser, and Dual)	5	4
3.6.2-D	Containment Air Locks	5	4
3.6.3-F	Containment Isolation Valves	5	4
3.6.4A-B	Containment Pressure (Atmospheric, Dual and Ice Condenser)	5	4
3.6.4B-B	Containment Pressure (Subatmospheric)	5	4
3.6.5A-B	Containment Air Temperature (Atmospheric and Dual)	5	4
3.6.5B-B	Containment Air Temperature (Ice Condenser)	5	4
3.6.5C-B	Containment Air Temperature (Subatmospheric)	5	4
3.6.6A-B	Containment Spray and Cooling Systems (Atmospheric and Dual)	5	4
3.6.6A-E	Containment Spray and Cooling Systems (Atmospheric and Dual)	5	4
3.6.6B-F	Containment Spray and Cooling Systems (Atmospheric and Dual)	5	4

Table 2-1 (cont.) Proposed Changes to Endstates

Technical Specification/ Condition	Title	Current Endstate	Proposed Endstate
3.6.6C-B	Containment Spray System (Ice Condenser)	5	4
3.6.6D-B	Quench Spray System (Subatmospheric)	5	4
3.6.6E-F	Recirculation Spray System (subatmospheric)	5	4
3.6.7-B	Spray Additive System (Atmospheric, Subatmospheric, Ice Condenser, and Dual)	5	4
3.6.8-B	Shield Building (Dual and Ice Condenser)	5	4
3.6.11-B	Iodine Cleanup System (Atmospheric and Subatmospheric)	5	4
3.6.12-B	Vacuum Relief Valves (Atmospheric and Ice Condenser)	5	4
3.6.13-B	Shield Building Air Cleanup System (Dual and Ice Condenser)	5	4
3.6.14-B	Air Return System (Ice Condenser)	5	4
3.6.15-B	Ice Bed (Ice Condenser)	5	4
3.6.16-D	Ice Condenser Doors (Ice Condenser)	5	4
3.6.17-C	Divided Barrier Integrity (Ice Condenser)	5	4
3.6.18-C	Containment Recirculation Drains (Ice Condenser)	5	4
3.7.7-B	Component Cooling Water System	5	4
3.7.8-B	Service Water System	5	4
3.7.9-C	Ultimate Heat Sink	5	4
3.7.10-C	Control Room Emergency Filtration System	5	4
3.7.11-B	Control Room Emergency Air Temperature Control System	5	4
3.7.12-C	ECCS Pump Room Exhaust Air Cleanup System	5	4
3.7.13-C	Fuel Building Air Cleanup System	5	4
3.7.14-C	Penetration Room Exhaust Air Cleanup System	5	4
3.8.1-G	AC Sources – Operating	5	4
3.8.4-D	DC Sources – Operating	5	4
3.8.7-B	Inverters – Operating	5	4
3.8.9-D	Distribution Systems – Operating	5	4

3 NEED FOR TECHNICAL SPECIFICATION CHANGE

As discussed in Regulatory Guide 1.177 acceptable reasons for requesting Technical Specification changes fall into one or more of the following categories:

- Improvement to Operational Safety: A change to the Technical Specifications can be made due to reductions in the plant risk or a reduction in the occupational exposure of plant personnel in complying with the Technical Specification requirements.

- Consistency with Risk Basis in Regulatory Requirements: Technical Specification requirements can be changed to reflect improved design features in a plant or to reflect equipment reliability improvements that make a previous requirement unnecessarily stringent or ineffective. Technical Specifications may be changed to establish consistently based requirements across the industry or across an industry group.

- Reduce Unnecessary Burdens: The change may be requested to reduce unnecessary burdens in complying with current Technical Specification requirements, based on operating history of the plant or industry in general. This includes extending completion times 1) that are too short to complete repairs when components fail with the plant at-power, 2) to complete additional maintenance activities at-power to reduce plant down time, and 3) to provide increased flexibility to plant operators.

The benefits of changing the Technical Specification Required Action endstates are related primarily to the first two categories.

With regard to operational safety, the risk of the transition from Mode 1 to Mode 4 is lower than the risk of the transition from Mode 1 to Mode 5. The additional mode transition (Mode 4 to Mode 5) involves re-aligning the unit from steam generator cooling to shutdown cooling (residual heat removal (RHR)). This activity requires system alignment changes that can lead to loss of inventory events and loss of shutdown cooling. In addition, in Mode 4, as opposed to Mode 5, additional systems are available for event mitigation that provide a reduced risk once the unit has transitioned to the required endstate. As an example, for a loss of offsite power/station blackout (LOSP/SBO) event, the turbine driven auxiliary feedwater pumps will be available for decay heat removal in Mode 4. In Mode 5, this capability is not available.

Changing the required endstate will also result in increasing unit availability by decreasing the time shutdown. The additional time required to transition to Mode 5 from Mode 4 when shutting down and also to Mode 4 from Mode 5 when restarting can be eliminated with the endstate change. As noted in Section 6.3.1.2, a typical total time for the transition from Mode 4 to Mode 5 during shutdown and from Mode 5 to 4 during startup is 70 hours. This change will allow a total time reduction of 70 hours.

4 DESIGN BASES REQUIREMENTS AND IMPACT

The requested change to the Technical Specification Required Action endstate does not impact the design basis for any unit. As discussed in Sections 5.1 and 5.2 defense-in-depth and safety margins will not be impacted. The FSAR accident analyses, events considered and input assumptions will not be changed.

The current Required Action for the unit to be in Mode 5 in 36 hours if inoperable equipment is not restored to operable status, or the Required Actions and associated Completion Times are not met, is being revised to be in Mode 4 in 12 hours.

5 IMPACT ON DEFENSE-IN-DEPTH AND SAFETY MARGINS

In addition to discussing the impact of the changes on plant risk, as presented in Section 6, the traditional engineering considerations also need to be addressed. These include defense-in-depth and safety margins. The fundamental safety principles on which the plant design is based cannot be compromised. Design basis accidents are used to develop the plant design. These are a combination of postulated challenges and failure events that are used in the plant design to demonstrate a safe plant response. Defense-in-depth and adequate safety margins may be impacted by the proposed change and consideration needs to be given to these elements.

5.1 DEFENSE-IN-DEPTH

The proposed change needs to meet the defense-in-depth principle that consists of a number of elements. These elements follow:

- A reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation is preserved.
- Over-reliance on programmatic activities to compensate for weaknesses in plant design.
- System redundancy, independence, and diversity are maintained commensurate with the expected frequency and consequences of challenges to the system.
- Defenses against potential common cause failures are maintained and the potential for introduction of new common cause failure mechanisms is assessed.
- Independence of barriers is not degraded.
- Defenses against human errors are maintained.
- The intent of the General Design Criteria in Appendix A to 10 CFR Part 50 is maintained.

Operation in Mode 4 offers additional system availability over Mode 5. The additional systems, that offer increased defense-in-depth, are available to mitigate events that can occur. For example:

- Core Cooling: In Mode 4, core cooling can be maintained by the SGs in conjunction with AFW, and the RHR system can provide a backup function. In Mode 5, core cooling is dependent on the RHR system and AFW is not required to be operable.
- Inventory Makeup: In Mode 4, one train of ECCS is available to mitigate loss of coolant events. The ECCS is not required to be operable in Mode 5. Mitigation of loss of coolant events is dependent on the availability of a high head injection pump/train.
- Electrical Power Sources: In Mode 4, all emergency DGs are operable, while in Mode 5 not all are required to be operable, depending on the other equipment required to be operable.

In addition, the endstate changes eliminate the need to transition from Mode 4 to Mode 5. This transition requires re-alignment of systems to transfer to shutdown cooling, which is cooling provided by the RHR system for the Westinghouse NSSS plants. This transition can lead to an increased probability of loss of shutdown cooling or loss of inventory events. Remaining in Mode 4 eliminates the need to make this transition.

Therefore, the system redundancy, dependence, and diversity are increased by remaining in Mode 4. The reasonable balance among prevention of core damage, prevention of containment failure, and consequence mitigation is not impacted since there is no change in plant configuration, design, or operation in the Modes of interest. In addition, the other elements of defense-in-depth are not impacted by this change since the plant configuration (systems, structures, and components) and operation within each Mode remains the same.

The impact on defense-in-depth is further discussed in each individual requested endstate change in Section 6.

5.2 IMPACT ON SAFETY MARGINS

The safety analysis acceptance criteria in the licensing basis is not impacted by this change. The codes and standards approved for use by the NRC continue to be met. Availability of redundant and diverse systems will be maintained or improved with the proposed endstate changes. The proposed changes will not allow plant operation in a configuration outside the design basis. For the proposed changes, Mode 4 offers additional defense-in-depth and a lower risk level, for the requested changes, than Mode 5. There is no impact on safety margins.

6 ASSESSMENT OF THE IMPACT OF THE ENDSTATE CHANGE

This section provides the discussion of the impact of each proposed endstate change on defense-in-depth, safety margins, and risk. The risk impact is discussed qualitatively and quantitatively. The quantitative risk discussion is primarily directed at the impact on core damage frequency. The impact with respect to large early release frequency is provided qualitatively. Also included in this section is a discussion of the transition risk model used in the quantitative evaluations.

The evaluation was completed consistent with the requirements in Regulatory Guides 1.174 and 1.177.

6.1 APPROACH TO THE EVALUATION

The evaluation supporting these Technical Specification changes is divided into three parts: defense-in-depth, safety margins, and risk assessment. The impact on defense-in-depth is discussed, in general terms, in Section 5.1. The impact on safety margins is discussed, in general terms, in Section 5.2. The specific impact of each proposed change is discussed, with regard to defense-in-depth, in Section 6.4.

The risk assessment supporting these changes is divided into two parts. The first part discusses the impact of the changes qualitatively and the second assesses the impact from the quantitative perspective. The qualitative and quantitative risk impacts are discussed in general terms in Sections 6.2 and 6.3. The specific impact of each proposed change is discussed in Section 6.4.

The Technical Specification change being considered is the Technical Specification Required Action endstate. A change from a Mode 5 endstate to a Mode 4 endstate is justified for a number of Technical Specifications. Each proposed endstate change listed in Table 2-1 is evaluated and discussed separately in Section 6.4.

The analysis approach identifies the appropriate endstate from a risk perspective, that is, which endstate is associated with the lowest risk. The evaluation considers the risk associated with:

- The transition from operating in Mode 1 at 100% power to Mode 4 or Mode 5 with the inoperable equipment assumed to be unavailable.
- Operation in the endstate of interest with the inoperable equipment assumed to be unavailable.
- The transition from Mode 4 or Mode 5 to Mode 1 at 100% power with all equipment operable.

To perform the quantitative evaluation a transition risk model is used. This model has the capability to evaluate the risk of changing plant operating modes during plant shutdowns and startups. Transitions between modes is specifically modeled. The risk analysis considers more than design basis events. The model is discussed in Section 6.3. Core damage probability (CDP) is the risk metric used in this model. Large early release probability (LERP) is not addressed quantitatively. A qualitative evaluation is performed for LERP.

6.2 QUALITATIVE RISK ASSESSMENT

The qualitative risk assessment is directed at the risk associated with plant operation in Mode 4 and Mode 5, and transitioning to and from these modes. Consistent with the Technical Specification mode definitions, this evaluation assumes that the unit has entered the mode of interest when the conditions associated with the upper end of mode are met. The following sections provide a qualitative assessment of the risk associated with transitioning a plant to, from, and operating in Modes 4 and 5. All equipment is assumed to be available, unless operating procedures direct that equipment be isolated or locked-out. In Section 6.4, the impact of inoperable equipment is addressed.

6.2.1 Mode Transition Risk Assessment

The following provides the general steps to shutting the plant down (to Mode 5). Plants that are shutting down as required by the Technical Specification or for a refueling or other forced outage will generally be starting at or near 100% power (Mode 1).

- The power reduction will start and eventually the feedwater supply will be switched from the main feedwater system to the auxiliary or startup feedwater system, and the turbine will be tripped. These plant configuration changes provide for an increased probability of loss of feedwater flow to the steam generators. After transitioning to AFW or the startup feedwater system and reducing the power level to less than 5%, the plant will be in Mode 2.

- The plant power level will continue to be reduced to 0% with AFW used to remove decay heat. The reactor coolant system (RCS) temperature remains at ~557°F, or 547°F depending on the no load T_{avg}, and the RCS pressure is at ~2235 psig with the secondary side at normal operating pressure. Mode 3 (hot standby) is achieved when the power level is 0%.

- The next step is to begin RCS cooldown. The shutdown margin (boration) is established and the reactor trip breakers are opened. The number of operating reactor coolant pumps (RCPs) may be reduced. Cooldown is initiated via the steam dump system or SG atmospheric relief valves. The transition to Mode 4 (hot shutdown) occurs when the RCS temperature is less than 350°F.

- The cooldown continues and the safety injection pumps are disabled. RCS cooling can be switched to the RHR system when the RCS temperature is less than 340°F and the RCS pressure is less than 365 psig. The number of operating RCPs can be reduced to one. The switch to Mode 5 (cold shutdown) occurs when the RCS temperature is less than 200°F.

To return to power, similar steps are required in the reverse order. Table 6-1 provides a summary of the important RCS parameters for the different mode transitions. This table also provides the Technical Specification temperatures and power levels specified for the different Modes.

Table 6-1 Key Plant Parameters by Technical Specification Mode

Parameter	Mode 5 to Mode 4	Mode 4 to Mode 3	Mode 3 to Mode 2	Mode 2 to Mode 1	Mode 1
Technical Specification RCS Average Temperature	≤200°F (Mode 5, Cold Shutdown)	>200°F to <350°F (Mode 4, Hot Shutdown)	≥350°F (Mode 3, Hot Standby)	NA (Mode 2, Startup)	NA (Mode 1, Power)
Technical Specification Reactor Power Level	NA (Mode 5)	NA (Mode 4)	NA (Mode 3)	≤5% (Mode 2)	>5% (Mode 1)
RCS Average Temperature	~185°F to ~330°F	~330°F to ~557°F	~557°F	~557°F	~557°F
RCS Pressure	~340 psig	~340 psig to ~2235 psig	~2235 psig	~2235 psig	~2235 psig
Pressurizer Status	Water solid to bubble	Bubble	Bubble	Bubble	Bubble
Secondary Side Pressure	0 psig	Normal operating pressure	Normal operating pressure	Normal operating pressure	Normal operating pressure

The following discussion centers around several plant operating states (POS). The POS approach is used as the basis for the qualitative discussion to be consistent with the quantitative transition PRA model, that is discussed in Section 6.3.1. A POS is a unique plant configuration defined by a set of parameters. For each POS, a unique set of initiating events, plant conditions, and systems available for event mitigation can be identified. Very often a plant will be in a POS for a relatively short period of time, because switching the plant configuration (system re-alignments) is required to reach the desired endstate. To identify the POSs, an understanding of the typical key activities that are in progress as the plant shuts down and restarts is required. The following provides a general summary of these activities:

Modes 1-2

- Decrease power (Mode 1)
- Take the turbine off-line (Mode 1)
- Transfer from MFW (main feedwater) to AFW (note that some plants may continue on MFW depending on their MFW design and approach to plant shutdown) (Mode 1)
- Mode 2 (startup) when power level is ≤ 5%

Modes 2-3

- Reduce power to 0% (Mode 2 to Mode 3)
- Insert control banks (Mode 2)
- Mode 3 (hot standby) when power level is 0% (T_{ave} = 557°F, pressurizer pressure = 2235 psig, pressurizer level = 25% to 40%, SG levels = 65%)

Modes 3-4 (upper part of Mode 4 on AFW, then transfer to RHR)

- Borate the RCS to the required boron concentration to satisfy the shutdown margin requirement (Mode 3)
- If running and not required to feed the SGs, stop the turbine-driven AFW pump (Mode 3)
- If running, shut down the MFW pumps (Mode 3)
- Maintain SG water level (Mode 3)
- If withdrawn, insert the shutdown banks (Mode 3)
- Open the reactor trip breakers (Mode 3)
- Reduce the number of operating RCPs (Mode 3)
- At approximately 2000 psig, block safety injection and steamline isolation (Mode 3)
- At approximately 950 psig, isolate the accumulators (Mode 3)
- If the secondary side is to be cooled down, start "Secondary Plant Shutdown" (Mode 3)
- Place cold overpressure protection in service prior to reaching 350°F (or plant-specific temperature) (Mode 3)
- RCS cooldown is controlled by the condenser steam dump valve and SG atmospheric relief valves
- Decrease the RCS temperature from ~557°F to ~330°F (transition to Mode 4 occurs when the RCS temperature drops below 350°F)
- Decrease the RCS pressure from ~2235 psig to ~340 psig
- When the RCS pressure is less than 365 psig and the RCS temperature is less than 340°F, place one RHR loop in operation (Mode 4)

Modes 4-5 (on RHR system)

- Disable the safety injection pumps (Mode 4)
- Defeat the AFW actuation system (Mode 4)
- Reduce the operating RCPs to one (Mode 4)
- Cooldown the RCS using the RHR system
- Maintain the pressurizer pressure at 250 psig
- At 200°F, Mode 5 (Cold Shutdown) is entered
- Continue to cooldown to 190°F to 170°F
- End state: A bubble in the pressurizer, the RCS temperature is between 190°F and 170°F, the RCS pressure is 250 psig
- Centrifugal charging pumps (CCP) are in standby (Mode 5) (one CCP operating if a RCP is running)
- Solid state protection system (SSPS) is in service only for certain functions depending on whether the control rods are capable of withdrawing (Mode 5)

Modes 5-4 (on RHR system)

- CCPs are in standby (Mode 5) (one CCP operating if a RCP is running)
- SSPS is in service (Mode 5)
- Increase the RCS temperature from ~185°F to ~330°F (transition to Mode 4 occurs when RCS temperature exceeds 200°F)
- Verify that AFW is aligned for startup (Mode 4)
- Maintain the RCS pressure at ~340 psig
- RCS cooling by RHR (Mode 5 and lower end of Mode 4)
- Cold overpressure protection in service (Mode 5 and lower end of Mode 4)

Modes 4-3 (lower end of Mode 4 on RHR, then transfer to AFW)

- Prepare the SG for startup (Mode 4)
- AFW actuation signals and AFW components are available for automatic actuation (Mode 4)
- Place the RHR system in standby (lower end of Mode 4)
- Block the cold overpressure protection system (Mode 4)
- Initiate AFW (note that at some plants, a startup feedwater pump or condensate pumps and MFW may be used for startup instead of AFW) (Mode 4)
- Increase the RCS temperature from ~330°F to ~557°F (transition to Mode 3 occurs when the RCS temperature is ≥ 350°F)
- Increase the RCS pressure from ~340 psig to ~2235 psig
- Start the remaining RCPs (Mode 3)
- Verify pressurizer (PZR) pressure safety injection (SI) and steamline pressure SI and steamline isolation (SLI) auto reset (Mode 3)
- RCS heatup is controlled by the condenser steam dump valves and the SG atmospheric relief valves

Modes 3-2

- Close the reactor trip breakers (Mode 3)
- Withdraw shutdown and control banks (Mode 3)
- Raise power to less than 5% (Mode 3 to Mode 2)

Modes 2-1

- Transfer from AFW to MFW (note that some plants may already be on MFW depending on their MFW design and approach to plant startup) (Mode 1)
- Increase power (Mode 1)
- Bring turbine on-line (Mode 1)

Table 6-2 provides a summary of system status by the Technical Specification mode. Table 6-3 provides the target plant conditions when shutting down as required by the Technical Specifications. The target conditions of interest are for Modes 4 and 5. As noted previously, it is assumed that the plant will stop the shutdown after entering the mode required by the Technical Specifications.

Each POS is defined based on the plant state, available equipment, and potential initiating events. Table 6-4 defines the POSs for the transition from power operation to cold shutdown (Mode 5). Table 6-5 defines the POSs for the transition from cold shutdown (Mode 5) to power operation. These plant operating states are based on the previously discussed information and each POS represents a unique plant configuration that is defined by the plant conditions and parameters provided on these tables.

Table 6-2 System Status by Technical Specification Mode

System	Mode 6	Mode 5	Mode 4	Mode 3	Mode 2	Mode 1
RCS Charging and Letdown[1]	Establish function	In service	In service	In service	In service	In service
Reactor Coolant Pumps	None running	As needed for plant heatup	As needed for plant heatup	All RCPs running	All RCPs running	All RCPs running
Reactor Trip Breakers	Open	Open	Open	Open/Closed	Closed	Closed
Residual Heat Removal	In service	In service	In service or in standby	Standby	Standby	Standby
Auxiliary Feedwater	Out of service	Out of service	Aligned for startup or in service	In service	In service	In service and then standby after switch to MFW
High Head Injection[1]	Pull to lock	Pull to lock when water solid, standby with bubble	Standby	Standby	Standby	Standby
Cold Overpressure Protection	Establish function	In service	In service[2]	Not required	Not required	Not required
High Flux at Shutdown Alarm (HFASA)	In service	In service	In service	In service	Not required	Not required
Source Range	Two channels in service	Two channels in service	Two channels in service	Two channels in service	Two channels in service below P-6	Not required
Intermediate Range	Not required	Not required	Not required	Not required	Two channels in service	Two channels in service below P-10
Power Range	Not required	Not required	Not required	Not required	Required	Required
Solid State Protection System	Not required	Not required	In service	In service	In service	In service
Emergency Diesel Generators	Less than full complement[3]	Less than full complement[3]	Full complement	Full complement	Full complement	Full complement

Notes:

1. One charging pump is operating to provide RCS charging in Modes 1-6.
2. Cold overpressurization is required in the lower part of Mode 4.
3. Depending on equipment required to be operable.

Table 6-3 Important Parameters for Mode Target Conditions					
Parameter	**Mode 1**	**Mode 2**	**Mode 3**	**Mode 4**	**Mode 5**
RCS Temperature	557°F	557°F	557°F	~330°F	170°F to 190°F
RCS Pressure	2235 psig	2235 psig	2235 psig	340 psig	250 psig
Secondary Side Status	Normal operating pressure	Normal operating pressure	Normal operating pressure	Normal operating pressure	Low pressure
PZR Status	Bubble	Bubble	Bubble	Bubble	Bubble
(Decay) Heat Removal Mode	MFW	AFW	AFW	AFW	RHR
Power Level	100%	5%	0%	0%	0%

Table 6-4 Plant Operating States (Power Operation to Cold Shutdown)

State	POS 1	POS 2	POS 3	POS 4
Plant Mode	1 (transition only) 2 3 (upper part)	3 (middle part)	3 (lower part) 4 (upper part)	4 (lower part) 5 (upper part)
RCS Temperature	557°F	557°F to XX°F[1]	XX°F[1] to 340°F	340°F to 180°F
RCS Pressure	2235 psig	2235 psig to 950 psig	950 psig to 365 psig	365 psig to 250 psig
Pressurizer	Bubble	Bubble	Bubble	Bubble
Secondary Side	Normal operating pressure	Normal operating pressure	Normal operating pressure	Low pressure (shutdown)
Activities	• AFW for decay heat removal • Reduce power • Switch from MFW to AFW • Borate • Insert control rods • Take turbine off-line	• AFW for decay heat removal and cooldown • Open trip breakers • Reduced operating RCPs • Block SI and SLI • RCS cooldown	• AFW for decay heat removal and cooldown • Reduced operating RCPs • Isolate accumulators • RCS cooldown • Start secondary side cooldown	• RHR for decay heat removal and cooldown • Switch to RHR cooling • Disable SI pumps • Defeat AFW start signals • Cold overpressure protection (COP) in service
System Status	• AFW operating • All systems available	• AFW operating • All systems available • SI and SLI signals blocked • Reactor trip breakers open	• AFW operating • All systems available • SI and SLI signals blocked • Accumulators isolated • Reactor trip breakers open	• RHR operating • SI, SLI, and AFW signals blocked • Accumulators isolated • SI pumps disabled • COP in service • Reactor trip breakers open

Note:

1. A defined temperature is not important to this analysis.

Table 6-5 Plant Operating States (Cold Shutdown to Power Operation)

State	POS 4	POS 5	POS 6	POS 7
Plant Mode	4 (lower part) 5 (upper part)	3 (lower part) 4 (upper part)	3 (middle part)	1 (transition only) 2 3 (upper part)
RCS Temperature	180°F to 340°F	340°F to XX°F[1]	XX°F[1] to 557°F	557°F
RCS Pressure	250 psig to 365 psig	365 psig to 950 psig	950 psig to 2235 psig	2235 psig
Pressurizer	Bubble	Bubble	Bubble	Bubble
Secondary Side	Low pressure (shutdown)	Normal operating pressure	Normal operating pressure	Normal operating pressure
Activities	• RHR for decay heat removal • Switch to AFW cooling • Establish AFW actuation signals • RCS heatup	• AFW for decay heat removal • One RCP running[2] • RCS heatup • Start secondary side heatup	• AFW for decay heat removal • One RCP running[2] • RCS heatup • Establish SI and SLI signals • Un-isolate accumulators	• AFW for decay heat removal • Switch from AFW to MFW • Withdraw shutdown and control rods • Bring turbine on-line • Close trip breakers • All RCPs running • Increase power
System Status	• RHR operating • SI, SLI, and AFW signals blocked • Accumulators isolated • SI pumps disabled • COP in service • Reactor trip breakers open	• AFW operating • All systems available • SI and SLI signals blocked • Accumulators isolated • Reactor trip breakers open	• AFW operating • All systems available • SI and SLI signals blocked • Reactor trip breakers open	• AFW to MFW • All systems available

Notes:

1. A defined temperature is not important to this analysis.
2. If the rods are not capable of withdrawal.

Table 6-6 lists the possible internal initiating events for each POS. The following discusses this information. These notes are also provided with Table 6-6.

1. RCS pressure is much lower in POS 3, 4, and 5 than in POS 1, 2, 6, and 7. Large and medium LOCAs are considered in POS 3 and 5, but at a reduced frequency. Large and medium LOCAs are not considered in POS 4.

2. Small LOCAs in POS 1, 2, 6, and 7 are due to random pipe breaks and random RCP seal failures. Small LOCAs in POS 3 and 5 are significantly reduced due to reduced RCS pressure and temperature. Small consequential LOCAs can also occur in POS 1 and 7 due to transient events that lead to the opening of PZR PORVs with failure of the PORVs to reseat. These are not considered in any other POS due to the low plant power level. In POS 4, LOCAs are due to alignment issues and open valves, not pipe breaks or random failures of RCP seals, and are referred to as loss of inventory events.

3. SGTRs are considered in POS 3 and 5, assuming the at-power frequency based on NUREG/CR-6144 (Reference 4), Section 4.7. SGTRs are not considered in POS 4 because the pressure difference across the tubes is much lower and the steam generators are not being used for RCS cooling. In POS 2 and 6 the RCS pressure is conservatively assumed to be at its higher value (2235 psig) the majority of the time.

4. Secondary side breaks are not considered in POS 4 since the secondary side pressure is much lower than in POS 1, 2, 3, 5, 6, and 7.

5. RCP seal LOCAs due to loss of seal cooling are not considered in POS 3, 4, and 5 since the RCS pressure and temperature are much lower than in POS 1, 2, 6, and 7. In addition, for POS 3, 4, and 5, there is a minimum of 50°F subcooling, which means that a RCP seal pop-open event is not an issue. In POS 2 and 6 the RCS pressure is conservatively assumed to be at its higher value (2235 psig) the majority of the time.

6. Rod withdrawal is not considered in POS 2, 3, 4, 5, and 6 since the reactor trip breakers are open.

7. Loss of decay heat removal is due to a loss of AFW in POS 1, 2, 3, 5, 6, and 7 and a loss of RHR in POS 4.

8. With regard to loss of feedwater control, there is an increased probability for loss of feedwater due to feedwater control problems related to the switch from MFW to AFW during the transition down in power and related to the switch from AFW to MFW during the transition up in power. This is only applicable in POS 1 and 7.

Table 6-6 Initiating Events by Plant Operating State

Initiating Event	POS 1	POS 2	POS 3	POS 4	POS 5	POS 6	POS 7
Large LOCA[1]	X	X	X		X	X	X
Medium LOCA[1]	X	X	X		X	X	X
Small LOCA[2]	X	X	X		X	X	X
Loss of Inventory[2]				X			
RCP Seal LOCAs (Loss of Seal Cooling)[5]	X	X				X	X
Loss of Feedwater Control[8]	X						X
Loss of Decay Heat Removal[7]	X	X	X	X	X	X	X
Loss of Offsite Power	X	X	X	X	X	X	X
Cold Overpressurization				X			
SG Tube Rupture[3]	X	X	X		X	X	X
Secondary Side Breaks[4]	X	X	X		X	X	X
ATWS							
Boron Dilution	X			X			X
Rod Withdrawal[6]	X						X

Notes:

1. RCS pressure is much lower in POS 3, 4, and 5 than in POS 1, 2, 6, and 7. Large and medium LOCAs are considered in POS 3 and 5, but at a reduced frequency. Large and medium LOCAs are not considered in POS 4.
2. Small LOCAs in POS 1, 2, 6, and 7 are due to random pipe breaks and random RCP seal failures. Small LOCAs in POS 3 and 5 are significantly reduced due to reduced RCS pressure and temperature. Small consequential LOCAs can also occur in POS 1 and 7 due to transient events that lead to the opening of PZR PORVs with failure of the PORVs to reseat. These are not considered in any other POS due to the low plant power level. In POS 4, LOCAs are due to alignment issues and open valves, not pipe breaks or random failures of RCP seals, and are referred to as loss of inventory events.
3. SGTRs are considered in POS 1, 2, 3, 5, 6, and 7. Even though in POS 3 and POS 5 the delta P across the tubes (P_{RCS} - $P_{secondary\ side}$) is much lower than in POS 1, 2, 6, and 7, the frequency was not reduced. SGTRs are not considered in POS 4 because the pressure difference across the tubes is much lower and the steam generators are not being used for RCS cooling. In POS 2 and 6 the RCS pressure is conservatively assumed to be at its higher value (2235 psig) the majority of the time.
4. Secondary side breaks are not considered in POS 4 since the secondary side pressure is much lower than in POS 1, 2, 3, 5, 6, and 7.
5. RCP seal LOCAs due to loss of seal cooling are not considered in POS 3, 4, and 5 since the RCS pressure and temperature are much lower than in POS 1, 2, 6, and 7. In addition, for POS 3, 4, and 5, there is a minimum of 50°F subcooling, which means that a RCP seal pop-open event is not an issue. In POS 2 and 6 the RCS pressure is conservatively assumed to be at its higher value (2235 psig) the majority of the time.
6. Rod withdrawal is not considered in POS 2, 3, 4, 5, and 6 since the reactor trip breakers are open.
7. Loss of decay heat removal is due to a loss of AFW in POS 1, 2, 3, 5, 6, and 7 and a loss of RHR in POS 4.
8. With regard to loss of feedwater control, there is an increased probability for loss of feedwater due to feedwater control problems related to the switch from MFW to AFW during the transition down in power and related to the switch from AFW to MFW during the transition up in power. This is only applicable in POS 1 and 7.
9. Boron dilution events have not been found to be important to plant risk, and are excluded from further consideration in POS 2, 3, 5, and 6.

POS 1 and POS 7

This state is defined as Technical Specification Mode 1 (only for transitioning from power operation to Mode 2), Mode 2, and the upper part of Mode 3. In Mode 1, only the additional risk associated with the transition from power operation to Mode 2 is included in POS 1. This additional risk is due to potential transients cause by feedwater control issues when shutting the plant down. Other risks associated with Mode 1 operation are not considered part of the risk of transitioning to lower modes, but are considered part of the at-power risk.

Mode 2 and the upper part of Mode 3 are very similar except for the power level (5% vs. 0%). All other key plant parameters are the same. The same initiating events are applicable in Modes 2 and the upper part of 3. The ATWS event is not considered since the plant is at very low power and the high RCS pressures cannot be reached. Most transients cannot occur due to equipment status, for example, the turbine and generator are not operating. Since the plant will be shutting down from 100% power, decay heat levels will be high.

The key difference in POS 1 and POS 7 is the decay heat level. With the lower decay heat levels when returning to power, due to the time the reactor was shut down, operators have a longer time to respond to events. In addition, feedwater control concerns and issues bringing the turbine on-line can lead to a different risk level when starting up than when shutting down.

In these POSs, all systems are available for event mitigation, that is, none have been removed from service related to the mode changes.

POS 2 and POS 6

This state is defined as the middle of Mode 3. The RCS pressure and temperature are being reduced, but are still relatively high. Signals for safety injection and steamline isolation are blocked and the reactor trip breakers are open. The same events in POS 1 are applicable except for rod withdrawal. Loss of feedwater control is no longer an issue either.

POS 2 and POS 6 are very similar except for the direction of transition. In POS 2 the plant is transitioning down (toward shutdown) and in POS 6 the plant is transitioning up (returning to power). The key difference in POS 2 and POS 6 is the decay heat level. With the lower decay heat levels when returning to power, due to the additional time being shut down, the operators have a longer time to respond to events.

POS 3 and POS 5

This state is defined as the lower part of Mode 3 and the upper part of Mode 4. The RCS pressure and temperature are significantly reduced from power operation, therefore, many of the events associated with the high RCS pressure (LOCAs/pipe breaks) have a reduced frequency. In addition, accumulators are isolated.

POS 3 and POS 5 are very similar except for the direction of transition. In POS 3 the plant is transitioning down (toward shutdown) and in POS 5 the plant is transitioning up (returning to power).

The key difference in POS 3 and POS 5 is the decay heat level. With the lower decay heat levels when returning to power, due to the additional time being shut down, the operators have a longer time to respond to events.

POS 4

This state is defined as the lower part of Mode 4 and the upper part of Mode 5. The transition from AFW cooling to RHR cooling occurs in this POS. The RCS pressure and temperature are significantly reduced from power operation, therefore, the LOCA events and SG tube rupture event are no longer applicable. The secondary side pressure is also reduced eliminating the secondary side break events. Loss of inventory related to the RCS cooling switch from AFW to RHR is an event that is added. This can occur when transitioning down or up. Cold overpressurization is also added.

Key Differences Between POS 1 and POS 2 (and POS 7 and POS 6)

- No switchover from MFW to AFW in POS 2
- Reactor trip breakers are open in POS 2
- SI and SLI signals are blocked in POS 2 (operator actuations required for some events)
- Most initiating events are the same, but rod withdrawal and many transient events (such as, loss of MFW and turbine trip) cannot occur in POS 2

Key Differences Between POS 2 and POS 3 (and POS 6 and POS 5)

- Reduced RCS pressure and temperature results in a reduced event frequency for pipe rupture type LOCAs and RCP seal LOCAs in POS 3
- Accumulators are isolated in POS 3

Key Differences Between POS 3 and POS 4 (and POS 5 and POS 4)

- Reduced RCS pressure and temperature in POS 4
- Reduced secondary side pressure and temperature in POS 4
- Loss of inventory and loss of decay heat removal important in POS 4 due to a transfer from AFW/SG cooling to RHR cooling
- Secondary side breaks cannot occur in POS 4 due to a reduced secondary side pressure
- Cold overpressurization needs to be addressed in POS 4

6.2.2 Comparison of Endstates

To achieve Mode 4 as an endstate, the plant will need to transition through POS 1, POS 2, and into POS 3. To achieve Mode 5 as an endstate, the plant will need to transition through POS 1, POS 2, POS 3, and into POS 4. With either endstate, the plant will need to transition through POS 1, POS 2 and into POS 3. To determine the appropriate endstate (Mode 4 vs. Mode 5), the additional risk for the transition through POS 3 and into POS 4 needs to be considered, as well as the risk of remaining in POS 3 (Mode 4) as opposed to POS 4 (Mode 5).

Several of the key differences between POS 3 and 4 are:

- The frequency of loss of decay heat removal is at an increased level with POS 4 as the endstate due to the system re-alignments required. Loss of decay heat removal events in POS 3 can be addressed with AFW (all pumps available) or the RHR system following depressurization of the RCS. In POS 4, the TD AFW pump will not be available to address similar events. In addition, the automatic AFW start signal is available in POS 3, but not POS 4. Therefore, additional options are available in POS 3 for decay heat removal.

- The frequencies of loss of inventory (LOCA) events can be at an increased level with POS 4 as the endstate due to the system re-alignments required. Loss of inventory events in POS 3 can be addressed with the available train of ECCS. In POS 4 a full train of ECCS is not available. The SI pumps are out of service. Inventory control is dependent on the charging system. Therefore, additional options are available in POS 3 for inventory control.

- Mitigation of loss of offsite power (LOSP)/station blackout (SBO) events in POS 3 can be provided by the AFW system including the turbine-driven pump. Availability of the turbine-driven pump is particularly important in case the event degrades to a station blackout. In POS 4, the AFW system turbine-driven pump will not be available for decay heat removal, and the plant will be dependent on restoring electric power to the RHR system. Again, additional options are available in POS 3 for event mitigation.

- The cold overpressurization event needs to be considered in POS 4, but not in POS 3. Although not a large risk contributor, this event is addressed in POS 4.

- Secondary side breaks are considered in POS 3, but not in POS 4. In POS 3 the secondary side may be near the normal operating pressure, but in POS 4 this pressure is greatly reduced, reducing the likelihood of a secondary side break. Secondary side breaks are not typically large contributors to risk, therefore, this assumption for POS 4 has a small risk impact.

- Risk in the shutdown modes is very dependent on electric power availability. There are more required independent sources of electrical power in POS 3 than in POS 4 and there are more potential activities in POS 4 that could cause a loss of offsite power.

- In POS 3, there is more redundancy and diversity of mitigating and support systems required to be available than there is in POS 4.

6.2.3 Containment Considerations

In Modes 1-4, the containment, containment isolation valves, containment sprays, and containment cooling systems are required to be operable. The Bases for the Technical Specifications state that in these modes a design basis accident could cause a release of radioactive material to containment, and an increase in containment pressure and temperature that would require the use of these systems for accident mitigation. The Bases also indicate that in Modes 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature in these modes. Additional operability requirements are specified for Mode 6.

The risk analysis considers more than design basis events. Events can occur in Mode 5 that may lead to core damage and may cause releases outside containment. With the reduced RCS pressure and temperature in Mode 5, as opposed to Modes 1-4, the need for containment cooling systems and containment spray is not as important. Mode 4 does require the containment, containment isolation, and containment cooling and spray systems to be operable.

6.2.4 Conclusions from the Qualitative Risk Assessment

Based on Sections 6.2.3 and 6.2.4, there are advantages, from the risk perspective and also the defense-in-depth perspective, to remain in POS 3 (Mode 4) as opposed to POS 4 (Mode 5) for shutdowns required by the Technical Specifications. In POS 3, the initiators are generally at a reduced probability of occurrence compared to power operation and there are additional systems available for event mitigation compared to POS 4 (Mode 5).

6.3 QUANTITATIVE RISK ASSESSMENT

As with the qualitative risk assessment, the quantitative assessment is also directed at the risk associated with plant operation in Mode 4 and Mode 5, and transitions to and from these modes. Evaluating the risk requires an assessment of the likelihood of applicable initiating events. Consistent with the Technical Specification mode definitions, this evaluation assumes that the unit has entered the mode of interest when conditions associated with the upper end of the mode are met. The following sections provide a quantitative assessment of the risk associated with transitioning a plant to, from, and remaining in Modes 4 and 5. All equipment is assumed to be available, unless operating procedures direct equipment to be isolated or locked-out.

6.3.1 Transition Risk Model

A generic transition risk model that is representative of Westinghouse Nuclear Steam Supply System (NSSS) plants is presented in this section. Only high level information of the model is presented as well as the model quantification results. The risk metric to be determined is core damage probability (CDP). A separate risk model, similar to a level 1, internal event, at-power PRA model, is developed for each POS. Only internal initiating events are included in the transition risk model.

This model is based on the information identified in the qualitative risk discussion in Section 6.2. The POSs are defined on Table 6-4 and 6-5, and the associated initiating events that are addressed are provided on Table 6-6. Equipment availability is discussed in Section 6.2.1.

The plant response or event trees for each initiating event in each POS, the time spent in each POS, the initiating event frequencies, mitigation equipment availability, and human error probabilities for operator actions are developed and discussed in the following sections. This is followed by the model quantification that provides the CDP values for each POS, along with the initiating event CDP distribution for POS 3 and POS 4. This quantification assumes all equipment is available except for equipment removed from service, as the plant transitions though the modes, following plant procedures.

The model is based on a single unit site with standard two train systems. Several key characteristics of this model include:

- AFW system – two MD pumps and one TD pump
- Emergency core cooling system (ECCS) – two train system, each train includes a high pressure and low pressure subsystem
- Reactor protection system (RPS) – SSPS
- Service water (SW) system – two train system
- Component cooling water (CCW) system – two train system
- Electrical power system – a two train system with one emergency diesel generator (EDG) per train

The transition risk PRA model is based on a single unit, therefore, it does not take credit for the availability of shared systems. The AFW system is similar to many Westinghouse NSSS plants. The AFW system does not include a diesel-driven pump that would provide diverse mitigation for loss of offsite power events.

The ECCS design is also similar to many Westinghouse NSSS plants. The centrifugal charging pumps are used for high pressure safety injection. High pressure safety injection does not include a set of separate safety injection pumps, but the general success criteria of requiring one train is common for Westinghouse NSSS PRA models. Low pressure injection and recirculation is performed by the RHR pumps and heat exchangers. This is similar to many other Westinghouse NSSS plants, although some plants do have low pressure safety injection pumps separate from the RHR system.

The reactor protection system for the transition risk PRA model is based on a solid state protection system. While many Westinghouse NSSS plants have relay protection systems, the reliability of the two systems is not significantly different, therefore, the model is applicable to both protection systems.

The modeled CCW system consists of two trains with one pump per train and one pump that can be aligned to either train. This is a common design among the Westinghouse NSSS plants.

The modeled SW system consists of two trains with one pump per train and one pump that can be aligned to either train. This is a common design among the Westinghouse NSSS plants.

The electric power system modeled is a two train system with one diesel generator per train. This is a common design among the Westinghouse NSSS plants. Some plants have more redundancy in their design, including shared diesels between units.

The model chosen includes many safety system features and support system features that are common among many of the Westinghouse NSSS plants. While the plant designs vary for the systems modeled, the model used provides representative results whose conclusions are applicable to all Westinghouse NSSS plants.

6.3.1.1 Plant Response Model

The following discusses the response of the plant to the initiating events in each POS. This model is based on a 3-loop Westinghouse NSSS plant at-power PRA model that has undergone the Owners Group Peer Review Process and has been updated in response to Peer Review comments. As discussed in Section 6.2, many of the events that can occur in the upper modes (Modes 2 and 3), or POSs, are mitigated similarly to the events that occur when at-power. Therefore, much of the modeling used in the at-power PRA model is also used in the modeling for events that occur in the transition modes. The events included in the baseline at-power model are:

Loss of Coolant Accidents

- Small LOCA
- Medium LOCA
- Large LOCA
- Interfacing Systems LOCA
- Reactor Vessel Rupture

Secondary Side Breaks

- Inside Containment
- Outside Containment

Transients

- Loss of Main Feedwater
- Partial Loss of Main Feedwater
- Loss of Condenser
- Positive Reactivity Insertion
- Primary System Transient
- Loss of Reactor Coolant Flow
- Reactor Trip
- Inadvertent Safety Injection Signal
- Turbine Trip
- Inadvertent Opening of a Steam Valve

Special Initiators

- Loss of CCW
- Loss of SW
- Loss of one DC Bus
- Loss of one AC Bus
- Loss of Instrument Air

Internal Flooding

- CCW Pipe Breaks
- SW Pipe Breaks

Others

- Loss of Offsite Power
- Steam Generator Tube Rupture
- Anticipated Transient Without Scram

POS 1 and POS 7: Plant Response Model

In POS 1, the plant conditions, in terms of RCS and secondary side pressures and temperatures, and system availabilities, are very similar to at-power plant conditions. Therefore, the at-power plant PRA model is used with several modifications. The initiating events that need to be considered are listed on Table 6-6. Each is listed below with explanatory notes.

- Large LOCA: Event mitigation is identical to that modeled in the at-power PRA model.

- Medium LOCA: Event mitigation is identical to that modeled in the at-power PRA model.

- Small LOCA: Event mitigation is identical to that modeled in the at-power PRA model.

- RCP Seal LOCAs: A number of events can lead to a loss of seal cooling. These are:

  - Loss of CCW
  - Loss of SW
  - Loss of Offsite Power
  - Internal Flooding Events

  Event mitigation is identical to that modeled in the at-power PRA model.

- Loss of Feedwater Control: This leads to a loss of decay heat removal event which is modeled as a loss of main feedwater. Event mitigation is identical to that modeled in the at-power PRA model.

- Loss of Decay Heat Removal: This can occur when the plant has already transitioned to the auxiliary feedwater or startup feedwater system. The event is failure of the system to continue to operate. Mitigation of the event is identical to the loss of main feedwater event, as modeled in the at-power PRA model, except for removing credit for the auxiliary or startup feedwater pump that failed and initiated the event.

- Loss of Offsite Power: Event mitigation is identical to that modeled in the at-power PRA model.
- SG Tube Rupture: Event mitigation is identical to that modeled in the at-power PRA model.
- Secondary Side Breaks: Event mitigation is identical to that modeled in the at-power PRA model.
- Boron Dilution: The positive reactivity insertion event mitigation is identical to that modeled in the at-power model.
- Rod Withdrawal: The positive reactivity insertion event mitigation is identical to that modeled in the at-power model.

The decay heat level in POS 7 is lower than that for POS 1. The lower decay heat level in POS 7 provides additional response time for the operator, however, no credit is taken for lower human error probabilities in POS 7.

POS 2 and POS 6: Plant Response Model

In POS 2, the RCS pressures and temperatures are very similar to at-power plant conditions, although both are being reduced. It is assumed that the plant is at the at-power pressure and temperature conditions for the RCS. The secondary side pressure is at the normal operating pressure. The reactor trip breakers are open so rod withdrawal is no longer a possible event. Signals for safety injection and steamline isolation are blocked. Operator actions are required to start equipment to mitigate a number of the potential events. The switchover from main feedwater to auxiliary feedwater (or startup feedwater) has occurred, therefore, loss of feedwater control is no longer an issue either. The at-power plant PRA model is applicable with several modifications. The initiating events that need to be considered are listed on Table 6-6. Each is listed below with explanatory notes.

- Large LOCA: Event mitigation is identical to that modeled in the at-power PRA model.
- Medium LOCA: Event mitigation is identical to that modeled in the at-power PRA model.
- Small LOCA: Event mitigation is identical to that modeled in the at-power PRA model.
- RCP Seal LOCAs: A number of events can lead to loss of seal cooling. These are:
  - Loss of CCW
  - Loss of SW
  - Loss of Offsite Power
  - Internal Flooding Events

  Event mitigation is identical to that modeled in the at-power PRA model.

- Loss of Decay Heat Removal: This event is the failure of the decay heat removal source which is either the auxiliary feedwater system or startup feedwater system. The event is failure of the system to continue to operate. Mitigation of the event is identical to the loss of main feedwater event, as modeled in the at-power PRA model, except for removing credit for the auxiliary or startup feedwater pump that failed and initiated the event.

- Loss of Offsite Power: Event mitigation is identical to that modeled in the at-power PRA model.

- SG Tube Rupture: Event mitigation is identical to that modeled in the at-power PRA model.

- Secondary Side Breaks: Event mitigation is identical to that modeled in the at-power PRA model.

POS 3 and POS 5: Plant Response Model

In POS 3, the RCS pressures and temperatures are significantly reduced compared to POS 1 and POS 2. Therefore, the LOCA events remain applicable, but at a reduced frequency. The secondary side remains at normal operating pressure. Similar to POS 2, the reactor trip breakers are open so rod withdrawal is no longer a possible event. Also, like POS 2, signals for safety injection and steamline isolation are blocked, therefore, operator actions are required to start equipment to mitigate a number of the potential events. Accumulators are isolated. Again, loss of feedwater control is no longer an issue. The at-power plant PRA model is applicable, with several modifications, to model this POS. The initiating events that need to be considered are listed on Table 6-6. Each is listed below with explanatory notes.

- Large LOCA: Event mitigation is identical to that modeled in the at-power PRA model except for the availability of accumulators.

- Medium LOCA: Event mitigation is identical to that modeled in the at-power PRA model except for the availability of accumulators.

- Small LOCA: Event mitigation is identical to that modeled in the at-power PRA model except for the availability of accumulators.

- Loss of Decay Heat Removal: This event is the failure of the decay heat removal source which is either the auxiliary feedwater system or startup feedwater system. The event is failure of the system to continue to operate. Mitigation of the event is identical to the loss of main feedwater event, as modeled in the at-power PRA model, except for removing credit for the auxiliary or startup feedwater pump that failed and initiated the event.

- Loss of Offsite Power: Event mitigation is identical to that modeled in the at-power PRA model.

- SG Tube Rupture: Event mitigation is identical to that modeled in the at-power PRA model.

- Secondary Side Breaks: Event mitigation is identical to that modeled in the at-power PRA model.

POS 4: Plant Response Model

In POS 4, the RCS pressures and temperatures are significantly reduced compared to POS 3. The secondary side conditions have also been significantly reduced. Therefore, the LOCA events, including RCP seal LOCAs, SGTR, and secondary side breaks are no longer applicable. The reactor trip breakers remain open so rod withdrawal is not a possible event. Core cooling has been switched to the RHR system (shutdown cooling). Due to this switchover, loss of inventory events are important. In addition, the loss of decay heat removal event is now related to the RHR system. Also, like POS 2 and POS 3, signals for safety injection and steamline isolation are blocked, therefore, operator actions are required to start equipment to mitigate a number of the potential events. Finally, cold overpressurization needs to be considered.

The at-power plant PRA model is no longer applicable due to the significant changes in the operating temperature and pressure on both the primary and secondary sides, available systems, and the events that can occur. The initiating events that need to be considered are listed on Table 6-6. Each is listed below with explanatory notes.

- Loss of Inventory: Loss of inventory events are associated with alignment issues when transferring to RHR (shutdown) cooling. These events can be divided between isolable events and non-isolable events. If the leak is not isolable or if isolation fails, then high pressure injection, via SI/charging, is required followed by recirculation. If isolation is successful, then high pressure injection is required to make up for the inventory lost prior to the leak being isolated. Decay heat removal is also required.

- Loss of Decay Heat Removal: Loss of decay heat removal events are primarily loss of RHR events. These can occur during the switchover from AFW cooling to RHR cooling or from failure of the RHR system. Mitigation of the event depends on the availability of the AFW system. SG cooling credits the MD AFW pumps, but not the TD AFW pump due to the reduced secondary side pressure. If AFW is not available, then feed and bleed followed by high pressure recirculation provides a path to success for cooling.

- Loss of Offsite Power: The causes of loss of offsite power events in POS 4 are similar to these events that occur when at-power. The consequences are different in that RCP seal LOCAs are no longer an issue, but the TD AFW pump is not available for decay heat removal. In addition, the lower decay heat level provides additional time for recovery from the event. For event mitigation, recovery of offsite power is initially addressed, and if successful, is followed by decay heat removal equipment. If offsite power recovery fails, then the availability of decay heat removal mitigating systems with power from the EDGs is addressed. Decay heat removal can be provided by the RHR system, AFW systems (MD pumps only), or by feed and bleed with follow-up recirculation.

- Cold Overpressurization: Mitigation of cold overpressure events requires the operators to control charging and letdown. If this is not successful, then pressure relief via a pressurizer PORV or a RHR relief valve is necessary. Following successful pressure relief, the pressurizer PORV or a RHR relief valve is required to re-close. If it does not reclose, a loss of inventory event occurs. This model does not address mitigation of the possible loss of inventory event, but conservatively assumes the event leads to core damage.

- Boron Dilution: The high flux at shutdown alarm will indicate the event. The operators are required to identify and terminate the dilution source. If the dilution is not terminated, the operator must initiate boration.

6.3.1.2 Time in Each Plant Operating State

The time spent in each POS is important to the calculation of initiating event probabilities. When shutting the plant down due to Technical Specification requirements, the Technical Specifications control the maximum length of time allowed in each mode.

If inoperable equipment is not restored to operable status, or the Required Actions and associated Completion Times are not met, the Required Actions require that the unit be in Mode 3 in 6 hours and Mode 5 in 36 hours. Based on this, the time spent in the POSs while shutting the plant down are provided in Table 6-7.

The time spent in each POS when returning to power is not controlled by the Technical Specifications, but rather on the reason for the forced outage and satisfying the applicable Technical Specifications prior to returning to power operation. Information was collected from several Westinghouse NSSS plants for startup times following a forced non-refueling outage. Table 6-7 provides a summary of the time in each POS based on this information. Note that the times begin from the time that the decision is made to shutdown and do not include any time prior to the shutdown because the Completion Times associated with the Required Actions to restore the equipment to operable status are not changing.

6.3.1.3 Initiating Event Probabilities

Table 6-8 provides a summary of the initiating event probabilities. Event probabilities are used, not frequencies, since the risk metric being used (core damage) is determined on a shutdown basis, not a yearly basis. The core damage probability (CDP) can be converted to a CDF by multiplying the CDP by the number of shutdowns per year. The event probabilities for each POS are determined by multiplying the event frequencies by the time in the POS. Additional information on each initiating event probability is provided in the following:

- Large LOCA: In POS 1, POS 2, POS 6, and POS 7 the at-power frequency is used. In POS 3 and POS 5 the RCS pressure is significantly reduced compared to at-power, therefore, the frequency is reduced by a factor of 20, based on Reference 4. The at-power initiating event frequency is 5.0E-06/yr.

Table 6-7 Summary of the Time Spent in the Plant Operating States		
Plant Operating State	**Time in the Plant Operating State**	**Justification**
1	7 hours	POS 1 covers the transition out of Mode 1, through Mode 2, and into Mode 3. The Technical Specification Required Actions require that this be completed in 6 hours. An additional 1 hour was added to prepare for the shutdown.
2	3 hours	POS 2 covers the mid part of Mode 3 (also viewed as transitioning from the upper end of Mode 3 to the lower end of Mode 3). It is assumed that Mode 4 will be entered in 13 hours. This results in 6 hours (13 hours - 7 hours) to go from the upper end of Mode 3 to the upper end of Mode 4. Assuming that half this time is used to transition from the upper end of Mode 3 to the lower end of Mode 3, the time in POS 2 in 3 hours.
3	3 hours	POS 3 covers the lower end of Mode 3 to the upper end of Mode 4. Following the logic presented in POS 2, half the time to go from Mode 3 to Mode 4 (6 hours) is assigned to POS 3.
4 (shutdown)	24 hours	POS 4 (shutdown) covers the transition through Mode 4 to Mode 5. Since the Technical Specification Required Actions require Mode 5 to be entered in 36 hours, and an additional 1 hour was added to prepare for the shutdown, the time in this POS is 37 - 7 - 3 - 3 = 24 hrs.
4 (startup)	46 hours	POS 4 (startup) covers the transition from Mode 5 to Mode 4. As discussed in Section 6.3.1.2, 46 hrs is based on plant operating experience.
5	19 hours	POS 5 covers the transition from Mode 4 to the lower end of Mode 3. As discussed in Section 6.3.1.2, 19 hrs is based on plant operating experience.
6	52 hours	POS 6 covers the middle part of Mode 3 (also viewed as moving from the lower end of Mode 3 to the upper end of Mode 3). As discussed in Section 6.3.1.2, 52 hrs is based on plant operating experience.
7	39 hours	POS 7 covers the upper end of Mode 3, through Mode 2, and the transition through Mode 1 to power operation. As discussed in Section 6.3.1.2, 39 hrs is based on plant operating experience.

Table 6-8 Summary of Initiating Event Probabilities for Each POS

Initiating Event	Initiating Event Probabilities						
	POS 1	POS 2	POS 3	POS 4	POS 5	POS 6	POS 7
Large LOCA	4.0E-09	1.7E-09	8.6E-11	NA	5.4E-10	3.0E-08	2.2E-08
Medium LOCA	3.2E-08	1.4E-08	6.9E-10	NA	4.3E-09	2.4E-07	1.8E-07
Small LOCA	2.4E-06	1.0E-06	5.1E-08	NA	3.3E-07	1.8E-05	1.3E-05
Interfacing Systems LOCA	1.1E-09	4.7E-10	4.7E-10	NA	3.0E-09	8.1E-09	6.1E-09
Reactor Vessel Rupture	8.0E-11	3.4E-11	3.4E-11	NA	2.2E-10	5.9E-10	4.5E-10
Loss of Inventory	NA	NA	NA	1.4E-04	NA	NA	NA
RCP Seal LOCAs[1]	9.6E-07 + FT	4.1E-07 + FT	NA	NA	NA	7.1E-06 + FT	5.3E-06 + FT
Loss of Feedwater Control[3]	6.8E-02 + FT	NA	NA	NA	NA	NA	8.8E-02 + FT
Loss of Decay Heat Removal	NA	FT[2]	FT[2]	FT[2]	FT[2]	FT[2]	NA
Loss of Offsite Power	2.0E-05	8.5E-06	8.5E-05	2.0E-04	5.4E-05	1.5E-04	1.1E-04
Cold Overpressurization	NA	NA	NA	1.5E-03	NA	NA	NA
SG Tube Rupture	2.2E-06	9.3E-07	9.3E-07	NA	5.9E-06	1.6E-05	1.2E-05
Secondary Side Breaks							
• Inside containment	5.7E-06	2.5E-06	2.5E-06	NA	1.6E-05	4.3E-05	3.2E-05
• Outside containment	5.7E-06	2.5E-06	2.5E-06	NA	1.6E-05	4.3E-05	3.2E-05
Boron Dilution	Note 4	NA	NA	4.2E-03	NA	NA	Note 4
Rod Withdrawal	7.9E-05	NA	NA	NA	NA	NA	4.4E-04

Notes:

1. RCP Seal LOCAs are caused by loss of CCW and loss of SW events, in addition to several flooding events that lead to degraded CCW and SW. The numerical values are the IE probability due to flooding events. The FT indicates that fault tree evaluations are used to determine the IE probability for the loss of CCW and loss of SW events. This evaluation is done as part of the model quantification.
2. The FT indicates that fault tree evaluations are used to determine the IE probability for the loss of decay heat removal events. This evaluation is done as part of the model quantification.
3. The loss of AFW is modeled as an initiating event for the time in the POS after AFW has been initiated. Fault tree evaluations are used to determine the IE probability.
4. Boron dilution IE probability is included in the rod withdrawal probability.

- Medium LOCA: In POS 1, POS 2, POS 6, and POS 7 the at-power frequency is used. In POS 3 and POS 5 the RCS pressure is significantly reduced compared to at-power, therefore, the frequency is reduced by a factor of 20, based on Reference 4. The at-power initiating event frequency is 4.0E-05/yr.

- Small LOCA: In POS 1, POS 2, POS 6, and POS 7 the at-power frequency is used. In POS 3 and POS 5 the RCS pressure is significantly reduced compared to at-power, therefore, the frequency is reduced by a factor of 20, based on Reference 4. The at-power initiating event frequency is 3.0E-03/yr.

- Interfacing Systems LOCA: In POS 1, POS 2, POS 3, POS 5, POS 6, and POS 7 the at-power frequency is used. The at-power initiating event frequency is 1.36E-06/yr.

- Reactor Vessel Rupture: In POS 1, POS 2, POS 3, POS 5, POS 6, and POS 7 the at-power frequency is used. The at-power initiating event frequency is 1.0E-07/yr.

- Loss of Inventory: This event is only applicable in POS 4. Based on Reference 4, the loss of inventory events are divided into three categories with the noted initiating event frequencies:

  - HLOCA – an event that results from an inadvertent transfer of reactor coolant out of the RCS
    IE frequency = 7.0E-03/yr

  - JLOCA – an event that occurs in a system connected to the RCS
    IE Frequency = 8.0E-03/yr

  - KLOCA – an event that results from a maintenance activity
    IE frequency = 3.0E-03/yr

  The total IE frequency is 1.8E-02/yr. The event probability is then determined by factoring in the length of time in POS 4.

- RCP Seal LOCAs: These are events that occur primarily due to a failure of seal cooling, such as, loss of CCW, loss of SW, and loss of offsite power. In addition, flooding events that are the result of breaks in the CCW or SW system can also result in RCP seal LOCAs due to loss of seal cooling. Loss of offsite power is addressed as a separate initiator and is discussed further below.

  The total CCW flooding frequency is 9.9E-04/yr and the total SW flooding frequency is 2.1E-04/yr. The event probabilities are then determined by factoring in the length of time for the applicable POS (POS 1, POS 2, POS 6, POS 7).

  The IE frequencies for the loss of CCW and loss of SW events are determined from fault tree evaluations in the model quantification. The component operating times in these fault trees are changed as required for the time in the POS.

- Loss of Feedwater Control: This event is applicable in POS 1 and POS 7 only. It considers reactor trips caused by loss of feedwater during the power reduction (POS 1) and power ascension (POS 7). Section 8.4 of Reference 5 provides a value for the probability of a reactor trip during a shutdown as 0.068 and the probability of a reactor trip during a startup as 0.088.

- Loss of Decay Heat Removal: This event is applicable in all the POSs. In POS 1 and POS 7 it is considered part of the Loss of Feedwater Control event or the loss of AFW after AFW is initiated. In POS 2, POS 3, POS 5, and POS 6 it is considered loss of auxiliary feedwater. In POS 4 it is considered loss of RHR. The IE frequencies for the loss of AFW and the loss of RHR are determined from fault tree evaluations in the model quantification.

- Loss of Offsite Power: In POS 1, POS 2, POS 3, POS 5, POS 6, and POS 7 the at-power IE frequency is used. The at-power IE frequency is 2.5E-02/yr. In POS 4 the events in Reference 6 were reviewed and an IE frequency determined. This frequency was similar to the 2.5E-02/yr value for the at-power LOSP event, therefore, the IE probability for POS 4 was also based on the 2.5E-02/yr value.

- Cold Overpressurization: This event only applies to POS 4. References 4 and 7 were reviewed to determine an appropriate frequency. Reference 7 was used since it provided a higher value of 1.8E-01/yr.

- SG Tube Rupture: In POS 1, POS 2, POS 3, POS 5, POS 6, and POS 7 the at-power frequency is used. The at-power initiating event frequency is 2.7E-03/yr.

- Secondary Side Breaks Inside and Outside Containment: In POS 1, POS 2, POS 3, POS 5, POS 6, and POS 7 the at-power frequency is used. The at-power initiating event frequency is 7.2E-03/yr.

- Rod Withdrawal: This event is only considered in POS 1 and POS 7. For POS 1 and POS 7, it is combined with the Boron Dilution initiating event and modeled as a positive reactivity insertion event with the at-power IE frequency of 9.9E-02/yr.

- Boron Dilution: For POS 1 and POS 7, it is combined with the Rod Withdrawal initiating event, and modeled as a positive reactivity insertion event with the at-power IE frequency of 9.9E-02/yr. For POS 4, Boron Dilution is modeled by itself with a frequency of 6.0E-05/hr based on Reference 4.

6.3.1.4 System Unavailabilities

System models for a typical Westinghouse NSSS plant were included in the model. As noted in Section 6.3.1, the base PRA model includes unavailability models for the following system configurations:

- AFW system – two MD pumps and one TD pump
- ECCS – two train system with each train including a high head and low head subsystem
- RPS – SSPS

- SW – two train system
- CCW – two train system
- Electrical power system – a two train system with one EDG per train

All system unavailabilities due to test and maintenance activities that are typically included in the at-power PRA model were eliminated. When a plant is starting up or shutting down, the specific plant configuration is modeled. The availability of components is known. Therefore, all component unavailability related to testing and maintenance activities were removed from the model.

6.3.1.5 Operator Actions

Operator actions and human error probabilities are key parameters for mitigating events in the transition states, particularly after blocking the automatic signals. Safety injection and steamline isolation signals are blocked in POS 2 and 3. Safety injection, steamline isolation, and AFW start signals are blocked in POS 4. For mitigation of several events, consecutive dependent operator actions are required. Dependencies between operator actions are addressed and accounted for as necessary.

6.3.2 Model Quantification

The base core damage probability results from quantifying the POS models are provided on Table 6-9. These results assume all the equipment is available, that is, no equipment is out of service or inoperable and all the unavailabilities in the model for test and maintenance are set to zero. Based on this, the core damage probabilities for transitioning to and returning from Mode 4 (POS 3) and to and from Mode 5 (POS 4) are:

- CDP (transition to and from POS 3/Mode 4) = 5.49E-06
- CDP (transition to and from POS 4/Mode 5) = 1.27E-05

There is a significant increase in CDP with the additional transition required to achieve Mode 5 as opposed to Mode 4. This is related to the risk associated with the transition from SG cooling to the shutdown (RHR) cooling and operator actions being required to initiate event mitigation equipment. The key initiating event is loss of RHR cooling with operator failure to establish alternate cooling.

Table 6-9 Core Damage Probability Results by Plant Operating State			
POS	**CDP**	**Time in POS (hours)**	**CDP/Hour in POS**
1	2.18E-07	7	3.11E-08
2	1.66E-07	3	5.53E-08
3	7.09E-08	3	2.36E-08
4	7.21E-06	70	1.03E-07
5	4.79E-07	19	2.62E-08
6	3.30E-06	52	6.35E-08
7	1.26E-06	39	3.23E-08

Since the primary objective of this analysis is to identify the appropriate endstate, Mode 4 or Mode 5, an examination of the initiating event contributors to core damage for each of these endstates provides relevant insights. This information is provided on Table 6-10. The values in this table are given as core damage probabilities based on the plant remaining in the POS for the time indicated in Table 6-9 with all systems available. The following is concluded:

- Adjusting for the differences in time in the POS, the core damage probability in Mode 5 (POS 4) is more than 4 times greater than that for Mode 4 (POS 3).

- The largest initiating event contributor in either mode is a loss of decay heat removal. In Mode 4 the plant is using AFW for removal of decay heat and the event is initiated by a failure of the operating pump. The other motor-driven pump and the turbine-driven AFW pump are available. In Mode 5 the plant is using the RHR system for decay heat removal. Included in this initiating event is the switchover from SG (AFW) cooling to shutdown (RHR) cooling. All actuations of mitigating systems are by operator actions and the turbine-driven pump is not available.

- Small LOCAs or loss of inventory events are larger risk contributors in Mode 5 than in Mode 4. In Mode 5, loss of inventory events can be initiated by the alignment change from SG cooling to shutdown cooling. Event mitigation relies on operator actions in both endstates.

- The loss of offsite power event is also a larger risk contributor in Mode 5 than in Mode 4. One significant difference is that in Mode 4 the turbine-driven pump is available for event mitigation, but not in Mode 5.

Based on these quantitative results, it is concluded that Mode 4 is preferred over Mode 5 as the endstate. The initiating event contributions for POS 3 and POS 4 in Table 6-9 are shown in Table 6-10. The top 100 cutsets for the POS 3 and POS 4 quantifications are presented in Appendix A. A sensitivity case that examines the time duration for POS 4 is presented in Section 6.5.

Table 6-10 Summary of Initiating Event Contribution for POS 3 and POS 4		
	Core Damage Probability	
Initiating Event	**POS 3 (Mode 4) Endstate**	**POS 4 (Mode 5) Endstate**
Loss of Decay Heat Removal/RHR	63.4%	71.8%
Loss of Offsite Power	12.7%	10.1%
Small LOCA/Loss of Inventory	5.7%	13.6%
SG Tube Rupture	9.4%	NA
Secondary Side Break Outside Containment	2.5%	NA
Secondary Side Break Inside Containment	5.0%	NA
Interfacing Systems LOCA	0.1%	NA
Reactor Vessel Rupture	<0.1%	NA
Cold Overpressure	NA	<0.1%
Boron Dilution	NA	4.4%

6.4 EVALUATION OF TECHNICAL SPECIFICATION REQUIRED ACTION ENDSTATES

This section provides an evaluation of each Technical Specification for which the endstate is proposed to be changed from Mode 5 to Mode 4. The Technical Specifications are listed in numerical order by Specification number as contained in NUREG-1431 (Reference 3). Qualitative and quantitative evaluations are presented to support the endstate change from Mode 5 to Mode 4.

Quantitative evaluations are performed if the components/systems are modeled in the POS risk models described in Section 6.3. In the quantitative evaluation, specific components/systems are modeled as inoperable in the POS risk models and the conditional CDP for each applicable POS is calculated. The risk models for POS 5, 6, and 7 model the restart of the unit after the inoperable equipment has been restored to operable status, therefore, the CDPs for these POSs are not requantified. The risk calculation results are presented along with the base case results from Section 6.3.2. In describing the results, the total CDP representing a cool down to POS 4 (Mode 5) and startup is compared to the total CDP representing a cool down to POS 3 (Mode 4) and startup.

6.4.1 Technical Specification 3.3.2 – Engineered Safety Features Actuation System (ESFAS) Instrumentation

The ESFAS instrumentation initiates necessary safety systems, based on the values of selected unit parameters, to protect against violating core design limits and the RCS pressure boundary, and to mitigate accidents. There are numerous ESFAS function LCOs. For this Technical Specification, each function is addressed separately.

Function 1. a. Safety Injection – Manual Initiation

Description

The safety injection system provides two primary functions:

1. Primary side water addition to ensure maintenance or recovery of reactor vessel water level (coverage of the active fuel for heat removal, clad integrity, and for limiting the peak clad temperature to ≤ 2200°F), and

2. Boration to ensure recovery and maintenance of shutdown margin ($k_{eff} < 1.0$).

These functions are necessary to mitigate the effects of high energy line breaks (HELBs) both inside and outside of containment. The SI signal is also used to initiate other functions (e.g., reactor trip).

The operator can initiate both trains of safety injection at any time from the control room by pushing one of two push buttons. This action will cause actuation of all components in the same manner as any of the automatic actuation signals.

Limiting Condition for Operation

Two channels shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One channel inoperable.

Current Required Action Endstate

The current endstate for Required Action B.2.2 is Mode 5. Specifically, the inoperable channel must be restored to operable status within 48 hours, or the unit must be in Mode 3 in 54 hours and Mode 5 in 84 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2.2 to be in Mode 4 in 60 hours if the inoperable channel or train is not restored to operable status in 48 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 include automatic actuation of safety injection and manual actuation of the equipment, however, credit is not taken for the manual initiation of safety injection. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one channel is inoperable, the other channel is available for the operator to initiate safety injection. If the operator is shutting down the unit because of an inoperable channel, there will be a heightened awareness that this protection feature is not fully operational. The operators can be expected to be prepared to address a unit transient requiring safety injection with one channel inoperable. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. The LERP in Mode 4 would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one channel is inoperable, the other channel is available for the operator to initiate safety injection. In addition, the two trains of automatic actuation logic are required to be operable to support the actuation of safety injection equipment. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 1. b. Safety Injection – Automatic Actuation Logic and Actuation Relays

Description

The general description is the same as that presented for Function 1. a., Safety Injection – Manual Initiation.

There are two trains for automatic actuation. In Mode 4 adequate time is available to manually actuate required components in the event of a design basis accident, however, because of the large number of components actuated, actuation is simplified by the use of the manual actuation push buttons. Automatic actuation logic and actuation relays must be operable in Mode 4 to support system level manual initiation.

Limiting Condition for Operation

Two trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One train inoperable.

Current Required Action Endstate

The current endstate for Required Action C.2.2 is Mode 5. Specifically, the inoperable train must be restored to operable status within 24 hours, or the unit must be in Mode 3 in 30 hours and Mode 5 in 60 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2.2 to be in Mode 4 in 36 hours if the inoperable train is not restored to operable status in 24 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 model the block of the automatic SI signal for POSs 2, 3, 4, 5, and 6. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one train is inoperable, the other train is available to initiate safety injection. In addition, if the operator is shutting down the unit because of an inoperable train, there will be a heightened awareness that this protection feature is not fully operational. The operators would be prepared to address a unit transient requiring safety injection knowing that manual initiation may be required. In this case, the operator will have both manual channels available. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions and mitigation strategies, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one train is inoperable, the other train is available to initiate safety injection. In addition, the two channels of manual actuation are required to be operable to perform the function. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 2. a. Containment Spray – Manual Initiation

Description

The containment spray system provides three primary functions:

1. Lowers containment pressure and temperature after a HELB in containment,

2. Reduces the amount of radioactive iodine in the containment atmosphere, and

3. Adjusts the pH of the water in the containment recirculation sump after a LOCA.

These functions are necessary to:

- Ensure the pressure boundary integrity of the containment structure,
- Limit the release of radioactive iodine to the environment in the event of a failure of the containment structure, and
- Minimize corrosion of the components and systems inside containment following a LOCA.

The operator can initiate containment spray at any time from the control room by simultaneously actuating two containment spray actuation switches in the same train. Because an inadvertent actuation of containment spray could have undesirable consequences, two switches must be actuated simultaneously. There are two sets of two switches in the control room. Simultaneously actuating the two switches in either set will start both trains of containment spray.

<u>Limiting Condition for Operation</u>

Two channels per train and two trains shall be operable.

<u>Applicability</u>

Modes 1, 2, 3, and 4.

<u>Condition Requiring Entry into Actions or a Unit Shutdown</u>

One channel or train inoperable.

<u>Current Required Action Endstate</u>

The current endstate for Required Action B.2.2 is Mode 5. Specifically, the inoperable channel or train must be restored to operable status within 48 hours, or the unit must be in Mode 3 in 54 hours and Mode 5 in 84 hours.

<u>Proposed Required Action and Endstate</u>

Revise the endstate for Required Action B.2.2 to be in Mode 4 in 60 hours if the inoperable channel or train is not restored to operable status in 48 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 are based on evaluating the core damage probability. The containment spray system does not have a significant impact on the core damage probability for the plant operating states modeled as described in Section 6.3. This is confirmed by the results in Table 6-13. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one channel or train is inoperable, the other train is available for the operator to initiate containment spray. If the operator is shutting down the unit because of an inoperable channel or train, there will be a heightened awareness that this protection feature is not fully operational. A cool down to Mode 4 places the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. The LERP in Mode 4 would be small due to the lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression due to lower temperatures and pressures, and the corresponding increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one channel or train is inoperable, the other train is available for the operator to initiate containment spray. In addition, the two trains of automatic actuation logic are required to be operable to support the actuation of containment spray equipment. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. In addition, the containment, containment isolation valves, containment spray system, and containment cooling system are required to be operable in Mode 4. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 2. b. Containment Spray – Automatic Actuation Logic and Actuation Relays

Description

The general description is the same as that presented for Function 2. a., Containment Spray – Manual Initiation.

There are two trains for automatic actuation. In Mode 4 adequate time is available to manually actuate required components in the event of a design basis accident, however, because of the large number of components actuated, actuation is simplified by the use of the manual actuation push buttons. Automatic actuation logic and actuation relays must be operable in Mode 4 to support system level manual initiation.

Limiting Condition for Operation

Two trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One train inoperable.

Current Required Action Endstate

The current endstate for Required Action C.2.2 is Mode 5. Specifically, the inoperable train must be restored to operable status within 24 hours, or the unit must be in Mode 3 in 30 hours and Mode 5 in 60 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2.2 to be in Mode 4 in 36 hours if the inoperable train is not restored to operable status in 24 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 are based on evaluating the core damage probability. The containment spray system does not have a significant impact on the core damage probability for the plant operating states modeled as described in Section 6.3. This is confirmed by the results in Table 6-13. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one train is inoperable, the other train is available to initiate containment spray. In addition, if the operator is shutting down the unit because of an inoperable train, there will be a heightened awareness that this protection feature is not fully operational. The operators would be prepared to address a unit transient requiring containment spray knowing that manual initiation may be required. In this case, the operator will have both manual trains available. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one train is inoperable, the other train is available to initiate containment spray. In addition, the two trains for manual initiation are required to be operable to support the actuation of containment spray equipment. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. In addition, the containment, containment isolation valves, containment spray system, and containment cooling system are required to be operable in Mode 4. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 3. a (1) Containment Isolation, Phase A Isolation, Manual Initiation

Description

Containment Isolation provides isolation of the containment atmosphere, and all process systems that penetrate containment, from the environment. This function is necessary to prevent or limit the release of radioactivity to the environment in the event of a large break LOCA.

There are two separate Containment Isolation signals, Phase A and Phase B. Phase A isolation isolates all automatically isolable process lines, except CCW, at a relatively low containment pressure indicative of primary or secondary system leaks. Phase A containment isolation is actuated automatically by SI, or manually via the automatic actuation logic. All process lines penetrating containment, with the exception of CCW, are isolated.

Manual Phase A Containment Isolation is accomplished by either of two switches in the control room. Either switch actuates both trains. Note that manual actuation of Phase A Containment Isolation also actuates Containment Purge and Exhaust Isolation.

Limiting Condition for Operation

Two channels shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One channel inoperable.

Current Required Action Endstate

The current endstate for Required Action B.2.2 is Mode 5. Specifically, the inoperable channel must be restored to operable status within 48 hours, or the unit must be in Mode 3 in 54 hours and Mode 5 in 84 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2.2 to be in Mode 4 in 60 hours if the inoperable channel or train is not restored to operable status in 48 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 are based on core damage probability and do not model containment isolation. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one channel is inoperable, the other channel is available for the operator to initiate containment isolation. If the operator is shutting down the unit because of an inoperable channel, there will be a heightened awareness that this protection feature is not fully operational. The operators would be prepared to address a unit transient requiring containment isolation with one channel inoperable. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. The LERP in Mode 4 would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one channel is inoperable, the other channel is available for the operator to initiate containment isolation. In addition, the two trains of automatic actuation logic are required to be operable to support the actuation of containment isolation equipment. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. In addition, the containment, containment isolation valves, containment spray system, and containment cooling system are required to be operable in Mode 4. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 3. a (2) Containment Isolation, Phase A Isolation, Automatic Actuation Logic and Actuation Relays

Description

The general description is the same as that presented for Function 3. a (1), Containment Isolation, Phase A Isolation, Manual Initiation.

There are two trains for automatic actuation. In Mode 4 adequate time is available to manually actuate required components in the event of a design basis accident, however, because of the large number of components actuated, actuation is simplified by the use of the manual switches. Automatic actuation logic and actuation relays must be operable in Mode 4 to support system level manual initiation.

Limiting Condition for Operation

Two trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One train inoperable.

Current Required Action Endstate

The current endstate for Required Action C.2.2 is Mode 5. Specifically, the inoperable train must be restored to operable status within 24 hours, or the unit must be in Mode 3 in 30 hours and Mode 5 in 60 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2.2 to be in Mode 4 in 36 hours if the inoperable train is not restored to operable status in 24 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 are based on core damage probability and do not model containment isolation. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one train is inoperable, the other train is available to initiate containment isolation Phase A. In addition, if the operator is shutting down the unit because of an inoperable train, there will be a heightened awareness that this protection feature is not fully operational. The operators would be prepared to address a unit transient requiring containment isolation knowing that manual initiation may be required. In this case, the operator will have both manual channels available. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one train is inoperable, the other train is available to initiate containment isolation Phase A. In addition, the two channels of manual actuation are required to be operable to perform the function. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. In addition, the containment, containment isolation valves, containment spray system, and containment cooling system are required to be operable in Mode 4. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 3. b (1) Containment Isolation, Phase B Isolation, Manual Initiation

Description

Containment Isolation provides isolation of the containment atmosphere, and all process systems that penetrate containment, from the environment. This function is necessary to prevent or limit the release of radioactivity to the environment in the event of a large break LOCA.

The Phase B signal isolates CCW. Manual Phase B containment isolation is accomplished by the same switches that actuate containment spray. When the two switches in either set are actuated simultaneously, Phase B containment isolation and containment spray will be actuated in both trains.

Limiting Condition for Operation

Two channels per train and two trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One channel or train inoperable.

Current Required Action Endstate

The current endstate for Required Action B.2.2 is Mode 5. Specifically, the inoperable channel must be restored to operable status within 48 hours, or the unit must be in Mode 3 in 54 hours and Mode 5 in 84 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2.2 to be in Mode 4 in 60 hours if the inoperable channel or train is not restored to operable status in 48 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 are based on core damage probability and do not model containment isolation. Therefore, a qualitative evaluation is performed for this proposed endstate change. The manual actuation of containment isolation Phase B uses the same switches and logic as containment spray. The bases for the proposed change provided for Function 2. a., Containment Spray – Manual Initiation, and for Function 3. a (1), Containment Isolation, Phase A Isolation, Manual Initiation, also apply to the manual initiation of containment isolation Phase B.

Defense-in-Depth Considerations

The defense-in depth considerations provided for Function 2. a., Containment Spray – Manual Initiation, and for Function 3. a (1), Containment Isolation, Phase A Isolation, Manual Initiation, also apply to the manual initiation of containment isolation Phase B.

Function 3. b (2) Containment Isolation, Phase B Isolation, Automatic Actuation Logic and Actuation Relays

Description

The general description is the same as that presented for Function 3. b (1), Containment Isolation, Phase B Isolation, Manual Initiation.

There are two trains for automatic actuation. The same channels and trains used for actuating containment spray are used for actuating containment isolation Phase B. Just as for containment spray, the automatic actuation logic and relays are required to be operable to support the manual initiation of containment isolation Phase B.

Limiting Condition for Operation

Two trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One train inoperable.

Current Required Action Endstate

The current endstate for Required Action C.2.2 is Mode 5. Specifically, the inoperable train must be restored to operable status within 24 hours, or the unit must be in Mode 3 in 30 hours and Mode 5 in 60 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2.2 to be in Mode 4 in 36 hours if the inoperable train is not restored to operable status in 24 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 are based on core damage probability and do not model containment isolation. Therefore, a qualitative evaluation is performed for this proposed endstate change. The automatic actuation of containment isolation Phase B uses the same channels and logic as containment spray. The bases for the proposed change provided for Function 2. b., Containment Spray – Automatic Actuation Logic and Actuation Relays, and Function 3. a (2), Containment Isolation, Phase A Isolation, Automatic Actuation Logic and Actuation Relays also apply to the automatic actuation of containment isolation Phase B.

Defense-in-Depth Considerations

The defense-in depth considerations provided for Function 2. b., Containment Spray – Automatic Actuation Logic and Actuation Relays, and Function 3. a (2), Containment Isolation, Phase A Isolation, Automatic Actuation Logic and Actuation Relays, also apply to the automatic actuation of containment isolation Phase B.

Function 7. a. Automatic Switchover to Containment Sump, Automatic Actuation Logic and Actuation Relays

Description

At the end of the injection phase of a LOCA, the RWST will be nearly empty. Continued cooling must be provided by the ECCS to remove decay heat. The source of water for the ECCS pumps is automatically switched to the containment recirculation sump. Switchover from the RWST to the containment sump must occur before the RWST empties to prevent damage to the RHR pumps and a loss of core cooling capability. For similar reasons, switchover must not occur before there is sufficient water in the containment sump to support ESF pump suction. Furthermore, early switchover must not occur to ensure that sufficient borated water is injected from the RWST. This ensures the reactor remains shut down in the recirculation mode.

There are two trains for automatic actuation and the logic and actuation relays consist of the same features and operate in the same manner as described for Function 1. b.

Limiting Condition for Operation

Two trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One train inoperable.

Current Required Action Endstate

The current endstate for Required Action C.2.2 is Mode 5. Specifically, the inoperable train must be restored to operable status within 24 hours, or the unit must be in Mode 3 in 30 hours and Mode 5 in 60 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2.2 to be in Mode 4 in 36 hours if the inoperable train is not restored to operable status in 24 hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 do not include explicit modeling of two trains for this function. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one train is inoperable, the other train is available to initiate switchover to the containment sump. In addition, if the operator is shutting down the unit because of an inoperable train, there will be a heightened awareness that this protection feature is not fully operational. The operators would be prepared to address a unit transient requiring safety injection and recirculation knowing that manual initiation of the switchover from the RWST to the containment sump may be required. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one train is inoperable, the other train is available to initiate switchover to the containment sump. In addition, the operator can perform the switchover manually. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

Function 7. b and 7. c. Automatic Switchover to Containment Sump – Refueling Water Storage Tank (RWST) Level – Low Low Coincident With Safety Injection, and RWST Level – Low Low Coincident With Containment Sump Level – High

Description

During the injection phase of a LOCA, the RWST is the source of water for all ECCS pumps. A low low level in the RWST coincident with an SI signal provides protection against a loss of water for the ECCS pumps and indicates the end of the injection phase of the LOCA. Automatic switchover occurs only if the RWST low low level signal is coincident with SI. This prevents accidental switchover during normal operation.

In some units, additional protection from spurious switchover is provided by requiring a Containment Sump Level – High signal as well as RWST Level – Low Low and SI. This ensures sufficient water is available in containment to support the recirculation phase of the accident. A Containment Sump Level – High signal must be present, in addition to the SI signal and the RWST Level – Low Low signal, to transfer the suction of the RHR pumps to the containment sump.

The RWST has four level transmitters. Units with the containment sump level circuitry also have four channels for the sump level instrumentation. The logic requires two out of four channels to initiate the switchover from the RWST to the containment sump.

Limiting Condition for Operation

Four channels shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

One channel inoperable.

Current Required Action Endstate

The current endstate for Required Action K.2.2 is Mode 5. Specifically, the inoperable channel must be restored to operable status within [6] hours, or the unit must be in Mode 3 in [12] hours and Mode 5 in [42] hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action K.2.2 to be in Mode 4 in [18] hours if the inoperable channel is not restored to operable status in [6] hours.

Basis for Proposed Change

The risk models described in Section 6.3.1 do not include explicit modeling of four channels for this function. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one channel is inoperable, the other three channels are available to initiate switchover to the containment sump In addition, if the operator is shutting down the unit because of an inoperable channel, there will be a heightened awareness that this protection feature is not fully operational. The operators would be prepared to address a unit transient requiring safety injection and recirculation knowing that manual initiation of the switchover from the RWST to the containment sump may be required. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one channel is inoperable, the other three channels are available to initiate switchover to the containment sump. The system redundancy is such that a single channel failure in addition to one channel being inoperable will not defeat the initiation of switchover from the RWST to the containment sump. Placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.2 Technical Specification 3.3.7 – Control Room Emergency Filtration System (CREFS) Actuation Instrumentation

Description

The CREFS provides an enclosed control room environment from which the unit can be operated following an uncontrolled release of radioactivity. During normal operation, the Auxiliary Building Ventilation System provides control room ventilation. Upon receipt of an actuation signal, the CREFS initiates filtered ventilation and pressurization of the control room.

The actuation instrumentation consists of redundant radiation monitors in the air intakes and control room area. A high radiation signal from any of these detectors will initiate both trains of the CREFS. The operator can initiate the CREFS at any time by using either of two switches in the control room. The CREFS is also actuated by a SI signal.

Limiting Condition for Operation

Two trains and [2] channels shall be operable.

Applicability

Modes 1, 2, 3, 4, [5, and 6], during movement of [recently] irradiated fuel assemblies.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time for Condition A or B not met in Mode 1, 2, 3, or 4.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time for Condition A or B not met in Mode 1, 2, 3, or 4.

Basis for Proposed Change

This system is not modeled in the risk models described in Section 6.3.1, and it is not typically modeled in Westinghouse NSSS plant PRAs. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one channel or train for one or more functions are inoperable, Required Action A.1 requires the operator to place one train of CREFS in emergency mode. If one or more functions with two channels or two trains are inoperable, Required Actions B.1.1 and B.1.2 require the operator to place one or both trains of CREFS in emergency mode. In the unlikely event that this does not occur, the inoperable equipment does not increase the likelihood of an initiating event. An independent initiating event must occur along with core damage for radiation in the control room to be a concern. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The system design provides redundancy and defense in depth from the multiple channels, trains, and functions available to actuate CREFS. If one or two channels or trains in one or more functions are inoperable, the Required Actions require one or both CREFS trains to be placed in the emergency radiation protection mode of operation. This accomplishes the actuation instrumentation function and places the unit in a conservative mode of operation. In the unlikely event that this is not accomplished and Condition C is entered, the likelihood of an initiating event is not increased and placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. The system design maintains sufficient defense-in-depth when the endstate is changed from Mode 5 to Mode 4.

6.4.3 Technical Specification 3.3.8 – Fuel Building Air Cleanup System (FBACS) Actuation Instrumentation

Description

The FBACS ensures that radioactive materials in the fuel building atmosphere following a fuel handling accident [involving handling recently irradiated fuel] or a LOCA are filtered and adsorbed prior to exhausting to the environment. The system initiates filtered ventilation of the fuel building automatically following receipt of a high radiation signal (gaseous or particulate) or a SI signal. Initiation may also be performed manually as needed from the main control room.

High gaseous and particulate radiation, each monitored by either of [two] monitors, provides FBACS initiation. Each FBACS train is initiated by high radiation detected by a channel dedicated to that train. There are a total of [two] channels, one for each train. Each channel contains a gaseous and particulate monitor. High radiation detected by any monitor or an SI signal from the ESFAS initiates fuel building isolation and starts the FBACS.

Limiting Condition for Operation

Two trains and [two] channels shall be operable.

Applicability

Modes 1, 2, 3, and 4 during movement of [recently] irradiated fuel assemblies in the fuel building.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time for Condition A or B not met in Mode 1, 2, 3, or 4.

Current Required Action Endstate

The current endstate for Required Action D.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action D.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time for Condition A or B not met in Mode 1, 2, 3, or 4.

Basis for Proposed Change

This system does not affect conditional core damage probability and is not modeled in the risk models described in Section 6.3.1. FBACS is not typically modeled in Westinghouse NSSS plant PRAs. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one channel or train for one or more functions are inoperable, Required Action A.1 requires the operator to place one train of FBACS in operation. If one or more functions with two channels or two trains are inoperable, Required Actions B.1.1 and B.1.2 require the operator to place one train of FBACS in operation or both trains in emergency mode. In the unlikely event that this does not occur, the inoperable equipment does not increase the likelihood of an initiating event. An independent initiating event (e.g., LOCA or fuel handling accident) must occur to require the operation of FBACS. A cool down to Mode 4 reduces the likelihood of a LOCA, leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions and mitigation strategies, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2.

Defense-in-Depth Considerations

The system design provides redundancy and defense in depth from the multiple channels, trains, and functions available to actuate FBACS. If one or two channels or trains in one or more functions are inoperable, the Required Actions require one or both FBACS trains to be placed in the emergency radiation protection mode of operation. This accomplishes the actuation instrumentation function and places the unit in a conservative mode of operation. In the unlikely event that this is not accomplished and Condition C is entered, the likelihood of an initiating event is not increased and placing the unit in Mode 5 does not increase the instrumentation available for event mitigation. The system design maintains sufficient defense-in-depth when the endstate is changed from Mode 5 to Mode 4.

6.4.4 Technical Specification 3.4.13 – RCS Operational Leakage

Description

Verifying RCS leakage to be within the LCO limits ensures that the integrity of the reactor coolant pressure boundary is maintained. Pressure boundary leakage would at first appear as unidentified leakage and can only be positively identified by inspection. It should be noted that leakage past seals and gaskets is not pressure boundary leakage.

Limiting Condition for Operation

RCS operational leakage shall be limited to:

a. No pressure boundary leakage,
b. 1 gpm unidentified leakage,
c. 10 gpm identified leakage,
d. 1 gpm total primary to secondary leakage through all steam generators (SGs), and
e. [500] gallons per day primary to secondary leakage through any one SG.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A not met, or pressure boundary leakage exists.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A not met, or pressure boundary leakage exists.

Basis for Proposed Change

A RCS leakage that is not large enough to be considered a small LOCA would typically be classified as an event leading to a controlled shutdown. Controlled shutdowns are not included in the risk models described in Section 6.3.1, therefore a qualitative evaluation is performed for this proposed endstate change.

RCS leakage can be reduced to lower amounts in Mode 5 compared to Mode 4 because of the lower RCS pressure in Mode 5, however, the RCS pressure in Mode 4 is already significantly lower than at power which will reduce the effects of the RCS leakage. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

In Mode 4, the RCS pressure is significantly reduced which reduces the leakage. All LOCA mitigating systems with the exception of the accumulators are available and RHR serves as the backup to auxiliary feedwater for decay heat removal. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.5 Technical Specification 3.4.14 – RCS Pressure Isolation Valve (PIV) Leakage

Description

RCS PIVs are defined as any two normally closed valves in series within the reactor coolant pressure boundary, that separate the high pressure RCS from an attached low pressure system. 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 leak-tight.

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.

Limiting Condition for Operation

Leakage from each RCS PIV shall be within limit.

Applicability

Modes 1, 2, and 3, and Mode 4, except valves in the RHR flow path when in, or during the transition to or from, the RHR mode of operation.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A not met.

Basis for Proposed Change

PIV leakage would not be considered a PRA initiating event and would be classified as an event leading to a controlled shutdown. Controlled shutdowns are not included in the risk models described in Section 6.3.1, therefore a qualitative evaluation is performed for this proposed endstate change.

This Technical Specification limits leakage primarily because of the concern of overpressurizing a lower pressure system that can lead to an interfacing system LOCA. PIV leakage can be reduced to a lower level in Mode 5 compared to Mode 4 because of the lower RCS pressure in Mode 5, however, the RCS pressure in Mode 4 is already significantly lower than at power which will reduce the effects of the PIV leakage. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

In Mode 4, the RCS pressure is significantly reduced which reduces the PIV leakage. All LOCA mitigating systems with the exception of the accumulators are available and RHR serves as the backup to auxiliary feedwater for decay heat removal. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.6 Technical Specification 3.4.15 – RCS Leakage Detection Instrumentation

Description

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified leakage.

Limiting Condition for Operation

The following RCS leakage detection instrumentation shall be operable:

a. One containment sump (level or discharge flow) monitor,
b. One containment atmosphere radioactivity monitor (gaseous or particulate), and
c. [One containment air cooler condensate flow rate monitor.]

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action E.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action E.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The RCS leakage detection functions; containment sump monitor, containment atmosphere radioactivity monitor, and containment air cooler condensate flow, are not modeled in the risk models described in Section 6.3.1. These functions are not typically modeled in Westinghouse NSSS plant PRAs. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one function is declared inoperable, the other functions are available to provide indication of RCS leakage. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one function is inoperable, the other functions are available to provide indication of RCS leakage. In the unlikely event that Condition E occurs, the likelihood of an initiating event is not increased and placing the unit in Mode 5 does not increase the instrumentation available for detecting RCS leakage. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.7 Technical Specification 3.5.3 – ECCS – Shutdown

Description

This Technical Specification is only applicable in Mode 4. In Mode 4, the required ECCS train consists of two separate subsystems: centrifugal charging (high head) and RHR (low head). The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the refueling water storage tank can be injected into the RCS if required following an accident.

Limiting Condition for Operation

One ECCS train shall be operable.

Applicability

Mode 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of [Condition B] not met.

Current Required Action Endstate

The current endstate for Required Action C.1 is Mode 5. Specifically, the unit must be in Mode 5 in 24 hours.

Proposed Required Action and Endstate

Condition A is revised from "Required ECCS residual heat removal (RHR) subsystem inoperable." to "Required ECCS train inoperable." Required Action A.1 is revised from "Initiate action to restore required ECCS RHR subsystem to operable status." to "Initiate action to restore required ECCS RHR train to operable status." This change allows the unit to remain in Mode 4, rather than transitioning to Mode 5 with an inoperable ECCS high head subsystem.

Basis for Proposed Change

This Technical Specification is only applicable in Mode 4. There are two subsystems addressed by this Technical Specification; the ECCS RHR subsystem and the ECCS high head subsystem. Both subsystems are included in the risk models described in Section 6.3.1, therefore, a quantitative evaluation is performed.

Current Condition A addresses both RHR trains inoperable and Required Action A.1 requires that action be initiated to restore the required RHR subsystem to operable status with an immediate Completion Time. Required Action A.1 and the immediate Completion Time acknowledge that in this condition it is inappropriate to require the unit to be placed in a Mode where the only means of decay heat removal is not available, rather than to remain in a Mode where steam generator cooling is also available for decay heat removal. Therefore, the change in endstate to evaluate applies to an inoperable high head subsystem, for which a transition to Mode 5 is currently required by Required Action C.1 if it is not returned to operable status within the Completion Time.

To model the inoperability of both train of ECCS high head, the three charging pumps are modeled as inoperable. Only POS 3 and POS 4 are quantified because this Technical Specification is only applicable in Mode 4. The resulting CDPs for each POS are presented in Table 6-11. Also provided are the CDPs from the base case.

Table 6-11 Technical Specification 3.5.3 ECCS – Shutdown

POS	Core Damage Probability	
	One Train Inoperable	**Base Case**
1	NA	NA
2	NA	NA
3	2.39E-06	7.09E-08
4	9.38E-05	7.21E-06
5	4.79E-07	4.79E-07
6	NA	NA
7	NA	NA
TOTAL	9.66E-05	7.76E-06
TOTAL Excluding POS 4	2.86E-06	5.50E-07

The unavailability of a complete train of ECCS results in an increase in the CDP for both POS 3 and 4. When comparing the base case to the inoperable ECCS train case, the POS 3 CDP increased by a larger factor than the POS 4 CDP, however, the POS 4 CDP for the inoperable ECCS train is approximately 40 times greater than the POS 3 CDP. Proceeding to Mode 5 does not increase the protection available and additional risk is introduced by switching from AFW cooling to RHR cooling. This case supports remaining in Mode 4 (POS 3) for this configuration rather than cooling down to Mode 5 (POS 4).

Defense-in-Depth Considerations

The proposed change to the Required Action C.1 endstate does not change the operability requirement for the ECCS. One train still must be operable in Mode 4. If one train of RHR is inoperable, then remaining in Mode 4 provides core cooling from the AFW pumps with the operable RHR pump as a backup. If both trains of RHR are inoperable, then the unit will remain on AFW cooling while one train is restored. The probability of transients occurring that require the ECCS are less likely in Mode 4 than at-power and the risk associated with transferring to RHR cooling from AFW cooling is eliminated by remaining in Mode 4. Sufficient defense-in-depth is maintained when the unit remains in Mode 4 rather than transitioning to Mode 5.

6.4.8 Technical Specification 3.5.4 – Refueling Water Storage Tank (RWST)

Description

The RWST supplies borated water to the Chemical and Volume Control System (CVCS) during abnormal operating conditions, to the refueling pool during refueling, and to the ECCS and the Containment Spray System during accident conditions.

Limiting Condition for Operation

The RWST shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The RWST is included in the risk models described in Section 6.3.1, therefore, a quantitative assessment is made for changing the endstate. Because safety injection is dependent on the RWST for the source of borated water, its inoperability is expected to increase the core damage probabilities above the base case values. The RWST was modeled as inoperable and the core damage probabilities were recalculated for POS 1, 2, 3, and 4. The resulting CDPs for each POS are presented in Table 6-12. Also provided are the CDPs from the base case.

Table 6-12 Technical Specification 3.5.4, RWST

POS	Core Damage Probability	
	RWST Inoperable	**Base Case**
1	1.00E-05	2.18E-07
2	3.36E-06	1.66E-07
3	2.36E-06	7.09E-08
4	9.31E-05	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	1.14E-04	1.27E-05
Total Excluding POS 4	2.08E-05	5.49E-06

With the RWST unavailable, safety injection and recirculation are not possible. Therefore, any loss of inventory events that cannot be isolated lead to core damage. For the inoperability of the RWST, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4, i.e., the upper portion of Mode 5) reduces the total core damage probability by more than a factor of 5. The primary accidents that rely on the RWST are the LOCAs and steam line breaks. These accidents are less likely in Mode 4 due to the limited time in the mode and less severe thermal-hydraulic conditions. In Mode 4, the control rods are inserted and the typical steamline break limiting assumption of the highest worth stuck rod is an unlikely scenario. In addition, the emergency boration system is likely to be available. In Mode 4, transients progress slower than at power, backup core cooling is available via RHR, and there is increased time for operator actions and mitigation strategies. Proceeding to Mode 5 does not increase the protection available and additional risk is introduced by switching from AFW cooling to RHR cooling. Variations in boron concentration are likely to be small, therefore, a shutdown to Mode 4 instead of Mode 5 is also appropriate. The RWST temperature variations are also expected to be small because the volume of the tank is large. The design basis accidents that conservatively use the RWST temperature are analyzed at power operation. Therefore, a shutdown to Mode 4 is also appropriate. Based on the risk results in Table 6-12 and the above discussion, if the RWST is inoperable for reasons other than boron concentration or temperature, a shutdown to Mode 4 is appropriate.

<u>Defense-in-Depth Considerations</u>

The proposed change to the Required Action C.2 endstate does not change the operability requirement for the RWST. It still must be operable in Mode 4. In Mode 4, the transient conditions are less severe than at power so that variations in the RWST parameters or other reasons of inoperability are less significant. In addition, if the boron concentration is low, the emergency boration equipment is likely to be available to increase the RCS boron concentration. By changing the endstate for Required Action C.2 to Mode 4, the possibility of having a loss of inventory event due to switching to RHR cooling is eliminated, reducing the possibility that the RWST inventory would be required. Sufficient defense-in-depth is maintained when the unit remains in Mode 4 rather than transitioning to Mode 5.

6.4.9 Technical Specification 3.6.1 – Containment (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

Description

The containment consists of the concrete reactor building, its steel liner, (or a free standing steel pressure vessel surrounded by a reinforced concrete shield building) and the penetrations through this structure. The structure is designed to contain radioactive material that may be released from the reactor core following a design basis LOCA. Additionally, this structure provides shielding from the fission products that may be present in the containment atmosphere following accident conditions. The isolation devices for the penetrations in the containment boundary are a part of the containment leak tight barrier.

Limiting Condition for Operation

The containment shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The containment Technical Specification has no direct impact on CDP. Containment integrity is not modeled in the risk models described in Section 6.3.1, therefore, a qualitative evaluation is performed for this proposed endstate change.

Significant leakage from containment that would result in a loss of sump inventory, fail recirculation cooling, and lead to core damage is highly unlikely due to the significantly reduced RCS temperature and pressure conditions as the unit is being shutdown, and the reduced likelihood of a LOCA or secondary side break due to the limited time in the shutdown modes and less severe thermal-hydraulic conditions. In Level 2 PRA models, containment leakage is not considered to contribute to LERF. A unit shutdown to Mode 5 requires switching to RHR cooling which introduces the potential for increased risks including LOCAs both inside and outside containment. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The proposed change to the Required Action B.2 endstate does not change the operability requirement for containment. The containment must still be operable in Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., containment spray, containment cooling) are required to be operable. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.10 Technical Specification 3.6.2 – Containment Air Locks (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

Description

Containment air locks form part of the containment pressure boundary and provide a means for personnel access during all modes of operation. Each air lock is nominally a right circular cylinder, 10 ft in diameter, with a door at each end. The doors are interlocked to prevent simultaneous opening. Each air lock door has been designed and tested to certify its ability to withstand a pressure in excess of the maximum expected pressure following a design basis accident in containment. As such, closure of a single door supports containment operability.

Limiting Condition for Operation

[Two] containment air lock[s] shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action D.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action D.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The air locks function to maintain containment integrity, therefore, the discussion for Technical Specification 3.6.1 also applies to this Technical Specification. The containment air lock Technical Specification has no direct impact on CDP. Containment integrity is not modeled in the risk models described in Section 6.3.1 so a qualitative evaluation is performed for this proposed endstate change.

Significant leakage from containment that would result in a loss of sump inventory, fail recirculation cooling, and lead to core damage, is highly unlikely due to the significantly reduced RCS temperature and pressure conditions as the unit is being shutdown, and the reduced likelihood of a LOCA or secondary side break due to the limited time in the shutdown modes and less severe thermal-hydraulic conditions. In addition, closure of a single door in each air lock is sufficient to provide a leak tight barrier following postulated events at power. In Level 2 PRA models, containment leakage is not considered to contribute to LERF. A unit shutdown to Mode 5 requires switching to RHR cooling which introduces the potential for increased risks including LOCAs both inside and outside containment. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The proposed change to the Required Action D.2 endstate does not change the operability requirement for the containment air locks. The air locks must still be operable in Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., containment spray, containment cooling) are required to be operable. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Closure of a single door in each air lock is sufficient to provide a leak tight barrier following postulated events. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.11 Technical Specification 3.6.3 – Containment Isolation Valves (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

Description

The containment isolation valves form part of the containment pressure boundary and provide a means for fluid penetrations not serving accident consequence limiting systems to be provided with two isolation barriers that are closed on a containment isolation signal. These isolation devices are either passive or active (automatic). Manual valves, de-activated automatic valves secured in their closed position (including check valves with flow through the valve secured), blind flanges, and closed systems are considered passive devices. Check valves, or other automatic valves designed to close without operator action following an accident, are considered active devices. 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 or leakage that exceeds limits assumed in the safety analyses.

Limiting Condition for Operation

Each containment isolation valve shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action F.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action F.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

A quantitative evaluation of containment isolation valves would be limited to changes in CDP because the risk models described in Section 6.3.1 do not include LERF branches. LERP impacts, not changes to CDP, are the primary concern for the containment isolation valves, therefore, a qualitative approach is taken to evaluate this Technical Specification.

Initiating events during the shutdown process are less severe for containment than those at-power because of the significantly reduced RCS temperature and pressure conditions as the unit is being shutdown, and the reduced likelihood of a LOCA or secondary side break due to the limited time in the shutdown modes and less severe thermal-hydraulic conditions. Some of the containment penetration lines have a small enough diameter such that they would not contribute to LERF even if all isolation capability for the line is inoperable. A unit shutdown to Mode 5 requires switching to RHR cooling which introduces the potential for increased risks including LOCAs both inside and outside containment. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The proposed change to the Required Action F.2 endstate does not change the operability requirement for the containment isolation valves. The valves must still be operable in Mode 4. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Most containment penetration lines have two isolation valves and it is unlikely that both would be inoperable. In the unlikely event that the actions cannot be completed in time and Condition F is entered, placing the unit in Mode 5 does not increase the equipment available for event mitigation. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., containment spray, containment cooling) are required to be operable. In addition, some of the containment penetration lines have a small enough diameter such that their contribution to LERP would be insignificant. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.12 Technical Specification 3.6.4A – Containment Pressure (Atmospheric, Dual, and Ice Condenser)

Description

Containment pressure is a process variable that is monitored and controlled. The containment pressure is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a LOCA or steam line break. These limits also prevent the containment pressure from exceeding the containment design negative pressure differential with respect to the outside atmosphere in the event of inadvertent actuation of the containment spray system.

Limiting Condition for Operation

Containment pressure shall be ≥ [-0.3] psig and ≤ [+1.5] psig.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

Containment pressure is used as an input to PRA model success criteria analyses, but it is not modeled in Westinghouse NSSS plant PRA models. The risk models described in Section 6.3.1 do not include containment pressure. Therefore, a qualitative evaluation is performed for this proposed endstate change.

The upper containment pressure limit is based on the Mode 1 design basis analyses. These analyses verify that the containment design pressure is not exceeded for a double-ended guillotine break of either the RCS or main steam piping. The containment design pressure is typically a factor of 2 or more below the containment failure pressure. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Consequently, containment loadings will be less than in Mode 1 and well below the design pressure and there will be significant margin to the failure pressure. Variations in containment pressure are expected to be small, therefore, any increase above the Technical Specification limit is expected to be small and it is concluded that there will still be sufficient margin to the design basis pressure and significant margin to the failure pressure.

The minimum Technical Specification containment pressure is established such that if there was an inadvertent actuation of the containment spray system, the minimum (negative) containment design pressure would not be exceeded. Inadvertent actuation of the containment spray system does not lead to core damage and LERF by itself, another event needs to occur to cause the core damage. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Defense-in-depth is maintained by the margin to containment failure in Mode 4. The containment pressure limit is based on Mode 1 design basis analyses that include higher energy releases than would occur in Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., containment spray, containment cooling) are required to be operable. In addition, containment vacuum relief valves and the containment purge system could be used to mitigate containment pressure being outside of the Technical Specification limits. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.13 Technical Specification 3.6.4B – Containment Pressure (Subatmospheric)

Description

Containment air partial pressure is a process variable that is monitored and controlled. The containment air partial pressure is maintained as a function of refueling water storage tank temperature and service water temperature to ensure that, following a design basis accident, the containment would depressurize in less than 60 minutes to subatmospheric conditions. Controlling containment partial pressure within prescribed limits also prevents the containment pressure from exceeding the containment design negative pressure differential with respect to the outside atmosphere in the event of an inadvertent actuation of the quench spray system.

Limiting Condition for Operation

Containment air partial pressure shall be ≥ [9.0] psia and within the acceptable operation range shown on Figure 3.6.4B-1.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

Containment air partial pressure is used as an input to PRA model success criteria analyses, but it is not modeled in Westinghouse NSSS plant PRA models. The risk models described in Section 6.3.1 do not include containment air partial pressure. Therefore, a qualitative evaluation is performed for this proposed endstate change.

The upper containment pressure limit is based on the Mode 1 design basis analyses. These analyses verify that the containment design pressure is not exceeded for a double-ended guillotine break of either the RCS or main steam piping. The containment design pressure is typically a factor of 2 or more below the containment failure pressure. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Consequently, containment loadings will be less than in Mode 1 and well below the design pressure and there will be significant margin to the failure pressure. Variations in containment pressure are expected to be small, therefore, any increase above the Technical Specification limit is expected to be small and it is concluded that there will still be sufficient margin to the design basis pressure and significant margin to the failure pressure.

The minimum Technical Specification containment pressure is established such that if there was an inadvertent actuation of the quench spray system, the minimum (negative) containment design pressure would not be exceeded. Inadvertent actuation of the quench spray system does not lead to core damage and LERF by itself, another event needs to occur to cause the core damage. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Defense-in-depth is maintained by the margin to containment failure in Mode 4. The containment pressure limit is based on Mode 1 design basis analyses that include higher energy releases than would occur in Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., quench spray, containment cooling) are required to be operable. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.14 Technical Specification 3.6.5A – Containment Air Temperature (Atmospheric and Dual)

Description

The containment structure serves to contain radioactive material that may be released from the reactor core following a design basis accident. The containment average air temperature is limited during normal operation to preserve the initial conditions assumed in the accident analyses for LOCA or steam line break. The higher the initial temperature, the more energy that must be removed, resulting in higher peak containment pressure and temperature. Exceeding containment design pressure may result in leakage greater than that assumed in the accident analysis.

Limiting Condition for Operation

Containment average air temperature shall be ≤ [120]°F.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

Containment air temperature is used as an input to PRA model success criteria analyses, but it is not modeled in Westinghouse NSSS plant PRA models. The risk models described in Section 6.3.1 do not include containment air temperature. Therefore, a qualitative evaluation is performed for this proposed endstate change.

The containment air temperature limit is based on the Mode 1 design basis analyses and containment equipment qualification requirements. The containment air temperature may exceed the design limit for a short period of time, however, the equipment surface temperatures remain below the design limit. The containment air temperature is also an important initial assumption for calculating the peak containment pressure during a LOCA or main steam line break. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Consequently, the containment temperature will be well below the design temperature and there will be significant margin to the design temperature. In the shutdown modes, the containment air temperature is not expected to be high because of lower RCS and steam generators temperatures. Variations in containment air temperature are expected to be small, therefore, any change that exceeds the Technical Specification limit is expected to be small and it is concluded that there will still be sufficient margin to the design basis temperature. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Defense-in-depth is maintained by the margin to the containment design air temperature limit that is available in Mode 4. The containment design air temperature limit is based on the Mode 1 design basis analyses that include higher energy releases than would occur for Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., containment spray, containment cooling) are required to be operable. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.15 Technical Specification 3.6.5B – Containment Air Temperature (Ice Condenser)

Description

The containment structure serves to contain radioactive material that may be released from the reactor core following a design basis accident. The containment average air temperature is limited during normal operation to preserve the initial conditions assumed in the accident analyses for LOCA or steam line break. Depending on the design basis analysis, either the maximum or minimum temperature is used.

Limiting Condition for Operation

Containment average air temperature shall be ≥ [85]°F and ≤ [110]°F for the containment upper compartment and ≥ [100]°F and ≤ [120]°F for the containment lower compartment.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

Containment air temperature is used as an input to PRA model success criteria analyses, but it is not modeled in Westinghouse NSSS plant PRA models. The risk models described in Section 6.3.1 do not include containment air temperature. Therefore, a qualitative evaluation is performed for this proposed endstate change.

The containment temperature limits are based on the Mode 1 design basis analyses and containment equipment qualification requirements. The containment air temperature may exceed the design limit for a short period of time, however, the equipment surface temperatures remain below the design limit. The containment temperature is also an important initial assumption for calculating the peak containment pressure during a LOCA or main steam line break. Depending on the design basis analysis, either the maximum or minimum temperature is used. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Consequently, the containment temperature will be well below the design temperature and there will be significant margin to the design temperature. In the shutdown modes, the containment temperature is not expected to be high because of lower RCS and steam generators temperatures. Variations in containment temperature are expected to be small, therefore, any change that falls outside of the Technical Specification limits is expected to be small and it is concluded that there will still be sufficient margin to the design basis temperature limit. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Defense-in-depth is maintained by the margin to the containment design air temperature limit that is available in Mode 4. The containment air temperature limit is based on the Mode 1 design basis analyses that include higher energy releases than would occur for Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., containment spray) are required to be operable. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.16 Technical Specification 3.6.5C – Containment Air Temperature (Subatmospheric)

Description

The containment structure serves to contain radioactive material that may be released from the reactor core following a design basis accident. The containment average air temperature is limited during normal operation to preserve the initial conditions assumed in the accident analyses for LOCA or steam line break. Depending on the design basis analysis, either the maximum or minimum temperature is used.

Limiting Condition for Operation

Containment average air temperature shall be ≥ [86]°F and ≤ [120]°F.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

Containment air temperature is used as an input to PRA model success criteria analyses, but it is not modeled in Westinghouse NSSS plant PRA models. The risk models described in Section 6.3.1 do not include containment air temperature. Therefore, a qualitative evaluation is performed for this proposed endstate change.

The containment temperature limits are based on the Mode 1 design basis analyses and containment equipment qualification requirements. The containment air temperature may exceed the design limit for a short period of time, however, the equipment surface temperatures remain below the design limit. The containment temperature is also an important initial assumption for calculating the peak containment pressure during a LOCA or main steam line break. Depending on the design basis analysis, either the maximum or minimum temperature is used. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Consequently, the containment temperature will be well below the design temperature and there will be significant margin to the design temperature. In the shutdown modes, the containment temperature is not expected to be high because of lower RCS and steam generators temperatures. Variations in containment temperature are expected to be small, therefore, any change that falls outside of the Technical Specification limits is expected to be small and it is concluded that there will still be sufficient margin to the design basis temperature limit. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Defense-in-depth is maintained by the margin to the containment design air temperature limit that is available in Mode 4. The containment air temperature limit is based on the Mode 1 design basis analyses that include higher energy releases than would occur for Mode 4. In Mode 4, the systems designed to mitigate the effects of accidents on the containment (e.g., quench spray, recirculation spray) are required to be operable. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.17 Technical Specification 3.6.6A – Containment Spray and Cooling Systems (Atmospheric and Dual) (Credit taken for iodine removal by the Containment Spray System)

Description

The containment spray and containment cooling systems provide containment atmosphere cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure and the iodine removal capability of the spray reduces the release of fission product radioactivity from containment to the environment, in the event of a design basis accident, to within limits.

The containment spray system consists of two separate trains of equal capacity, each capable of meeting the design bases. Each train includes a containment spray pump, spray headers, nozzles, valves, and piping. Each train is powered from a separate ESF bus. The RWST supplies borated water to the containment spray system during the injection phase of operation. In the recirculation mode of operation, containment spray pump suction is transferred from the RWST to the containment sump(s).

Two trains of containment cooling, each of sufficient capacity to supply 100% of the design cooling requirement, are provided. Each train of two fan units is supplied with cooling water from a separate train of SW. Air is drawn into the coolers through the fan and discharged to the steam generator compartments, pressurizer compartment, instrument tunnel, and outside the secondary shield in the lower areas of containment. During normal operation, all four fan units are operating. The fans are normally operated at high speed with SW supplied to the cooling coils. In post accident operation following an actuation signal, the containment cooling system fans are designed to start automatically in slow speed if not already running. If running in high (normal) speed, the fans automatically shift to slow speed. The fans are operated at the lower speed during accident conditions to prevent motor overload from the higher mass atmosphere.

Limiting Condition for Operation

Two containment spray trains and [two] containment cooling trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A not met, and Required Action and associated Completion Time of Condition C or D not met.

Current Required Action Endstate

The current endstate for Required Actions B.2 and E.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 84 hours for Condition B, and the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours for Condition E.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 60 hours, and revise the endstate for Required Action E.2 to be in Mode 4 in 12 hours.

Basis for Proposed Change

The containment spray system and containment cooling units are modeled for a few sequences in the risk models described in Section 6.3.1. In the fault tree models these systems provide backup cooling for recirculation. Their impact on CDF is minimal. The main impact of the inoperability of the containment spray and containment cooling units is in the containment response in the Level 2 analysis, which is not included in the risk models. For POS 4, neither system is credited for providing a backup cooling function. Note that POS 4 includes the upper portion of Mode 5 and these systems are not required to be operable.

Technical Specification 3.6.6A, Actions A, C, and D address combinations of inoperable trains of containment spray and containment cooling units. Technical Specification 3.6.6B, Actions A through E also address combinations of inoperable trains of containment spray and containment cooling units. The risk models described in Section 6.3.1 are used to model the combinations of inoperable equipment and determine the resulting CDP for POS 1, 2, and 3 for these two Specifications. The containment spray system and containment cooling system are not modeled for POS 4. Table 6-13 presents the combinations of inoperable equipment, the applicable Technical Specification and Action, and the resulting CDPs. Also provided are the CDPs from the base case.

Table 6-13 Technical Specifications 3.6.6A and 3.6.6B Containment Spray and Containment Cooling Systems

POS	Core Damage Probability					
	One Train Containment Spray Inoperable[1]	Two Trains Containment Spray Inoperable[2]	One Train Containment Cooling Units Inoperable[3]	Two Trains Containment Cooling Units Inoperable[4]	One Train Containment Spray, One Train Containment Cooling Units Inoperable[5]	Base Case
1	2.18E-07	2.18E-07	2.22E-07	3.98E-07	2.22E-07	2.18E-07
2	1.66E-07	1.66E-07	1.67E-07	2.11E-07	1.67E-07	1.66E-07
3	7.09E-08	7.09E-08	7.13E-08	9.14E-08	7.13E-08	7.09E-08
4	7.21E-06	7.21E-06	7.21E-06	7.21E-06	7.21E-06	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06
Total	1.27E-05	1.27E-05	1.27E-05	1.29E-05	1.27E-05	1.27E-05
Total Excluding POS 4	5.49E-06	5.49E-06	5.50E-06	5.74E-06	5.50E-06	5.49E-06

Notes:
1. Technical Specifications 3.6.6A and 3.6.6B, Action A.
2. Technical Specification 3.6.6B, Action C.
3. Technical Specification 3.6.6A, Action C and Technical Specification 3.6.6B, Action B.
4. Technical Specification 3.6.6A, Action D and Technical Specification 3.6.6B, Action E.
5. Technical Specification 3.6.6B, Action D.

The results confirm that these two systems have little effect on the calculated CDPs from the base case. For containment spray, the results are the same as the base results. For the containment cooling units, the results are not significantly different. The conclusion for all five cases is that containment spray and containment cooling do not significantly affect the shutdown modes CDP and there is a risk increase by cooling down to Mode 5 (POS 4). A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, and there is increased time for operator actions and mitigation strategies. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The containment spray and containment cooling systems are designed for accident conditions initiated at power. One train of each system satisfies the assumptions in the safety analyses and one train of containment spray is required to satisfy assumptions regarding iodine removal. If one train of either containment spray or containment cooling is inoperable the other train is available to mitigate the accident along with both trains of the other system. If both trains of containment cooling are inoperable, containment spray can serve as the cooling system and it also serves to remove iodine. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.18 Technical Specification 3.6.6B – Containment Spray and Cooling Systems (Atmospheric and Dual) (Credit not taken for iodine removal by the Containment Spray System)

Description

The containment spray and containment cooling systems provide containment atmosphere cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment, in the event of a design basis accident, to within limits.

The containment spray system consists of two separate trains of equal capacity, each capable of meeting the design bases. Each train includes a containment spray pump, spray headers, nozzles, valves, and piping. Each train is powered from a separate ESF bus. The RWST supplies borated water to the containment spray system during the injection phase of operation. In the recirculation mode of operation, containment spray pump suction is transferred from the RWST to the containment sump(s).

Two trains of containment cooling, each of sufficient capacity to supply 100% of the design cooling requirement, are provided. Each train of two fan units is supplied with cooling water from a separate train of SW. Air is drawn into the coolers through the fan and discharged to the steam generator compartments, pressurizer compartment, instrument tunnel, and outside the secondary shield in the lower areas of containment. During normal operation, all four fan units are operating. The fans are normally operated at high speed with SW supplied to the cooling coils. In post accident operation following an actuation signal, the containment cooling system fans are designed to start automatically in slow speed if not already running. If running in high (normal) speed, the fans automatically shift to slow speed. The fans are operated at the lower speed during accident conditions to prevent motor overload from the higher mass atmosphere.

Limiting Condition for Operation

Two containment spray trains and [two] containment cooling trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A, B, C, D, or E not met.

Current Required Action Endstate

The current endstate for Required Action F.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action F.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A, B, C, D, or E not met.

Basis for Proposed Change

This Technical Specification is very similar to Technical Specification 3.6.6A. However, because no credit is taken for iodine removal, a Required Action is provided to restore two inoperable trains of containment spray. If two trains of containment spray are inoperable, the containment cooling units are still available to provide containment cooling. The cases presented in Table 6-13 demonstrate that the containment spray case results are the same as the base results. For the containment cooling units, the results are not significantly different. The conclusion for all five cases is that containment spray and containment cooling do not significantly affect the shutdown modes CDP and there is a risk increase by cooling down to Mode 5 (POS 4). A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, and there is increased time for operator actions and mitigation strategies. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The containment spray and containment cooling systems are designed for accident conditions initiated at power. One train of each system satisfies the assumptions in the safety analyses. If one train of either containment spray or containment cooling is inoperable the other train is available to mitigate the accident conditions along with both trains of the other system. If both trains of one system are unavailable, the two trains of the other system are available to provide containment cooling. Note that this Technical Specification does not take credit for iodine removal by the containment spray system. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.19 Technical Specification 3.6.6C – Containment Spray System (Ice Condenser)

Description

The containment spray system provides containment atmosphere cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure and the iodine removal capability of the spray reduce the release of fission product radioactivity from containment to the environment, in the event of a design basis accident.

Each train includes a containment spray pump, one containment spray heat exchanger, spray headers, nozzles, valves, and piping. Each train is powered from a separate ESF bus. The RWST supplies borated water to the containment spray system during the injection phase of operation. In the recirculation mode of operation, containment spray pump suction is transferred from the RWST to the containment recirculation sump(s).

The diversion of a portion of the recirculation flow from each train of RHR to additional redundant spray headers completes the containment spray system heat removal capability. Each RHR train is capable of supplying spray coverage, if required, to supplement the containment spray system. The RHR spray operation is initiated manually, when required by the emergency operating procedures, after the ECCS is operating in the recirculation mode.

Limiting Condition for Operation

Two containment spray trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 84 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 60 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

If one train of containment spray is inoperable, the other train is still available to provide accident mitigation. The inoperability of one train of containment spray would not significantly affect the shutdown modes CDP and there is risk associated with cooling down to Mode 5 (POS 4). A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, and there is increased time for operator actions and mitigation strategies. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The containment spray system is designed for accident conditions initiated at power. One train satisfies the assumptions in the safety analyses. In addition, the containment ice condenser is required to be operable and it is designed to handle a heat load in excess of the initial blowdown of a design basis LOCA, or any feedwater or steamline break event inside containment. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. In addition, RHR spray could be used if necessary for continued containment cooling. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.20 Technical Specification 3.6.6D – Quench Spray (QS) System (Subatmospheric)

Description

The quench spray system is designed to provide containment atmosphere cooling to limit post accident pressure and temperature in containment to less than the design values. The QS system, operating in conjunction with the recirculation spray (RS) system, is designed to cool and depressurize the containment structure to subatmospheric pressure in less than 60 minutes following a design basis accident. Reduction of containment pressure and the iodine removal capability of the spray limit the release of fission product radioactivity from containment to the environment in the event of a design basis accident.

The QS System consists of two separate trains of equal capacity, each capable of meeting the design bases. Each train includes a spray pump, spray headers, nozzles, valves, and piping. Each train is powered from a separate ESF bus. The RWST supplies borated water to the QS system. The QS system is actuated either automatically by a containment High-High pressure signal or manually. Each train of the QS system provides adequate spray coverage to meet the system design requirements for containment heat and iodine fission product removal.

Limiting Condition for Operation

Two QS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

If one train of quench spray is inoperable, the other train is still available to provide accident mitigation. The inoperability of one train of quench spray would not significantly affect the shutdown modes CDP and there is risk associated with cooling down to Mode 5 (POS 4). A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, and there is increased time for operator actions and mitigation strategies. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The quench spray system is designed for accident conditions initiated at power. One train satisfies the assumptions in the safety analyses. In addition, the containment temperature and pressure limits are set to account for the effects of an energy release during an event in full power operation. Events, such as a LOCA or a secondary side break, are less likely in Mode 4 due to the limited time in the mode and less severe thermal-hydraulic conditions. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.21 Technical Specification 3.6.6E – Recirculation Spray (RS) System (Subatmospheric)

Description

The recirculation spray system, operating in conjunction with the quench spray system, is designed to limit the post accident pressure and temperature in the containment to less than the design values and to depressurize the containment structure to a subatmospheric pressure in less than 60 minutes following a design basis accident. The reduction of containment pressure and the removal of iodine from the containment atmosphere by the spray limit the release of fission product radioactivity from containment to the environment in the event of a design basis accident.

The RS system consists of two separate trains of equal capacity, each capable of meeting the design and accident analysis bases. Each train includes one RS subsystem outside containment and one RS subsystem inside containment. Each subsystem consists of one 50% capacity spray pump, one spray cooler, one 180° coverage spray header, nozzles, valves, piping, instrumentation, and controls. Each outside RS subsystem also includes a casing cooling pump with its own valves, piping, instrumentation, and controls. The two outside RS subsystems' spray pumps are located outside containment and the two inside RS subsystems' spray pumps are located inside containment. Each RS train (one inside and one outside RS subsystem) is powered from a separate ESF bus. Each train of the RS system provides adequate spray coverage to meet the system design requirements for containment heat and iodine fission product removal.

Limiting Condition for Operation

Four RS subsystems [and a casing cooling tank] shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action F.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 84 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action F.2 to be in Mode 4 in 60 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include recirculation spray because recirculation spray is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. If any of Technical Specification 3.6.6E Conditions A through E are entered, the recirculation spray system can still perform its safety function. Note that if the casing cooling tank is inoperable, the net positive suction head available to the outside RS subsystem pumps may not be sufficient. This situation is the same as Condition D. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur. This evaluation does not take credit for location differences of the subsystems and is, therefore, applicable to similar system configurations that have all of the pumps and heat exchangers located either inside or outside of the containment.

Defense-in-Depth Considerations

The recirculation spray system is designed for accident conditions initiated at power. One train (two subsystems) satisfies the assumptions in the safety analyses. In addition, the containment temperature and pressure limits are set to account for the effects of an energy release during an event in full power operation. Events, such as a LOCA or a secondary side break, are less likely in Mode 4 due to the limited time in the mode and less severe thermal-hydraulic conditions. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.22 Technical Specification 3.6.7 – Spray Additive System (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

Description

The spray additive system is a subsystem of the containment spray system that assists in reducing the iodine fission product inventory in the containment atmosphere resulting from a design basis accident.

Radioiodine in its various forms is the fission product of primary concern in the evaluation of a design basis accident. It is absorbed by the spray from the containment atmosphere. To enhance the iodine absorption capacity of the spray, the spray solution is adjusted to an alkaline pH that promotes iodine hydrolysis, in which iodine is converted to nonvolatile forms.

For an eductor feed system, the spray additive system consists of one spray additive tank that is shared by the two trains of spray additive equipment. Each train of equipment provides a flow path from the spray additive tank to a containment spray pump and consists of an eductor for each containment spray pump, valves, instrumentation, and connecting piping. Each eductor draws the NaOH spray solution from the common tank using a portion of the borated water discharged by the containment spray pump as the motive flow. The eductor mixes the NaOH solution and the borated water and discharges the mixture into the spray pump suction line.

For a gravity feed system, the spray additive system consists of one spray additive tank, two parallel redundant motor operated valves in the line between the additive tank and the RWST, instrumentation, and recirculation pumps. The NaOH solution is added to the spray water by a balanced gravity feed from the additive tank through the connecting piping into a weir within the RWST. There, it mixes with the borated water flowing to the spray pump suction.

Limiting Condition for Operation

The spray additive system shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 84 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 60 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the spray additive system because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. The spray additive system assists in reducing the iodine fission product inventory. Containment spray by itself removes some iodine from the containment atmosphere, so iodine removal will still occur with an inoperable spray additive system. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The spray additive system is designed for accident conditions initiated at power. The containment spray system will remove some iodine from the containment atmosphere without the additive system and two trains of containment spray are required to be operable. The spray additive system also serves to provide the proper pH in the containment sump. For most containments, a backup system for containment sump pH is not available, but proceeding to Mode 5 does not increase the protection available. Note that the ice condenser containments have ice that is adjusted to an alkaline pH that facilitates removal of radioactive iodine from the containment atmosphere and minimizes the occurrence of the chloride and caustic stress corrosion on mechanical systems and components. Events, such as a LOCA or a secondary side break, are less likely in Mode 4 due to the limited time in the mode and less severe thermal-hydraulic conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.22a Recirculation Fluid pH Control System

Some Westinghouse NSSS plants have replaced the spray additive system with a passive ECCS recirculation fluid pH control system. Although the Technical Specification for this system is not contained in NUREG-1431, the endstate is Mode 5 if the system is inoperable, and the Required Action and associated Completion Time are not met. The system consists of baskets in the containment sump with a specified amount of trisodium phosphate in each basket. The trisodium phosphate dissolves when the containment sump level increases to the level of the baskets.

It is highly unlikely that all of the baskets would be empty, therefore, an inoperable recirculation fluid pH control system would still provide some pH control. The justification for changing the endstate to Mode 4 for Technical Specification 3.6.7, "Spray Additive System," is also applicable to the recirculation fluid pH control system, since they perform the same function.

The recirculation fluid pH control system Technical Specification currently requires the unit to be in Mode 3 in 6 hours and Mode 5 in 84 hours if the system is inoperable, and the Required Action and associated Completion Time are not met. The current Mode 5 endstate is proposed to be changed to require the unit to be in Mode 4 in 60 hours if the Required Action and associated Completion Time are not met.

6.4.23 Technical Specification 3.6.8 – Shield Building (Dual and Ice Condenser)

Description

The shield building is a concrete structure that surrounds the steel containment vessel. Between the containment vessel and the shield building inner wall is an annulus that collects containment leakage than may occur following a loss of coolant accident, steam line break, or control rod ejection.

Limiting Condition for Operation

The shield building shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The shield building Technical Specification has no impact on CDP. Shield building integrity is not modeled in the risk models described in Section 6.3.1, therefore, a qualitative evaluation is performed for this proposed endstate change.

Significant leakage from the containment vessel and the shield building in Mode 4 is highly unlikely due to the significantly reduced RCS temperature and pressure conditions as the unit is being shutdown, and the reduced likelihood of a LOCA or secondary side break due to reduced thermal-hydraulic conditions. In Level 2 PRA models, shield building and containment vessel leakage is not considered to contribute to LERF. A unit shutdown to Mode 5 requires transferring to RHR cooling which introduces the potential for increased risks including LOCAs both inside and outside containment. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The proposed change to the Required Action B.2 endstate does not change the operability requirement for the shield building. The shield building must still be operable in Mode 4. In Mode 4, two trains of containment spray are required to be operable to mitigate radioactive releases after an event. Significant leakage from the containment vessel and the shield building is highly unlikely due to the significantly reduced RCS temperature and pressure conditions as the unit is being shutdown, the reduced likelihood of a LOCA in the shutdown modes, and reduced thermal-hydraulic conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.24 Technical Specification 3.6.11 – Iodine Cleanup System (ICS) (Atmospheric and Subatmospheric)

Description

The iodine cleanup system functions together with the containment spray and cooling systems following a design basis accident to reduce the potential release of radioactive material, principally iodine, from the containment to the environment.

The iodine cleanup system consists of two 100% capacity, separate, independent, and redundant trains. Each train includes a heater, [cooling coils,] a prefilter, a demister, a HEPA filter, an activated charcoal adsorber section for removal of radioiodines, and a fan. Ductwork, valves and/or dampers, and instrumentation also form part of the system. Each ICS train is powered from a separate ESF bus and is provided with a separate power panel and control panel. During normal operation, the containment cooling system is aligned to bypass the ICS HEPA filters and charcoal adsorbers. For ICS operation following a design basis accident, however, the bypass dampers automatically reposition to draw the air through the filters and adsorbers.

Limiting Condition for Operation

Two ICS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the iodine cleanup system because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. The iodine cleanup system assists in reducing the iodine fission product inventory. If one iodine cleanup system train is inoperable, the other is available to perform its function. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

The iodine cleanup system is designed for accident conditions initiated at power. One train of the iodine cleanup system is available and capable of performing its design basis function. In addition, the containment spray system will also remove iodine from the containment atmosphere and two trains of containment spray are required to be operable. Events, such as a LOCA or a secondary side break, are less likely in Mode 4 due to the limited time in the mode and less severe thermal-hydraulic conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.25 Technical Specification 3.6.12 – Vacuum Relief Valves (Atmospheric and Ice Condenser)

Description

The purpose of the vacuum relief lines is to protect the containment vessel against negative pressure (i.e., a lower pressure inside than outside). Excessive negative pressure inside containment can occur if there is an inadvertent actuation of containment cooling features, such as the containment spray system. Multiple equipment failures or human errors are necessary to cause inadvertent actuation of these systems.

The containment pressure vessel contains two 100% vacuum relief lines that protect the containment from excessive external loading.

Limiting Condition for Operation

[Two] vacuum relief lines shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the vacuum relief valves because they are a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. The vacuum relief valves protect the containment from negative pressure due to an inadvertent actuation of the containment spray system. Inadvertent actuation of the containment spray system does not lead directly to core damage and large early releases. Another event needs to occur to cause the core damage. In addition, if one vacuum relief line is inoperable, the other line is available to provide the containment protection. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Inadvertent actuation of containment spray is unlikely due to the instrumentation design for automatic and manual initiation. Inadvertent actuation of the containment spray system does not lead directly to core damage and large early releases by itself. Another event needs to occur to cause core damage. In addition, if one vacuum relief line is inoperable, the other line is available to provide the containment protection. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.26 Technical Specification 3.6.13 – Shield Building Air Cleanup System (SBACS) (Dual and Ice Condenser)

Description

The containment has a secondary containment called the shield building, that is a concrete structure that surrounds the steel primary containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects any containment leakage that may occur following a LOCA. This space also allows for periodic inspection of the outer surface of the steel containment vessel.

The SBACS establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment.

The SBACS consists of two separate and redundant trains. Each train includes a heater, [cooling coils,] a prefilter, moisture separators, a HEPA filter, an activated charcoal adsorber section for removal of radioiodines, and a fan. During normal operation, the shield building cooling system is aligned to bypass the SBACS's HEPA filters and charcoal adsorbers. For SBACS operation following a design basis accident, however, the bypass dampers automatically reposition to draw the air through the filters and adsorbers.

Limiting Condition for Operation

Two SBACS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the SBACS because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. If one SBACS train is inoperable, the other train is available to provide the annulus air cleanup. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one SBACS train is inoperable, the other train is available to provide the annulus air cleanup. In addition, two trains of containment spray are required to be operable to mitigate radioactive releases after an event. Significant leakage from containment is highly unlikely due to the significantly reduced RCS temperature and pressure conditions as the unit is being shutdown, and reduced likelihood of a LOCA in the shutdown modes, and less severe thermal-hydraulic conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.27 Technical Specification 3.6.14 – Air Return System (ARS) (Ice Condenser)

Description

The air return system is designed to assure the rapid return of air from the upper to the lower containment compartment after the initial blowdown following a design basis accident. The return of this air to the lower compartment and subsequent recirculation back up through the ice condenser assists in cooling the containment atmosphere and limiting the post accident pressure and temperature in containment to less than design values. The air return system provides post accident hydrogen mixing in selected areas of containment. The air return system also functions, after all the ice has melted, to circulate any steam still entering the lower compartment to the upper compartment where the containment spray system can cool it.

The air return system consists of two separate trains of equal capacity, each capable of meeting the design bases. Each train includes a 100% capacity air return fan, associated damper, and hydrogen collection headers with isolation valves. The ARS fans are automatically started and the hydrogen collection header isolation valves are opened by the containment pressure High-High signal 10 minutes after the containment pressure reaches the pressure setpoint. Each train is powered from a separate ESF bus.

Limiting Condition for Operation

Two ARS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the air return system because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. If one air return train is inoperable, the other train is available to assist in cooling the containment atmosphere. In addition, two trains of containment spray are required to be operable. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one air return train is inoperable, the other train is available to assist in cooling the containment atmosphere. Containment cooling is still available from the containment ice condenser and from two trains of containment spray that are required to be operable. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.28 Technical Specification 3.6.15 – Ice Bed (Ice Condenser)

Description

The ice absorbs energy and limits containment peak pressure and temperature during a design basis accident. The ice condenser is an annular compartment enclosing approximately 300° of the perimeter of the upper containment compartment, but penetrating the operating deck so that a portion extends into the lower containment compartment. The ice bed consists of over [2,721,600] lb of ice stored in [1944] baskets within the ice condenser. Its primary purpose is to provide a large heat sink in the event of a release of energy from a design basis accident in containment.

The ice baskets contain the ice within the ice condenser. The ice baskets position the ice within the ice bed in an arrangement to promote heat transfer from the steam to the ice. This arrangement enhances the ice condenser's primary function of condensing steam and absorbing heat energy released to the containment during a design basis accident.

In the event of a design basis accident, the ice condenser inlet doors (located below the operating deck) open due to the pressure rise in the lower compartment. This allows air and steam to flow from the lower compartment into the ice condenser. The resulting pressure increase within the ice condenser causes the intermediate deck doors and the top deck doors to open, which allows the air to flow out of the ice condenser into the upper compartment. Steam condensation within the ice condenser limits the pressure and temperature buildup in containment. A divider barrier separates the upper and lower compartments and ensures that the steam is directed into the ice condenser.

The ice, together with the containment spray, is adequate to absorb the initial blowdown of steam and water from a design basis accident and the additional heat loads that would exist in containment during several hours following the initial blowdown. As ice melts, the water passes through the ice condenser floor drains into the lower compartment. Thus, a second function of the ice bed is to serve as a large source of borated water (via the containment sump) for long term ECCS and containment spray system heat removal functions in the recirculation mode.

A third function of the ice bed and melted ice is to remove fission product iodine that may be released from the core during a design basis accident. Iodine removal occurs during the ice melt phase of the accident and continues as the melted ice is sprayed into the containment atmosphere by the containment spray system. The ice is adjusted to an alkaline pH that facilitates removal of radioactive iodine from the containment atmosphere. The alkaline pH also minimizes the occurrence of chloride and caustic stress corrosion on mechanical systems and components exposed to ECCS and containment spray system fluids in the recirculation mode of operation.

Limiting Condition for Operation

The ice bed shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the ice bed because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. Two phenomena that can degrade the ice bed during power operation are the loss of ice by melting or sublimation and the obstruction of flow passages through the ice bed due to buildup of frost or ice. Both of these degrading phenomena are reduced by minimizing air leakage into and out of the ice condenser. Due to the very large mass of stored ice, if the ice bed is inoperable, it would still retain cooling capability and the containment spray system and the air return system would also provide cooling for accident conditions. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

Due to the very large mass of stored ice, if the ice bed is inoperable, it is highly unlikely that it would have no contribution to containment cooling if an event occurred. In addition, two trains of the containment spray system and two trains of the air return system provide cooling capability for accident conditions. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.29 Technical Specification 3.6.16 – Ice Condenser Doors (Ice Condenser)

Description

The ice condenser doors consist of the inlet doors, the intermediate deck doors, and the top deck doors. The functions of the doors are to seal the ice condenser from air leakage and open in the event of a design basis accident to direct the hot steam air mixture into the ice bed, where the ice would absorb energy and limit containment peak pressure and temperature during the accident transient. The ice baskets contained in the ice bed within the ice condenser are arranged to promote heat transfer from steam to ice.

In the event of a design basis accident, the ice condenser inlet doors (located below the operating deck) open due to the pressure rise in the lower compartment. This allows air and steam to flow from the lower compartment into the ice condenser. The resulting pressure increase within the ice condenser causes the intermediate deck doors and the top deck doors to open, which allows the air to flow out of the ice condenser into the upper compartment. Steam condensation within the ice condensers limits the pressure and temperature buildup in containment. A divider barrier separates the upper and lower compartments and ensures that the steam is directed into the ice condenser.

Limiting Condition for Operation

The ice condenser inlet doors, intermediate deck doors, and top deck [doors] shall be operable and closed.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A or C not met.

Current Required Action Endstate

The current endstate for Required Action D.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action D.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A or C not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the ice condenser because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. There are a series of ice condenser doors at each level (lower, intermediate, and upper). It is highly unlikely that a sufficient number of doors would be inoperable to the extent that they would render the ice condenser ineffective for cooling containment during accident conditions. In addition, the containment spray system and the air return system provide cooling capability. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one or more ice condenser doors are inoperable such that the ice condenser is degraded for cooling containment during accident conditions, two trains of the containment spray system and two trains of the air return system are required to be operable and would provide cooling capability. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. The likelihood of an event that would challenge containment integrity occurring in Mode 4 is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.30 Technical Specification 3.6.17 – Divider Barrier Integrity (Ice Condenser)

Description

The divider barrier consists of the operating deck and associated seals, personnel access doors, and equipment hatches that separate the upper and lower containment compartments. Divider barrier integrity is necessary to minimize bypassing of the ice condenser by the hot steam and air mixture released into the lower compartment during a design basis accident. This ensures that most of the gases pass through the ice bed, which condenses the steam and limits pressure and temperature during the accident transient.

Limiting Condition for Operation

Divider barrier integrity shall be maintained.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the divider barrier because it is a containment system and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. It is unlikely that the divider barrier would create a large enough bypass of the ice condenser to render the ice condenser completely ineffective during accident conditions. During accident conditions, the containment spray system and the air return system will also provide cooling capability. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

It is unlikely that the divider barrier would create a large enough bypass of the ice condenser to render the ice condenser completely ineffective during accident conditions. Two trains of the containment spray system and two trains of the air return system are required to be operable and would provide cooling capability during accident conditions. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.31 Technical Specification 3.6.18 – Containment Recirculation Drains (Ice Condenser)

Description

The containment recirculation drains consist of the ice condenser drains and the refueling canal drains. [Twenty of the 24] ice condenser bays have a floor drain at the bottom to drain the melted ice into the lower compartment (in the [4] bays that do not have drains, the water drains through the floor drains in the adjacent bays). A check (flapper) valve at the end of each pipe keeps warm air from entering during normal operation, but when the water exerts pressure, the check valve opens to allow the water to spill into the lower compartment. This prevents water from backing up and interfering with the ice condenser inlet doors. The water delivered to the lower containment serves to cool the atmosphere as it drains to the floor and provides a source of borated water at the containment sump for long term use by the ECCS and the containment spray system during the recirculation mode of operation.

The two refueling canal drains are at low points in the refueling canal. In the event of a design basis accident, the refueling canal drains are the main return path to the lower compartment for containment spray system water sprayed into the upper compartment.

Limiting Condition for Operation

The ice condenser floor drains and the refueling canal drains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The CDP risk models described in Section 6.3.1 do not include the ice condenser and refueling canal drains because they are containment systems and the risk models are based on core damage probability. Therefore, a qualitative evaluation is performed for this proposed endstate change. If one drain is inoperable, there are other drains available to perform the function of transferring water to its intended destination. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one ice condenser floor drain is inoperable, there are [19] others available to drain the water to the lower compartment. If one refueling canal drain is inoperable, there is another refueling canal drain to transfer the containment spray water to the lower compartment. An event in Mode 4 that releases energy into containment will release far less energy than an event in Mode 1. The likelihood of an event occurring in Mode 4 that would challenge containment integrity is reduced along with the consequences because of the significantly reduced RCS temperature and pressure conditions. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.32 Technical Specification 3.7.7 – Component Cooling Water (CCW) System

Description

The component cooling water system provides a heat sink for the removal of process and operating heat from safety related components during a design basis accident. The CCW system serves as a barrier to prevent the release of radioactive byproducts between potentially radioactive systems and the service water system, and then to the environment.

A typical CCW System is arranged as two independent, full capacity cooling loops, and has isolatable nonsafety related components. Each safety related train includes a full capacity pump, surge tank, heat exchanger, piping, valves, and instrumentation. Each safety related train is powered from a separate bus. An open surge tank in the system provides pump trip protective functions to ensure that sufficient net positive suction head is available. The pump in each train is automatically started on receipt of a safety injection signal, and all nonessential components are isolated.

Limiting Condition for Operation

Two CCW trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A not met.

Basis for Proposed Change

The CCW system is included in the risk models described in Section 6.3.1. The model includes two independent trains with one pump in each train, and a third pump that can be aligned to either train. A quantitative evaluation is performed using the risk models.

Two scenarios are modeled. In the first scenario, CCW Train A, that has two pumps aligned to the train, is assumed to be inoperable. The Train A configuration is conservative for units that have a backup pump in each train. In the second scenario, CCW Train B, that has one pump aligned to the train, is assumed to be inoperable. Both cases are analyzed and the results are presented in Table 6-14 along with the results from the base case.

Table 6-14 Technical Specification 3.7.7, CCW

POS	Core Damage Probability		
	Train A – Two Pumps Inoperable	**Train B – One pump Inoperable**	**Base Case**
1	3.29E-06	1.47E-06	2.18E-07
2	1.12E-06	1.22E-06	1.66E-07
3	7.65E-08	7.25E-08	7.09E-08
4	2.98E-05	2.78E-05	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06
Total	3.93E-05	3.56E-05	1.27E-05
Total Excluding POS 4	9.53E-06	7.80E-06	5.49E-06

For the inoperability of CCW Train A that includes the swing pump, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by a factor of 4. The POS 1 and 2 contributions are relatively high because of the loss of CCW initiating event and resulting RCP seal LOCAs that are modeled in these POSs, and this case assumes two CCW pumps are inoperable.

For the inoperability of CCW Train B that includes one pump, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by more than a factor of 4. The CCW Train B case total CDP and the POS 4 CDP are less than the Train A case results because the Train A case models two inoperable CCW pumps. The conclusion for both cases is there is less risk associated with a cool down to Mode 4 than there is with a cool down to Mode 5 when a train of CCW is inoperable.

Defense-in-Depth Considerations

One CCW train will be operating when the unit enters Mode 4, therefore, failures of the pump to start or valves to open are not applicable. Each train is designed to handle 100% of the heat loads during power operation and accident conditions. If the unit design includes a swing pump, it is highly probable that the swing pump would be available to backup the operating pump. The heat loads will be significantly less in the shutdown modes and some accidents are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.33 Technical Specification 3.7.8 – Service Water System (SWS)

Description

The service water system provides a heat sink for the removal of process and operating heat from safety related components during a design basis accident. During normal operation, and a normal shutdown, the SWS also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

A typical SWS consists of two separate, 100% capacity, safety related, cooling water trains. Each train consists of two 100% capacity pumps, one component cooling water heat exchanger, piping, valving, instrumentation, and two cyclone separators. The pumps and valves are remote and manually aligned, except in the unlikely event of a LOCA. The pumps aligned to the critical loops are automatically started upon receipt of a safety injection signal, and all essential valves are aligned to their post accident positions. The SWS also provides emergency makeup to the spent fuel pool and CCW system and typically is the backup water supply to the auxiliary feedwater system.

Limiting Condition for Operation

Two SWS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A not met.

Basis for Proposed Change

The service water system is included in the risk models described in Section 6.3.1. The model includes two independent trains with one pump in each train, and a third pump that can be aligned to either train. A quantitative evaluation is performed using the risk model.

Two scenarios are modeled. In the first scenario, SWS Train A, that has two pumps aligned to the train, is assumed to be inoperable. The Train A configuration is conservative for units that have a backup pump in each train. In the second scenario, SWS Train B, that has one pump aligned to the train, is assumed to be inoperable. Both cases are analyzed and the results are presented in Table 6-15 along with the results from the base case.

Table 6-15 Technical Specification 3.7.8, SWS

POS	Core Damage Probability		
	Train A – Two Pumps Inoperable	**Train B – One Pump Inoperable**	**Base Case**
1	1.56E-05	8.68E-07	2.18E-07
2	8.99E-07	3.67E-07	1.66E-07
3	2.06E-07	1.58E-07	7.09E-08
4	4.07E-05	3.43E-05	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06
Total	6.24E-05	4.07E-05	1.27E-05
Total Excluding POS 4	2.17E-05	6.43E-06	5.49E-06

For the inoperability of SWS Train A that includes the swing pump, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by almost a factor of 3.

For the inoperability of SWS Train B that includes one pump, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by more than a factor of 6. This results in a greater reduction in CDP than the Train A case, although the POS 4 CDP for the Train A case is greater than the POS 4 CDP for the Train B case. The greater reduction in CDP for the Train B case is because the POS 4 CDP dominates the Train B results, whereas the Train A results have larger CDPs, particularly for POS 1. This decreases the impact of subtracting the POS 4 results for the Train A case. The main conclusion of both cases is the same; a cool down to Mode 4 instead of Mode 5 reduces the risk of the shutdown process when a train of the SWS is inoperable.

Defense-in-Depth Considerations

One SWS train will be operating when the unit enters Mode 4, therefore, failures of the pump to start or valves to open are not applicable. Each train is designed to handle 100% of the heat loads during power operation and accident conditions. If the plant design includes a swing pump or redundant pumps in each train, it is highly probable that another pump would be available to backup the operating pump. The heat loads will be significantly less in the shutdown modes and some accidents are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.34 Technical Specification 3.7.9 – Ultimate Heat Sink (UHS)

Description

The ultimate heat sink provides a heat sink for the removal of process and operating heat from safety related components during an accident, as well as during normal operation. This is done by utilizing the service water system and the component cooling water system.

The UHS has been defined as the water sources, including necessary retaining structures (e.g., a pond with its dam, or a river with its dam), and the canals or conduits connecting the sources with, but not including, the cooling water system intake structures as discussed in the FSAR. If cooling towers or portions thereof are required to accomplish the UHS safety functions, they should meet the same requirements as the heat sink. The two principal functions of the UHS are the dissipation of residual heat after reactor shutdown, and dissipation of residual heat after an accident.

A variety of water sources are used to meet the requirements for a UHS. A lake or an ocean may qualify as a single source. If the water sources include a water source contained by a structure, it is likely that a second source will be required.

Limiting Condition for Operation

The UHS shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

[Required Action and associated Completion Time of Condition A or B not met, or] UHS inoperable [for reasons other than Condition A or B].

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the [Required Action and associated Completion Time of Condition A or B not met, or] UHS inoperable [for reasons other than Condition A or B].

Basis for Proposed Change

The risk models described in Section 6.3.1 do not include cooling towers because the models are based on a plant that has a cooling pond that supplies cooling water to the service water system. Therefore, a qualitative approach is used for this endstate change.

The Actions of Technical Specification 3.7.9 address degradations to the cooling capability of the ultimate heat sink. Because of the limitations on water temperature and the variety of designs of the ultimate heat sink, the most likely scenario for entering Condition C is that the cooling capability of the ultimate heat sink is only partially degraded. A cool down to Mode 4 places the unit in a state in which the heat loads are significantly less than at full power. There are additional risks associated with a cool down to Mode 5, e.g., switching to RHR cooling, and transferring the heat load to the component cooling water system.

Defense-in-Depth Considerations

The ultimate heat sink is designed to remove 100% of the heat loads generated during power operation and accident conditions. The heat loads will be significantly less in the shutdown modes and some accidents are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.35 Technical Specification 3.7.10 – Control Room Emergency Filtration System (CREFS)

Description

The CREFS provides a protected environment from which the operators can control the unit following an uncontrolled release of radioactivity, chemicals, or toxic gas.

The CREFS consists of two independent, redundant trains that recirculate and filter the control room air. Each train consists of a prefilter or demister, a HEPA filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation also form part of the system, as well as demisters to remove water droplets from the air stream. A second bank of HEPA filters is downstream of the adsorber section to collect carbon fines and provide backup in case of failure of the main HEPA filter bank.

Limiting Condition for Operation

Two CREFS trains shall be operable.

Applicability

Modes 1, 2, 3, 4, [5, and 6], during movement of [recently] irradiated fuel assemblies.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time for Condition A or B not met in Mode 1, 2, 3, or 4.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time for Condition A or B not met in Mode 1, 2, 3, or 4.

Basis for Proposed Change

This system is not modeled in the risk models described in Section 6.3.1, and it is not typically modeled in Westinghouse NSSS plant PRAs. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one CREFS train is inoperable, the other train provides the necessary filtration. If two CREFS trains are inoperable due to an inoperable control room boundary, an independent initiating event must occur along with core damage and containment isolation failure for filtration to be required. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one CREFS train is inoperable, the other train remains available to provide control room filtration. If two CREFS trains are inoperable due to an inoperable control room boundary, an independent initiating event and subsequent failures must occur for filtration to be required. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.36 Technical Specification 3.7.11 – Control Room Emergency Air Temperature Control System (CREATCS)

Description

The CREATCS provides temperature control for the control room following isolation of the control room.

The CREATCS consists of two independent and redundant trains that provide cooling and heating of recirculated control room air. Each train consists of heating coils, cooling coils, instrumentation, and controls to provide for control room temperature control.

Limiting Condition for Operation

Two CREATCS trains shall be operable.

Applicability

Modes 1, 2, 3, 4, [5, and 6], during movement of [recently] irradiated fuel assemblies.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A not met in Mode 1, 2, 3, or 4.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A not met in Mode 1, 2, 3, or 4.

Basis for Proposed Change

This system is not modeled in the risk models described in Section 6.3.1, and it is not typically modeled in Westinghouse NSSS plant PRAs. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one CREATCS train is inoperable, the other train provides the necessary temperature control. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one CREATCS train is inoperable, the other train remains available to provide control room temperature control. The slower nature of accident event progression in the shutdown modes, and increased time for operator actions and mitigation strategies, limit the severity of accidents in the shutdown modes. The inoperability of equipment does not affect the likelihood of an event occurring and some events are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.37 Technical Specification 3.7.12 – Emergency Core Cooling System (ECCS) Pump Room Exhaust Air Cleanup System (PREACS)

Description

The ECCS PREACS filters air from the area of the active ECCS components during the recirculation phase of a LOCA. The ECCS PREACS, in conjunction with other normally operating systems, also provides environmental control of temperature and humidity in the ECCS pump room area and the lower areas of the Auxiliary Building.

The ECCS PREACS consists of two independent and redundant trains. Each train consists of a heater, a prefilter or demister, a HEPA filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation also form part of the system, as well as demisters functioning to reduce the relative humidity of the air stream. A second bank of HEPA filters is downstream of the adsorber section to collect carbon fines and provide backup in case the main HEPA filter bank fails. The downstream HEPA filter is not credited in the accident analysis, but serves to collect charcoal fines, and to back up the upstream HEPA filter should it develop a leak. The system initiates filtered ventilation of the pump room following receipt of a SI signal.

Limiting Condition for Operation

Two ECCS PREACS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

This system is not modeled in the risk models described in Section 6.3.1, and it is not typically modeled in Westinghouse NSSS plant PRAs. This system has no impact on plant CDP. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one ECCS PREACS train is inoperable, the other train provides the necessary filtration. If two trains are inoperable due to an inoperable ECCS pump room boundary, a LOCA must also occur to require the operation of the ECCS PREACS. A LOCA in Mode 4 is less likely due to the reduced RCS temperature and pressure. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one ECCS PREACS train is inoperable, the other train remains available to provide pump room air filtration. If two trains are inoperable due to an inoperable ECCS pump room boundary, a LOCA must also occur to require operation of the ECCS PREACS. The slower nature of accident event progression in the shutdown modes, and increased time for operator actions and mitigation strategies, limit the severity of accidents in the shutdown modes. In addition, a LOCA is less likely to occur in the shutdown modes.

Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.38 Technical Specification 3.7.13 – Fuel Building Air Cleanup System (FBACS)

Description

The FBACS filters airborne radioactive particulates from the area of the fuel pool following a fuel handling accident or a LOCA. A LOCA is analyzed to address radioactive leakage from the ECCS. The FBACS, in conjunction with other normally operating systems, also provides environmental control of temperature and humidity in the fuel pool area.

The FBACS consists of two independent and redundant trains. Each train consists of a heater, a prefilter or demister, a HEPA filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation also form part of the system, as well as demisters, functioning to reduce the relative humidity of the airstream. A second bank of HEPA filters is downstream of the adsorber section to collect carbon fines and provide backup in case the main HEPA filter bank fails. The downstream HEPA filter is not credited in the analysis, but serves to collect charcoal fines, and to back up the upstream HEPA filter should it develop a leak. The system initiates filtered ventilation of the fuel handling building following receipt of a high radiation signal.

Limiting Condition for Operation

Two FBACS trains shall be operable.

Applicability

Modes 1, 2, 3, 4, [5, and 6], during movement of [recently] irradiated fuel assemblies.

Condition Requiring Entry into Actions or a Unit Shutdown

[Required Action and associated Completion Time of Condition A or B not met in Mode 1, 2, 3, or 4.] or Two FBACS trains inoperable in Mode 1, 2, 3, or 4 for reasons other than Condition B.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the [Required Action and associated Completion Time of Condition A or B not met in Mode 1, 2, 3, or 4.] or Two FBACS trains inoperable in Mode 1, 2, 3, or 4 for reasons other than Condition B.

Basis for Proposed Change

This system is not modeled in the risk models described in Section 6.3.1, and it is not typically modeled in Westinghouse NSSS plant PRAs. This system has no impact on plant CDP. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one FBACS train is inoperable, the other train provides the necessary filtration. If two FBACS trains are inoperable, a LOCA or fuel handling accident must also occur to require the operation of the FBACS. A LOCA in Mode 4 is less likely due to the reduced RCS temperature and pressure. If irradiated fuel is being moved, Condition E of the Specification requires that the movement be suspended. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one FBACS train is inoperable, the other train remains available to provide fuel building air filtration. If two FBACS trains are inoperable, a LOCA or fuel handling accident must also occur to require operation of the FBACs. LOCAs are less likely in Mode 4 because of the reduced RCS temperature and pressure in Mode 4 and Condition E reduces the probability of a fuel handling accident. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.39 Technical Specification 3.7.14 – Penetration Room Exhaust Air Cleanup System (PREACS)

Description

The PREACS filters air from the penetration area between containment and the Auxiliary Building.

The PREACS consists of two independent and redundant trains. Each train consists of a heater, a prefilter or demister, a HEPA filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan. Ductwork, valves or dampers, and instrumentation, as well as demisters, functioning to reduce the relative humidity of the air stream, also form part of the system. A second bank of HEPA filters, downstream of the adsorber section, collects carbon fines and provides backup in case of failure of the main HEPA filter bank. The downstream HEPA filter, although not credited in the accident analysis, collects charcoal fines and serves as a backup should the upstream HEPA filter develop a leak. The system initiates filtered ventilation following receipt of a safety injection signal.

Limiting Condition for Operation

Two PREACS trains shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action C.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action C.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

This system is not modeled in the risk models described in Section 6.3.1, and it is not typically modeled in Westinghouse NSSS plant PRAs. This system has no impact on plant CDP. Therefore, a qualitative evaluation is performed for this proposed endstate change.

If one PREACS train is inoperable, the other train provides the necessary filtration. If two PREACS trains are inoperable due to an inoperable penetration room boundary, a LOCA and a passive failure in the penetration room must occur to require air filtration. LOCAs are less likely in Mode 4 because of the reduced RCS temperature and pressure. A cool down to Mode 4 leaves the unit in a state in which transients progress slower than at power, backup core cooling is available via RHR, there is increased time for operator actions, and there is a lower overall risk than proceeding to Mode 5 as demonstrated in Section 6.3.2. LERP in the shutdown modes would be reduced due to lower levels of radionuclide inventory in the RCS, the slower nature of severe accident event progression, and increased time for operator actions and mitigation strategies if an event were to occur.

Defense-in-Depth Considerations

If one PREACS train is declared inoperable, the other train remains available to provide penetration room air filtration. If two PREACS trains are inoperable due to an inoperable penetration room boundary, a LOCA and passive failure in the penetration room must occur to require air filtration. A LOCA is less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.40 Technical Specification 3.8.1 – AC Sources – Operating

Description

The unit Class 1E AC Electrical Power Distribution System AC sources consist of the offsite power sources (preferred power sources, normal and alternate(s)), and the onsite standby power sources (Train A and Train B DGs). The design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the ESF systems.

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

Offsite power is typically supplied to the unit switchyard(s) from the transmission network by two transmission lines. From the switchyard(s), two electrically and physically separated circuits provide AC power, through step down station auxiliary transformers, to the 4.16 kV ESF buses. An offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E ESF bus(es).

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

After the DG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with an SI signal. The DGs will also start and operate in the standby mode without tying to the ESF bus on an SI signal alone.

Limiting Condition for Operation

The following AC electrical sources shall be operable:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System,

b. Two diesel generators (DGs) capable of supplying the onsite Class 1E power distribution subsystem(s), and

c. [Automatic load sequencers for Train A and Train B.]

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time of Condition A, B, C, D, E, or [F] not met.

Current Required Action Endstate

The current endstate for Required Action G.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action G.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time of Condition A, B, C, D, E, or [F] not met.

Basis for Proposed Change

Electric power is included in the risk models described in Section 6.3.1. Each condition of this Technical Specification is evaluated quantitatively by modeling the inoperable equipment. The Conditions are grouped according to equipment and are not necessarily in the order in which the Condition appears in the Technical Specification.

Conditions A and C – Offsite Power Circuits

Condition A – One Offsite Circuit Inoperable

A transformer in the risk models was selected as the component to use for one offsite circuit inoperable. The transformer was modeled as inoperable and the core damage probabilities were recalculated for POS 1, 2, 3, and 4. The results are presented in Table 6-16. Also provided are the CDPs from the base case.

Condition C – Two Offsite Circuits Inoperable

A transformer common cause basic event in the risk models was selected to model two offsite circuits inoperable. The common cause basic event was modeled as inoperable and the core damage probabilities were recalculated for POS 1, 2, 3, and 4. The results are presented in Table 6-16. Also provided are the CDPs from the base case.

There is a significant increase in the CDP when two offsite power circuits are inoperable compared to one circuit being inoperable. This is expected because the unit is dependent on the diesel generators for power when both circuits are inoperable. For one circuit inoperable, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by approximately a factor of 3. When both offsite circuits are inoperable, the decrease in CDP for remaining in Mode 4 is approximately a factor of 8.

Table 6-16 Technical Specification 3.8.1, Conditions A and C, Offsite AC Circuits Inoperable			
	Core Damage Probability		
POS	One Offsite Circuit Inoperable	Two Offsite Circuits Inoperable	Base Case
1	5.82E-07	8.62E-04	2.18E-07
2	2.35E-07	1.47E-04	1.66E-07
3	1.37E-07	1.47E-04	7.09E-08
4	1.17E-05	8.06E-03	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06
Total	1.77E-05	9.22E-03	1.27E-05
Total Excluding POS 4	5.99E-06	1.16E-03	5.49E-06

<u>Conditions B and E – Diesel Generators</u>

Condition B – One Diesel Generator (DG) Inoperable

One diesel generator was modeled as inoperable and the core damage probabilities were recalculated for POS 1, 2, 3, and 4. The resulting CDPs are presented in Table 6-17 along with the CDPs from the base case.

Condition E – Two Diesel Generators Inoperable

A common cause basic event for both diesel generators was selected to model the inoperability of two diesel generators. The POS 1, 2, 3, and 4 risk models were requantified. The resulting CDPs for each POS are presented in Table 6-17 along with the CDPs from the base case.

Table 6-17 Technical Specification 3.8.1, Conditions B and E, Diesel Generator(s) Inoperable			
	Core Damage Probability		
POS	One DG Inoperable	Two DGs Inoperable	Base Case
1	3.54E-07	2.38E-06	2.18E-07
2	2.15E-07	9.51E-07	1.66E-07
3	1.49E-07	1.31E-06	7.09E-08
4	1.37E-05	1.10E-04	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06
Total	1.95E-05	1.20E-04	1.27E-05
Total Excluding POS 4	5.76E-06	9.68E-06	5.49E-06

For the inoperability of one DG, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by more than a factor of 3. When both DGs are inoperable, the decrease in CDP for remaining in Mode 4 is approximately a factor 12.

Condition D – One Offsite Circuit and One DG Inoperable

A transformer and diesel generator were selected to model the inoperable equipment for this condition. The POS 1, 2, 3, and 4 risk models were requantified. The resulting CDPs for each POS are presented in Table 6-18. Also provided are the CDPs from the base case.

Table 6-18 Technical Specification 3.8.1, Condition D One Offsite Circuit and One DG Inoperable

POS	Core Damage Probability	
	One Offsite Circuit and One DG Inoperable	Base Case
1	4.64E-06	2.18E-07
2	1.03E-06	1.66E-07
3	9.37E-07	7.09E-08
4	6.69E-05	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	7.85E-05	1.27E-05
Total Excluding POS 4	1.16E-05	5.49E-06

The CDPs for one offsite AC circuit and one DG inoperable, as expected, are greater than the CDPs for one offsite AC circuit inoperable and are also greater than the CDPs for one DG inoperable. The total CDP decreases by more than a factor of 6 when the unit is cooled down to Mode 4 (POS 3) instead of Mode 5 (POS 4). This is a larger decrease than for either the one offsite AC circuit inoperable case or the one DG inoperable case.

Condition F – One Load Sequencer Inoperable

One load sequencer was selected to model this condition. The load sequencer was modeled as inoperable and the POS 1, 2, 3, and 4 risk models were requantified. The resulting CDPs for each POS are presented in Table 6-19. Also provided are the CDPs from the base case.

Table 6-19 Technical Specification 3.8.1, Condition F One Load Sequencer Inoperable		
	Core Damage Probability	
POS	One Load Sequencer Inoperable	Base Case
1	3.94E-07	2.18E-07
2	2.32E-07	1.66E-07
3	1.57E-07	7.09E-08
4	1.42E-05	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	2.00E-05	1.27E-05
Total Excluding POS 4	5.82E-06	5.49E-06

The results for this case are similar to the results for the one DG inoperable case, which is expected, because the consequences of the inoperable equipment are similar. For the inoperability of one load sequencer, remaining in Mode 4 (POS 3) instead of cooling down to Mode 5 (POS 4) reduces the total core damage probability by more than a factor of 3.

For each of the Conditions of this Technical Specification that were evaluated, the results show that a cool down to Mode 4 instead of Mode 5 reduces the risk of the shutdown process when the unit has inoperable electrical power components. The reduction in risk ranges from a factor of 3 to a factor of 12.

Defense-in-Depth Considerations

The electric power design maintains defense-in-depth when the Conditions for this Technical Specification are considered. Two trains of diesel generators are available if two offsite power circuits are inoperable and two offsite power circuits are available if two diesel generators are inoperable. If an offsite power circuit and/or a diesel generator are inoperable, at least one of each remains available. The slower nature of event progression in the shutdown modes provides increased time for operator actions and mitigation strategies if an event were to occur. In addition, some events are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.41 Technical Specification 3.8.4 – DC Sources – Operating

Description

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and preferred AC vital bus power (via inverters). The DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure.

The typical 125/250 VDC electrical power system consists of two independent and redundant safety related Class 1E DC electrical power subsystems (Train A and Train B). Each subsystem consists of two 125 VDC batteries (each battery with 50% capacity), the associated battery charger(s) for each battery, and all the associated control equipment and interconnecting cabling.

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

During normal operation, the 125/250 VDC load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

<u>Limiting Condition for Operation</u>

The Train A and Train B DC electrical power subsystems shall be operable.

<u>Applicability</u>

Modes 1, 2, 3, and 4.

<u>Condition Requiring Entry into Actions or a Unit Shutdown</u>

Required Action and associated Completion Time not met.

<u>Current Required Action Endstate</u>

The current endstate for Required Action D.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

<u>Proposed Required Action and Endstate</u>

Revise the endstate for Required Action D.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

<u>Basis for Proposed Change</u>

DC power is included in the risk models described in Section 6.3.1. Each Condition of this Technical Specification is evaluated quantitatively by modeling the inoperable equipment.

Condition A – One [or Two] Battery Charger[s on one train] Inoperable

There is one battery charger per battery (and per train) in the risk models described in Section 6.3.1. One battery charger was modeled as inoperable and the POS 1, 2, 3, and 4 risk models were requantified.

The resulting CDPs for each POS are presented in Table 6-20. Also provided are the CDPs from the base case.

Table 6-20 Technical Specification 3.8.4, Condition A Battery Charger Inoperable

POS	Core Damage Probability	
	Battery Charger Inoperable	Base Case
1	2.18E-07	2.18E-07
2	1.66E-07	1.66E-07
3	7.14E-08	7.09E-08
4	7.21E-06	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	1.27E-05	1.27E-05
Total Excluding POS 4	5.49E-06	5.49E-06

The results are basically the same as the base case. The CDP is reduced by slightly more than a factor of two when the unit is cooled down to Mode 4 instead of Mode 5.

Condition B – One Battery/Two Batteries on One Train Inoperable

There is one battery modeled per train in the risk models described in Section 6.3.1. One battery was modeled as inoperable and the POS 1, 2, 3, and 4 risk models were requantified. The resulting CDPs for each POS are presented in Table 6-21. Also provided are the CDPs from the base case.

Table 6-21 Technical Specification 3.8.4, Condition B One Battery Inoperable

POS	Core Damage Probability	
	One Battery Inoperable	Base Case
1	3.85E-07	2.18E-07
2	2.36E-07	1.66E-07
3	1.71E-07	7.09E-08
4	1.43E-05	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	2.01E-05	1.27E-05
Total Excluding POS 4	5.83E-06	5.49E-06

The results are expected to be similar to those for the battery charger. The inoperable battery CDPs are larger than the CDPs for an inoperable battery charger. The battery chargers are the primary source for DC power and the batteries serve as the backup, however, the failure probability for the battery chargers is twice that of the batteries. Therefore, modeling the battery as inoperable results in a larger change in the CDPs. For this case, the CDP is reduced by more than a factor of three when the unit is cooled down to Mode 4 instead of Mode 5.

Condition C – One DC Subsystem (train) Inoperable for Reasons Other Than Condition A or B

A DC panel was selected to model the inoperability of one DC train. The risk models described in Section 6.3.1 were requantified for POS 1, 2, 3, and 4. The resulting CDPs for each POS are presented in Table 6-22. Also provided are the base CDPs.

Table 6-22 Technical Specification 3.8.4, Condition C One DC Subsystem Inoperable for Reasons Other Than Condition A or B

POS	Core Damage Probability	
	One DC Subsystem Inoperable	Base Case
1	5.73E-05	2.18E-07
2	6.11E-05	1.66E-07
3	6.10E-05	7.09E-08
4	8.79E-05	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	2.72E-04	1.27E-05
Total Excluding POS 4	1.84E-04	5.49E-06

The CDP values for POS 1, 2, 3, and 4 are larger than those of the previous two cases. This is expected because one entire DC subsystem is inoperable. For this case, the CDP is reduced by more a factor of approximately 1.5 when the unit is cooled down to Mode 4 instead of Mode 5. This is a smaller decrease than the other two cases. The POS 4 CDP is greater for this case than the other two cases, however, the CDPs for the POS 1, 2, and 3 are much greater for this case than they are for the previous two cases. The POS 1, 2, and 3 and CDPs lessen the effect of the POS 4 contribution. Note that the DC panel chosen for this case fails the Train A pump of emergency feedwater (EFW, also known as AFW) that is modeled as the running pump for POS 3. The model treats this as a failure during POS 3 and then addresses starting the Train B pump and associated check valve opening failures. These actions would have taken place prior to entering POS 3. As a result, the loss of EFW initiating event dominates the results with cutsets that are not applicable for this situation. Therefore, there is a greater difference between the POS 3 risk and the POS 4 risk than indicated by the results.

All three cases presented demonstrate a reduction in risk when the unit is cooled down to Mode 4 instead of Mode 5.

Defense-in-Depth Considerations

The DC power system is designed for the battery chargers to provide the normal DC power. The batteries back up the chargers in the event that AC power to the chargers is lost. There are two redundant trains of DC power so if one is inoperable, the other is available to provide the necessary DC power. The slower nature of event progression in the shutdown modes provides increased time for operator actions and mitigation strategies if an event were to occur. In addition, some events are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.42 Technical Specification 3.8.7 – Inverters – Operating

Description

The inverters are the preferred source of power for the AC vital buses because of the stability and reliability they achieve. The function of the inverters is to provide AC electrical power to the vital buses. The inverters can be powered from an internal AC source/rectifier or from the station battery. The station battery provides an uninterruptible power source for the instrumentation and controls for the RPS and ESFAS. The four inverters [(two per train)] ensure an uninterruptible supply of AC electrical power to the AC vital buses even if the 4.16 kV safety buses are de-energized.

Limiting Condition for Operation

The required Train A and Train B inverters shall be operable.

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action B.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action B.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The inverters are included in the risk models described in Section 6.3.1. Based on the specific design of the unit chosen for the generic PRA model, the two inverter trains are not symmetrically modeled. Train A includes one inverter and Train B includes two inverters. Two cases were evaluated for this Technical Specification. One case models Train A inoperable and the other case models Train B inoperable. The risk models described in Section 6.3.1 were requantified for POS 1, 2, 3, and 4 for each case. The resulting CDPs for each POS are presented in Table 6-23. Also provided are the base CDPs.

Table 6-23 Technical Specification 3.8.7, Inverters – Operating

POS	Core Damage Probability		
	Train A – One Inverter Inoperable	**Train B – Two Inverters Inoperable**	**Base Case**
1	4.05E-07	4.00E-07	2.18E-07
2	2.36E-07	2.35E-07	1.66E-07
3	1.58E-07	1.52E-07	7.09E-08
4	1.42E-05	1.37E-05	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06
Total	2.00E-05	1.95E-05	1.27E-05
Total Excluding POS 4	5.84E-06	5.83E-06	5.49E-06

Although the fault tree modeling is slightly different for the two trains, the results are basically the same. For these two cases, the CDP is reduced by more than a factor of 3 when the unit is cooled down to Mode 4 instead of Mode 5.

Defense-in-Depth Considerations

The inverters can be powered from AC sources or from the batteries. There are two redundant trains of inverters so if one is inoperable, the other is available to provide the necessary AC power. The slower nature of event progression in the shutdown modes provides increased time for operator actions and mitigation strategies if an event were to occur. In addition, some events are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.4.43 Technical Specification 3.8.9 – Distribution Systems – Operating

Description

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

The AC electrical power subsystem for each train consists of a primary ESF 4.16 kV bus and secondary 480 and 120 V buses, distribution panels, motor control centers and load centers. Each 4.16 kV ESF bus has at least one separate and independent offsite source of power as well as a dedicated onsite DG source. Each 4.16 kV ESF bus is normally connected to a preferred offsite source. After a loss of the preferred offsite power source to a 4.16 kV ESF bus, a transfer to the alternate offsite source is accomplished by utilizing a time delayed bus undervoltage relay. If all offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries.

The secondary AC electrical power distribution subsystem for each train includes safety related buses, load centers, motor control centers, and distribution panels.

The 120 VAC vital buses are arranged in two load groups per train and are normally powered from the inverters. The alternate power supply for the vital buses are Class 1E constant voltage source transformers powered from the same train as the associated inverter. Each constant voltage source transformer is powered from a Class 1E AC bus.

The DC electrical power distribution subsystem typically consists of 125 V buses and distribution panels.

Limiting Condition for Operation

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

Applicability

Modes 1, 2, 3, and 4.

Condition Requiring Entry into Actions or a Unit Shutdown

Required Action and associated Completion Time not met.

Current Required Action Endstate

The current endstate for Required Action D.2 is Mode 5. Specifically, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

Proposed Required Action and Endstate

Revise the endstate for Required Action D.2 to be in Mode 4 in 12 hours if the Required Action and associated Completion Time not met.

Basis for Proposed Change

The electrical distribution systems are included in the risk models described in Section 6.3.1. Each Condition of this Technical Specification is evaluated quantitatively by modeling the inoperable equipment.

Condition A – One or More AC Electrical Power Distribution Subsystems Inoperable

A representative electrical bus was chosen to provide representative results for one AC electrical power distribution subsystem inoperable. The bus was modeled as inoperable and the risk models described in Section 6.3.1 were requantified for POS 1, 2, 3, and 4. The resulting CDPs for each POS are presented in Table 6-24. Also provided are the base CDPs.

Table 6-24 Technical Specification 3.8.9, Condition A AC Power Distribution Subsystem Inoperable

POS	Core Damage Probability	
	One AC Power Distribution Subsystem Inoperable	Base Case
1	2.11E-05	2.18E-07
2	2.52E-06	1.66E-07
3	2.43E-06	7.09E-08
4	7.38E-05	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
Total	1.05E-04	1.27E-05
Total Excluding POS 4	3.11E-05	5.49E-06

The CDPs for this case are greater than those for the loss of an offsite source (Table 6-26). They are also greater than those for having one DG inoperable (Table 6-17). This is expected because an inoperable onsite source disables the offsite power feed as well as the associated diesel generator. For this case, the CDP is reduced by more than a factor of 3 when the unit is cooled down to Mode 4 instead of Mode 5.

Condition B – One or More AC Vital Buses Inoperable

Two cases are examined for this Technical Specification Condition; one inoperable panel and three inoperable panels to model one or more vital buses. The equipment was modeled as inoperable and the risk models described in Section 6.3.1 were requantified for POS 1, 2, 3, and 4. The resulting CDPs for each POS are presented in Table 6-25. Also provided are the base CDPs.

Table 6-25 Technical Specification 3.8.9, Condition B AC Vital Buses Inoperable

POS	Core Damage Probability		
	One Panel Inoperable	Three Panels Inoperable	Base Case
1	4.05E-07	5.13E-06	2.18E-07
2	2.36E-07	1.99E-06	1.66E-07
3	1.58E-07	1.45E-06	7.09E-08
4	1.42E-05	1.10E-04	7.21E-06
5	4.79E-07	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06	1.26E-06
Total	2.00E-05	1.24E-04	1.27E-05
Total Excluding POS 4	5.84E-06	1.36E-05	5.49E-06

The CDPs for the three panel case are almost a factor of 10 greater than the one panel case for POSs 1, 2, 3, and 4. For the one panel case, the CDP is reduced by more than a factor of 3 when the unit is cooled down to Mode 4 instead of Mode 5. For the three panel case, the CDP is reduced by a factor of 9 when the unit is cooled down to Mode 4 instead of Mode 5.

Condition C – One or More DC Electrical Power Distribution Subsystems Inoperable

This Condition evaluates one DC subsystem being inoperable. If more than one DC subsystem is inoperable, the results will differ, however, the results of Technical Specification 3.8.4 Condition C (Table 6-22) and other DC cases run have demonstrated the same conclusion; the risk of the shutdown process, in terms of CDP, is reduced when the unit is cooled down to Mode 4 instead of Mode 5. Therefore, a separate quantitative risk evaluation was not performed for this Condition.

The risk evaluation cases run for Technical Specification 3.8.9 demonstrate that the risk of the shutdown process, in terms of CDP, is reduced when the unit is cooled down to Mode 4 instead of Mode 5.

<u>Defense-in-Depth Considerations</u>

If Technical Specification 3.8.9 Condition D applies, there is no loss of safety function and the operable electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to mitigate accidents and shut down the reactor and maintain it in a safe shutdown condition.

The slower nature of event progression in the shutdown modes provides increased time for operator actions and mitigation strategies if an event were to occur. In addition, some events are less likely to occur in the shutdown modes. Therefore, sufficient defense-in-depth is maintained when the endstate is changed from Mode 5 to Mode 4.

6.5 SENSITIVITY ANALYSIS

6.5.1 POS 4 Time Sensitivity

The time spent in POS 4 was estimated to be 70 hours as described in Section 6.3.1.2. 24 hours were assumed to begin and complete the transition from AFW to RHR cooling as required by the Technical Specifications to be in Mode 5 from Mode 4. The remaining 46 hours were estimated from plant startup data. The number of hours in the POS has an important effect on the predicted CDP for that POS. Because the quantitative evaluations in this report are used to demonstrate an increase in risk by cooling down to POS 4, a sensitivity case is performed to examine the effects of reducing the amount of time assumed for POS 4. 24 hours were chosen for the sensitivity study because the base model assumes that it will take 24 hours to complete the transition from Mode 4 to Mode 5.

Basic events and initiating event probabilities that are dependent on the time assumed for POS 4 were recalculated and the POS 4 fault tree was requantified. Table 6-26 presents the revised POS 4 CDP with the base case results.

Table 6-26 Pos 4 Time Sensitivity Case

	Core Damage Probability	
POS	**24 hour POS 4**	**Base Case**
1	2.18E-07	2.18E-07
2	1.66E-07	1.66E-07
3	7.09E-08	7.09E-08
4	2.30E-06	7.21E-06
5	4.79E-07	4.79E-07
6	3.30E-06	3.30E-06
7	1.26E-06	1.26E-06
TOTAL	7.08E-06	1.27E-05
TOTAL Excluding POS 4	5.49E-06	5.49E-06

For the time sensitivity case, the CDP is reduced by a factor of 1.4 when the unit is cooled down to POS 3 (Mode 4) instead of POS 4 (Mode 5). For the base case, the CDP is reduced by more than a factor of 2 when the unit is cooled down to POS 3 instead of POS 4. The results demonstrate that there is a dependency on the time assumed for POS 4. The Technical Specification Condition specific runs in Section 6.3 would also show lower reduction factors for removing the POS 4 CDP if 24 hours are assumed for POS 4. The numerical results would change, however, not the conclusion that there is greater risk for the unit to cool down to Mode 5 (POS 4) instead of Mode 4 (POS 3).

Another insight from Table 6-26 comes from comparing the base case POS 3 and POS 5 CDPs to the 24 hour POS 4 CDP. POS 3 and POS 5 are very similar states and their combined time is 22 hours (refer to Table 6-9). The POS 3 and POS 5 total CDP is 5.5E-07. The 24 hour POS 4 CDP is 2.2E-06. The POS 4 time is less than 10 percent greater than the combined POS 3 and POS 5 times (24 versus 22 hours), however, the POS 4 CDP is 4 times greater than the combined POS 3 and POS 5 total. This is another demonstration of the increase in risk when the plant cools down to POS 4 versus remaining in POS 3.

6.5.2 Steam Generator Tube Rupture Initiating Event Frequency Sensitivity

To address the various types of steam generators installed in the Westinghouse NSSS designed plants, the effects of assuming a larger SGTR initiating event frequency was investigated. As stated in the text following Table 6-8, the SGTR initiating event frequency used was 2.7E-03/yr. This value was increased by a factor of 4 for the base case and the results are provided in Table 6-27.

Table 6-27 Steam Generator Tube Rupture Frequency Sensitivity

	Core Damage Probability		
POS	Base Case	Sensitivity Case	Percent Increase
1	2.18E-07	2.19E-07	0.3
2	1.66E-07	1.86E-07	12
3	7.09E-08	9.09E-08	28
4	7.21E-06	7.21E-06	0.0
5	4.79E-07	6.05E-07	26
6	3.30E-06	3.65E-06	10
7	1.26E-06	1.26E-06	0.3
Total	1.27E-05	1.32E-05	4
Total Excluding POS 4	5.49E-06	6.01E-06	9

POS 3 and POS 5 are the most affected by the increase in the SGTR frequency. The increase is small for the total and the total excluding POS 4. Note that POS 4 does not include the SGTR initiating event and, therefore, is not affected by the sensitivity. Although there is an increase in the core damage probability, the increase is small compared to the change in the initiating event frequency and the changes do not alter the conclusions drawn from the model quantifications presented in Section 6.4.

6.6 TIER 2 AND 3 REQUIREMENTS

Regulatory Guide 1.177 defines a Tier 2 assessment as providing reasonable assurance that risk-significant plant equipment outage configurations will not occur when specific plant equipment is out-of-service consistent with the proposed Technical Specification change. The risk-informed evaluations provided in Section 6.4 address one Technical Specification Condition at a time, evaluating a change to the endstate from Mode 5 to Mode 4. The endstate change does not change the Technical Specification requirements for other equipment required to be operable in the shutdown modes. In addition, no completion times are being extended and no surveillance test intervals are being changed. The evaluations in Section 6.4 demonstrate that there is a reduction in risk and advantages in defense-in-depth when the unit cools down to Mode 4 instead of continuing the cooldown to Mode 5. Therefore, Tier 2 requirements are not applicable to the proposed change to the Technical Specification endstate.

Regulatory Guide 1.177 defines a Tier 3 assessment as a program that ensures that the risk impact of out-of-service equipment is appropriately evaluated prior to performing any maintenance activity. 10 CFR 50.65 (a)(4) requires that prior to performing maintenance activities, risk assessments shall be performed to assess and manage the increased risk that may result from proposed maintenance activities. These requirements are applicable to all plant modes. The plant-specific implementation of 10 CFR 50.65 (a)(4) provides assurance that risk-significant plant equipment outage configurations will not occur when equipment in addition to the equipment associated with the Technical Specification Condition that resulted in the shutdown is taken out of service.

6.7 EXTERNAL EVENTS EVALUATION

As noted in Section 6.3.1.3, CCW and SW internal flooding events are included in the PRA model because of their impact on RCP seal LOCAs. Due to reduced RCS pressure, RCP seal LOCAs are not modeled for POS 3, 4, and 5. Therefore, conclusions regarding the effects of flooding on the POS 3 and 4 risk cannot be drawn directly from the quantitative results. By the time the unit has entered POS 3, feedwater system operation has been terminated and secondary cooling is provided by the auxiliary feedwater system. Therefore, feedwater system flooding events are not applicable. The flooding events of interest for POS 3 and 4 involve the CCW and SW systems. The quantitative results presented in Tables 6-14 and 6-15 for CCW and SW, respectively, show that the risk for POS 4 is much greater than that for POS 3 when a train of these systems is inoperable. A partial or total loss of these systems and the subsequent consequences due to flooding events would exhibit a similar difference in risk between POS 3 and POS 4. It is therefore concluded that consideration of flooding events would not change the conclusions presented in Section 6.4.

For fire events, the Appendix R evaluations address the safe shutdown requirements. Operating procedures are in place to respond to fires. The operators will respond to fires occurring in Mode 4 similar to fires occurring in Mode 5. Additionally, more safety system equipment is required to be operable in Mode 4 than in Mode 5 by the Technical Specifications. This provides additional assurance of successful mitigation of fires and other external events.

A seismic PRA is not available for Modes 4 and 5, however, several observations can be made. It is reasonable to assume that the trains of a seismically qualified system will respond to the event in a similar manner for either mode. If one train of a system can still perform its functions after a seismic event, then it is likely that all trains will be able to perform their functions after a seismic event and the defense in depth rational developed for changing the endstate to Mode 4 remains applicable. In addition, a seismic event is likely to lead to a loss of power and there are more independent sources of power required to be available in Mode 4 than in Mode 5. It is concluded that considerations of seismic events would not change the conclusions developed in Section 6.4.

Although not included in the PRA models used to assess the risk for the various plant operating states, external events would not change the conclusions presented in Section 6.4. The risk associated with POS 3 is less than that for POS 4. With more equipment options required for POS 3, there is less likelihood that all redundancy and defense-in-depth will be defeated by an external event in POS 3 than in POS 4.

7 SUMMARY OF RESULTS

An evaluation is performed to assess the risk associated with a cooldown to Mode 4 instead of Mode 5 for specific Technical Specification Required Actions. To perform this evaluation, plant operating states are defined for the changing conditions as a plant shuts down from full power operation and cools down to Mode 5. These POSs are evaluated qualitatively and quantitatively. The qualitative evaluation of the POSs demonstrates that there are advantages in risk and in defense-in-depth when the plant remains in POS 3 (Mode 4) rather than continuing the cooldown to POS 4 (Mode 5). Each Technical Specification listed in Table 2-1 is evaluated for a change in endstate from Mode 5 to Mode 4. These evaluations are presented in Sections 6.4.1 through 6.4.43. Technical Specifications addressing equipment included in the POS PRA models are evaluated quantitatively. In all cases, it is demonstrated that there is an increase in plant risk if the plant cools down to POS 4 (Mode 5) instead of POS 3 (Mode 4). Technical Specifications addressing equipment not included in the POS PRA models are evaluated qualitatively. Defense-in-depth is addressed for each Technical Specification and Sections 6.4.1 through 6.4.43 demonstrate that the endstates for the Technical Specifications listed in Table 2-1 can be changed from Mode 5 to Mode 4. Sensitivity cases are presented in Section 6.5 that examine the influence of the time modeled for POS 4 and the effects of assuming a different SGTR initiating event frequency. In support of these results, Section 6.6 addresses Tier 2 requirements and Section 6.7 qualitatively evaluates external events.

8 CONCLUSIONS

The Technical Specifications listed in Table 2-1 have been evaluated for a change in endstate from Mode 5 to Mode 4. The qualitative evaluation of the POSs in Section 6.2 concludes that there are advantages in risk and in defense-in-depth when the plant remains in POS 3 (Mode 4) rather than continuing to cooldown to POS 4 (Mode 5). Safety margins are not reduced as discussed in Section 5.2. Technical Specification-specific evaluations are presented in Sections 6.4.1 through 6.4.43. These qualitative and quantitative evaluations demonstrate that there is less risk if the endstates for these Technical Specifications are changed from Mode 5 to Mode 4. The model used for the quantitative evaluations is described and shown to be representative of Westinghouse NSSS plants. Defense-in-depth is addressed for each Technical Specification and the evaluations support the conclusion that the endstate can be changed from Mode 5 to Mode 4.

From a sensitivity case presented in Section 6.5, the results demonstrate that changes to the time duration modeled for POS 4 (Mode 5) does not affect the conclusion that there is less risk associated with a cooldown to Mode 4 than there is for a cooldown to Mode 5. The other sensitivity case of assuming a different SGTR initiating event frequency was applied to all POSs and the conclusion that there is less risk associated with a cooldown to Mode 4 than there is for a cooldown to Mode 5 remains applicable.

In support of the evaluations of risk for the Technical Specifications, Section 6.6 addresses Tier 2 requirements. It is concluded that the program used to assess and manage the risk associated with maintenance as required by 10CFR50.65 (a)(4) provides reasonable assurance that risk-significant plant equipment outage configurations will not occur when equipment in addition to the affected Technical Specification is taken out of service.

Section 6.7 qualitatively evaluates external events and concludes that the inclusion of external events into the PRA models for the POSs would not change the conclusions presented in Section 6.4.

The above conclusions support changing the endstate from Mode 5 to Mode 4 for the Technical Specifications listed in Table 2-1, as discussed in Section 6.4, and shown in the markups in Appendix B.

9 REFERENCES

1. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Rev. 1, November 2002.

2. Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998.

3. NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 3.

4. NUREG/CR-6144, Vol. 2, Parts 1A and 1B, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1," June 1994.

5. WCAP-14333-P-A, Rev. 1, "Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times," October 1998.

6. EPRI Technical Report 10029987, "Losses of Offsite Power at U.S. Nuclear Power Plants through 2001," April 2002.

7. WCAP-11737, "Low Temperature Overpressurization," March 1989.

APPENDIX A
TOP 100 CUTSETS FOR POS 3 AND POS 4

The top 100 cutsets for POS 3 are presented in Table A-1. These cutsets are from the base case that assumes that no equipment is out of service for testing or maintenance. The time duration for POS 3 is 3 hours. The CDP for the top 100 cutsets is 6.48 E-08 which is slightly more than 90% of 7.09E-08, the total CDP calculated for POS 3. The largest initiating event contributor to the POS 3 CDP is Loss of Decay Heat Removal (EFW). This event is the loss of emergency feedwater (also known as AFW) and, in the top 100 cutsets, it accounts for 4.18E-08 (approximately 60%) of the total CDP.

The top 100 cutsets for POS 4 are presented in Table A-2. These cutsets are from the base case that assumes that no equipment is out of service for testing or maintenance. The time duration for POS 4 is 70 hours. The CDP for the top 100 cutsets is 7.06E-06 which is 98% of 7.21E-06, the total CDP calculated for POS 4. The largest initiating event contributor to the POS 4 CDP is Loss of RHR. In the top 100 cutsets, this event accounts for 5.09E-06 (approximately 70%) of the total CDP.

Table A-1	POS 3 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
1	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.67E-08
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
2	%SGR	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT	9.32E-07	5.96E-09
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAI_1	OPERATOR FAILS TO DIAGNOSE, IDENTIFY, & ISOLATE RUPTURED SG	6.40E-03	
3	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.99E-09
	EFWICC-XPP-FR04	XPP21A, XPP21B, XPP8 FAIL TO RUN BY CCF	3.33E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
4	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.05E-09
	DBPT----XPP8FS	TD PUMP FAILS TO START DUE TO MECHANICAL FAILURE	5.96E-03	
	EFW8P		5.00E-01	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
5	%SLO	SMALL LOCA INITIATING EVENT	5.14E-08	3.86E-09
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
6	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.84E-09
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
7	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.77E-09
	D-AV-IFV2030FO	AIR-OP FLOW CONTROL IFV-2030FAILS TO OPEN DUE TO LOCAL FLT	1.30E-03	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
8	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.65E-09
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFWICC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
9	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.48E-09
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	ESF-CC-720BU-FOR	1 COMBINATION OF 2 OF 2 7200 VAC BUSES	1.20E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
10	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.25E-09
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	UC-FTIFLTSGCHE	HUMAN ERROR FAILURE TO CLOSE EFW FLOW VALVES TO STEAM GEN C	6.80E-03	
11	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.01E-09
	D-VLVMISPOS-HE	HUMAN ERROR FAIL TO RESTORE VALVE SETTINGS AFTER TEST	7.40E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
12	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	9.59E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	OAT2	OPERATOR FAILS TO TERMINATE SI GIVEN SSB	5.20E-03	
13	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	9.59E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	OAT2	OPERATOR FAILS TO TERMINATE SI GIVEN SSB	5.20E-03	
14	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.20E-10
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
15	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	8.22E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_2	FAILURE TO RECOVER OFFSITE POWER AT 12 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	4.24E-01	
16	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	8.16E-10
	ALLTRIPS-ATWS-PF	INITIATORS THAT RESULT IN A PARTIAL FLOW ATWS	1.00E+00	
	D-MVSPURSIGNFA	DURG TDP OPER SPUR SIGN TO ISLXTIE SUPPL STM CLOSE 2802A&B	6.00E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
17	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	7.07E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_1	FAILURE TO RECOVER OFFSITE POWER AT 14 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	3.65E-01	
18	%MLO	MEDIUM LOCA INITIATING EVENT	6.85E-10	6.85E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
19	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	6.70E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	CNU_2	CORE IS UNCOVERED AT 12 HOURS (WITH RCS COOLDOWN)	3.46E-01	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
20	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	5.65E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	XHR_2	FAILURE TO RECOVER OFFSITE POWER AT 12 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	4.24E-01	
21	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.49E-10
	EFWICC-XPP-FR04	XPP21A, XPP21B, XPP8 FAIL TO RUN BY CCF	3.33E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
22	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.13E-10
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	Q-SIRWSTLOLOFA	NO SAFGUARDS ACTUATION SIGNAL (RWST LO-LO LEVEL)	4.60E-04	
23	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	4.91E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	CNU_1	CORE IS UNCOVERED AT 14 HOURS (WITH RCS COOLDOWN)	3.99E-01	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_1-SUCCESS	XHR SUCCESS, POWER IS RECOVERED AT 14 HOURS	6.35E-01	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
24	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	4.87E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_1	FAILURE TO RECOVER OFFSITE POWER AT 14 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	3.65E-01	
25	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	4.61E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	CNU_2	CORE IS UNCOVERED AT 12 HOURS (WITH RCS COOLDOWN)	3.46E-01	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
26	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.46E-10
	DBPT----XPP8FS	TD PUMP FAILS TO START DUE TO MECHANICAL FAILURE	5.96E-03	
	EFW8P		5.00E-01	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
27	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.46E-10
	DBPT----XPP8FS	TD PUMP FAILS TO START DUE TO MECHANICAL FAILURE	5.96E-03	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
28	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.00E-10
	DBPT----XPP8FS	TD PUMP FAILS TO START DUE TO MECHANICAL FAILURE	5.96E-03	
	EFW8P		5.00E-01	
	EFWICC-XPP-FR01	XPP21A; XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
29	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	3.69E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	UCAVIFV3551-FC	FAILURE TO CLOSE IFV-3551 WHICH SUPPLIES MD HEADER FLOW	2.00E-03	
30	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	3.69E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	UCAVIFV3556-FC	FAILURE TO CLOSE IFV-3556 WHICH SUPPLIES TD HEADER FLOW	2.00E-03	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
31	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	3.58E-10
	DBPT----XPP8FS	TD PUMP FAILS TO START DUE TO MECHANICAL FAILURE	5.96E-03	
	EFW8P		5.00E-01	
	ESF-CC-720BU-FOR	1 COMBINATION OF 2 OF 2 7200 VAC BUSES	1.20E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
32	%SGR	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT	9.32E-07	3.56E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAD_1	OPERATOR FAILS TO DEPRESSURIZE SECONDARY SIDE (NORMAL COOL DOWN)	5.10E-03	
	OAESF3		7.50E-02	
33	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	3.47E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	DBPT----XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	3.28E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
34	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	3.38E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	CNU_1	CORE IS UNCOVERED AT 14 HOURS (WITH RCS COOLDOWN)	3.99E-01	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_1-SUCCESS	XHR SUCCESS, POWER IS RECOVERED AT 14 HOURS	6.35E-01	
35	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	3.00E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	CNU_4	CORE IS UNCOVERED AT 4 HOURS (WITH RCS COOLDOWN)	2.83E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
36	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	2.75E-10
	EFWICC-XPP-FR04	XPP21A, XPP21B, XPP8 FAIL TO RUN BY CCF	3.33E-07	
	ESF-CC-DRIC-FOR	1 combination of 2 of 2 cards (driver circuit)	1.00E+00	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
37	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	2.73E-10
	1HR_1-SUCCESS	1HR_1 SUCCESS, POWER IS RESTORED AT 1 hour	6.32E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
38	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	2.39E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	DBPT----XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	3.28E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
39	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	2.06E-10
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	CNU_4	CORE IS UNCOVERED AT 4 HOURS (WITH RCS COOLDOWN)	2.83E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
40	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.95E-10
	D-AV-IFV2030FO	AIR-OP FLOW CONTROL IFV-2030FAILS TO OPEN DUE TO LOCAL FLT	1.30E-03	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
41	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.92E-10
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
	OAT2	OPERATOR FAILS TO TERMINATE SI GIVEN SSB	5.20E-03	
42	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.92E-10
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	OAT2	OPERATOR FAILS TO TERMINATE SI GIVEN SSB	5.20E-03	
43	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	1.88E-10
	1HR_1-SUCCESS	1HR_1 SUCCESS, POWER IS RESTORED AT 1 HOUR	6.32E-01	
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
44	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.82E-10
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFWICC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
45	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.75E-10
	D-AV-IFV2030FO	AIR-OP FLOW CONTROL IFV-2030FAILS TO OPEN DUE TO LOCAL FLT	1.30E-03	
	EFWICC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
46	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.56E-10
	D-AV-IFV2030FO	AIR-OP FLOW CONTROL IFV-2030FAILS TO OPEN DUE TO LOCAL FLT	1.30E-03	
	ESF-CC-720BU-FOR	1 COMBINATION OF 2 OF 2 7200 VAC BUSES	1.20E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
47	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.53E-10
	EFWICC-XPP-FR04	XPP21A, XPP21B, XPP8 FAIL TO RUN BY CCF	3.33E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	Q-SIRWSTLOLOFA	NO SAFGUARDS ACTUATION SIGNAL (RWST LO-LO LEVEL)	4.60E-04	
48	%SGR	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT	9.32E-07	1.40E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	UAAVIFV3531-FC	FAILURE TO CLOSEIFV-3531 WHICH SUPPLIES MD HEADER FLOW	2.00E-03	
49	%SGR	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT	9.32E-07	1.40E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	OAESF3		7.50E-02	
	UAAVIFV3536-FC	FAILURE TO CLOSEIFV-3536 WHICH SUPPLIES TD HEADER FLOW	2.00E-03	
50	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.36E-10
	DBCV-XVC1014FO	CHECK VALVE XVC-1014 FAILS TO OPEN	1.00E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
51	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.36E-10
	DBCV-XVC1016FO	CHECK VALVE XVC-1016 FAILS TO OPEN	1.00E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.) POS 3 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
52	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.29E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC2	XVM-2801A AND -2801B FAIL DUE TO COMMON CAUSE	6.99E-04	
	OAESF3		7.50E-02	
53	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.29E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC3	XVM-2801B AND -2801C FAIL DUE TO COMMON CAUSE	6.99E-04	
	OAESF3		7.50E-02	
54	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.29E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC1	XVM-2801A AND -2801B FAIL DUE TO COMMON CAUSE	6.99E-04	
	OAESF3		7.50E-02	
55	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.29E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC2	XVM-2801A AND -2801B FAIL DUE TO COMMON CAUSE	6.99E-04	
	OAESF3		7.50E-02	
56	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.29E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC3	XVM-2801B AND -2801C FAIL DUE TO COMMON CAUSE	6.99E-04	
	OAESF3		7.50E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
57	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.24E-10
	DBPT----XPP8FS	TD PUMP FAILS TO START DUE TO MECHANICAL FAILURE	5.96E-03	
	EFW8P		5.00E-01	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	Q-SIRWSTLOLOFA	NO SAFGUARDS ACTUATION SIGNAL (RWST LO-LO LEVEL)	4.60E-04	
58	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.12E-10
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	F-CVXVC08926FO	XVC-8926 FAILS TO OPEN	1.00E-04	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
59	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.11E-10
	D-VLVMISPOS-HE	HUMAN ERROR FAIL TO RESTORE VALVE SETTINGS AFTER TEST	7.40E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
60	%SSBI	SECONDARY SIDE BREAK INSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.10E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC4	XVM-2801A, -2801B, AND -2801C FAIL DUE TO COMMON CAUSE	5.98E-04	
	OAESF3		7.50E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
61	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	1.10E-10
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	MSIV-CC-FC4	XVM-2801A, -2801B, AND -2801C FAIL DUE TO COMMON CAUSE	5.98E-04	
	OAESF3		7.50E-02	
62	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	1.00E-10
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	ACP-CC-TRFM-FOR	1 COMBINATION OF 2 OF 2 TRANSFORMERS	2.40E-06	
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
63	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.93E-11
	D-VLVMISPOS-HE	HUMAN ERROR FAIL TO RESTORE VALVE SETTINGS AFTER TEST	7.40E-04	
	EFWICC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
64	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.93E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	PZR-CC-AV-FO-04	PVC-00445A-RC, PVC-00445B-RC, AND PVC-00444B-RC CCF	8.90E-05	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
65	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.73E-11
	D-AV-IFV2030FO	AIR-OP FLOW CONTROL IFV-2030FAILS TO OPEN DUE TO LOCAL FLT	1.30E-03	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
66	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.62E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	HPI-CC-PM43-FS	1 COMBINATION OF 2 OF 2 PUMPS	8.62E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
67	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.20E-11
	EFT-CC-SACV-FO4	SPRING ASSISTED CHECK VALVES XVC-1009A, -1009B, -1009C CCF TO OPEN	1.15E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	RACB-DPN1HA1CO	125 VDC CIRCUIT BREAKER TRANSFERS OPEN DURING OPERATION	8.00E-06	
68	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	9.08E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW1CC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
69	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	8.98E-11
	ALLTRIPS-ATWS-PF	INITIATORS THAT RESULT IN A PARTIAL FLOW ATWS	1.00E+00	
	D-MVSPURSIGNFA	DURG TDP OPER SPUR SIGN TO ISLXTIE SUPPL STM CLOSE 2802A&B	6.00E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
70	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	8.88E-11
	D-VLVMISPOS-HE	HUMAN ERROR FAIL TO RESTORE VALVE SETTINGS AFTER TEST	7.40E-04	
	ESF-CC-720BU-FOR	1 COMBINATION OF 2 OF 2 7200 VAC BUSES	1.20E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
71	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	8.67E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	HPR-CC-PM31-FR	1 COMBINATION OF 2 OF 2 PUMPS	7.77E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.) POS 3 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
72	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	8.59E-11
	DAPMI-XPP21AFR	MDP XPP-21A FAILS TO RUN DUE TO LOCAL FAULTS	4.98E-04	
	EFT-CC-SACV-FO4	SPRING ASSISTED CHECK VALVES XVC-1009A, -1009B, -1009C CCF TO OPEN	1.15E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
73	%LLO	LARGE LOCA INITIATING EVENT	8.56E-11	8.56E-11
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
74	%SLO	SMALL LOCA INITIATING EVENT	5.14E-08	8.48E-11
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
	OARC	OPERATOR FAILS TO ALIGN & ESTABLISH CL RECIRC (CONDITIONAL)	1.50E-01	
75	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	8.06E-11
	ALLTRIPS-ATWS-PF	INITIATORS THAT RESULT IN A PARTIAL FLOW ATWS	1.00E+00	
	D-MVSPURSIGNFA	DURG TDP OPER SPUR SIGN TO ISLXTIE SUPPL STM CLOSE 2802A&B	6.00E-04	
	EFWICC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
76	%SSBO	SECONDARY SIDE BREAK OUTSIDE CONTAINMENT INITIATING EVENT	2.46E-06	7.51E-11
	EAAVXVM2801AFC	FAILURE TO ISOL MS FLOW FROM SG A, XVM-2801A FAILS TO CLOSE	4.49E-03	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	UA-FTIFLTSGAHE	HUMAN ERROR FAILURE TO CLOSEEFW FLOW VALVES TO STEAM GEN A	6.80E-03	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
77	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	7.25E-11
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-BUSBK-FO	1 COMBINATION OF 2 OF 2 BUS FEEDER BREAKERS	3.00E-04	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_2	FAILURE TO RECOVER OFFSITE POWER AT 12 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	4.24E-01	
78	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	7.21E-11
	EFW-CC-XVC-F16	CV XVC 1014, 1016, 1013A, 1013B, 1048A, 1048B FAIL BY CCF	9.01E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	RACB-DPN1HA1CO	125 VDC CIRCUIT BREAKER TRANSFERS OPEN DURING OPERATION	8.00E-06	
79	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	7.20E-11
	ALLTRIPS-ATWS-PF	INITIATORS THAT RESULT IN A PARTIAL FLOW ATWS	1.00E+00	
	D-MVSPURSIGNFA	DURG TDP OPER SPUR SIGN TO ISLXTIE SUPPL STM CLOSE 2802A&B	6.00E-04	
	ESF-CC-720BU-FOR	1 COMBINATION OF 2 OF 2 7200 VAC BUSES	1.20E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
80	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	6.91E-11
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	ACP-CC-TRFM-FOR	1 COMBINATION OF 2 OF 2 TRANSFORMERS	2.40E-06	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
81	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	6.73E-11
	DAPMI-XPP21AFR	MDP XPP-21A FAILS TO RUN DUE TO LOCAL FAULTS	4.98E-04	
	EFW-CC-XVC-F16	CV XVC 1014, 1016, 1013A, 1013B, 1048A, 1048B FAIL BY CCF	9.01E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
82	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	6.24E-11
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-BUSBK-FO	1 COMBINATION OF 2 OF 2 BUS FEEDER BREAKERS	3.00E-04	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_1	FAILURE TO RECOVER OFFSITE POWER AT 14 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	3.65E-01	
83	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	5.91E-11
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	ACP-CC-BUSBK-FO	1 COMBINATION OF 2 OF 2 BUS FEEDER BREAKERS	3.00E-04	
	CNU_2	CORE IS UNCOVERED AT 12 HOURS (WITH RCS COOLDOWN)	3.46E-01	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.) POS 3 Top 100 Cutsets				
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
84	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.54E-11
	D-VLVMISPOS-HE	HUMAN ERROR FAIL TO RESTORE VALVE SETTINGS AFTER TEST	7.40E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
85	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.51E-11
	DBPM—XPP21BFS	MDP XPP-21B FAILS TO START DUE TO LOCAL FAULTS	1.12E-03	
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW21P		5.00E-01	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	RACB-DPN1HA1CO	125 VDC CIRCUIT BREAKER TRANSFERS OPEN DURING OPERATION	8.00E-06	
86	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.42E-11
	D-AV-IFV2030FO	AIR-OP FLOW CONTROL IFV-2030FAILS TO OPEN DUE TO LOCAL FLT	1.30E-03	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	Q-SIRWSTLOLOFA	NO SAFGUARDS ACTUATION SIGNAL (RWST LO-LO LEVEL)	4.60E-04	
87	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	5.27E-11
	1HR_1-SUCCESS	1HR_1 SUCCESS, POWER IS RESTORED AT 1 hour	6.32E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	OAQ_1	OPERATOR FAILS TO RESTORE EQUIPMENT AFTER SBO & RECOVERY OF OFFSITE POWER	2.90E-03	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
88	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	5.18E-11
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	BBPM—XPP39BFS	LOCAL FAULTS OF MDP XPP-39B CAUSE FAILURE TO START	3.68E-03	
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_2	FAILURE TO RECOVER OFFSITE POWER AT 12 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	4.24E-01	
89	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.15E-11
	DAPMI-XPP21AFR	MDP XPP-21A FAILS TO RUN DUE TO LOCAL FAULTS	4.98E-04	
	DBPM—XPP21BFS	MDP XPP-21B FAILS TO START DUE TO LOCAL FAULTS	1.12E-03	
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW21P		5.00E-01	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
90	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.06E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFWICC-XPP-FR01	XPP21A, XPP21B FAIL TO RUN BY CCF	8.95E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	Q-SIRWSTLOLOFA	NO SAFGUARDS ACTUATION SIGNAL (RWST LO-LO LEVEL)	4.60E-04	
91	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	5.02E-11
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	ESF-CC-720BK-SO	1 COMBINATION OF 2 OF 2 7200 VAC FEED BREAKERS	1.20E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
92	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.95E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO01	XVG8811A, XVG8811B FAIL TO OPEN BY CCF	4.44E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
93	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.95E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO03	XVG8811A, XVG8812B FAIL TO OPEN BY CCF	4.44E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
94	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.95E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO08	XVG8811B, XVG8812A FAIL TO OPEN BY CCF	4.44E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
95	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.95E-11
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO11	XVG8812A, XVG8812B FAIL TO OPEN BY CCF	4.44E-05	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
96	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.90E-11
	DBPMI-XPP21BFR	MDP XPP-21B FAILS TO RUN DUE TO LOCAL FAULTS	4.98E-04	
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	RACB-DPN1HA1CO	125 VDC CIRCUIT BREAKER TRANSFERS OPEN DURING OPERATION	8.00E-06	
97	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.80E-11
	D-TK----XTK8RP	CONDENSATE STORAGE TANK XTK-8 FAILS OR LEAKS EXCESSIVLY	3.20E-09	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	

Table A-1 (cont.)	POS 3 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
98	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.58E-11
	DAPMI-XPP21AFR	MDP XPP-21A FAILS TO RUN DUE TO LOCAL FAULTS	4.98E-04	
	DBPMI-XPP21BFR	MDP XPP-21B FAILS TO RUN DUE TO LOCAL FAULTS	4.98E-04	
	DBPTI---XPP8FR	TD PUMP FAILS TO RUN DUE TO MECHANICAL FAILURE	1.23E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAR4	OPERATOR FAILS TO ALIGN HP CL RECIRC (NON-ISLOCA))	1.50E-02	
99	%EFW1	LOSS OF DECAY HEAT REMOVAL (EFW) SPECIAL INITIATING EVENT	1.00E+00	4.49E-11
	ALLTRIPS-ATWS-PF	INITIATORS THAT RESULT IN A PARTIAL FLOW ATWS	1.00E+00	
	D-MVSPURSIGNFA	DURG TDP OPER SPUR SIGN TO ISLXTIE SUPPL STM CLOSE 2802A&B	6.00E-04	
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	ESF-CC-DRIC-FOR	1 COMBINATION OF 2 OF 2 CARDS (DRIVER CIRCUIT)	1.00E+00	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF3		7.50E-02	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.10E-02	
100	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	8.46E-06	4.46E-11
	1HR_1	FAILURE TO RECOVER OFFSITE POWER WITHIN 1 HR	3.68E-01	
	4HR_1	FAILURE TO RECOVER OFFSITE POWER AT 4 HOURS GIVEN NO RECOVERY AT 1 HR	1.83E-01	
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	BBPM—XPP39BFS	LOCAL FAULTS OF MDP XPP-39B CAUSE FAILURE TO START	3.68E-03	

Table A-1 (cont.)	**POS 3 Top 100 Cutsets**			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	SBO-FLAG	STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	XHR_1	FAILURE TO RECOVER OFFSITE POWER AT 14 HRS GIVEN NO RECOVERY AT 1 & 4 HRS	3.65E-01	
		Total CDP		6.48E-08

Table A-2 POS 4 Top 100 Cutsets				
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
1	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.43E-06
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	OAH_1IE	OPERATOR FAILS TO ALIGN CCW TO RHR HXs (NORMAL TRANSITION IN MODE 4)	1.17E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
2	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.33E-06
	CBPM---XPP1BHE	OPERATOR FAILS TO MANUALLY ACTUATE MDP XPP-1B	4.20E-03	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	1.40E+03	
3	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.72E-07
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4CC-PM31-FR	RHR PUMPS XPP-31A & B CCF FAIL TO RUN FOR LOSS OF RHR INIT EVENT	2.27E-04	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
4	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.20E-07
	CBPM---XPP1BHE	OPERATOR FAILS TO MANUALLY ACTUATE MDP XPP-1B	4.20E-03	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAIA	OPERATOR FAILS TO CLEAR CONT ISOL AND RESTORE IAS TO PORV	2.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAIA-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO RESTORE IAS TO PORV	2.50E+02	
5	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	3.50E-07
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
	SIPOS4HE	OPERATOR ACTION TO ACTUATE HPSI	4.10E-03	
6	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	3.35E-07
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
7	%DIL	BORON DILUTION EVENT IN POS 4	4.20E-03	3.12E-07
	OAE_1	OPERATOR FAILS TO IMPLEMENT EMERGENCY BORATION	3.10E-04	
	POS4OADILTM	OPERATOR FAILS TO TERMINATE DILUTION EVENT	5.00E-04	
	OAE_1D	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO IMPLEMENT EMERGENCY BORATION	4.80E+02	

Table A-2 (cont.) POS 4 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
8	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	2.30E-07
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
9	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.12E-07
	POS4OAISOLEAK	OPERATOR ACTION TO ISOLATE LEAK	1.00E-02	
	SIPOS4HE	OPERATOR ACTION TO ACTUATE HPSI	4.10E-03	
	SIPOS4HE-D	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE HPSI	3.70E+01	
10	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.20E-07
	ESF-CC-720BU-FOR	1 COMBINATION OF 2 OF 2 7200 VAC BUSES	1.20E-07	
11	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	1.13E-07
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	POS4OASIT	OPERATOR FAILS TO TERMINATE SI	5.30E-03	
	OAH_1-D3	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.30E+02	
12	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	9.99E-08
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
13	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	7.04E-08
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	POS4OAISOLEAK	OPERATOR ACTION TO ISOLATE LEAK	1.00E-02	

Table A-2 (cont.) POS 4 Top 100 Cutsets				
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	OAH_1-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO ALIGN CCW TO RHR HXs	4.30E+01	
14	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	6.64E-08
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAIA	OPERATOR FAILS TO CLEAR CONT ISOL AND RESTORE IAS TO PORV	2.30E-02	
	POS4CC-PM31-FR	RHR PUMPS XPP-31A & B CCF FAIL TO RUN FOR LOSS OF RHR INIT EVENT	2.27E-04	
	OAIA-D3	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO RESTORE IAS TO PORV	3.10E+00	
15	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.68E-08
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	POS4CC-PM31-FR	RHR PUMPS XPP-31A & B CCF FAIL TO RUN FOR LOSS OF RHR INIT EVENT	2.27E-04	
	OAH_1-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO ALIGN CCW TO RHR HXs	4.30E+01	
16	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	3.74E-08
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
17	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	3.16E-08
	OAR2	OPERATOR FAILS TO ALIGN FOR LP CL RECIRCULATION	3.70E-04	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
18	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.48E-08
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	D-TRANOPSTRTHE-D	DEPENDENT MULTIPLIER FOR OPERATOR FAILS START EFW	3.70E+01	
19	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	2.11E-08
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	BBPM--XPP39BFS	LOCAL FAULTS OF MDP XPP-39B CAUSE FAILURE TO START	3.68E-03	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
20	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	2.03E-08
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	OAH_1-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO ALIGN CCW TO RHR HXs	4.30E+01	
21	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	1.48E-08
	ACP-CC-BUSBK-FO	1 COMBINATION OF 2 OF 2 BUS FEEDER BREAKERS	3.00E-04	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	PWRRECD	FAILURE TO RESET BREAKER	5.00E-01	
22	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	1.18E-08
	ACP-CC-INV-FOR	1 COMBINATION OF 2 OF 2 INVERTERS	1.20E-04	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
23	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	9.84E-09
	ACP-CC-7248T-SO	1 COMBINATION OF 2 OF 2 7200/480 TRANSFORMERS	2.40E-06	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
24	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	8.62E-09
	AACB-----DGAFC	DIESEL GENERATORBREAKER FAILS TOCLOSE	3.00E-03	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	PWRRECD	FAILURE TO RESET BREAKER	5.00E-01	
25	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	8.62E-09
	AACB--XSW1DAFO	BUS XSW1DA FEEDER BREAKER FAILS TO OPEN	3.00E-03	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	PWRRECD	FAILURE TO RESET BREAKER	5.00E-01	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
26	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	8.62E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABCB-----DGBFC	DIESEL GENERATOR BREAKER FAILS TOCLOSE	3.00E-03	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	PWRRECD	FAILURE TO RESET BREAKER	5.00E-01	
27	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	8.62E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABCB--XSW1DBFO	BUS XSW1DB FEEDER BREAKER FAILS TO OPEN	3.00E-03	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	PWRRECD	FAILURE TO RESET BREAKER	5.00E-01	
28	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	8.54E-09
	F-CVXVC08926FO	XVC-8926 FAILS TO OPEN	1.00E-04	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
29	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	8.27E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFS	DIESEL GENERATORFAILS TO START DUE TO RANDOM FAULTS	1.44E-03	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
30	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	8.27E-09

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	AADG-----DGAFS	DIESEL GENERATORFAILS TO START DUE TO RANDOM FAULTS	1.44E-03	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
31	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	8.16E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	ACP-CC-TRFM-FOR	1 COMBINATION OF 2 OF 2 TRANSFORMERS	2.40E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
32	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	7.36E-09
	HPI-CC-PM43-FS	1 COMBINATION OF 2 OF 2 PUMPS	8.62E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
33	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	6.64E-09
	HPR-CC-PM31-FR	1 COMBINATION OF 2 OF 2 PUMPS	7.77E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
34	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	6.56E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	SWS-CC-STR-BL04	TRAVELING SCREENS XRS-2A, 2B, 2C FAIL BY CCF	1.60E-06	
35	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	6.48E-09
	CCW-CCPMFR04	XPP1A, XPP1B, XPP1C FAIL TO RUN BY CCF	1.58E-06	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	

Table A-2 (cont.) POS 4 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
36	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	5.71E-09
	ACP-CC-DGOKR-FC	1 COMBINATION OF 2 OF 2 DG OUTPUT BREAKERS	1.16E-04	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	PWRRECD	FAILURE TO RESET BREAKER	5.00E-01	
37	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.62E-09
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	ACP-CC-TRFM-FOR	1 COMBINATION OF 2 OF 2 TRANSFORMERS	2.40E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
38	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.43E-09
	CAMVXVB9503AFO	MOTOR-OPERATED VALVE XVB-9503A FAILS TO OPEN	6.16E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
39	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.43E-09
	CBMVXVB9503BFO	MOTOR-OPERATED VALVE XVB-9503B FAILS TO OPEN	6.16E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	Events	Description	Event Probability	Cutset Probability
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
40	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.43E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8811AFO	VALVE FAILS TO OPEN	6.16E-04	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
41	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.43E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8812AFO	VALVE FAILS TO OPEN	6.16E-04	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
42	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.43E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IBMVXVG8811BFO	VALVE FAILS TO OPEN	6.16E-04	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	

Table A-2 (cont.) POS 4 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
43	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.43E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IBMVXVG8812BFO	VALVE FAILS TO OPEN	6.16E-04	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
44	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	5.26E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAIA	OPERATOR FAILS TO CLEAR CONT ISOL AND RESTORE IAS TO PORV	2.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAIA-D3	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO RESTORE IAS TO PORV	3.10E+00	
45	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.89E-09
	CBPM---XPP1BFS	PUMP XPP-1B FAILS TO START	5.55E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
46	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.08E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	ESF-CC-720BK-SO	1 COMBINATION OF 2 OF 2 7200 VAC FEED BREAKERS	1.20E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
47	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.03E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO01	XVG8811A, XVG8811B FAIL TO OPEN BY CCF	4.44E-05	
48	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.03E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO03	XVG8811A, XVG8812B FAIL TO OPEN BY CCF	4.44E-05	
49	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.03E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO08	XVG8811B, XVG8812A FAIL TO OPEN BY CCF	4.44E-05	
50	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	4.03E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO11	XVG8812A, XVG8812B FAIL TO OPEN BY CCF	4.44E-05	
51	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	3.79E-09
	LPR-CCMVFO01	XVG8811A, XVG8811B FAIL TO OPEN BY CCF	4.44E-05	

Table A-2 (cont.) POS 4 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
52	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	3.79E-09
	LPR-CCMVFO03	XVG8811A, XVG8812B FAIL TO OPEN BY CCF	4.44E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
53	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	3.79E-09
	LPR-CCMVFO08	XVG8811B, XVG8812A FAIL TO OPEN BY CCF	4.44E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
54	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	3.79E-09
	LPR-CCMVFO11	XVG8812A, XVG8812B FAIL TO OPEN BY CCF	4.44E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
55	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	3.71E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAH_1-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO ALIGN CCW TO RHR HXs	4.30E+01	
56	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	3.67E-09
	CBPM---XPP1BHE	OPERATOR FAILS TO MANUALLY ACTUATE MDP XPP-1B	4.20E-03	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAH_1-D2	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO ALIGN CCW TO RHR HXs	4.30E+01	
57	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	3.54E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	BBMVXVB3116BFO	LOCAL FAULTS OF MOTOR-OPERATED VALVE XVB-3116B	6.16E-04	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
58	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	3.31E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	GAPMXPP0031AFS	XPP-31A FAILS TO START	3.76E-04	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031BFR	RHR PUMP XPP-31B FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
59	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	3.31E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	GBPMXPP0031BFS	XPP-31B FAILS TO START	3.76E-04	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	

Cutset Number	Events	Description	Event Probability	Cutset Probability
Table A-2 (cont.)	POS 4 Top 100 Cutsets			
60	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	3.13E-09
	CBPM---XPP1BFR	PUMP XPP-1B FAILS TO RUN - RANDOM	3.55E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	POS4XPP0031AFR	RHR PUMP XPP-31A FAILS TO RUN FOR LOSS OF RHR INIT EVENT	4.24E-03	
	OAB2-HS-D1	DEPENDENT MULTIPLIER FOR OPERATOR FAILS TO INITIATE FEED AND BLEED	3.90E+01	
61	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.81E-09
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	ESF-CC-720BK-SO	1 COMBINATION OF 2 OF 2 7200 VAC FEED BREAKERS	1.20E-06	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
62	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.56E-09
	HPR-CCMVFO03	XVG8706A, XVG8706B, XVG8885 FAIL BY CCF	3.00E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
63	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.46E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO04	XVG8811A, XVG8811B, XVG8812A FAIL TO OPEN BY CCF	2.71E-05	
64	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.46E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO05	XVG8811A, XVG8811B, XVG8812B FAIL TO OPEN BY CCF	2.71E-05	
65	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.46E-09

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO06	XVG8811A, XVG8812A, XVG8812B FAIL TO OPEN BY CCF	2.71E-05	
66	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.46E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	LPR-CCMVFO10	XVG8811B, XVG8812A, XVG8812B FAIL TO OPEN BY CCF	2.71E-05	
67	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.44E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	OAH_1IE	OPERATOR FAILS TO ALIGN CCW TO RHR HXs (NORMAL TRANSITION IN MODE 4)	1.17E-03	
	OAIA	OPERATOR FAILS TO CLEAR CONT ISOL AND RESTORE IAS TO PORV	2.30E-02	
68	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.41E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	OAH_1	OPERATOR FAILS TO ALIGN CCW TO RHR HXs	1.17E-03	
	OAH_1IE	OPERATOR FAILS TO ALIGN CCW TO RHR HXs (NORMAL TRANSITION IN MODE 4)	1.17E-03	
	OAH_1-D1	DEPENDENT MULT FOR OA FAILS TO ALIGN CCW TO RHR HXs, INCL RUNNING EFW FAILURE	4.30E-01	
69	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.31E-09
	LPR-CCMVFO04	XVG8811A, XVG8811B, XVG8812A FAIL TO OPEN BY CCF	2.71E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
70	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.31E-09
	LPR-CCMVFO05	XVG8811A, XVG8811B, XVG8812B FAIL TO OPEN BY CCF	2.71E-05	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
71	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.31E-09
	LPR-CCMVFO06	XVG8811A, XVG8812A, XVG8812B FAIL TO OPEN BY CCF	2.71E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
72	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.31E-09
	LPR-CCMVFO10	XVG8811B, XVG8812A, XVG8812B FAIL TO OPEN BY CCF	2.71E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
73	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.21E-09
	ACPSWGCC48BKSO16	6/6 480 VAC FEED BREAKERS FAIL BY CCF	5.40E-07	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
74	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.16E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	HPR-CC-PM31-FS	1 COMBINATION OF 2 OF 2 PUMPS	2.38E-05	
75	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	2.04E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	ACP-CC-TR-BK-SO2	1 COMBINATION OF 3 OF 3 TRANSFORMER I/O BREAKERS (XTF4, XTF31, 8892)	6.00E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
76	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	2.03E-09
	HPR-CC-PM31-FS	1 COMBINATION OF 2 OF 2 PUMPS	2.38E-05	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
77	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	1.94E-09
	HPHLRCCMVFO07	XVG8884, XVG8886, XVG8706A, XVG8706B FAIL BY CCF	2.27E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
78	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	1.94E-09
	HPI-CCMVFO07	LCV115B, LCV115D, XVG8801A, XVG8801B FAIL BY CCF	2.27E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
79	%LOI	LOSS OF INVENTORY INITIATING EVENT FOR POS 4	1.40E-04	1.94E-09
	HPR-CCMVFC07	LCV115B, LCV115D, XVG8809A, XVG8809B FAIL BY CCF	2.27E-05	
	POS4ISOLEAK	POS 4 LEAK NOT ISOLABLE	6.10E-01	
80	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.86E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	POS4CC-PM31-FR	RHR PUMPS XPP-31A & B CCF FAIL TO RUN FOR LOSS OF RHR INIT EVENT	2.27E-04	
	XAAV-XVA2659FO	AIR OPERATED VALVE XVA-2659 FAILS TO OPEN	2.00E-03	
81	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.86E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	POS4CC-PM31-FR	RHR PUMPS XPP-31A & B CCF FAIL TO RUN FOR LOSS OF RHR INIT EVENT	2.27E-04	
	XAAV-XVT2660FO	AIR OPERATED VALVE XVT-2660 FAILS TO OPEN	2.00E-03	
82	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	CAMVXVB9503AFO	MOTOR-OPERATED VALVE XVB-9503A FAILS TO OPEN	6.16E-04	
	CBMVXVB9503BFO	MOTOR-OPERATED VALVE XVB-9503B FAILS TO OPEN	6.16E-04	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
83	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	CAMVXVB9503AFO	MOTOR-OPERATED VALVE XVB-9503A FAILS TO OPEN	6.16E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IBMVXVG8811BFO	VALVE FAILS TO OPEN	6.16E-04	
84	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	CAMVXVB9503AFO	MOTOR-OPERATED VALVE XVB-9503A FAILS TO OPEN	6.16E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IBMVXVG8812BFO	VALVE FAILS TO OPEN	6.16E-04	
85	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	CBMVXVB9503BFO	MOTOR-OPERATED VALVE XVB-9503B FAILS TO OPEN	6.16E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8811AFO	VALVE FAILS TO OPEN	6.16E-04	
86	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	CBMVXVB9503BFO	MOTOR-OPERATED VALVE XVB-9503B FAILS TO OPEN	6.16E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8812AFO	VALVE FAILS TO OPEN	6.16E-04	
87	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8811AFO	VALVE FAILS TO OPEN	6.16E-04	
	IBMVXVG8811BFO	VALVE FAILS TO OPEN	6.16E-04	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
88	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8811AFO	VALVE FAILS TO OPEN	6.16E-04	
	IBMVXVG8812BFO	VALVE FAILS TO OPEN	6.16E-04	
89	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8812AFO	VALVE FAILS TO OPEN	6.16E-04	
	IBMVXVG8811BFO	VALVE FAILS TO OPEN	6.16E-04	
90	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.56E-09
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8812AFO	VALVE FAILS TO OPEN	6.16E-04	
	IBMVXVG8812BFO	VALVE FAILS TO OPEN	6.16E-04	
91	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.40E-09
	ACP-CC-DG-FR	1 COMBINATION OF 2 OF 2 DGS	2.34E-03	
	ACP-CC-TR-BK-SO2	1 COMBINATION OF 3 OF 3 TRANSFORMER I/O BREAKERS (XTF4, XTF31, 8892)	6.00E-07	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
92	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.40E-09
	CAMVXVB9503AFO	MOTOR-OPERATED VALVE XVB-9503A FAILS TO OPEN	6.16E-04	
	CBPM---XPP1BFS	PUMP XPP-1B FAILS TO START	5.55E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	

Table A-2 (cont.) POS 4 Top 100 Cutsets

Cutset Number	Events	Description	Event Probability	Cutset Probability
93	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.40E-09
	CBPM---XPP1BFS	PUMP XPP-1B FAILS TO START	5.55E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8811AFO	VALVE FAILS TO OPEN	6.16E-04	
94	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.40E-09
	CBPM---XPP1BFS	PUMP XPP-1B FAILS TO START	5.55E-04	
	D-TRANOPSTRTHE	FAILURE OF OPERATOR TO START THE EFW PUMPS	4.10E-03	
	IAMVXVG8812AFO	VALVE FAILS TO OPEN	6.16E-04	
95	%LRHR	LOSS OF RHR INITIATING EVENT	1.00E+00	1.38E-09
	EFW-CC-PM21-FS	1 COMBINATION OF 2 OF 2 MD PUMPS TO START	9.07E-05	
	OAB2-HS	INITIATE FEED AND BLEED	1.30E-02	
	OAH_1IE	OPERATOR FAILS TO ALIGN CCW TO RHR HXs (NORMAL TRANSITION IN MODE 4)	1.17E-03	
96	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	1.38E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	ABIV-XIT5903OP	INVERTER XIT-5903 FAILS DURING OPERATION	2.40E-03	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	NVERT1		1.00E-01	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
97	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	1.38E-09
	AAIV-XIT5901OP	INVERTER XIT-5901 FAILS DURING OPERATION	2.40E-03	

Table A-2 (cont.)	POS 4 Top 100 Cutsets			
Cutset Number	**Events**	**Description**	**Event Probability**	**Cutset Probability**
	ABDG-----DGBFR	DIESEL GENERATOR FAILS TO RUN DUE TO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	NVERT1		1.00E-01	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
98	%DIL	BORON DILUTION EVENT IN POS 4	4.20E-03	1.29E-09
	FBXV-XMV8104FO	VALVE 8140 FAILS TO OPEN	6.16E-04	
	POS4OADILTM	OPERATOR FAILS TO TERMINATE DILUTION EVENT	5.00E-04	
99	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	1.28E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF1		6.50E-02	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	QBRE-----K43FA	SEQUENCER STEP RELAY K43B FAILS	3.42E-03	
100	%LSP	LOSS OF OFFSITE POWER INITIATING EVENT	1.97E-04	1.28E-09
	AADG-----DGAFR	DIESEL GENERATORFAILS TO RUN DUETO RANDOM FAULTS	5.83E-02	
	NOSBO-FLAG	NO STATION BLACKOUT SEQUENCE MARKER	1.00E+00	
	OAESF1		6.50E-02	
	POS4PWRREC	POWER NOT RECOVERED IN 2 HOURS	5.00E-01	
	QBRE----XK58FA	RELAY DRIVER XK58 FAILS	3.42E-03	
		Total CDP		7.06E-06

APPENDIX B
MARKED-UP TECHNICAL SPECIFICATIONS AND BASES

Technical Specification Markups

3.3 INSTRUMENTATION

3.3.2 Engineered Safety Feature Actuation System (ESFAS) Instrumentation

LCO 3.3.2 The ESFAS instrumentation for each Function in Table 3.3.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.2-1.

ACTIONS

-----NOTE-----

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more required channels or trains inoperable.	A.1 Enter the Condition referenced in Table 3.3.2-1 for the channel(s) or train(s).	Immediately
B. One channel or train inoperable.	B.1 Restore channel or train to OPERABLE status. OR B.2.1 Be in MODE 3. AND B.2.2 Be in MODE ~~5~~ 4.	48 hours 54 hours ~~84~~ 60 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One train inoperable.	---NOTE--- One train may be bypassed for up to [4] hours for surveillance testing provided the other train is OPERABLE. ---	
	C.1 Restore train to OPERABLE status.	24 hours
	OR	
	C.2.1 Be in MODE 3.	30 hours
	AND	
	C.2.2 Be in MODE ~~5~~ 4.	~~60~~ 36 hours
D. One channel inoperable.	[---NOTE--- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---	
	---REVIEWER'S NOTE--- The below Note should be used for plants with installed bypass test capability: One channel may be bypassed for up to 12 hours for surveillance testing. ---]	
	D.1 Place channel in trip.	72 hours
	OR	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
K. One channel inoperable.	[------------NOTE------------ One additional channel may be bypassed for up to [4] hours for surveillance testing. ------------------------------------ --------REVIEWER'S NOTE-------- The below Note should be used for plants with installed bypass test capability: One channel may be bypassed for up to 12 hours for surveillance testing. ------------------------------------]	
	K.1 Place channel in bypass.	[6] hours
	OR	
	K.2.1 Be in MODE 3.	[12] hours
	AND	
	K.2.2 Be in MODE ~~5~~ 4.	[~~42~~] 18 hours
L. One or more channels inoperable.	L.1 Verify interlock is in required state for existing unit condition.	1 hour
	OR	
	L.2.1 Be in MODE 3.	7 hours
	AND	
	L.2.2 Be in MODE 4.	13 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.1.2 Enter applicable Conditions and Required Actions for one CREFS train made inoperable by inoperable CREFS actuation instrumentation.	Immediately
	OR	
	B.2 Place both trains in emergency [radiation protection] mode.	Immediately
C. Required Action and associated Completion Time for Condition A or B not met in MODE 1, 2, 3, or 4.	C.1 Be in MODE 3.	6 hours
	AND	
	C.2 Be in MODE ~~5~~ 4.	~~36~~ 12 hours
D. Required Action and associated Completion Time for Condition A or B not met during movement of [recently] irradiated fuel assemblies.	D.1 Suspend movement of [recently] irradiated fuel assemblies.	Immediately
E. [Required Action and associated Completion Time for Condition A or B not met in MODE 5 or 6.	E.1 Initiate action to restore one CREFS train to OPERABLE status.	Immediately]

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Required Action and associated Completion Time for Condition A or B not met during movement of [recently] irradiated fuel assemblies in the fuel building.	C.1	Suspend movement of [recently] irradiated fuel assemblies in the fuel building.	Immediately
D. [Required Action and associated Completion Time for Condition A or B not met in MODE 1, 2, 3, or 4.	D.1 AND D.2	Be in MODE 3. Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours]

SURVEILLANCE REQUIREMENTS

NOTE

Refer to Table 3.3.8-1 to determine which SRs apply for each FBACS Actuation Function.

SURVEILLANCE		FREQUENCY
SR 3.3.8.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.8.2	Perform COT.	92 days
SR 3.3.8.3	[Perform ACTUATION LOGIC TEST.	31 days on a STAGGERED TEST BASIS]
SR 3.3.8.4	NOTE Verification of setpoint is not required. Perform TADOT.	[18] months

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. 1 gpm unidentified LEAKAGE,

c. 10 gpm identified LEAKAGE,

d. 1 gpm total primary to secondary LEAKAGE through all steam generators (SGs), and

e. [500] gallons per day primary to secondary LEAKAGE through any one SG.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE.	A.1 Reduce LEAKAGE to within limits.	4 hours
B. Required Action and associated Completion Time of Condition A not met. OR Pressure boundary LEAKAGE exists.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	A.2	[Isolate the high pressure portion of the affected system from the low pressure portion by use of a second closed manual, deactivated automatic, or check valve.	72 hours
	[or]		
		Restore RCS PIV to within limits.	72 hours]
B. Required Action and associated Completion Time for Condition A not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours
C. [RHR System autoclosure interlock function inoperable.	C.1	Isolate the affected penetration by use of one closed manual or deactivated automatic valve.	4 hours]

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. [Required containment atmosphere radioactivity monitor inoperable. AND Required containment air cooler condensate flow rate monitor inoperable.	D.1 OR D.2	Restore required containment atmosphere radioactivity monitor to OPERABLE status. Restore required containment air cooler condensate flow rate monitor to OPERABLE status.	30 days 30 days]
E. Required Action and associated Completion Time not met.	E.1 AND E.2	Be in MODE 3. Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours
F. All required monitors inoperable.	F.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of the required containment atmosphere radioactivity monitor.	12 hours
SR 3.4.15.2	Perform COT of the required containment atmosphere radioactivity monitor.	92 days
SR 3.4.15.3	Perform CHANNEL CALIBRATION of the required containment sump monitor.	[18] months

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.3 ECCS - Shutdown

LCO 3.5.3 One ECCS train shall be OPERABLE.

-----NOTE-----
An RHR train may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned to the ECCS mode of operation.

APPLICABILITY: MODE 4.

ACTIONS

-----NOTE-----
LCO 3.0.4.b is not applicable to ECCS high head subsystem.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [Required ECCS ~~residual heat removal (RHR) subsystem~~ train inoperable.	A.1 Initiate action to restore required ECCS ~~RHR subsystem~~ train to OPERABLE status.	Immediately]
~~B. Required ECCS [high head subsystem] inoperable.~~	~~B.1 Restore required ECCS [high head subsystem] to OPERABLE status.~~	~~1 hour~~
~~C. Required Action and associated Completion Time [of Condition B] not met.~~	~~C.1 Be in MODE 5.~~	~~24 hours~~

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.4 Refueling Water Storage Tank (RWST)

LCO 3.5.4 The RWST shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RWST boron concentration not within limits. OR RWST borated water temperature not within limits.	A.1 Restore RWST to OPERABLE status.	8 hours
B. RWST inoperable for reasons other than Condition A.	B.1 Restore RWST to OPERABLE status.	1 hour
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3. AND C.2 Be in MODE ~~5~~ 4	6 hours ~~36~~ 12 hours

3.6 CONTAINMENT SYSTEMS

3.6.1 Containment (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

LCO 3.6.1 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. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.1.1	Perform required visual examinations and leakage rate testing except for containment air lock testing, in accordance with the Containment Leakage Rate Testing Program.	In accordance with the Containment Leakage Rate Testing Program
SR 3.6.1.2	[Verify containment structural integrity in accordance with the Containment Tendon Surveillance Program.	In accordance with the Containment Tendon Surveillance Program]

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	B.2	Lock an OPERABLE door closed in the affected air lock.	24 hours
	AND		
	B.3	---NOTE--- Air lock doors in high radiation areas may be verified locked closed by administrative means. --- Verify an OPERABLE door is locked closed in the affected air lock.	Once per 31 days
C. One or more containment air locks inoperable for reasons other than Condition A or B.	C.1	Initiate action to evaluate overall containment leakage rate per LCO 3.6.1.	Immediately
	AND		
	C.2	Verify a door is closed in the affected air lock.	1 hour
	AND		
	C.3	Restore air lock to OPERABLE status.	24 hours
D. Required Action and associated Completion Time not met.	D.1	Be in MODE 3.	6 hours
	AND		
	D.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	E.2	-----NOTES----- 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by use of administrative means. -----	
		Verify the affected penetration flow path is isolated.	Once per 31 days for isolation devices outside containment AND Prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days for isolation devices inside containment
	AND		
	E.3	Perform SR 3.6.3.7 for the resilient seal purge valves closed to comply with Required Action E.1.	Once per [92] days]
F. Required Action and associated Completion Time not met.	F.1	Be in MODE 3.	6 hours
	AND		
	F.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

3.6 CONTAINMENT SYSTEMS

3.6.4A Containment Pressure (Atmospheric, Dual, and Ice Condenser)

LCO 3.6.4A Containment pressure shall be ≥ [-0.3] psig and ≤ [+1.5] psig.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Containment pressure not within limits.	A.1 Restore containment pressure to within limits.	1 hour
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4A.1	Verify containment pressure is within limits.	12 hours

3.6 CONTAINMENT SYSTEMS

3.6.4B Containment Pressure (Subatmospheric)

LCO 3.6.4B Containment air partial pressure shall be ≥ [9.0] psia and within the acceptable operation range shown on Figure 3.6.4B-1.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Containment air partial pressure not within limits.	A.1	Restore containment air partial pressure to within limits.	1 hour
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE ~~5~~ 4	~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4B.1	Verify containment air partial pressure is within limits.	12 hours

3.6 CONTAINMENT SYSTEMS

3.6.5A Containment Air Temperature (Atmospheric and Dual)

LCO 3.6.5A Containment average air temperature shall be ≤ [120]°F.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Containment average air temperature not within limit.	A.1 Restore containment average air temperature to within limit.	8 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours 12 ~~36~~ hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5A.1	Verify containment average air temperature is within limit.	24 hours

3.6 CONTAINMENT SYSTEMS

3.6.5B Containment Air Temperature (Ice Condenser)

LCO 3.6.5B Containment average air temperature shall be:

a. ≥ [85]°F and ≤ [110]°F for the containment upper compartment and

b. ≥ [100]°F and ≤ [120]°F for the containment lower compartment.

---NOTE---
The minimum containment average air temperature in MODES 2, 3, and 4 may be reduced to [60]°F.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Containment average air temperature not within limits.	A.1	Restore containment average air temperature to within limits.	8 hours
B. Required Action and associated Completion Time not met.	B.1 AND B.2	Be in MODE 3. Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5B.1	Verify containment upper compartment average air temperature is within limits.	24 hours

3.6 CONTAINMENT SYSTEMS

3.6.5C Containment Air Temperature (Subatmospheric)

LCO 3.6.5C Containment average air temperature shall be ≥ [86]°F and ≤ [120]°F.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Containment average air temperature not within limits.	A.1	Restore containment average air temperature to within limits.	8 hours
B. Required Action and associated Completion Time not met.	B.1 AND B.2	Be in MODE 3. Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5C.1	Verify containment average air temperature is within limits.	24 hours

3.6 CONTAINMENT SYSTEMS

3.6.6A Containment Spray and Cooling Systems (Atmospheric and Dual) (Credit taken for iodine removal by the Containment Spray System)

LCO 3.6.6A Two containment spray trains and [two] containment cooling trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One containment spray train inoperable.	A.1 Restore containment spray train to OPERABLE status.	72 hours AND 10 days from discovery of failure to meet the LCO
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours 60 ~~84~~ hours
C. One [required] containment cooling train inoperable.	C.1 Restore [required] containment cooling train to OPERABLE status.	7 days AND 10 days from discovery of failure to meet the LCO
D. Two [required] containment cooling trains inoperable.	D.1 Restore one [required] containment cooling train to OPERABLE status.	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time of Condition C or D not met.	E.1 Be in MODE 3. AND E.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours
F. Two containment spray trains inoperable. OR Any combination of three or more trains inoperable.	F.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6A.1	Verify each containment spray manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.6A.2	Operate each [required] containment cooling train fan unit for ≥ 15 minutes.	31 days
SR 3.6.6A.3	Verify each [required] containment cooling train cooling water flow rate is ≥ [700] gpm.	31 days
SR 3.6.6A.4	Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One containment spray train and one [required] containment cooling train inoperable.	D.1	Restore containment spray train to OPERABLE status.	72 hours
	<u>OR</u>		
	D.2	Restore [required] containment cooling train to OPERABLE status.	72 hours
E. Two [required] containment cooling trains inoperable.	E.1	Restore one [required] containment cooling train to OPERABLE status.	72 hours
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met.	F.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	F.2	Be in MODE ~~5~~ 4.	~~30~~ 12 hours
G. Any combination of three or more trains inoperable.	G.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6B.1	Verify each containment spray manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.6B.2	Operate each [required] containment cooling train fan unit for ≥ 15 minutes.	31 days

3.6 CONTAINMENT SYSTEMS

3.6.6C Containment Spray System (Ice Condenser)

LCO 3.6.6C Two containment spray trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One containment spray train inoperable.	A.1 Restore containment spray train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~84~~ 60 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6C.1	Verify each containment spray manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.6C.2	Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

3.6 CONTAINMENT SYSTEMS

3.6.6D Quench Spray (QS) System (Subatmospheric)

LCO 3.6.6D Two QS trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One QS train inoperable.	A.1	Restore QS train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6D.1	Verify each QS manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.6D.2	Verify each QS pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

3.6 CONTAINMENT SYSTEMS

3.6.6E Recirculation Spray (RS) System (Subatmospheric)

LCO 3.6.6E Four RS subsystems [and a casing cooling tank] shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RS subsystem inoperable.	A.1 Restore RS subsystem to OPERABLE status.	7 days
B. Two RS subsystems inoperable in one train.	B.1 Restore one RS subsystem to OPERABLE status.	72 hours
C. [Two inside RS subsystems inoperable.	C.1 Restore one RS subsystem to OPERABLE status.	72 hours]
D. [Two outside RS subsystems inoperable.	D.1 Restore one RS subsystem to OPERABLE status.	72 hours]
E. [Casing cooling tank inoperable.	E.1 Restore casing cooling tank to OPERABLE status.	72 hours]
F. Required Action and associated Completion Time not met.	F.1 Be in MODE 3. AND F.2 Be in MODE ~~5~~ 4.	6 hours ~~84~~ 60 hours
G. Three or more RS subsystems inoperable.	G.1 Enter LCO 3.0.3.	Immediately

3.6 CONTAINMENT SYSTEMS

3.6.7 Spray Additive System (Atmospheric, Subatmospheric, Ice Condenser, and Dual)

LCO 3.6.7 The Spray Additive System shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Spray Additive System inoperable.	A.1 Restore Spray Additive System to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~84~~ 60 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.7.1	Verify each spray additive manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.7.2	Verify spray additive tank solution volume is ≥ [2568] gal and ≤ [4000] gal.	184 days
SR 3.6.7.3	Verify spray additive tank [NaOH] solution concentration is ≥ [30]% and ≤ [32]% by weight.	184 days

3.6 CONTAINMENT SYSTEMS

3.6.8 Shield Building (Dual and Ice Condenser)

LCO 3.6.8 The shield building shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Shield building inoperable.	A.1 Restore shield building to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.8.1	[Verify annulus negative pressure is > [5] inches water gauge.	12 hours]
SR 3.6.8.2	Verify one shield building access door in each access opening is closed.	31 days
SR 3.6.8.3	[Verify shield building structural integrity by performing a visual inspection of the exposed interior and exterior surfaces of the shield building.	During shutdown for SR 3.6.1.1 Type A tests]

3.6 CONTAINMENT SYSTEMS

3.6.11 Iodine Cleanup System (ICS) (Atmospheric and Subatmospheric)

LCO 3.6.11 Two ICS trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ICS train inoperable.	A.1 Restore ICS train to OPERABLE status.	7 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.11.1	Operate each ICS train for [≥ 10 continuous hours with heaters operating or (for systems without heaters) ≥ 15 minutes].	31 days
SR 3.6.11.2	Perform required ICS filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.6.11.3	Verify each ICS train actuates on an actual or simulated actuation signal.	[18] months

3.6 CONTAINMENT SYSTEMS

3.6.12 Vacuum Relief Valves (Atmospheric and Ice Condenser)

LCO 3.6.12 [Two] vacuum relief lines shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One vacuum relief line inoperable.	A.1 Restore vacuum relief line to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.12.1	Verify each vacuum relief line is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program

3.6 CONTAINMENT SYSTEMS

3.6.13 Shield Building Air Cleanup System (SBACS) (Dual and Ice Condenser)

LCO 3.6.13 Two SBACS trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SBACS train inoperable.	A.1 Restore SBACS train to OPERABLE status.	7 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.13.1	Operate each SBACS train for [≥ 10 continuous hours with heaters operating or (for systems without heaters) ≥ 15 minutes].	31 days
SR 3.6.13.2	Perform required SBACS filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.6.13.3	Verify each SBACS train actuates on an actual or simulated actuation signal.	[18] months

3.6 CONTAINMENT SYSTEMS

3.6.14 Air Return System (ARS) (Ice Condenser)

LCO 3.6.14 Two ARS trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ARS train inoperable.	A.1 Restore ARS train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.14.1	Verify each ARS fan starts on an actual or simulated actuation signal, after a delay of ≥ [9.0] minutes and ≤ [11.0] minutes, and operates for ≥ 15 minutes.	[92] days
SR 3.6.14.2	Verify, with the ARS fan dampers closed, each ARS fan motor current is ≥ [20.5] amps and ≤ [35.5] amps [when the fan speed is ≥ [840] rpm and ≤ [900] rpm].	92 days

3.6 CONTAINMENT SYSTEMS

3.6.15 Ice Bed (Ice Condenser)

LCO 3.6.15 The ice bed shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Ice bed inoperable.	A.1 Restore ice bed to OPERABLE status.	48 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.15.1	Verify maximum ice bed temperature is ≤ [27]°F.	12 hours
SR 3.6.15.2	Verify total weight of stored ice is ≥ [2,721,600] lb by: a. Weighing a representative sample of ≥ 144 ice baskets and verifying each basket contains ≥ [1400] lb of ice and b. Calculating total weight of stored ice, at a 95% confidence level, using all ice basket weights determined in SR 3.6.15.2.a.	9 months

3.6 CONTAINMENT SYSTEMS

3.6.16 Ice Condenser Doors (Ice Condenser)

LCO 3.6.16 The ice condenser inlet doors, intermediate deck doors, and top deck [doors] shall be OPERABLE and closed.

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

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each ice condenser door.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more ice condenser inlet doors inoperable due to being physically restrained from opening.	A.1 Restore inlet door to OPERABLE status.	1 hour
B. One or more ice condenser doors inoperable for reasons other than Condition A or not closed.	B.1 Verify maximum ice bed temperature is ≤ [27]°F. AND B.2 Restore ice condenser door to OPERABLE status and closed positions.	Once per 4 hours 14 days
C. Required Action and associated Completion Time of Condition B not met.	C.1 Restore ice condenser door to OPERABLE status and closed positions.	48 hours
D. Required Action and associated Completion Time of Condition A or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

3.6 CONTAINMENT SYSTEMS

3.6.17 Divider Barrier Integrity (Ice Condenser)

LCO 3.6.17 Divider barrier integrity shall be maintained.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. ----------NOTE---------- For this action, separate Condition entry is allowed for each personnel access door or equipment hatch. ------------------------------ One or more personnel access doors or equipment hatches open or inoperable, other than for personnel transit entry.	A.1	Restore personnel access doors and equipment hatches to OPERABLE status and closed positions.	1 hour
B. Divider barrier seal inoperable.	B.1	Restore seal to OPERABLE status.	1 hour
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	C.2	Be in MODE ~~5~~ 4.	~~30~~ 12 hours

3.6 CONTAINMENT SYSTEMS

3.6.18 Containment Recirculation Drains (Ice Condenser)

LCO 3.6.18 The ice condenser floor drains and the refueling canal drains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ice condenser floor drain inoperable.	A.1 Restore ice condenser floor drain to OPERABLE status.	1 hour
B. One refueling canal drain inoperable.	B.1 Restore refueling canal drain to OPERABLE status.	1 hour
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3. AND C.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

3.7 PLANT SYSTEMS

3.7.7 Component Cooling Water (CCW) System

LCO 3.7.7 Two CCW trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One CCW train inoperable.	A.1	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by CCW. ------------------------------	
		Restore CCW train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

3.7 PLANT SYSTEMS

3.7.8 Service Water System (SWS)

LCO 3.7.8 Two SWS trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One SWS train inoperable.	A.1	------------NOTES------------ 1. Enter applicable and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by SWS. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by SWS. --------------------------------- Restore SWS train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	B.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

3.7 PLANT SYSTEMS

3.7.9 Ultimate Heat Sink (UHS)

LCO 3.7.9 The UHS shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [One or more cooling towers with one cooling tower fan inoperable.	A.1 Restore cooling tower fan(s) to OPERABLE status.	7 days]
-----REVIEWER'S NOTE----- The [ ]°F is the maximum allowed UHS temperature value and is based on temperature limitations of the equipment that is relied upon for accident mitigation and safe shutdown of the unit. --------------------------------- B. [Water temperature of the UHS > [90]°F and ≤ [ ]°F.	B.1 Verify water temperature of the UHS is ≥ [90]°F averaged over the previous 24 hour period.	Once per hour]
C. [Required Action and associated Completion Time of Condition A or B not met. OR] UHS inoperable [for reasons other than Condition A or B].	C.1 Be in MODE 3. AND C.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

3.7 PLANT SYSTEMS

3.7.10 Control Room Emergency Filtration System (CREFS)

LCO 3.7.10 Two CREFS trains shall be OPERABLE.

-----NOTE-----
The control room boundary may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, 3, 4, [5, and 6],
During movement of [recently] irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One CREFS train inoperable.	A.1	Restore CREFS train to OPERABLE status.	7 days
B. Two CREFS trains inoperable due to inoperable control room boundary in MODE 1, 2, 3, or 4.	B.1	Restore control room boundary to OPERABLE status.	24 hours
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4.	C.1	Be in MODE 3.	6 hours
	AND		
	C.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

3.7 PLANT SYSTEMS

3.7.11 Control Room Emergency Air Temperature Control System (CREATCS)

LCO 3.7.11 Two CREATCS trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, 4, [5, and 6],
During movement of [recently] irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CREATCS train inoperable.	A.1 Restore CREATCS train to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, 3, or 4.	B.1 Be in MODE 3. AND B.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours
C. Required Action and associated Completion Time of Condition A not met [in MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies.	C.1 Place OPERABLE CREATCS train in operation. OR C.2 Suspend movement of [recently] irradiated fuel assemblies.	Immediately Immediately
D. Two CREATCS trains inoperable [in MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies.	D.1 Suspend movement of [recently] irradiated fuel assemblies.	Immediately

3.7 PLANT SYSTEMS

3.7.12 Emergency Core Cooling System (ECCS) Pump Room Exhaust Air Cleanup System (PREACS)

LCO 3.7.12 Two ECCS PREACS trains shall be OPERABLE.

-----NOTE-----
The ECCS pump room boundary may be opened intermittently under administrative control.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ECCS PREACS train inoperable.	A.1 Restore ECCS PREACS train to OPERABLE status.	7 days
B. Two ECCS PREACS trains inoperable due to inoperable ECCS pump room boundary.	B.1 Restore ECCS pump room boundary to OPERABLE status.	24 hours
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3. AND C.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. [Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4. OR Two FBACS trains inoperable in MODE 1, 2, 3, or 4 for reasons other than Condition B.	C.1 AND C.2	Be in MODE 3. 4 Be in MODE ~~5~~.	6 hours 12 ~~36~~ hours]
D. Required Action and associated Completion Time [of Condition A] not met during movement of [recently] irradiated fuel assemblies in the fuel building.	D.1 OR D.2	Place OPERABLE FBACS train in operation. Suspend movement of [recently] irradiated fuel assemblies in the fuel building.	Immediately Immediately
E. Two FBACS trains inoperable during movement of [recently] irradiated fuel assemblies in the fuel building.	E.1	Suspend movement of [recently] irradiated fuel assemblies in the fuel building.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.13.1	Operate each FBACS train for [≥ 10 continuous hours with the heaters operating or (for systems without heaters) ≥ 15 minutes].	31 days

3.7 PLANT SYSTEMS

3.7.14 Penetration Room Exhaust Air Cleanup System (PREACS)

LCO 3.7.14 Two PREACS trains shall be OPERABLE.

------------------------------NOTE------------------------------
The penetration room boundary may be opened intermittently under administrative control.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One PREACS train inoperable.	A.1 Restore PREACS train to OPERABLE status.	7 days
B. Two PREACS trains inoperable due to inoperable penetration room boundary.	B.1 Restore penetration room boundary to OPERABLE status.	24 hours
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3. AND C.2 Be in MODE ~~5~~ 4.	6 hours ~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.14.1	Operate each PREACS train for [≥ 10 continuous hours with heaters operating or (for systems without heaters) ≥ 15 minutes].	31 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources - Operating

LCO 3.8.4 The Train A and Train B DC electrical power subsystems shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One [or two] battery charger[s on one train] inoperable.	A.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	<u>AND</u>		
	A.2	Verify battery float current ≤ [2] amps.	Once per [12] hours
	<u>AND</u>		
	A.3	Restore battery charger[s] to OPERABLE status.	7 days
[B. One [or two] batter[y][ies on one train] inoperable.	B.1	Restore batter[y][ies] to OPERABLE status.	[2] hours]
C. One DC electrical power subsystem inoperable for reasons other than Condition A [or B].	C.1	Restore DC electrical power subsystem to OPERABLE status.	[2] hours
D. Required Action and Associated Completion Time not met.	D.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	D.2	Be in MODE ~~5~~ 4.	~~36~~ 12 hours

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters - Operating

LCO 3.8.7 The required Train A and Train B inverters shall be OPERABLE.

-----NOTE-----
[[One/two] inverter[s] may be disconnected from [its/their] associated DC bus for ≤ 24 hours to perform an equalizing charge on [its/their] associated [common] battery, provided:

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

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

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [required] inverter inoperable.	A.1 -----NOTE----- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating" with any AC vital bus de-energized. ----- Restore inverter to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND	6 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.2 Be in MODE ~~5~~ 4.	~~36~~ 12 hours

SURVEILLANCE REQUIREMENTS

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

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One or more DC electrical power distribution subsystems inoperable.	C.1	Restore DC electrical power distribution subsystem(s) to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
D. Required Action and associated Completion Time not met.	D.1 AND D.2	Be in MODE 3. Be in MODE ~~5~~ 4.	6 hours 12 ~~36~~ hours
E. Two or more electrical power distribution subsystems inoperable that result in a loss of safety function.	E.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

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

Bases Markups

BASES

ACTIONS (continued)

This action addresses the train orientation of the SSPS for the functions listed above. If a channel or train is inoperable, 24 hours is allowed to return it to an OPERABLE status. Note that for containment spray and Phase B isolation, failure of one or both channels in one train renders the train inoperable. Condition B, therefore, encompasses both situations. The specified Completion Time is reasonable considering that there are two automatic actuation trains and another manual initiation train OPERABLE for each Function, and the low probability of an event occurring during this interval. If the train cannot be restored to OPERABLE status, the unit must be placed in a MODE in which the ~~LCO does not apply.~~ Insert 1 This is done by placing the unit in at least MODE 3 within an additional 6 hours (54 hours total time) and in MODE ~~5~~ 4 within an additional ~~30~~ 6 hours (~~84~~ 60 hours total time). The allowable 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. Insert 2

C.1, C.2.1, and C.2.2

Condition C applies to the automatic actuation logic and actuation relays for the following functions:

- SI,
- Containment Spray,
- Phase A Isolation,
- Phase B Isolation, and
- Automatic Switchover to Containment Sump.

This action addresses the train orientation of the SSPS and the master and slave relays. If one train is inoperable, 24 hours are allowed to restore the train to OPERABLE status. The 24 hours allowed for restoring the inoperable train to OPERABLE status is justified in Reference ~~8~~ 9. The specified Completion Time is reasonable considering that there is another train OPERABLE, and the low probability of an event occurring during this interval. If the train cannot be restored to OPERABLE status, the unit must be placed in a MODE in which the ~~LCO does not apply.~~ Insert 1 This is done by placing the unit in at least MODE 3 within

BASES

ACTIONS (continued)

4

an additional 6 hours (30 hours total time) and in MODE ~~5~~ within an additional ~~30~~ hours (~~60~~ hours total time). 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. Insert 2

6 — 36

The Required Actions are modified by a Note that allows one train to be bypassed for up to [4] hours for surveillance testing, provided the other train is OPERABLE. This allowance is based on the reliability analysis assumption of WCAP-10271-P-A (Ref. ~~9~~) that 4 hours is the average time required to perform train surveillance. 10

D.1, D.2.1, and D.2.2

Condition D applies to:

- Containment Pressure - High 1,
- Pressurizer Pressure - Low (two, three, and four loop units),
- Steam Line Pressure - Low,
- Steam Line Differential Pressure - High,
- High Steam Flow in Two Steam Lines Coincident With T_{avg} - Low Low or Coincident With Steam Line Pressure - Low,
- Containment Pressure - High 2,
- Steam Line Pressure - Negative Rate - High,
- High Steam Flow Coincident With Safety Injection Coincident With T_{avg} - Low Low,
- High High Steam Flow Coincident With Safety Injection,
- High Steam Flow in Two Steam Lines Coincident With T_{avg} - Low Low,
- SG Water level - Low Low (two, three, and four loop units), and
- [SG Water level - High High (P-14) (two, three, and four loop units).]

Insert 1

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 8).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

ACTIONS (continued)

If one channel is inoperable, 72 hours are allowed to restore the channel to OPERABLE status or to place it in the tripped condition. Generally this Condition applies to functions that operate on two-out-of-three logic. Therefore, failure of one channel places the Function in a two-out-of-two configuration. One channel must be tripped to place the Function in a one-out-of-three configuration that satisfies redundancy requirements. The 72 hours allowed to restore the channel to OPERABLE status or to place it in the tripped condition is justified in Reference ~~8~~. 9

Failure to restore the inoperable channel to OPERABLE status or place it in the tripped condition within 72 hours requires the unit be placed in MODE 3 within the following 6 hours and MODE 4 within the next 6 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. In MODE 4, these Functions are no longer required OPERABLE.

[The Required Actions are modified by a Note that allows the inoperable channel to be bypassed for up to 12 hours for surveillance testing of other channels. The 12 hours allowed for testing, are justified in Reference ~~8~~. 9]

-----------------------REVIEWER'S NOTE-----------------------

The below text should be used for plants with installed bypass test capability:

The Required Actions are modified by a Note that allows placing one channel in bypass for up to 12 hours while performing routine surveillance testing. The 12 hour time limit is justified in Reference ~~8~~. 9

E.1, E.2.1, and E.2.2

Condition E applies to:

- Containment Spray Containment Pressure - High 3 (High, High) (two, three, and four loop units), and
- Containment Phase B Isolation Containment Pressure - High 3 (High, High).

BASES

ACTIONS (continued)

None of these signals has input to a control function. Thus, two-out-of-three logic is necessary to meet acceptable protective requirements. However, a two-out-of-three design would require tripping a failed channel. This is undesirable because a single failure would then cause spurious containment spray initiation. Spurious spray actuation is undesirable because of the cleanup problems presented. Therefore, these channels are designed with two-out-of-four logic so that a failed channel may be bypassed rather than tripped. Note that one channel may be bypassed and still satisfy the single failure criterion. Furthermore, with one channel bypassed, a single instrumentation channel failure will not spuriously initiate containment spray.

To avoid the inadvertent actuation of containment spray and Phase B containment isolation, the inoperable channel should not be placed in the tripped condition. Instead it is bypassed. Restoring the channel to OPERABLE status, or placing the inoperable channel in the bypass condition within 72 hours, is sufficient to assure that the Function remains OPERABLE and minimizes the time that the Function may be in a partial trip condition (assuming the inoperable channel has failed high). The Completion Time is further justified based on the low probability of an event occurring during this interval. Failure to restore the inoperable channel to OPERABLE status, or place it in the bypassed condition within 6 hours, requires the unit be placed in MODE 3 within the following 6 hours and MODE 4 within the next 72 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. In MODE 4, these Functions are no longer required OPERABLE.

[The Required Actions are modified by a Note that allows one additional channel to be bypassed for up to 12 hours for surveillance testing. Placing a second channel in the bypass condition for up to 12 hours for testing purposes is acceptable based on the results of Reference ~~8~~. 9]

-----REVIEWER'S NOTE-----

The below text should be used for plants with installed bypass test capability:

The Required Actions are modified by a Note that allows placing one channel in bypass for up to 12 hours while performing routine surveillance testing. The 12 hour time limit is justified in Reference ~~8~~. 9

BASES

ACTIONS (continued)

The action addresses the train orientation of the SSPS and the master and slave relays for these functions. If one train is inoperable, 24 hours are allowed to restore the train to OPERABLE status. The 24 hours allowed for restoring the inoperable train to OPERABLE status is justified 9 in Reference ~~8~~. The Completion Time for restoring a train to OPERABLE status is reasonable considering that there is another train OPERABLE, and the low probability of an event occurring during this interval. If the train cannot be returned to OPERABLE status, the unit must be brought to MODE 3 within the next 6 hours and MODE 4 within the following 6 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. Placing the unit in MODE 4 removes all requirements for OPERABILITY of the protection channels and actuation functions. In this MODE, the unit does not have analyzed transients or conditions that require the explicit use of the protection functions noted above.

The Required Actions are modified by a Note that allows one train to be bypassed for up to [4] hours for surveillance testing provided the other train is OPERABLE. This allowance is based on the reliability analysis 10 (Ref. ~~9~~) assumption that 4 hours is the average time required to perform channel surveillance.

[H.1 and H.2

Condition H applies to the automatic actuation logic and actuation relays for the Turbine Trip and Feedwater Isolation Function.

This action addresses the train orientation of the SSPS and the master and slave relays for this Function. If one train is inoperable, 24 hours are allowed to restore the train to OPERABLE status or the unit must be placed in MODE 3 within the following 6 hours. The 24 hours allowed for restoring the inoperable train to OPERABLE status is justified in 9 Reference ~~8~~. The Completion Time for restoring a train to OPERABLE status is reasonable considering that there is another train OPERABLE, and the low probability of an event occurring during this interval. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging unit systems. These Functions are no longer required in MODE 3. Placing the unit in MODE 3 removes all requirements for OPERABILITY of the protection channels and actuation functions. In this MODE, the unit does not have analyzed transients or conditions that require the explicit use of the protection functions noted above.

BASES

ACTIONS (continued)

The Required Actions are modified by a Note that allows one train to be bypassed for up to [4] hours for surveillance testing provided the other train is OPERABLE. This allowance is based on the reliability analysis (Ref. ~~9~~) assumption that 4 hours is the average time required to perform 10 channel surveillance.]

<u>I.1 and I.2</u>

Condition I applies to:

- [SG Water Level - High High (P-14) (two, three, and four loop units), and]
- Undervoltage Reactor Coolant Pump.

If one channel is inoperable, 72 hours are allowed to restore one channel to OPERABLE status or to place it in the tripped condition. If placed in the tripped condition, the Function is then in a partial trip condition where one-out-of-two or one-out-of-three logic will result in actuation. Failure to restore the inoperable channel to OPERABLE status or place it in the tripped condition within 72 hours requires the unit to be placed in MODE 3 within the following 6 hours. The allowed Completion Time of 78 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging unit systems. In MODE 3, these Functions are no longer required OPERABLE.

[The Required Actions are modified by a Note that allows the inoperable channel to be bypassed for up to [12] hours for surveillance testing of other channels. The 72 hours allowed to place the inoperable channel in the tripped condition, and the 12 hours allowed for a second channel to be in the bypassed condition for testing, are justified in Reference ~~8~~.] 9

---REVIEWER'S NOTE---

The below text should be used for plants with installed bypass test capability:

The Required Actions are modified by a Note that allows placing one channel in bypass for up to 12 hours while performing routine surveillance testing. The 72 hours allowed to place the inoperable channel in the tripped condition, and the 12 hours allowed for a second channel to be in the bypassed condition for testing, are justified in Reference ~~8~~. 9

BASES

ACTIONS (continued)

J.1 and J.2

Condition J applies to the AFW pump start on trip of all MFW pumps.

This action addresses the train orientation of the SSPS for the auto start function of the AFW System on loss of all MFW pumps. The OPERABILITY of the AFW System must be assured by allowing automatic start of the AFW System pumps. If a channel is inoperable, 48 hours are allowed to return it to an OPERABLE status. If the function cannot be returned to an OPERABLE status, 6 hours are allowed to place the unit in MODE 3. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging unit systems. In MODE 3, the unit does not have any analyzed transients or conditions that require the explicit use of the protection function noted above. The allowance of 48 hours to return the train to an OPERABLE status is justified in Reference ~~8~~. 10

K.1, K.2.1, and K.2.2

Condition K applies to:

- RWST Level - Low Low Coincident with Safety Injection, and
- RWST Level - Low Low Coincident with Safety Injection and Coincident with Containment Sump Level - High.

RWST Level - Low Low Coincident With SI and Coincident With Containment Sump Level - High provides actuation of switchover to the containment sump. Note that this Function requires the bistables to energize to perform their required action. The failure of up to two channels will not prevent the operation of this Function. However, placing a failed channel in the tripped condition could result in a premature switchover to the sump, prior to the injection of the minimum volume from the RWST. Placing the inoperable channel in bypass results in a two-out-of-three logic configuration, which satisfies the requirement to allow another failure without disabling actuation of the switchover when required. Restoring the channel to OPERABLE status or placing the inoperable channel in the bypass condition within [6] hours is sufficient to ensure that the Function remains OPERABLE, and minimizes the time that the Function may be in a partial trip condition (assuming the

BASES

ACTIONS (continued)

Insert 3

Insert 2

inoperable channel has failed high). The [6] hour Completion Time is justified in Reference ~~10~~ 11. If the channel cannot be returned to OPERABLE status or placed in the bypass condition within 6 hours, the unit must ~~be brought to~~ MODE 3 within the following [6] hours and MODE ~~5~~ 4 within the next ~~30~~ 6 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. ~~In MODE 5, the unit does not have any analyzed transients or conditions that require the explicit use of the protection functions noted above.~~

[The Required Actions are modified by a Note that allows placing a second channel in the bypass condition for up to [4] hours for surveillance testing. The total of [12] hours to reach MODE 3 and [4] hours for a second channel to be bypassed is acceptable based on the results of Reference ~~10~~ 11.]

----------REVIEWER'S NOTE----------

The below text should be used for plants with installed bypass test capability:

The Required Actions are modified by a Note that allows placing one channel in bypass for up to 12 hours while performing routine surveillance testing. The channel to be tested can be tested in bypass with the inoperable channel also in bypass. The total of [12] hours to reach MODE 3 and [4] hours for a second channel to be bypassed is acceptable based on the results of Reference ~~10~~ 11.

L.1, L.2.1, and L.2.2

Condition L applies to the P-11 and P-12 [and P-14] interlocks.

With one or more channels inoperable, the operator must verify that the interlock is in the required state for the existing unit condition. This action manually accomplishes the function of the interlock. Determination must be made within 1 hour. The 1 hour Completion Time is equal to the time allowed by LCO 3.0.3 to initiate shutdown actions in the event of a complete loss of ESFAS function. If the interlock is not in the required state (or placed in the required state) for the existing unit condition, the unit must be placed in MODE 3 within the next 6 hours and MODE 4 within the following 6 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. Placing the unit in MODE 4 removes all requirements for OPERABILITY of these interlocks.

Insert 3

placed in a MODE in which the overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 8). This is done by placing the unit in at least

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and reliability. 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 3.3.2.2

SR 3.3.2.2 is the performance of an ACTUATION LOGIC TEST. The SSPS is tested every 92 days on a STAGGERED TEST BASIS, using the semiautomatic tester. The train being tested is placed in the bypass condition, thus preventing inadvertent actuation. Through the semiautomatic tester, all possible logic combinations, with and without applicable permissives, are tested for each protection function. In addition, the master relay coil is pulse tested for continuity. This verifies that the logic modules are OPERABLE and that there is an intact voltage signal path to the master relay coils. The Frequency of every 92 days on a STAGGERED TEST BASIS is justified in Reference ~~11~~.
12

SR 3.3.2.3

SR 3.3.2.3 is the performance of an ACTUATION LOGIC TEST as described in SR 3.3.2.2, except that the semiautomatic tester is not used and 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 the SSPS test circuits installed to utilize the semiautomatic tester or perform the continuity check. This test is also performed every 31 days on a STAGGERED TEST BASIS. The Frequency is adequate based on industry operating experience, considering instrument reliability and operating history data.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.4

SR 3.3.2.4 is the performance of a MASTER RELAY TEST. The MASTER RELAY TEST is the energizing of the master relay, verifying contact operation and a low voltage continuity check of the slave relay coil. Upon master relay contact operation, a low voltage is injected to the slave relay coil. This voltage is insufficient to pick up the slave relay, but large enough to demonstrate signal path continuity. This test is performed every 92 days on a STAGGERED TEST BASIS. The time allowed for the testing (4 hours) is justified in Reference ~~11~~ 12. The Frequency of 92 days is justified in Reference ~~8~~ 10.

SR 3.3.2.5

SR 3.3.2.5 is the performance of a COT.

A COT is performed on each required channel to ensure the entire channel will perform the intended Function. Setpoints must be found within the Allowable Values specified in Table 3.3.1-1. 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 COT 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 difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology. The setpoint shall be left set consistent with the assumptions of the current unit specific setpoint methodology.

The "as found" and "as left" values must also be recorded and reviewed for consistency with the assumptions of Reference 6.

The Frequency of 184 days is justified in Reference ~~11~~ 12.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.10

This SR ensures the individual channel ESF RESPONSE TIMES are less than or equal to the maximum values assumed in the accident analysis. Response Time testing acceptance criteria are included in the Technical Requirements Manual, Section 15 (Ref. ~~12~~ 13). Individual component response times are not modeled in the analyses. The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the Trip Setpoint value at the sensor, to the point at which the equipment in both trains reaches the required functional state (e.g., pumps at rated discharge pressure, valves in full open or closed position).

For channels that include dynamic transfer functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer functions set to one with the resulting measured response time compared to the appropriate FSAR response time. Alternately, the response time test can be performed with the time constants set to their nominal value provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

-----REVIEWER'S NOTE-----
Applicable portions of the following Bases are applicable for plants adopting WCAP-13632-P-A (Ref. ~~9~~ 10) and/or WCAP-14036-P (Ref. ~~10~~ 11).

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) in place, 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," (Ref. ~~13~~ 14) dated January 1996, 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

WCAP-14036-P, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," (Ref. ~~14~~ 15) 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 the WCAP may be replaced without verification testing. One example where response time could be affected is replacing the sensing assembly of a transmitter.

ESF RESPONSE TIME tests are conducted on an [18] month STAGGERED TEST BASIS. Testing of the final actuation devices, which make up the bulk of the response time, is included in the testing of each channel. The final actuation device in one train is tested with each channel. Therefore, staggered testing results in response time verification of these devices every [18] months. The [18] month Frequency is consistent with the typical refueling cycle and is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

This SR is modified by a Note that clarifies that the turbine driven AFW pump is tested within 24 hours after reaching [1000] psig in the SGs.

SR 3.3.2.11

SR 3.3.2.11 is the performance of a TADOT as described in SR 3.3.2.8, except that it is performed for the P-4 Reactor Trip Interlock, and the Frequency is once per RTB cycle. 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. This Frequency is based on operating experience demonstrating that undetected failure of the P-4 interlock sometimes occurs when the RTB is cycled.

The SR is modified by a Note that excludes verification of setpoints during the TADOT. The Function tested has no associated setpoint.

BASES

REFERENCES

1. FSAR, Chapter [6].

2. FSAR, Chapter [7].

3. FSAR, Chapter [15].

4. IEEE-279-1971.

5. 10 CFR 50.49.

6. Plant-specific setpoint methodology study.

7. NUREG-1218, April 1988.

8. Insert 4

9 ~~8.~~ WCAP-14333-P-A, Rev. 1, October 1998.

10 ~~9.~~ WCAP-10271-P-A, Supplement 2, Rev. 1, June 1990.

11 ~~10.~~ [Plant specific evaluation reference.]

12 ~~11.~~ WCAP-15376, Rev. 0. October 2000.

13 ~~12.~~ Technical Requirements Manual, Section 15, "Response Times."

14 ~~13.~~ WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," January 1996.

15 ~~14.~~ WCAP-14036-P, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," December 1995.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

C.1 and C.2

Condition C applies when the Required Action and associated Completion Time for Condition A or B 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 Insert 5 ~~LCO requirements are not applicable.~~ To achieve this status, the unit must be brought to MODE 3 within 6 hours and MODE ~~5~~ 4 within ~~36~~ 12 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.
Insert 2

D.1

Condition D applies when the Required Action and associated Completion Time for Condition A or B have not been met when [recently] irradiated fuel assemblies are being moved. Movement of [recently] irradiated fuel assemblies must be suspended immediately to reduce the risk of accidents that would require CREFS actuation.

E.1

Condition E applies when the Required Action and associated Completion Time for Condition A or B have not been met in MODE 5 or 6. Actions must be initiated to restore the inoperable train(s) to OPERABLE status immediately to ensure adequate isolation capability in the event of a waste gas decay tank rupture.

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 CREFS 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.

Insert 5

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 1).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.7.4

SR 3.3.7.4 is the performance of a MASTER RELAY TEST. The MASTER RELAY TEST is the energizing of the master relay, verifying contact operation and a low voltage continuity check of the slave relay coil. Upon master relay contact operation, a low voltage is injected to the slave relay coil. This voltage is insufficient to pick up the slave relay, but large enough to demonstrate signal path continuity. This test is performed every 31 days on a STAGGERED TEST BASIS. The Frequency is acceptable based on instrument reliability and industry operating experience.

[SR 3.3.7.5

SR 3.3.7.5 is the performance of an ACTUATION LOGIC TEST. The train being tested is placed in the bypass condition, thus preventing inadequate actuation. Through the semiautomatic tester, all possible logic combinations, with and without applicable permissives, are tested for each protection function. In addition, the master relay coil is pulse tested for continuity. This verifies that the logic modules are OPERABLE and there is an intact voltage signal path to the master relay coils. This test is performed ever 92 days on a STAGGERED TEST BASIS. The Surveillance interval is justified in Reference ~~1~~. 2

The SR is modified by a Note stating that the Surveillance is only applicable to the actuation logic of the ESFAS Instrumentation.]

[SR 3.3.7.6

SR 3.3.7.6 is the performance of a MASTER RELAY TEST. The MASTER RELAY TEST is the energizing of the master relay, verifying contact operation and a low voltage continuity check of the slave relay coil. Upon master relay contact operation, a low voltage is injected to the slave relay coil. This voltage is insufficient to pick up the slave relay, but large enough to demonstrate signal path continuity. This test is performed every 92 days on a STAGGERED TEST BASIS. The Surveillance interval is justified in Reference ~~1~~. 2

The SR is modified by a Note stating that the Surveillance is only applicable to the master relays of the ESFAS Instrumentation.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.7.9

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. Insert 4

2 ~~1~~. WCAP-15376, Rev. 0, October 2000.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

C.1

Condition C applies when the Required Action and associated Completion Time for Condition A or B have not been met and [recently] irradiated fuel assemblies are being moved in the fuel building. Movement of [recently] irradiated fuel assemblies in the fuel building must be suspended immediately to eliminate the potential for events that could require FBACS actuation.

D.1 and D.2

Condition D applies when the Required Action and associated Completion Time for Condition A or B 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 ~~LCO requirements are not applicable.~~ Insert 6 To achieve this status, the unit must be brought to MODE 3 within 6 hours and MODE ~~5~~ 4 within ~~30~~ 12 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. Insert 2

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

Insert 6

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3). The FBACS Actuation Instrumentation does not impact the plant core damage frequency.

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Specifications tests at least once per refueling interval with applicable extensions. In some instances, the test includes actuation of the end device (e.g., pump starts, valve cycles, etc.). 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 Functions 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. Unit Specific Setpoint Calibration Procedure.

3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

Unidentified LEAKAGE, identified LEAKAGE, or primary to secondary LEAKAGE in excess of the LCO limits must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

B.1 and B.2

If any pressure boundary LEAKAGE exists, or if unidentified LEAKAGE, identified LEAKAGE, or primary to secondary LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. The reactor must be brought to MODE 3 within 6 hours and MODE ~~5~~ 4 within ~~36~~ 12 hours. This action reduces the LEAKAGE and also reduces the factors that tend to degrade the pressure boundary.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE ~~5~~ 4, the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely. Insert 7

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE to be within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance. Primary to secondary LEAKAGE is also measured by performance of an RCS water inventory balance in conjunction with effluent monitoring within the secondary steam and feedwater systems.

The RCS water inventory balance must be met with the reactor at steady state operating conditions (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, [and RCP seal injection and return flows]). Therefore, a Note is added allowing that this SR is not required to be performed until 12 hours after establishing steady state operation. The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Insert 7

The overall plant risk is reduced by remaining in MODE 4 as justified in WCAP-16294-NP (Ref. 4). Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Steady state operation is required to perform a proper inventory balance since calculations during maneuvering are not useful. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

An early warning of pressure boundary LEAKAGE or unidentified LEAKAGE is provided by the automatic systems that monitor the containment atmosphere radioactivity and the containment sump level. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. These leakage detection systems are specified in LCO 3.4.15, "RCS Leakage Detection Instrumentation."

The 72 hour Frequency is a reasonable interval to trend LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents.

SR 3.4.13.2

This SR provides the means necessary to determine SG OPERABILITY in an operational MODE. The requirement to demonstrate SG tube integrity in accordance with the Steam Generator Tube Surveillance Program emphasizes the importance of SG tube integrity, even though this Surveillance cannot be performed at normal operating conditions

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.
2. Regulatory Guide 1.45, May 1973.
3. FSAR, Section [15].
4. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

[Required Action A.2 specifies that the double isolation barrier of two valves be restored by closing some other valve qualified for isolation or restoring one leaking PIV. The 72 hour Completion Time after exceeding the limit considers the time required to complete the Action and the low probability of a second valve failing during this time period.

[or]

The 72 hour Completion Time after exceeding the limit allows for the restoration of the leaking PIV to OPERABLE status. This timeframe considers the time required to complete this Action and the low probability of a second valve failing during this period.]

---REVIEWER'S NOTE---

Two options are provided for Required Action A.2. The second option (72 hour restoration) is appropriate if isolation of a second valve would place the unit in an unanalyzed condition.

B.1 and B.2

If leakage cannot be reduced, [the system can not be isolated,] or the other Required Actions accomplished, the plant must be brought to a MODE in which the ~~requirement does not apply~~. Insert 8 To achieve this status, the plant must be brought to MODE 3 within 6 hours and MODE ~~5~~ 4 within 12 ~~36~~ hours. This Action may reduce the leakage and also reduces the potential for a LOCA outside the containment. The allowed Completion Times are reasonable based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

C.1

The inoperability of the RHR autoclosure interlock renders the RHR suction isolation valves incapable of isolating in response to a high pressure condition and preventing inadvertent opening of the valves at RCS pressures in excess of the RHR systems design pressure. If the RHR autoclosure interlock is inoperable, operation may continue as long as the affected RHR suction penetration is closed by at least one closed manual or deactivated automatic valve within 4 hours. This Action accomplishes the purpose of the autoclosure function.

Insert 8

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 7).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.14.1

Performance of leakage testing on each RCS PIV or isolation valve used to satisfy Required Action A.1 and Required Action A.2 is required to verify that leakage is below the specified limit and to identify each leaking valve. The leakage limit of 0.5 gpm per inch of nominal valve diameter up to 5 gpm maximum applies to each valve. Leakage testing requires a stable pressure condition.

For the two PIVs in series, the leakage requirement applies to each valve individually and not to the combined leakage across both valves. If the PIVs are not individually leakage tested, one valve may have failed completely and not be detected if the other valve in series meets the leakage requirement. In this situation, the protection provided by redundant valves would be lost.

Testing is to be performed every [18] months, a typical refueling cycle, if the plant does not go into MODE 5 for at least 7 days. The [18 month] Frequency is consistent with 10 CFR 50.55a(g) (Ref. ~~8~~) as contained in 9 the Inservice Testing Program, is within frequency allowed by the American Society of Mechanical Engineers (ASME) Code, Section XI (Ref. ~~7~~), and is based on the need to perform such surveillances under 8 the conditions that apply during an outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

In addition, testing must be performed once after the valve has been opened by flow or exercised to ensure tight reseating. PIVs disturbed in the performance of this Surveillance should also be tested unless documentation shows that an infinite testing loop cannot practically be avoided. Testing must be performed within 24 hours after the valve has been reseated. Within 24 hours is a reasonable and practical time limit for performing this test after opening or reseating a valve.

The leakage limit is to be met at the RCS pressure associated with MODES 1 and 2. This permits leakage testing at high differential pressures with stable conditions not possible in the MODES with lower pressures.

Entry into MODES 3 and 4 is allowed to establish the necessary differential pressures and stable conditions to allow for performance of this Surveillance. The Note that allows this provision is complementary to the Frequency of prior to entry into MODE 2 whenever the unit has been in MODE 5 for 7 days or more, if leakage testing has not been performed in the previous 9 months. In addition, this Surveillance is not required to

BASES

SURVEILLANCE REQUIREMENTS (continued)

be performed on the RHR System when the RHR System is aligned to the RCS in the shutdown cooling mode of operation. PIVs contained in the RHR shutdown cooling flow path must be leakage rate tested after RHR is secured and stable unit conditions and the necessary differential pressures are established.

[SR 3.4.14.2 and SR 3.4.14.3

Verifying that the RHR autoclosure interlocks are OPERABLE ensures that RCS pressure will not pressurize the RHR system beyond 125% of its design pressure of [600] psig. The interlock setpoint that prevents the valves from being opened is set so the actual RCS pressure must be < [425] psig to open the valves. This setpoint ensures the RHR design pressure will not be exceeded and the RHR relief valves will not lift. The [18] month Frequency is based on the need to perform the Surveillance under conditions that apply during a plant outage. The [18] month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment.

These SRs are modified by Notes allowing the RHR autoclosure function to be disabled when using the RHR System suction relief valves for cold overpressure protection in accordance with SR 3.4.12.7.]

REFERENCES

1. 10 CFR 50.2.
2. 10 CFR 50.55a(c).
3. 10 CFR 50, Appendix A, Section V, GDC 55.
4. WASH-1400 (NUREG-75/014), Appendix V, October 1975.
5. NUREG-0677, May 1980.
[6. Document containing list of PIVs.]
7. Insert 4
8 ~~7.~~ ASME, Boiler and Pressure Vessel Code, Section XI.
9 ~~8.~~ 10 CFR 50.55a(g).

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

[D.1 and D.2

With the required containment atmosphere radioactivity monitor and the required containment air cooler condensate flow rate monitor inoperable, the only means of detecting leakage is the containment sump monitor. This Condition does not provide the required diverse means of leakage detection. The Required Action is to restore either of the inoperable required monitors to OPERABLE status within 30 days to regain the intended leakage detection diversity. The 30 day Completion Time ensures that the plant will not be operated in a reduced configuration for a lengthy time period.]

E.1 and E.2

Insert 9

If a Required Action of Condition A, B, [C], or [D] cannot be met, the plant must be brought to a MODE in which the ~~requirement does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

F.1

With all required monitors inoperable, no automatic means of monitoring leakage are available, and immediate plant shutdown in accordance with LCO 3.0.3 is required.

SURVEILLANCE REQUIREMENTS

SR 3.4.15.1

SR 3.4.15.1 requires the performance of a CHANNEL CHECK of the required containment atmosphere radioactivity monitor. The check gives reasonable confidence that the channel is operating properly. The Frequency of 12 hours is based on instrument reliability and is reasonable for detecting off normal conditions.

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a COT on the required containment atmosphere radioactivity monitor. The test ensures that the monitor can perform its function in the desired manner. 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 COT 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 test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers instrument reliability, and operating experience has shown that it is proper for detecting degradation.

SR 3.4.15.3, [SR 3.4.15.4, and SR 3.4.15.5]

These SRs require the performance of a CHANNEL CALIBRATION for each of the RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of [18] months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.
2. Regulatory Guide 1.45.
3. FSAR, Section [ ].
4. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

No Changes

BASES

LCO (continued)

This LCO is modified by a Note that allows an RHR train to be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the ECCS mode of operation and not otherwise inoperable. This allows operation in the RHR mode during MODE 4.

APPLICABILITY

In MODES 1, 2, and 3, the OPERABILITY requirements for ECCS are covered by LCO 3.5.2.

In MODE 4 with RCS temperature below 350°F, one OPERABLE ECCS train is acceptable without single failure consideration, on the basis of the stable reactivity of the reactor and the limited core cooling requirements.

In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level," and LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level."

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable ECCS high head subsystem when entering MODE 4. There is an increased risk associated with entering MODE 4 from MODE 5 with an inoperable ECCS high head subsystem and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

<u>A.1</u>

With no ECCS RHR subsystem OPERABLE, the plant is not prepared to respond to a loss of coolant accident or to continue a cooldown using the RHR pumps and heat exchangers. The Completion Time of immediately to initiate actions that would restore at least one ECCS RHR subsystem to OPERABLE status ensures that prompt action is taken to restore the required cooling capacity. Normally, in MODE 4, reactor decay heat is removed from the RCS by an RHR loop. If no RHR loop is OPERABLE for this function, reactor decay heat must be removed by some alternate method, such as use of the steam generators. The alternate means of heat removal must continue until the inoperable RHR loop components can be restored to operation so that decay heat removal is continuous.

BASES

ACTIONS (continued)

With both RHR pumps and heat exchangers inoperable, it would be unwise to require the plant to go to MODE 5, where the only available heat removal system is the RHR. Therefore, the appropriate action is to initiate measures to restore one ECCS RHR subsystem and to continue the actions until the subsystem is restored to OPERABLE status.

A ~~B.1~~ initiate actions that would

With no ECCS high head subsystem OPERABLE, due to the inoperability of the centrifugal charging pump or flow path from the RWST, the plant is not prepared to provide high pressure response to Design Basis Events requiring SI. The ~~1 hour~~ Completion Time to restore at least one ECCS high head subsystem to OPERABLE status ensures that prompt action is taken to provide the required cooling capacity ~~or to initiate actions to place the plant in MODE 5, where an ECCS train is not required.~~

of immediately

Insert 10

~~C.1~~

~~When the Required Actions of Condition B cannot be completed within the required Completion Time, a controlled shutdown should be initiated. Twenty-four hours is a reasonable time, based on operating experience, to reach MODE 5 in an orderly manner and without challenging plant systems or operators.~~

SURVEILLANCE REQUIREMENTS

SR 3.5.3.1

The applicable Surveillance descriptions from Bases 3.5.2 apply.

REFERENCES

1. Insert 4

The applicable references from Bases 3.5.2 apply.

9150

Insert 10

The overall plant risk is reduced by remaining in MODE 4 as justified in WCAP-16294-NP (Ref. 1). Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

B.1

With the RWST inoperable for reasons other than Condition A (e.g., water volume), it must be restored to OPERABLE status within 1 hour.

In this Condition, neither the ECCS nor the Containment Spray System can perform its design function. Therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the plant in a MODE in which the RWST is not required. The short time limit of 1 hour to restore the RWST to OPERABLE status is based on this condition simultaneously affecting redundant trains.

C.1 and C.2

If the RWST cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. Insert 1 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable~~,~~ based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.5.4.1

The RWST borated water temperature should be verified every 24 hours to be within the limits assumed in the accident analyses band. This Frequency is sufficient to identify a temperature change that would approach either limit and has been shown to be acceptable through operating experience.

The SR is modified by a Note that eliminates the requirement to perform this Surveillance when ambient air temperatures are within the operating limits of the RWST. With ambient air temperatures within the band, the RWST temperature should not exceed the limits.

Insert 11

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 2).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.4.2

The RWST water volume should be verified every 7 days to be above the required minimum level in order to ensure that a sufficient initial supply is available for injection and to support continued ECCS and Containment Spray System pump operation on recirculation. Since the RWST volume is normally stable and is protected by an alarm, 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. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO (continued)

Individual leakage rates specified for the containment air lock (LCO 3.6.2) [and purge valves with resilient seals (LCO 3.6.3)] are not specifically part of the acceptance criteria of 10 CFR 50, Appendix J. Therefore, leakage rates exceeding these individual limits only result in the containment being inoperable when the leakage results in exceeding the overall acceptance criteria of 1.0 L_a.

APPLICABILITY

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

ACTIONS

A.1

In the event containment is inoperable, containment must be restored to OPERABLE status within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining containment during MODES 1, 2, 3, and 4. This time period also ensures that the probability of an accident (requiring containment OPERABILITY) occurring during periods when containment is inoperable is minimal.

B.1 and B.2

If containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which Insert 9 ~~the LCO does not apply.~~ To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within 12 ~~36~~ hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

Maintaining the containment OPERABLE requires compliance with the visual examinations and leakage rate test requirements of the Containment Leakage Rate Testing Program. Failure to meet air lock [and purge valve with resilient seal] leakage limits specified in LCO 3.6.2 [and LCO 3.6.3] does not invalidate the acceptability of these overall leakage determinations unless their contribution to overall Type A, B, and C leakage causes that to exceed limits. As left leakage prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test is required to be $< 0.6\ L_a$ for combined Type B and C leakage, and [$< 0.75\ L_a$ for Option A] [$0.75\ L_a$ for Option B] for overall Type A leakage. At all other times between required leakage rate tests, the acceptance criteria is based on an overall Type A leakage limit of $\leq 1.0\ L_a$. At $\leq 1.0\ L_a$ the offsite dose consequences are bounded by the assumptions of the safety analysis. SR Frequencies are as required by the 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 analysis.

---------------------------------REVIEWER'S NOTE------------------------------
Regulatory Guide 1.163 and NEI 94-01 include acceptance criteria for as-left and as-found Type A leakage rates and combined Type B and C leakage rates, which may be reflected in the Bases.

[SR 3.6.1.2

For ungrouted, post tensioned tendons, this SR ensures that the structural integrity of the containment will be maintained in accordance with the provisions of the Containment Tendon Surveillance Program. Testing and Frequency are consistent with the recommendations of Regulatory Guide 1.35 (Ref. ~~4~~ 5).]

REFERENCES

1. 10 CFR 50, Appendix J, Option [A][B].

2. FSAR, Chapter [15].

3. FSAR, Section [6.2].

4. Insert 4

5 ~~4~~. Regulatory Guide 1.35, Revision [1].

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO	Containment OPERABILITY is maintained by limiting leakage to $\leq 1.0\ L_a$, except prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test. At this time the applicable leakage limits must be met. Compliance with this LCO will ensure a containment configuration, including equipment hatches, that is structurally sound and that will limit leakage to those leakage rates assumed in the safety analysis. Individual leakage rates specified for the containment air lock (LCO 3.6.2) [, purge valves with resilient seals, and secondary bypass leakage (LCO 3.6.3)] are not specifically part of the acceptance criteria of 10 CFR 50, Appendix J. Therefore, leakage rates exceeding these individual limits only result in the containment being inoperable when the leakage results in exceeding the overall acceptance criteria of $1.0\ L_a$.
APPLICABILITY	In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material into containment. In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, containment is not required to be OPERABLE in MODE 5 to prevent leakage of radioactive material from containment. The requirements for containment during MODE 6 are addressed in LCO 3.9.4, "Containment Penetrations."
ACTIONS	<u>A.1</u> In the event containment is inoperable, containment must be restored to OPERABLE status within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining containment OPERABLE during MODES 1, 2, 3, and 4. This time period also ensures that the probability of an accident (requiring containment OPERABILITY) occurring during periods when containment is inoperable is minimal. <u>B.1 and B.2</u> If containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~ Insert 9. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

- overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

Maintaining the containment OPERABLE requires compliance with the visual examinations and leakage rate test requirements of the Containment Leakage Rate Testing Program. Failure to meet air lock [, secondary containment bypass leakage path and purge valve with resilient seal] leakage limits specified in LCO 3.6.2 [and LCO 3.6.3] does not invalidate the acceptability of these overall leakage determinations unless their contribution to overall Type A, B, and C leakage causes that to exceed limits. As left leakage prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test is required to be $< 0.6\ L_a$ for combined Type B and C leakage, and [$< 0.75\ L_a$ for Option A][$\leq 0.75\ L_a$ for Option B] for overall Type A leakage. At all other times between required Containment Leakage Rate Testing Program leakage rate tests, the acceptance criteria is based on an overall Type A leakage limit of $\leq 1.0\ L_a$. At $\leq 1.0\ L_a$ the offsite dose consequences are bounded by the assumptions of the safety analysis. SR Frequencies are as required by the 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 analysis.

-----REVIEWER'S NOTE-----
Regulatory Guide 1.163 and NEI 94-01 include acceptance criteria for as-left and as-found Type A leakage rates and combined Type B and C leakage rates, which may be reflected in the Bases.

[SR 3.6.1.2

For ungrouted, post tensioned tendons, this SR ensures that the structural integrity of the containment will be maintained in accordance with the provisions of the Containment Tendon Surveillance Program. Testing and Frequency are consistent with the recommendations of Regulatory Guide 1.35 (Ref. ~~4~~ 5).]

REFERENCES

1. 10 CFR 50, Appendix J, Option [A][B].
2. FSAR, Chapter [15].
3. FSAR, Section [6.2].
4. Insert 4
5. Regulatory Guide 1.35, Revision [1].

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO

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

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

Individual leakage rates specified for the containment air lock (LCO 3.6.2) [, purge valves with resilient seals, and secondary bypass leakage (LCO 3.6.3)] are not specifically part of the acceptance criteria of 10 CFR 50, Appendix J. Therefore, leakage rates exceeding these individual limits only result in the containment being inoperable when the leakage results in exceeding the overall acceptance criteria of $1.0\ L_a$.

APPLICABILITY

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

ACTIONS

A.1

In the event containment is inoperable, containment must be restored to OPERABLE status within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining containment OPERABLE during MODES 1, 2, 3, and 4. This time period also ensures that the probability of an accident (requiring containment OPERABILITY) occurring during periods when containment is inoperable is minimal.

B.1 and B.2

If containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~ Insert 9. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

Maintaining the containment OPERABLE requires compliance with the visual examinations and leakage rate test requirements of the Containment Leakage Rate Testing Program. Failure to meet air lock [, secondary containment bypass leakage path, and purge valve with resilient seal] leakage limits specified in LCO 3.6.2 [and LCO 3.6.3] does not invalidate the acceptability of these overall leakage determinations unless their contribution to overall Type A, B, and C leakage causes that to exceed limits. As left leakage prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test is required to be < 0.6 L_a for combined Type B and C leakage, and [<0.75 L_a for Option A] [≤ 0.75 L_a for Option B] for overall Type A leakage. At all other times between required leakage rate tests, the acceptance criteria is based on an overall Type A leakage limit of ≤ 1.0 L_a. At ≤ 1.0 L_a the offsite dose consequences are bounded by the assumptions of the safety analysis. SR Frequencies are as required by the 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 analysis.

-----REVIEWER'S NOTE-----
Regulatory Guide 1.163 and NEI 94-01 include acceptance criteria for as-left and as-found Type A leakage rates and combined Type B and C leakage rates, which may be reflected in the Bases.

[SR 3.6.1.2

For ungrouted, post tensioned tendons, this SR ensures that the structural integrity of the containment will be maintained in accordance with the provisions of the Containment Tendon Surveillance Program. Testing and Frequency are consistent with the recommendations of Regulatory Guide 1.35 (Ref. ~~4~~ 5).]

REFERENCES

1. 10 CFR 50, Appendix J, Option [A][B].
2. FSAR, Chapter [15].
3. FSAR, Section [6.2].
4. Insert 4
5 ~~4~~. Regulatory Guide 1.35, Revision [1].

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO (continued)

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

Individual leakage rates specified for the containment air lock (LCO 3.6.2) [and purge valves with resilient seals (LCO 3.6.3)] are not specifically part of the acceptance criteria of 10 CFR 50, Appendix J. Therefore, leakage rates exceeding these individual limits only result in the containment being inoperable when the leakage results in exceeding the overall acceptance criteria of 1.0 L_a.

APPLICABILITY

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

ACTIONS

A.1

In the event containment is inoperable, containment must be restored to OPERABLE status within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining containment during MODES 1, 2, 3, and 4. This time period also ensures that the probability of an accident (requiring containment OPERABILITY) occurring during periods when containment is inoperable is minimal.

B.1 and B.2

If containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~ Insert 9. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

Maintaining the containment OPERABLE requires compliance with the visual examinations and leakage rate test requirements of the Containment Leakage Rate Testing Program. Failure to meet air lock [and purge valve with resilient seal] leakage limits specified in LCO 3.6.2 [and LCO 3.6.3] does not invalidate the acceptability of these overall leakage determinations unless their contribution to overall Type A, B, and C leakage causes that to exceed limits. As left leakage prior to the first startup after performing a required Containment Leakage Rate Testing Program leakage test is required to be < 0.6 L_a for combined Type B and C leakage, and [< 0.75 L_a for Option A] [≤ 0.75 L_a for Option B] for overall Type A leakage. At all other times between required leakage rate tests, the acceptance criteria is based on an overall Type A leakage limit of ≤ 1.0 L_a. At ≤ 1.0 L_a the offsite dose consequences are bounded by the assumptions of the safety analysis. SR Frequencies are as required by the 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 analysis.

REVIEWER'S NOTE

Regulatory Guide 1.163 and NEI 94-01 include acceptance criteria for as-left and as-found Type A leakage rates and combined Type B and C leakage rates, which may be reflected in the Bases.

[SR 3.6.1.2

For ungrouted post tensioned tendons, this SR ensures that the structural integrity of the containment will be maintained in accordance with the provisions of the Containment Tendon Surveillance Program. Testing and Frequency are consistent with the recommendations of Regulatory Guide 1.35 (Ref. 4).]

REFERENCES

1. 10 CFR 50, Appendix J, Option [A][B].
2. FSAR, Chapter [15].
3. FSAR, Section [6.2].
4: Insert 4
5. ~~4.~~ Regulatory Guide 1.35, Revision [1].

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

Required Action B.3 is modified by a Note that applies to air lock doors located in high radiation areas and allows these doors to be verified locked closed by use of administrative means. Allowing verification by administrative means is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of the door, once it has been verified to be in the proper position, is small.

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

With one or more air locks inoperable for reasons other than those described in Condition A or B, Required Action C.1 requires action to be initiated immediately to evaluate previous combined leakage rates using current air lock test results. An evaluation is acceptable, since it is overly conservative to immediately declare the containment inoperable if both doors in an air lock have failed a seal test or if the overall air lock leakage is not within limits. In many instances (e.g., only one seal per door has failed), containment remains OPERABLE, yet only 1 hour (per LCO 3.6.1) would be provided to restore the air lock door to OPERABLE status prior to requiring a plant shutdown. In addition, even with both doors failing the seal test, the overall containment leakage rate can still be within limits.

Required Action C.2 requires that one door in the affected containment air lock must be verified to be closed within the 1 hour Completion Time. This specified time period is consistent with the ACTIONS of LCO 3.6.1, which requires that containment be restored to OPERABLE status within 1 hour.

Additionally, the affected air lock(s) must be restored to OPERABLE status within the 24 hour Completion Time. The specified time period is considered reasonable for restoring an inoperable air lock to OPERABLE status, assuming that at least one door is maintained closed in each affected air lock.

D.1 and D.2

If the inoperable containment air lock cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to
Insert 12
a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~30~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

REFERENCES

1. 10 CFR 50, Appendix J, Option [A][B].
2. FSAR, Section [6.2].
3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

For the containment purge valve with resilient seal that is isolated in accordance with Required Action E.1, 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, Generic Issue 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 E.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.]

F.1 and F.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.~~ Insert 13 To achieve this status, the plant must be brought to at least MODE 3 ~~within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.~~ 4 12 Insert 2

SURVEILLANCE REQUIREMENTS

[SR 3.6.3.1

Each [42] inch containment purge valve is required to be verified sealed closed at 31 day intervals. This Surveillance is designed to ensure that a gross breach of containment is not caused by an inadvertent or spurious opening of a containment purge valve. Detailed analysis of the purge valves failed to conclusively demonstrate their ability to close during a LOCA in time to limit offsite doses. Therefore, these valves are required to be in the sealed closed position during MODES 1, 2, 3, and 4. A

Insert 13

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 5).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

containment purge valve that is sealed closed must have motive power to the valve operator removed. This can be accomplished by de-energizing the source of electric power or by removing the air supply to the valve operator. In this application, the term "sealed" has no connotation of leak tightness. The Frequency is a result of an NRC initiative, Generic
6 Issue B-24 (Ref. ~~8~~), related to containment purge valve use during plant operations. In the event purge valve leakage requires entry into Condition E, the Surveillance permits opening one purge valve in a penetration flow path to perform repairs.]

[SR 3.6.3.2

This SR ensures that the minipurge valves are closed as required or, if open, open for an allowable reason. If a purge valve is open in violation of this SR, the valve is considered inoperable. If the inoperable valve is not otherwise known to have excessive leakage when closed, it is not considered to have leakage outside of limits. The SR is not required to be met when the minipurge valves are open for the reasons stated. The valves may be opened for pressure control, ALARA or air quality considerations for personnel entry, or for Surveillances that require the valves to be open. The minipurge valves are capable of closing in the environment following a LOCA. Therefore, these valves are allowed to be open for limited periods of time. The 31 day Frequency is consistent with other containment isolation valve requirements discussed in SR 3.6.3.3.]

SR 3.6.3.3

This SR requires verification that each containment isolation manual valve and blind flange located outside containment and not locked, sealed, or otherwise secured and required to be closed during accident conditions is closed. The SR helps to ensure that post accident leakage of radioactive fluids or gases outside of the containment boundary is within design limits. This SR does not require any testing or valve manipulation. Rather, it involves verification that those containment isolation valves outside containment and capable of being mispositioned are in the correct position. Since verification of valve position for containment isolation valves outside containment is relatively easy,

BASES

REFERENCES

1. FSAR, Section [15].

2. FSAR, Section [6.2].

3. Standard Review Plan 6.2.4.

4. Generic Issue B-20, "Containment Leakage Due to Seal Deterioration."

5. Insert 4

6 ~~5.~~ Generic Issue B-24.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

B.1 and B.2

If containment pressure cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply.~~ Insert 12 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.4A.1

Verifying that containment pressure is within limits ensures that unit operation remains within the limits assumed in the containment analysis. The 12 hour Frequency of this SR was developed based on operating experience related to trending of containment pressure variations during the applicable MODES. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal containment pressure condition.

REFERENCES

1. FSAR, Section [6.2].

2. 10 CFR 50, Appendix K.

3. Insert 4

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

When containment air partial pressure is not within the limits of the LCO, containment pressure must be restored to within these limits within 1 hour. The Required Action is necessary to return operation to within the bounds of the containment analysis. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1, "Containment," which requires that containment be restored to OPERABLE status within 1 hour.

B.1 and B.2

If containment air partial pressure cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~ Insert 12. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.4B.1

Verifying that containment air partial pressure is within limits ensures that operation remains within the limits assumed in the containment analysis. The 12 hour Frequency of this SR was developed considering operating experience related to trending of containment pressure variations and pressure instrument drift during the applicable MODES. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal containment pressure condition.

REFERENCES

1. FSAR, Section [6.2].

2. 10 CFR 50, Appendix K.

3. Insert 4

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

When containment average air temperature is not within the limit of the LCO, it must be restored to within limit within 8 hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The 8 hour Completion Time is acceptable considering the sensitivity of the analysis to variations in this parameter and provides sufficient time to correct minor problems.

B.1 and B.2

Insert 12

If the containment average air temperature cannot be restored to within its limit within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply.~~ To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~30~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.5A.1

Verifying that containment average air temperature is within the LCO limit ensures that containment operation remains within the limit assumed for the containment analyses. In order to determine the containment average air temperature, an arithmetic average is calculated using measurements taken at locations within the containment selected to provide a representative sample of the overall containment atmosphere. The 24 hour Frequency of this SR is considered acceptable based on observed slow rates of temperature increase within containment as a result of environmental heat sources (due to the large volume of containment). Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal containment temperature condition.

REFERENCES

1. FSAR, Section [6.2].
2. 10 CFR 50.49.
3. Insert 4

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO

During a DBA, with an initial containment average air temperature within the LCO temperature limits, the resultant accident temperature profile assures that the containment structural temperature is maintained below its design temperature and that required safety related equipment will continue to perform its function. In MODES 3 and 4, containment air temperature may be as low as 60°F because the resultant calculated peak containment accident pressure would not exceed the design pressure due to a lesser amount of energy released from the pipe break in these MODES.

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, maintaining containment average air temperature within the limit is not required in MODE 5 or 6.

ACTIONS

A.1

When containment average air temperature in the upper or lower compartment is not within the limit of the LCO, the average air temperature in the affected compartment must be restored to within limits within 8 hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The 8 hour Completion Time is acceptable considering the sensitivity of the analysis to variations in this parameter and provides sufficient time to correct minor problems.

B.1 and B.2

If the containment average air temperature cannot be restored to within its limits within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. Insert 12 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.5B.1 and SR 3.6.5B.2

Verifying that containment average air temperature is within the LCO limits ensures that containment operation remains within the limits assumed for the containment analyses. In order to determine the containment average air temperature, a weighted average is calculated

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

using measurements taken at locations within the containment selected to provide a representative sample of the overall containment atmosphere. The 24 hour Frequency of these SRs is considered acceptable based on observed slow rates of temperature increase within containment as a result of environmental heat sources (due to the large volume of containment). Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal containment temperature condition.

REFERENCES

1. FSAR, Section [6.2].

2. 10 CFR 50.49.

3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

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, maintaining containment average air temperature within the limit is not required in MODE 5 or 6.

ACTIONS

A.1

When containment average air temperature is not within the limits of the LCO, it must be restored to within limits within 8 hours. This Required Action is necessary to return operation to within the bounds of the containment analysis. The 8 hour Completion Time is acceptable considering the sensitivity of the analysis to variations in this parameter and provides sufficient time to correct minor problems.

B.1 and B.2

Insert 12

If the containment average air temperature cannot be restored to within its limits within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~30~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.5C.1

Verifying that containment average air temperature is within the LCO limits ensures that containment operation remains within the limits assumed for the containment analyses. In order to determine the containment average air temperature, a weighted average is calculated using measurements taken at locations within containment selected to provide a representative sample of the overall containment atmosphere. The 24 hour Frequency of this SR is considered acceptable based on observed slow rates of temperature increase within containment as a result of environmental heat sources (due to the large volume of containment). Furthermore, the 24 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal containment temperature condition.

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

REFERENCES

1. FSAR, Section [6.2].
2. 10 CFR 50.49.
3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

The 10 day portion of the Completion Time for Required Action A.1 is based upon engineering judgment. It takes into account the low probability of coincident entry into two Conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to Section 1.3, "Completion Times," for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.

B.1 and B.2

If the inoperable containment spray train cannot be restored to OPERABLE status within the required Completion Time, the plant must ~~be brought to a MODE in which the LCO does not apply.~~ Insert 1 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~84~~ 60 hours. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems. The extended interval to reach MODE ~~5~~ 4 allows additional time for attempting restoration of the containment spray train and is reasonable when considering the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3. Insert 2

C.1

With one of the required containment cooling trains inoperable, the inoperable required containment cooling train must be restored to OPERABLE status within 7 days. The components in this degraded condition provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs. The 7 day Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray System and Containment Cooling System and the low probability of DBA occurring during this period.

The 10 day portion of the Completion Time for Required Action C.1 is based upon engineering judgment. It takes into account the low probability of coincident entry into two Conditions in this Specification coupled with the low probability of an accident occurring during this time. Refer to Section 1.3 for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO" portion of the Completion Time.

BASES

ACTIONS (continued)

D.1

With two required containment cooling trains inoperable, one of the required containment cooling trains must be restored to OPERABLE status within 72 hours. The components in this degraded condition provide iodine removal capabilities and are capable of providing at least 100% of the heat removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal capabilities afforded by combinations of the Containment Spray System and Containment Cooling System, the iodine removal function of the Containment Spray System, and the low probability of DBA occurring during this period.

E.1 and E.2

If the Required Action and associated Completion Time of Condition C or D of this LCO are not met, the plant must be brought to a MODE in ~~which the LCO does not apply~~ Insert 1. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

F.1

With two containment spray trains or any combination of three or more containment spray and cooling trains inoperable, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.6.6A.1

Verifying the correct alignment for manual, power operated, and automatic valves in the containment spray flow path provides assurance that the proper flow paths will exist for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment (only check valves are inside containment) and capable of potentially being mispositioned are in the correct position.

Insert 1

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 8).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6A.2

Operating each [required] containment cooling train fan unit for ≥ 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. The 31 day Frequency was developed considering the known reliability of the fan units and controls, the two train redundancy available, and the low probability of significant degradation of the containment cooling train occurring between surveillances. It has also been shown to be acceptable through operating experience.

SR 3.6.6A.3

Verifying that each [required] containment cooling train ESW cooling flow rate to each cooling unit is ≥ [700] gpm provides assurance that the design flow rate assumed in the safety analyses will be achieved (Ref. 3). The Frequency was developed considering the known reliability of the Cooling Water System, the two train redundancy available, and the low probability of a significant degradation of flow occurring between surveillances.

SR 3.6.6A.4

Verifying each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by Section XI of the ASME Code (Ref. ~~8~~ 9). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by abnormal performance. The Frequency of the SR is in accordance with the Inservice Testing Program.

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. 10 CFR 50, Appendix K.
3. FSAR, Section [ ].
4. FSAR, Section [ ].
5. FSAR, Section [ ].
6. FSAR, Section [ ].
7. FSAR, Section [ ].
8. Insert 4
9. ~~8.~~ ASME, Boiler and Pressure Vessel Code, Section XI.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

F.1 and F.2

Insert 1

If any of the Required Actions or associated Completion Times for Condition A, B, C, D, or E of this LCO are not met, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

G.1

With any combination of three or more containment spray and containment cooling trains inoperable, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.6.6B.1

Verifying the correct alignment for manual, power operated, and automatic valves, excluding check valves, in the Containment Spray System flow path provides assurance that the proper flow path exists for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct positions prior to being secured. This SR does not require testing or valve manipulation. Rather, it involves verification that those valves outside containment (only check valves are inside containment) and capable of potentially being mispositioned are in the correct position.

SR 3.6.6B.2

Operating each [required] containment cooling train fan unit for ≥ 15 minutes ensures that all trains are OPERABLE and all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. The 31 day Frequency was developed based on the known reliability of the fan units and controls, the two train redundancy available, and the low probability of significant degradation of the containment cooling train occurring between surveillances.

Insert 1

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 8).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6B.3

Verifying that each [required] containment cooling train ESW cooling flow rate to each cooling unit is ≥ [700] gpm provides assurance that the design flow rate assumed in the analyses will be achieved (Ref. 3). The Frequency was developed considering the known reliability of the Cooling Water System, the two train redundancy available, and the low probability of a significant degradation of flow occurring between surveillances.

SR 3.6.6B.4

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by Section XI of the ASME Code (Ref. ~~8~~ 9). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.6.6B.5 and SR 3.6.6B.6

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated containment High-3 pressure 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 these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The surveillance of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance may be used to satisfy both requirements.

SR 3.6.6B.7

This SR ensures that each [required] containment cooling train actuates upon receipt of an actual or simulated safety injection signal. The [18] month Frequency is based on engineering judgment and has been proven acceptable through operating experience. See SR 3.6.6B.5 and SR 3.6.6B.6, above, for further discussion of the basis for the [18] month Frequency.

SR 3.6.6B.8

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. Because of the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. 10 CFR 50, Appendix A.
3. FSAR, Section [15].
4. FSAR, Section [6.2].
5. FSAR, Section [ ].
6. FSAR, Section [ ].
7. FSAR, Section [ ].
8. Insert 4
9 ~~8~~. ASME, Boiler and Pressure Vessel Code, Section XI.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the Containment Spray System.

In MODES 5 and 6, the probability and consequences of these events are reduced because of the pressure and temperature limitations of these MODES. Thus, the Containment Spray System is not required to be OPERABLE in MODE 5 or 6.

ACTIONS

A.1

With one containment spray train inoperable, the affected train must be restored to OPERABLE status within 72 hours. The components in this degraded condition are capable of providing 100% of the heat removal and iodine removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal and iodine removal capabilities afforded by the OPERABLE train and the low probability of a DBA occurring during this period.

B.1 and B.2

Insert 13

If the affected containment spray train cannot be restored to OPERABLE status within the required Completion Time, ~~the plant must be brought to a MODE in which the LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~84~~ 60 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. The extended interval to reach MODE ~~5~~ 4 allows additional time and is reasonable when considering that the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.6C.1

Verifying the correct alignment of manual, power operated, and automatic valves, excluding check valves, in the Containment Spray System provides assurance that the proper flow path exists for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since they were verified in the correct position prior to being secured. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment and capable of potentially being mispositioned, are in the correct position.

Insert 13

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 5).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6.2

Verifying that each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray 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. ~~5~~ 6). Since the containment spray pumps cannot be tested with flow through the spray headers, they are tested on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.6.6.3 and SR 3.6.6.4

These SRs require verification that each automatic containment spray valve actuates to its correct position and each containment spray pump starts upon receipt of an actual or simulated containment spray 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 these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillances when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

The surveillance of containment sump isolation valves is also required by SR 3.6.6.3. A single surveillance may be used to satisfy both requirements.

SR 3.6.6.5

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. Because of the passive design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40, GDC 41, GDC 42, and GDC 43.
2. FSAR, Section [6.2].
3. 10 CFR 50.49.
4. 10 CFR 50, Appendix K.
5. Insert 4
6. ~~5.~~ ASME, Boiler and Pressure Vessel Code, Section XI.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

If one QS train is inoperable, it must be restored to OPERABLE status within 72 hours. The components in this degraded condition are capable of providing 100% of the heat removal and iodine removal needs after an accident. The 72 hour Completion Time was developed taking into account the redundant heat removal and iodine removal capabilities afforded by the OPERABLE train and the low probability of a DBA occurring during this period.

B.1 and B.2

Insert 9

If the Required Action and associated Completion Time are not met, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2 12

SURVEILLANCE REQUIREMENTS

SR 3.6.6D.1

Verifying the correct alignment of manual, power operated, and automatic valves, excluding check valves, in the QS System provides assurance that the proper flow path exists for QS System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they were verified to be in the correct position prior to being secured. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment and capable of potentially being mispositioned are in the correct position.

SR 3.6.6D.2

Verifying that each QS pump's developed head at the flow test point is greater than or equal to the required developed head ensures that QS 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. ~~4~~). Since the QS System pumps cannot be tested with flow through the spray headers, they are tested on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program. 5

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6D.3 and SR 3.6.6D.4

These SRs ensure that each QS automatic valve actuates to its correct position and each QS pump starts upon receipt of an actual or simulated containment spray 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 these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances when performed at an [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.6D.5

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. Due to the passive nature of the design of the nozzle, a test at [the first refueling and at] 10 year intervals is considered adequate to detect obstruction of the nozzles.

REFERENCES

1. FSAR, Section [6.2].
2. 10 CFR 50.49.
3. 10 CFR 50, Appendix K.
4. Insert 4
5. ~~4.~~ ASME, Boiler and Pressure Vessel Code, Section XI.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

[C.1
With two inside RS subsystems inoperable, at least one of the inoperable subsystems must be restored to OPERABLE status within 72 hours. The components in this degraded condition are capable of providing 100% of the heat removal needs after an accident. The 72 hour Completion Time was chosen based on the same reasons as given in Required Action B.1.]

[D.1

With two outside RS subsystems inoperable, at least one of the inoperable subsystems must be restored to OPERABLE status within 72 hours. The components in this degraded condition are capable of providing 100% of the heat removal needs after an accident. The 72 hour Completion Time was chosen based on the same reasons as given in Required Action B.1.]

[E.1

With the casing cooling tank inoperable, the NPSH available to the outside RS subsystem pumps may not be sufficient. The inoperable casing cooling tank must be restored to OPERABLE status within 72 hours. The components in this degraded condition are capable of providing 100% of the heat removal needs after an accident. The 72 hour Completion Time was chosen based on the same reasons as given in Required Action B.1.]

F.1 and F.2

If the inoperable RS subsystem(s) or the casing cooling tank cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. Insert 9 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~84~~ 60 hours. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems. The extended interval to reach MODE ~~5~~ 4 allows additional time and is reasonable considering that the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3. Insert 2

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6E.4

Verifying the correct alignment of manual, power operated, and automatic valves, excluding check valves, in the RS System and casing cooling tank provides assurance that the proper flow path exists for operation of the RS System. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified as being in the correct position prior to being secured. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment and capable of potentially being mispositioned are in the correct position.

SR 3.6.6E.5

Verifying that each RS [and casing cooling] pump's developed head at the flow test point is greater than or equal to the required developed head ensures that these pumps' 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. ~~4~~ 5). Since the QS System pumps cannot be tested with flow through the spray headers, they are tested on bypass flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.6.6E.6

These SRs ensure that each automatic valve actuates and that the RS System and casing cooling pumps start upon receipt of an actual or simulated High-High containment pressure signal. Start delay times are also verified for the RS System pumps. 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 plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was considered to be acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6E.7

This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment will meet its design bases objective. An air or smoke test is performed through each spray header. Due to the passive design of the spray header and its normally dry state, a test at [the first refueling and at] 10 year intervals is considered adequate for detecting obstruction of the nozzles.

REFERENCES

1. FSAR, Section [6.2].
2. 10 CFR 50.49.
3. 10 CFR 50, Appendix K.
4. Insert 4
5 ~~4~~. ASME, Boiler and Pressure Vessel Code, Section XI.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO (continued)

spray flow until the Containment Spray System suction path is switched from the RWST to the containment sump, and to raise the average spray solution pH to a level conducive to iodine removal, namely, to between [7.2 and 11.0]. This pH range maximizes the effectiveness of the iodine removal mechanism without introducing conditions that may induce caustic stress corrosion cracking of mechanical system components. In addition, it is essential that valves in the Spray Additive System flow paths are properly positioned and that automatic valves are capable of activating to their correct positions.

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment requiring the operation of the Spray Additive System. The Spray Additive System assists in reducing the iodine fission product inventory prior to release to the environment.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Thus, the Spray Additive System is not required to be OPERABLE in MODE 5 or 6.

ACTIONS

A.1

If the Spray Additive System is inoperable, it must be restored to OPERABLE within 72 hours. The pH adjustment of the Containment Spray System flow for corrosion protection and iodine removal enhancement is reduced in this condition. The Containment Spray System would still be available and would remove some iodine from the containment atmosphere in the event of a DBA. The 72 hour Completion Time takes into account the redundant flow path capabilities and the low probability of the worst case DBA occurring during this period.

B.1 and B.2

Insert 11

If the Spray Additive System cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ within 4 60 ~~84~~ hours. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems. The extended interval to reach MODE ~~5~~ 4 allows 48 hours for restoration of the Spray

Insert 11

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 2).

BASES

ACTIONS (continued)

Additive System in MODE 3 and ~~36~~ 12 hours to reach MODE ~~5~~ 4. This is reasonable when considering the reduced pressure and temperature conditions in MODE 3 for the release of radioactive material from the Reactor Coolant System. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.7.1

Verifying the correct alignment of Spray Additive System manual, power operated, and automatic valves in the spray additive flow path provides assurance that the system is able to provide additive to the Containment Spray System in the event of a DBA. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves outside containment and capable of potentially being mispositioned are in the correct position.

SR 3.6.7.2

To provide effective iodine removal, the containment spray must be an alkaline solution. Since the RWST contents are normally acidic, the volume of the spray additive tank must provide a sufficient volume of spray additive to adjust pH for all water injected. This SR is performed to verify the availability of sufficient NaOH solution in the Spray Additive System. The 184 day Frequency was developed based on the low probability of an undetected change in tank volume occurring during the SR interval (the tank is isolated during normal unit operations). Tank level is also indicated and alarmed in the control room, so that there is high confidence that a substantial change in level would be detected.

SR 3.6.7.3

This SR provides verification of the NaOH concentration in the spray additive tank and is sufficient to ensure that the spray solution being injected into containment is at the correct pH level. The 184 day Frequency is sufficient to ensure that the concentration level of NaOH in the spray additive tank remains within the established limits. This is based on the low likelihood of an uncontrolled change in concentration (the tank is normally isolated) and the probability that any substantial variance in tank volume will be detected.

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.7.4

This SR provides verification that each automatic valve in the Spray Additive System flow path actuates to its correct position. 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 plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.7.5

To ensure that the correct pH level is established in the borated water solution provided by the Containment Spray System, the flow rate in the Spray Additive System is verified once every 5 years. This SR provides assurance that the correct amount of NaOH will be metered into the flow path upon Containment Spray System initiation. Due to the passive nature of the spray additive flow controls, the 5 year Frequency is sufficient to identify component degradation that may affect flow rate.

REFERENCES

1. FSAR, Chapter [15].
2. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

In the event shield building OPERABILITY is not maintained, shield building OPERABILITY must be restored within 24 hours. Twenty-four hours is a reasonable Completion Time considering the limited leakage design of containment and the low probability of a Design Basis Accident occurring during this time period.

B.1 and B.2

If the shield building cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply.~~ Insert 19 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are ~~reasonable,~~ based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

[SR 3.6.8.1

Verifying that shield building annulus negative pressure is within limit ensures that operation remains within the limit assumed in the containment analysis. The 12 hour Frequency of this SR was developed considering operating experience related to shield building annulus pressure variations and pressure instrument drift during the applicable MODES.]

SR 3.6.8.2

Maintaining shield building OPERABILITY requires verifying one door in the access opening closed. [An access opening may contain one inner and one outer door, or in some cases, shield building access openings are shared such that a shield building barrier may have multiple inner or multiple outer doors. The intent is to not breach the shield building boundary at any time when the shield building boundary is required. This is achieved by maintaining the inner or outer portion of the barrier closed at all times.] However, all shield building access doors are normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access opening. The 31 day Frequency of this SR is based on engineering judgment and is considered adequate in view of the other indications of door status that are available to the operator.

Insert 19

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 1).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[SR 3.6.8.3

This SR would give advance indication of gross deterioration of the concrete structural integrity of the shield building. The Frequency of this SR is the same as that of SR 3.6.1.1. The verification is done during shutdown.]

SR 3.6.8.4

The Shield Building Air Cleanup System produces a negative pressure to prevent leakage from the building. SR 3.6.8.4 verifies that the shield building can be rapidly drawn down to [-0.5] inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by SR 3.6.8.4, which demonstrates that the shield building can be drawn down to ≤ [-0.5] inches of vacuum water gauge in the annulus ≤ [22] seconds using one Shield Building Air Cleanup System train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this SR is a shield building boundary integrity test, it does not need to be performed with each Shield Building Air Cleanup System train. The Shield Building Air Cleanup System train used for this Surveillance is staggered to ensure that in addition to the requirements of LCO 3.6.8.4, either train will perform this test. The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the Shield Building Air Cleanup System being tested functions as designed. The inoperability of the Shield Building Air Cleanup System train does not necessarily constitute a failure of this Surveillance relative to the shield building OPERABILITY. The 18 month Frequency is based on the need to perform this Surveillance under conditions that apply during a plant outage.

REFERENCES ~~None.~~ 1. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

With one ICS train inoperable, the inoperable train must be restored to OPERABLE status within 7 days. The components in this degraded condition are capable of providing 100% of the iodine removal needs after a DBA. The 7 day Completion Time is based on consideration of such factors as:

a. The availability of the OPERABLE redundant ICS train,

b. The fact that, even with no ICS train in operation, almost the same amount of iodine would be removed from the containment atmosphere through absorption by the Containment Spray System, and

c. The fact that the Completion Time is adequate to make most repairs.

B.1 and B.2

Insert 13

If the ICS train cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.11.1

Operating each ICS train for ≥ 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. For systems with heaters, operation with the heaters on (automatic heater cycling to maintain temperature) for ≥ 10 continuous hours eliminates moisture on the adsorbers and HEPA filters. Experience from filter testing at operating units indicates that the 10 hour period is adequate for moisture elimination on the adsorbers and HEPA filters. The 31 day Frequency was developed considering the known reliability of fan motors and controls, the two train redundancy available, and the iodine removal capability of the Containment Spray System independent of the ICS.

Insert 13

- overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 5).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.11.2

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

SR 3.6.11.3

The automatic startup test verifies that both trains of equipment start upon receipt of an actual or simulated test signal. The [18] month Frequency is 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 Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. Furthermore, the Frequency was developed considering that the system equipment OPERABILITY is demonstrated at a 31 day Frequency by SR 3.6.11.1.

[SR 3.6.11.4

The ICS filter bypass dampers are tested to verify OPERABILITY. The dampers are in the bypass position during normal operation and must reposition for accident operation to draw air through the filters. The [18] month Frequency is considered to be acceptable based on the damper reliability and design, the mild environmental conditions in the vicinity of the dampers, and the fact that operating experience has shown that the dampers usually pass the Surveillance when performed at the [18] month Frequency.]

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41, GDC 42, and GDC 43.
2. FSAR, Section [6.5].
3. Regulatory Guide 1.52, Revision [2].
4. FSAR, Chapter [15].

5. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO	The LCO establishes the minimum equipment required to accomplish the vacuum relief function following the inadvertent actuation of containment cooling features. Two 100% vacuum relief lines are required to be OPERABLE to ensure that at least one is available, assuming one or both valves in the other line fail to open.
APPLICABILITY	In MODES 1, 2, 3, and 4, the containment cooling features, such as the Containment Spray System, are required to be OPERABLE to mitigate the effects of a DBA. Excessive negative pressure inside containment could occur whenever these systems are required to be OPERABLE due to inadvertent actuation of these systems. Therefore, the vacuum relief lines are required to be OPERABLE in MODES 1, 2, 3, and 4 to mitigate the effects of inadvertent actuation of the Containment Spray System, Quench Spray (QS) System, or Containment Cooling System. In MODES 5 and 6, the probability and consequences of a DBA are reduced due to the pressure and temperature limitations of these MODES. The Containment Spray System, QS System, and Containment Cooling System are not required to be OPERABLE in MODES 5 and 6. Therefore, maintaining OPERABLE vacuum relief valves is not required in MODE 5 or 6.
ACTIONS	A.1 When one of the required vacuum relief lines is inoperable, the inoperable line must be restored to OPERABLE status within 72 hours. The specified time period is consistent with other LCOs for the loss of one train of a system required to mitigate the consequences of a LOCA or other DBA. B.1 and B.2 If the vacuum relief line cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in Insert 1 which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 11

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 2).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.12.1

This SR cites the Inservice Testing Program, which establishes the requirement that inservice testing of the ASME Code Class 1, 2, and 3 pumps and valves shall be performed in accordance with Section XI of the ASME, Boiler and Pressure Vessel Code and applicable Addenda (Ref. ~~2~~ 3). Therefore, SR Frequency is governed by the Inservice Testing Program.

REFERENCES

1. FSAR, Section [6.2].
2. Insert 4
3. ~~2.~~ ASME, Boiler and Pressure Vessel Code, Section XI.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO

In the event of a DBA, one SBACS train is required to provide the minimum particulate iodine removal assumed in the safety analysis. Two trains of the SBACS must be OPERABLE to ensure that at least one train will operate, assuming that the other train is disabled by a single active failure.

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could lead to fission product release to containment that leaks to the shield building. The large break LOCA, on which this system's design is based, is a full power event. Less severe LOCAs and leakage still require the system to be OPERABLE throughout these MODES. The probability and severity of a LOCA decrease as core power and Reactor Coolant System pressure decrease. With the reactor shut down, the probability of release of radioactivity resulting from such an accident is low.

In MODES 5 and 6, the probability and consequences of a DBA are low due to the pressure and temperature limitations in these MODES. Under these conditions, the Filtration System is not required to be OPERABLE (although one or more trains may be operating for other reasons, such as habitability during maintenance in the shield building annulus).

ACTIONS

A.1

With one SBACS train inoperable, the inoperable train must be restored to OPERABLE status within 7 days. The components in this degraded condition are capable of providing 100% of the iodine removal needs after a DBA. The 7 day Completion Time is based on consideration of such factors as the availability of the OPERABLE redundant SBACS train and the low probability of a DBA occurring during this period. The Completion Time is adequate to make most repairs.

B.1 and B.2

Insert 9

If the SBACS train cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within 12 ~~36~~ hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[SR 3.6.13.4

The SBACS filter bypass dampers are tested to verify OPERABILITY. The dampers are in the bypass position during normal operation and must reposition for accident operation to draw air through the filters. The [18] month Frequency is considered to be acceptable based on damper reliability and design, mild environmental conditions in the vicinity of the dampers, and the fact that operating experience has shown that the dampers usually pass the Surveillance when performed at the [18] month Frequency.]

SR 3.6.13.5

The proper functioning of the fans, dampers, filters, adsorbers, etc., as a system is verified by the ability of each train to produce the required system flow rate. The [18] month Frequency on a STAGGERED TEST BASIS is consistent with Regulatory Guide 1.52 (Ref. ~~4~~ 5) guidance for functional testing.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. FSAR, Section [6.5].
3. FSAR, Chapter [15].
4. Insert 4
5. ~~4.~~ Regulatory Guide 1.52, Revision [2].

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

B.1 and B.2

If the ARS train cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which Insert 12 the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within 12 ~~36~~ hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.14.1

Verifying that each ARS fan starts on an actual or simulated actuation signal, after a delay ≥ [9.0] minutes and ≤ [11.0] minutes, and operates for ≥ 15 minutes is sufficient to ensure that all fans are OPERABLE and that all associated controls and time delays are functioning properly. It also ensures that blockage, fan and/or motor failure, or excessive vibration can be detected for corrective action. The [92] day Frequency was developed considering the known reliability of fan motors and controls and the two train redundancy available.

SR 3.6.14.2

Verifying ARS fan motor current to be at rated speed with the return air dampers closed confirms one operating condition of the fan. This test is indicative of overall fan motor performance. Such inservice tests confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of 92 days conforms with the testing requirements for similar ESF equipment and considers the known reliability of fan motors and controls and the two train redundancy available.

SR 3.6.14.3

Verifying the OPERABILITY of the return air damper provides assurance that the proper flow path will exist when the fan is started. By applying the correct counterweight, the damper operation can be confirmed. The Frequency of 92 days was developed considering the importance of the dampers, their location, physical environment, and probability of failure. Operating experience has also shown this Frequency to be acceptable.

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[SR 3.6.14.4

Verifying the OPERABILITY of the motor operated valve in the Hydrogen Skimmer System hydrogen collection header to the lower containment compartment provides assurance that the proper flow path will exist when the valve receives an actuation signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. This Surveillance also confirms that the time delay to open is within specified tolerances. The 92 day Frequency was developed considering the known reliability of the motor operated valves and controls and the two train redundancy available. Operating experience has also shown this Frequency to be acceptable.]

REFERENCES

1. FSAR, Section [6.2].
2. 10 CFR 50, Appendix K.
3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

B.1 and B.2

Insert 12

If the ice bed cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.15.1

Verifying that the maximum temperature of the ice bed is ≤ [27]°F ensures that the ice is kept well below the melting point. The 12 hour Frequency was based on operating experience, which confirmed that, due to the large mass of stored ice, it is not possible for the ice bed temperature to degrade significantly within a 12 hour period and was also based on assessing the proximity of the LCO limit to the melting temperature.

Furthermore, the 12 hour Frequency is considered adequate in view of indications in the control room, including the alarm, to alert the operator to an abnormal ice bed temperature condition. This SR may be satisfied by use of the Ice Bed Temperature Monitoring System.

SR 3.6.15.2

The weighing program is designed to obtain a representative sample of the ice baskets. The representative sample shall include 6 baskets from each of the 24 ice condenser bays and shall consist of one basket from radial rows 1, 2, 4, 6, 8, and 9. If no basket from a designated row can be obtained for weighing, a basket from the same row of an adjacent bay shall be weighed.

The rows chosen include the rows nearest the inside and outside walls of the ice condenser (rows 1 and 2, and 8 and 9, respectively), where heat transfer into the ice condenser is most likely to influence melting or sublimation. Verifying the total weight of ice ensures that there is adequate ice to absorb the required amount of energy to mitigate the DBAs.

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.15.5

Verifying the chemical composition of the stored ice ensures that the stored ice has a boron concentration ≥ [1800] ppm and ≤ [2000] ppm as sodium tetraborate and a high pH, ≥ [9.0] and ≤ [9.5], in order to meet the requirement for borated water when the melted ice is used in the ECCS recirculation mode of operation. Additionally, the minimum boron concentration value is used to assure reactor subcriticality in a post LOCA environment, while the maximum boron concentration is used as the bounding value in the hot leg switchover timing calculation (Ref. ~~3~~). This 4 is accomplished by obtaining at least 24 ice samples. Each sample is taken approximately one foot from the top of the ice of each randomly selected ice basket in each ice condenser bay. The SR is modified by a Note that allows the boron concentration and pH value obtained from averaging the individual samples' analysis results to satisfy the requirements of the SR. If either the average boron concentration or average pH value is outside their prescribed limit, then entry into Condition A is required. Sodium tetraborate has been proven effective in maintaining the boron content for long storage periods, and it also enhances the ability of the solution to remove and retain fission product iodine. The high pH is required to enhance the effectiveness of the ice and the melted ice in removing iodine from the containment atmosphere. This pH range also minimizes the occurrence of chloride and caustic stress corrosion on mechanical systems and components exposed to ECCS and Containment Spray System fluids in the recirculation mode of operation. The Frequency of [54] months is intended to be consistent with the expected length of three fuel cycles, and was developed considering these facts:

a. Long term ice storage tests have determined that the chemical composition of the stored ice is extremely stable,

b. There are no normal operating mechanisms that decrease the boron concentration of the stored ice, and pH remains within a 9.0-9.5 range when boron concentrations are above approximately 1200 ppm,

c. Operating experience has demonstrated that meeting the boron concentration and pH requirements has never been a problem, and

d. Someone would have to enter the containment to take the sample, and, if the unit is at power, that person would receive a radiation dose.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.15.6

This SR ensures that a representative sampling of ice baskets, which are relatively thin walled, perforated cylinders, have not been degraded by wear, cracks, corrosion, or other damage. Each ice basket must be raised at least 12 feet for this inspection. The Frequency of 40 months for a visual inspection of the structural soundness of the ice baskets is based on engineering judgment and considers such factors as the thickness of the basket walls relative to corrosion rates expected in their service environment and the results of the long term ice storage testing.

SR 3.6.15.7

This SR ensures that initial ice fill and any subsequent ice additions meet the boron concentration and pH requirements of SR 3.6.15.5. The SR is modified by a Note that allows the chemical analysis to be performed on either the liquid or resulting ice of each sodium tetraborate solution prepared. If ice is obtained from offsite sources, then chemical analysis data must be obtained for the ice supplied.

REFERENCES

1. FSAR, Section [6.2].
2. 10 CFR 50, Appendix K.
3. Insert 4
4. ~~3.~~ [Westinghouse letter, WAT-D-10686, "Upper Limit Ice Boron Concentration In Safety Analysis"]

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

because of the large mass of ice involved. The 14 day Completion Time is based on long term ice storage tests that indicate that if the temperature is maintained below [27]°F, there would not be a significant loss of ice from sublimation. If the maximum ice bed temperature is > [27]°F at any time, the situation reverts to Condition C and a Completion Time of 48 hours is allowed to restore the inoperable door to OPERABLE status or enter into Required Actions D.1 and D.2. Ice bed temperature must be verified to be within the specified Frequency as augmented by the provisions of SR 3.0.2. If this verification is not made, Required Actions D.1 and D.2, not Required Action C.1, must be taken. Entry into Condition B is not required due to personnel standing on or opening an intermediate deck or upper deck door for short durations to perform required surveillances, minor maintenance such as ice removal, or routine tasks such as system walkdowns.

C.1

If Required Actions B.1 or B.2 are not met, the doors must be restored to OPERABLE status and closed positions within 48 hours. The 48 hour Completion Time is based on the fact that, with the very large mass of ice involved, it would not be possible for the temperature to decrease to the melting point and a significant amount of ice to melt in a 48 hour period. Condition C is entered from Condition B only when the Completion Time of Required Action B.2 is not met or when the ice bed temperature has not been verified at the required frequency.

D.1 and D.2

If the ice condenser doors cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply.~~ Insert 12 To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

c. The light construction of the doors would ensure that, in the event of a DBA, air and gases passing through the ice condenser would find a flow path, even if a door were obstructed.

REFERENCES

1. FSAR, Chapter [15].

2. 10 CFR 50, Appendix K.

3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

C.1 and C.2

Insert 11

If divider barrier integrity cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.6.17.1

Verification, by visual inspection, that all personnel access doors and equipment hatches between the upper and lower containment compartments are closed provides assurance that divider barrier integrity is maintained prior to the reactor being taken from MODE 5 to MODE 4. This SR is necessary because many of the doors and hatches may have been opened for maintenance during the shutdown.

SR 3.6.17.2

Verification, by visual inspection, that the personnel access door and equipment hatch seals, sealing surfaces, and alignments are acceptable provides assurance that divider barrier integrity is maintained. This inspection cannot be made when the door or hatch is closed. Therefore, SR 3.6.17.2 is required for each door or hatch that has been opened, prior to the final closure. Some doors and hatches may not be opened for long periods of time. Those that use resilient materials in the seals must be opened and inspected at least once every 10 years to provide assurance that the seal material has not aged to the point of degraded performance. The Frequency of 10 years is based on the known resiliency of the materials used for seals, the fact that the openings have not been opened (to cause wear), and operating experience that confirms that the seals inspected at this Frequency have been found to be acceptable.

Insert 11

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 2).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.17.3

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

SR 3.6.17.4

Conducting periodic physical property tests on divider barrier seal test coupons provides assurance that the seal material has not degraded in the containment environment, including the effects of irradiation with the reactor at power. The required tests include a tensile strength test [and a test for elongation]. The Frequency of [18] months was developed considering such factors as the known resiliency of the seal material used, the inaccessibility of the seals and absence of traffic in their vicinity, and the unit conditions needed to perform the SR. Operating experience has shown that these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.17.5

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

REFERENCES

1. FSAR, Section [6.2].
2. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

APPLICABILITY (continued)

The probability and consequences of these events in MODES 5 and 6 are low due to the pressure and temperature limitations of these MODES. As such, the containment recirculation drains are not required to be OPERABLE in these MODES.

ACTIONS

A.1

If one ice condenser floor drain is inoperable, 1 hour is allowed to restore the drain to OPERABLE status. The Required Action is necessary to return operation to within the bounds of the containment analysis. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1, "Containment," which requires that containment be restored to OPERABLE status within 1 hour.

B.1

If one refueling canal drain is inoperable, 1 hour is allowed to restore the drain to OPERABLE status. The Required Action is necessary to return operation to within the bounds of the containment analysis. The 1 hour Completion Time is consistent with the ACTIONS of LCO 3.6.1, which requires that containment be restored to OPERABLE status in 1 hour.

C.1 and C.2

If the affected drain(s) cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the ~~LCO does not apply~~ Insert 1. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 11

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 2).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.18.1

Verifying the OPERABILITY of the refueling canal drains ensures that they will be able to perform their functions in the event of a DBA. This Surveillance confirms that the refueling canal drain plugs have been removed and that the drains are clear of any obstructions that could impair their functioning. In addition to debris near the drains, attention must be given to any debris that is located where it could be moved to the drains in the event that the Containment Spray System is in operation and water is flowing to the drains. SR 3.6.18.1 must be performed before entering MODE 4 from MODE 5 after every filling of the canal to ensure that the plugs have been removed and that no debris that could impair the drains was deposited during the time the canal was filled. The 92 day Frequency was developed considering such factors as the inaccessibility of the drains, the absence of traffic in the vicinity of the drains, and the redundancy of the drains.

SR 3.6.18.2

Verifying the OPERABILITY of the ice condenser floor drains ensures that they will be able to perform their functions in the event of a DBA. Inspecting the drain valve disk ensures that the valve is performing its function of sealing the drain line from warm air leakage into the ice condenser during normal operation, yet will open if melted ice fills the line following a DBA. Verifying that the drain lines are not obstructed ensures their readiness to drain water from the ice condenser. The [18] month Frequency was developed considering such factors as the inaccessibility of the drains during power operation; the design of the ice condenser, which precludes melting and refreezing of the ice; and operating experience that has confirmed that the drains are found to be acceptable when the Surveillance is performed at an [18] month Frequency. Because of high radiation in the vicinity of the drains during power operation, this Surveillance is normally done during a shutdown.

REFERENCES

1. FSAR, Section [6.2].

2. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

APPLICABILITY (continued)

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

ACTIONS

A.1

Required Action A.1 is modified by a Note indicating that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," be entered if an inoperable CCW train results in an inoperable RHR loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

If one CCW train is inoperable, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE CCW train is adequate to perform the heat removal function. The 72 hour Completion Time is reasonable, based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this period.

B.1 and B.2

If the CCW train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the ~~LCO does not apply~~ Insert 12. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE ~~5~~ 4 within ~~30~~ 12 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. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.7.7.1

This SR is modified by a Note indicating that the isolation of the CCW flow to individual components may render those components inoperable but does not affect the OPERABILITY of the CCW System.

Verifying the correct alignment for manual, power operated, and automatic valves in the CCW flow path provides assurance that the proper flow paths exist for CCW operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves are verified to be in the correct position prior to locking,

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

sealing, or securing. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This Surveillance does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position.

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

SR 3.7.7.2

This SR verifies proper automatic operation of the CCW valves on an actual or simulated actuation signal. The CCW System is a normally operating system that cannot be fully actuated as part of routine testing during normal operation. 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. 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 3.7.7.3

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

REFERENCES

1. FSAR, Section [9.2.2].

2. FSAR, Section [6.2].

3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

LCO 3.0.6 and ensures the proper actions are taken for these components. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period.

B.1 and B.2

Insert 9

If the SWS train cannot be restored to OPERABLE status within the associated Completion Time, 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 ~~at least~~ MODE 3 within 6 hours and in MODE ~~5~~ 4 within ~~36~~ 12 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. Insert 2

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the SWS components or systems may render those components inoperable, but does not affect the OPERABILITY of the SWS.

Verifying the correct alignment for manual, power operated, and automatic valves in the SWS flow path provides assurance that the proper flow paths exist for SWS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

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

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.2

This SR verifies proper automatic operation of the SWS valves on an actual or simulated actuation signal. The SWS is a normally operating system that cannot be fully actuated as part of normal testing. 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. 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 3.7.8.3

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

REFERENCES

1. FSAR, Section [9.2.1].
2. FSAR, Section [6.2].
3. FSAR, Section [5.4.7].
4. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

The 7 day Completion Time is reasonable based on the low probability of an accident occurring during the 7 days that one cooling tower fan is inoperable (in one or more cooling towers), the number of available systems, and the time required to reasonably complete the Required Action.]

[B.1

-----REVIEWER'S NOTE-----
The [ ]°F is the maximum allowed UHS temperature value and is based on temperature limitations of the equipment that is relied upon for accident mitigation and safe shutdown of the unit.

With water temperature of the UHS > [90]°F, the design basis assumption associated with initial UHS temperature are bounded provided the temperature of the UHS averaged over the previous 24 hour period is ≤ [90]°F. With the water temperature of the UHS > [90]°F, long term cooling capability of the ECCS loads and DGs may be affected. Therefore, to ensure long term cooling capability is provided to the ECCS loads when water temperature of the UHS is > [90]°F, Required Action B.1 is provided to more frequently monitor the water temperature of the UHS and verify the temperature is ≤ [90]°F when averaged over the previous 24 hour period. The once per hour Completion Time takes into consideration UHS temperature variations and the increased monitoring frequency needed to ensure design basis assumptions and equipment limitations are not exceeded in this condition. If the water temperature of the UHS exceeds [90]°F when averaged over the previous 24 hour period or the water temperature of the UHS exceeds [ ]°F, Condition C must be entered immediately.]

[C.1 and C.2

If the Required Actions and Completion Times of Condition [A or B] are not met, or the UHS is inoperable for reasons other than Condition A [or B], the unit must be placed in a MODE in which the ~~LCO does not apply.~~ Insert 12 ~~To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE ~~5~~ 4 within ~~36~~ 12 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.]

Insert 2

Insert 12

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

[SR 3.7.9.1

This SR verifies that adequate long term (30 day) cooling can be maintained. The specified level also ensures that sufficient NPSH is available to operate the SWS pumps. The [24] hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES. This SR verifies that the UHS water level is ≥ [562] ft [mean sea level].]

[SR 3.7.9.2

This SR verifies that the SWS is available to cool the CCW System to at least its maximum design temperature with the maximum accident or normal design heat loads for 30 days following a Design Basis Accident. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES. This SR verifies that the average water temperature of the UHS is ≤ [90°F].]

[SR 3.7.9.3

Operating each cooling tower fan for ≥[15] minutes ensures that all fans are OPERABLE and that all associated controls are functioning properly. It also ensures that fan or motor failure, or excessive vibration, can be detected for corrective action. The 31 day Frequency is based on operating experience, the known reliability of the fan units, the redundancy available, and the low probability of significant degradation of the UHS cooling tower fans occurring between surveillances.]

[SR 3.7.9.4

This SR verifies that each cooling tower fan starts and operates on an actual or simulated actuation signal. The [18] month Frequency is consistent with the typical refueling 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.]

REFERENCES

1. FSAR, Section [9.2.5].
2. Regulatory Guide 1.27.

3. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the condition. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures. The 24 hour Completion Time is a typically reasonable time to diagnose, plan and possibly repair, and test most problems with the control room boundary.

C.1 and C.2

Insert 14

In MODE 1, 2, 3, or 4, if the inoperable CREFS 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~~ 4 within ~~36~~ 12 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. Insert 2

D.1 and D.2

[In MODE 5 or 6, or] during movement of [recently] irradiated fuel assemblies, if the inoperable CREFS train cannot be restored to OPERABLE status within the required Completion Time, action must be taken to immediately place the OPERABLE CREFS train in the emergency 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.

An alternative to Required Action D.1 is to immediately suspend activities that could result in a release of radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

Required Action D.1 is modified by a Note indicating to place the system in the toxic gas protection mode if automatic transfer to toxic gas protection mode is inoperable.

Insert 14

in which the overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 3).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.10.3

This SR verifies that each CREFS train starts and operates on an actual or simulated actuation signal. The Frequency of [18] months is specified in Regulatory Guide 1.52 (Ref. ~~3~~ 4).

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 potentially contaminated adjacent areas, is periodically tested to verify proper functioning of the CREFS. During the emergency mode of operation, the CREFS is designed to pressurize the control room ≥[0.125] inches water gauge positive pressure with respect to adjacent areas in order to prevent unfiltered inleakage. The CREFS is designed to maintain this positive pressure with one train at a makeup flow rate of [3000] cfm. The Frequency of [18] months on a STAGGERED TEST BASIS is consistent with the guidance provided in NUREG-0800 (Ref. ~~4~~ 5).

REFERENCES

1. FSAR, Section [6.4].

2. FSAR, Chapter [15].

3. Insert 4

4 ~~3.~~ Regulatory Guide 1.52, Rev. [2].

5 ~~4.~~ NUREG-0800, Section 6.4, Rev. 2, July 1981.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

LCO (continued)

The CREATCS is considered to be OPERABLE when the individual components necessary to maintain the control room temperature are OPERABLE in both trains. These components include the heating and cooling coils and associated temperature control instrumentation. In addition, the CREATCS must be operable to the extent that air circulation can be maintained.

APPLICABILITY

In MODES 1, 2, 3, 4, [5, and 6,] and during movement of [recently] irradiated fuel assemblies, the CREATCS must be OPERABLE to ensure that the control room temperature will not exceed equipment operational requirements following isolation of the control room. [The CREATCS is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days), due to radioactive decay.]

[In MODE 5 or 6,] CREATCS may not be required for those facilities that do not require automatic control room isolation.

ACTIONS

A.1

With one CREATCS train inoperable, action must be taken to restore OPERABLE status within 30 days. In this Condition, the remaining OPERABLE CREATCS train is adequate to maintain the control room temperature within limits. However, the overall reliability is reduced because a single failure in the OPERABLE CREATCS train could result in loss of CREATCS function. The 30 day Completion Time is based on the low probability of an event requiring control room isolation, the consideration that the remaining train can provide the required protection, and that alternate safety or nonsafety related cooling means are available.

B.1 and B.2

Insert 15

In MODE 1, 2, 3, or 4, if the inoperable CREATCS train cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE ~~that minimizes the risk~~ 4. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE ~~5~~ 4 within ~~36~~ 12 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. Insert 2

Insert 15

in which the overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 2).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

ACTIONS (continued)

C.1 and C.2

[In MODE 5 or 6, or] during movement of [recently] irradiated fuel, if the inoperable CREATCS train cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE CREATCS train must be placed in operation immediately. This action ensures that the remaining train is OPERABLE, that no failures preventing automatic actuation will occur, and that active failures will be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of 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.

D.1

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

E.1

If both CREATCS trains are inoperable in MODE 1, 2, 3, or 4, the control room CREATCS may not be capable of performing its intended function. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

This SR verifies that the heat removal capability of the system is sufficient to remove the heat load assumed in the [safety analyses] in the control room. This SR consists of a combination of testing and calculations. The [18] month Frequency is appropriate since significant degradation of the CREATCS is slow and is not expected over this time period.

REFERENCES

1. FSAR, Section [6.4].
2. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

If the ECCS pump room boundary is inoperable, the ECCS PREACS trains cannot perform their intended functions. Actions must be taken to restore an OPERABLE ECCS pump room boundary within 24 hours. During the period that the ECCS pump room boundary is inoperable, appropriate compensatory measures [consistent with the intent, as applicable, of GDC 19, 60, 64 and 10 CFR Part 100] should be utilized to protect plant personnel from potential hazards such as radioactive contamination, toxic chemicals, smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the condition. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures. The 24 hour Completion Time is a typically reasonable time to diagnose, plan and possibly repair, and test most problems with the ECCS pump room boundary.

<u>C.1 and C.2</u>

If the ECCS PREACS train or ECCS pump room boundary cannot be restored to OPERABLE status within the associated Completion Time, Insert 16 ~~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 at least MODE 3 within 6 hours, and in MODE ~~5~~ 4 within ~~36~~ 12 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. Insert 2

SURVEILLANCE REQUIREMENTS

<u>SR 3.7.12.1</u>

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 a month provides an adequate check on this system. Monthly heater operations dry out any moisture that may have accumulated in the charcoal from humidity in the ambient air. [Systems with heaters must be operated ≥10 continuous hours with the heaters energized. Systems without heaters need only be operated for ≥15 minutes to demonstrate the function of the system.] The 31 day Frequency is based on the known reliability of equipment and the two train redundancy available.

Insert 16

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 6). The ECCS PREACS does not impact the plant core damage frequency.

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.12.2

This SR verifies that the required ECCS PREACS testing is performed in accordance with the [Ventilation Filter Testing Program (VFTP)]. The [VFTP] includes testing HEPA filter performance, charcoal adsorbers efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test Frequencies and additional information are discussed in detail in the [VFTP].

SR 3.7.12.3

This SR verifies that each ECCS PREACS train starts and operates on an actual or simulated actuation signal. The [18] month Frequency is consistent with that specified in Reference 4.

SR 3.7.12.4

This SR verifies the integrity of the ECCS pump room enclosure. The ability of the ECCS pump room to maintain a negative pressure, with respect to potentially uncontaminated adjacent areas, is periodically tested to verify proper functioning of the ECCS PREACS. During the [post accident] mode of operation, the ECCS PREACS is designed to maintain a slight negative pressure in the ECCS pump room, with respect to adjacent areas, to prevent unfiltered LEAKAGE. The ECCS PREACS is designed to maintain a ≤[-0.125] inches water gauge relative to atmospheric pressure at a flow rate of [3000] cfm from the ECCS pump room. The Frequency of [18] months is consistent with the guidance provided in NUREG-0800, Section 6.5.1 (Ref. ~~6~~ 7).

This test is conducted with the tests for filter penetration; thus, an [18] month Frequency on a STAGGERED TEST BASIS is consistent with that specified in Reference 4.

[SR 3.7.12.5

Operating the ECCS PREACS bypass damper is necessary to ensure that the system functions properly. The OPERABILITY of the ECCS PREACS bypass damper is verified if it can be specified in Reference 4.]

BASES

REFERENCES

1. FSAR, Section [6.5.1].
2. FSAR, Section [9.4.5].
3. FSAR, Section [15.6.5].
4. Regulatory Guide 1.52 (Rev. 2).
5. 10 CFR 100.11.
6. Insert 4
7. ~~6.~~ NUREG-0800, Section 6.5.1, Rev. 2, July 1981.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

applicable, of GDC 19, 60, 61, 63, 64 and 10 CFR Part 100] should be utilized to protect plant personnel from potential hazards such as radioactive contamination, toxic chemicals, smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the condition. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures. The 24 hour Completion Time is a typically reasonable time to diagnose, plan and possibly repair, and test most problems with the fuel 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 FBACS trains are inoperable for reasons other than an inoperable fuel 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~~ 4 within ~~36~~ 12 hours. 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.] Insert 2

Insert 17

D.1 and D.2

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

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

Insert 17

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 6). The FBACS does not impact the plant core damage frequency.

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

ACTIONS (continued)

E.1

When two trains of the FBACS are inoperable during movement of [recently] 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 [recently] irradiated fuel assemblies in the fuel building. This does not preclude the movement of fuel to a safe position.

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 provides an adequate check on this system.

Monthly heater operation dries out any moisture accumulated in the charcoal from humidity in the ambient air. [Systems with heaters must be operated for ≥10 continuous hours with the heaters energized. Systems without heaters need only be operated for ≥15 minutes to demonstrate the function of the system.] The 31 day Frequency is based on the known reliability of the equipment and the two train redundancy available.

[SR 3.7.13.2

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

[SR 3.7.13.3

This SR verifies that each FBACS train starts and operates on an actual or simulated actuation signal. The [18] month Frequency is consistent with Reference ~~6~~.]

7

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.13.4

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 FBACS. During the [post accident] mode of operation, the FBACS is designed to maintain a slight negative pressure in the fuel building, to prevent unfiltered LEAKAGE. The FBACS is designed to maintain a ≤[-0.125] inches water gauge with respect to atmospheric pressure at a flow rate of [20,000] cfm to the fuel building. The Frequency of [18] months is consistent with the guidance provided in NUREG-0800, Section 6.5.1 (Ref. ~~7~~ 8).

An [18] month Frequency (on a STAGGERED TEST BASIS) is consistent with Reference ~~6~~ 7.

[SR 3.7.13.5

Operating the FBACS filter bypass damper is necessary to ensure that the system functions properly. The OPERABILITY of the FBACS filter bypass damper is verified if it can be closed. An [18] month Frequency is consistent with Reference ~~6~~ 7.]

REFERENCES

1. FSAR, Section [6.5.1].

2. FSAR, Section [9.4.5].

3. FSAR, Section [15.7.4].

4. Regulatory Guide 1.25.

5. 10 CFR 100.

6. Insert 4

7 ~~6~~. Regulatory Guide 1.52, Rev. [2].

8 ~~7~~. NUREG-0800, Section 6.5.1, Rev. 2, July 1981.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

C.1 and C.2

If the inoperable train or penetration room boundary cannot be restored to OPERABLE status within the associated Completion Time, 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 at least MODE 3 within 6 hours, and in MODE ~~5~~ 4 within ~~36~~ 12 hours. 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. Insert 2

Insert 18

SURVEILLANCE REQUIREMENTS

SR 3.7.14.1

Standby systems should be checked periodically to ensure that they function properly. As the environmental and normal operating conditions on this system are not severe, testing each train once every month provides an adequate check on this system. Monthly heater operation dries out any moisture that may have accumulated in the charcoal as a result of humidity in the ambient air. [Systems with heaters must be operated for ≥10 continuous hours with the heaters energized. Systems without heaters need only be operated for ≥15 minutes to demonstrate the function of the system.] The 31 day Frequency is based on the known reliability of equipment and the two train redundancy available.

SR 3.7.14.2

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

[SR 3.7.14.3

This SR verifies that each PREACS starts and operates on an actual or simulated actuation signal. The [18] month Frequency is consistent with that specified in Reference ~~5~~ 6.]

Insert 18

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 5). The PREACS does not impact the plant core damage frequency.

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[SR 3.7.14.4

This SR verifies the integrity of the penetration room enclosure. The ability of the penetration room to maintain a negative pressure, with respect to potentially uncontaminated adjacent areas, is periodically tested to verify proper function of PREACS. During the [post accident] mode of operation, the PREACS is designed to maintain a ≤[-0.125] inches water gauge relative to atmospheric pressure at a flow rate of [3000] cfm in the penetration room, with respect to adjacent areas, to prevent unfiltered LEAKAGE. The Frequency of [18] months is consistent with the guidance provided in NUREG-0800 (Ref. ~~8~~ 7).

The minimum system flow rate maintains a slight negative pressure in the penetration room area, and provides sufficient air velocity to transport particulate contaminants, assuming only one filter train is operating. The number of filter elements is selected to limit the flow rate through any individual element to about [3000] cfm. This may vary based on filter housing geometry. The maximum limit ensures that the flow through, and pressure drop across, each filter element are not excessive.

The number and depth of the adsorber elements ensure that, at the maximum flow rate, the residence time of the air stream in the charcoal bed achieves the desired adsorption rate. At least a [0.125] second residence time is necessary for an assumed [99]% efficiency.

The filters have a certain pressure drop at the design flow rate when clean. The magnitude of the pressure drop indicates acceptable performance, and is based on manufacturers' recommendations for the filter and adsorber elements at the design flow rate. An increase in pressure drop or a decrease in flow indicates that the filter is being loaded or that there are other problems with the system.

This test is conducted along with the tests for filter penetration; thus, the [18] month Frequency is consistent with that specified in Reference ~~5~~ 6.]

[SR 3.7.14.5

It is necessary to operate the PREACS filter bypass damper to ensure that the system functions properly. The OPERABILITY of the PREACS filter bypass damper is verified if it can be closed. An [18] month Frequency is consistent with that specified in Reference ~~5~~ 6.]

BASES

REFERENCES

1. FSAR, Section [6.5.1].
2. FSAR, Section [9.4.5].
3. FSAR, Section [15.6.5].
4. 10 CFR 100.
5. Insert 4
6. ~~5.~~ Regulatory Guide 1.52, Rev. [2].
7. ~~6.~~ NUREG-0800, Section 6.5.1, Rev. 2, July 1981.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

system in the [division]. The [12] hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining sequencer OPERABILITY. This time period also ensures that the probability of an accident (requiring sequencer OPERABILITY) occurring during periods when the sequencer is inoperable is minimal.

This Condition is preceded by a Note that allows the Condition to be deleted if the unit design is such that any sequencer failure mode will only affect the ability of the associated DG to power its respective safety loads under any conditions. Implicit in this Note is the concept that the Condition must be retained if any sequencer failure mode results in the inability to start all or part of the safety loads when required, regardless of power availability, or results in overloading the offsite power circuit to a safety bus during an event and thereby causes its failure. Also implicit in the Note, is that the Condition is not applicable to any train that does not have a sequencer.]

G.1 and G.2

Insert 1

If the inoperable AC electric power sources cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~30~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

H.1

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

Insert 1

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 8).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. ~~8~~ 9). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the DGs are in accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3), Regulatory Guide 1.108 (Ref. ~~9~~ 10), and Regulatory Guide 1.137 (Ref. ~~10~~ 11), as addressed in the ~~F~~SAR.

Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of [3740] V is 90% of the nominal 4160 V output voltage. This value, which is specified in ANSI C84.1 (Ref. ~~11~~ 12), allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90% or 3600 V. It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 90% of name plate rating. The specified maximum steady state output voltage of [4756] V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the DG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3).

SR 3.8.1.1

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank [and engine mounted tank] is at or above the level at which fuel oil is automatically added. The level is expressed as an equivalent volume in gallons, and is selected to ensure 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 [and engine mounted] 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~~ 11). 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 automatic fuel transfer systems are OPERABLE.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[The Frequency for this SR is variable, depending on individual system design, with up to a [92] day interval. The [92] day Frequency corresponds to the testing requirements for pumps as contained in the
12 ASME Code, Section XI (Ref. ~~11~~); however, the design of fuel transfer systems is such that pumps operate automatically or must be started manually in order to maintain an adequate volume of fuel oil in the day [and engine mounted] tanks during or following DG testing. In such a case, a 31 day Frequency is appropriate. Since proper operation of fuel transfer systems is an inherent part of DG OPERABILITY, the Frequency of this SR should be modified to reflect individual designs.]

SR 3.8.1.7

See SR 3.8.1.2.

[SR 3.8.1.8

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

This SR is modified by a Note. The reason for the Note is that, during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the

BASES

SURVEILLANCE REQUIREMENTS (continued)

potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment.] Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.9

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. [For this unit, the single load for each DG and its horsepower rating is as follows:] This Surveillance may be accomplished by:

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

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

As required by IEEE-308 (Ref. ~~12~~ 13), the load rejection test is acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint, or 15% above synchronous speed, whichever is lower.

The time, voltage, and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The 3 seconds specified is equal to 60% of a typical 5 second load sequence interval associated with sequencing of the largest load. The voltage and frequency specified are consistent with the design range of the equipment powered by the DG. SR 3.8.1.9.a corresponds to the maximum frequency excursion, while

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.9.b and SR 3.8.1.9.c are steady state voltage and frequency values to which the system must recover following load rejection. The [18 month] Frequency is consistent with the recommendation of Regulatory Guide 1.108 (Ref. ~~9~~ 10).

This SR is modified by two Notes. The reason for Note 1 is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

Note 2 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ [0.9]. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. Under certain conditions, however, Note 2 allows the Surveillance to be conducted at a power factor other than ≤ [0.9]. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ [0.9] results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to [0.9] while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power factor of [0.9] may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to [0.9] without exceeding the DG excitation limits.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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

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

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

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

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.

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. 10

This SR has been modified by two Notes. The reason for Note 1 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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

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

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

SR 3.8.1.11

10

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

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

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency of [18 months] is consistent with the recommendations of 10 Regulatory Guide 1.108 (Ref. ~~9~~), paragraph 2.a.(1), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations. The reason for Note 2 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

[SR 3.8.1.12

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

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

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

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

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

<u>SR 3.8.1.14</u>

Regulatory Guide 1.108 (Ref. ~~9~~ 10), paragraph 2.a.(3), requires demonstration once per 18 months that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ [2] hours of which is at a load equivalent to 110% of the continuous duty rating and the remainder of the time at a load equivalent to the continuous duty rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.

The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The [18 month] Frequency is consistent with the recommendations of 10 Regulatory Guide 1.108 (Ref. ~~9~~), paragraph 2.a.(3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This Surveillance is modified by three Notes. Note 1 states that momentary transients due to changing bus loads do not invalidate this test. Similarly, momentary power factor transients above the power factor limit will not invalidate the test. The reason for Note 2 is that during operation with the reactor critical, performance of this Surveillance could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR. Note 3 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ [0.9]. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. Under certain conditions, however, Note 3 allows the Surveillance to be conducted as a power factor other than ≤ [0.9]. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ [0.9] results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to [0.9] while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power factor of [0.9] may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained close as practicable to [0.9] without exceeding the DG excitation limits.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.15

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

This SR is modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. The load band is provided to avoid routine overloading of the DG. Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. The requirement that the diesel has operated for at least [2] hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Momentary transients due to changing bus loads do not invalidate this test. Note 2 allows all DG starts to be preceded by an engine prelube period to minimize wear and tear on the diesel during testing.

SR 3.8.1.16

As required by Regulatory Guide 1.108 (Ref. ~~9~~ 10), paragraph 2.a.(6), this Surveillance ensures that the manual synchronization and automatic load transfer from the DG to the offsite source can be made and the DG can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the DG to reload if a subsequent loss of offsite power occurs. The DG is considered to be in ready to load status when the DG is at rated speed and voltage, the output breaker is open and can receive an autoclose signal on bus undervoltage, and the load sequence timers are reset.

The Frequency of [18 months] is consistent with the recommendations of Regulatory Guide 1.108 (Ref. ~~9~~ 10), paragraph 2.a.(6), and takes into consideration unit conditions required to perform the Surveillance.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

[SR 3.8.1.17

Demonstration of the test mode override ensures that the DG availability under accident conditions will not be compromised as the result of testing and the DG will automatically reset to ready to load operation if a LOCA actuation signal is received during operation in the test mode. Ready to load operation is defined as the DG running at rated speed and voltage with the DG output breaker open. These provisions for automatic switchover are required by IEEE-308 (Ref. 13) paragraph 6.2.6(2). ok

The requirement to automatically energize the emergency loads with offsite power is essentially identical to that of SR 3.8.1.12. The intent in the requirement associated with SR 3.8.1.17.b is to show that the emergency loading was not affected by the DG operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

The [18 month] Frequency is consistent with the recommendations of 10 Regulatory Guide 1.108 (Ref. ~~8~~), paragraph 2.a.(8), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

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

SR 3.8.1.18

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

The Frequency of [18 months] is consistent with the recommendations of 10 Regulatory Guide 1.108 (Ref. ~~9~~), paragraph 2.a.(2), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs. The reason for Note 2 is that the performance of the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

<u>SR 3.8.1.20</u>

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

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.

2. FSAR, Chapter [8].

3. Regulatory Guide 1.9, Rev. 3.

4. FSAR, Chapter [6].

5. FSAR, Chapter [15].

6. Regulatory Guide 1.93, Rev. 0, December 1974.

7. Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability," July 2, 1984.

8. Insert 4

9 ~~8.~~ 10 CFR 50, Appendix A, GDC 18.

10 ~~9.~~ Regulatory Guide 1.108, Rev. 1, August 1977.

11 ~~10.~~ Regulatory Guide 1.137, Rev. [ ], [date].

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

13 ~~12.~~ IEEE Standard 308-1978.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

C.1

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

If one of the required DC electrical power subsystems is inoperable for reasons other than Condition A or B (e.g., inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst- case single failure could, however, result in the loss of minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 7) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

D.1 and D.2

If the inoperable DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which ~~the LCO does not apply~~ Insert 1. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. ~~The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 7).~~ Insert 2

Insert 1

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 8).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge helps to ensure the effectiveness of the battery chargers, which support the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated DC subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer ([2.20] Vpc or [127.6] V at the battery terminals). This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. ~~8~~ 9).

SR 3.8.4.2

This SR verifies the design capacity of the battery chargers. According to 10 Regulatory Guide 1.32 (Ref. ~~8~~), the battery charger supply is recommended to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying [400] amps at the minimum established float voltage for [8] hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of AC power. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least [2] hours.

The other option requires that each battery charger be capable of recharging the battery after a service test coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these demands occur). This level of loading may not normally be available following the

BASES

SURVEILLANCE REQUIREMENTS (continued)

battery service test and will need to be supplemented with additional loads. The duration for this test may be longer than the charger sizing criteria since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is ≤ [2] amps.

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

SR 3.8.4.3

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

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

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

The reason for Note 2 is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial

BASES

SURVEILLANCE REQUIREMENTS (continued)

Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308-[1978].
4. FSAR, Chapter [8].
5. FSAR, Chapter [6].
6. FSAR, Chapter [15].
7. Regulatory Guide 1.93, December 1974.
8. Insert 4
9 ~~8~~. IEEE-450-[1995].
10 ~~9~~. Regulatory Guide 1.32, February 1977.
11 ~~10~~. Regulatory Guide 1.129, December 1974.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS

A.1

With a required inverter inoperable, its associated AC vital bus becomes inoperable until it is [manually] re-energized from its [Class 1E constant voltage source transformer or inverter using internal AC source].

For this reason a Note has been included in Condition A requiring the entry into the Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating." This ensures that the vital bus is re-energized within 2 hours.

Required Action A.1 allows 24 hours to fix the inoperable inverter and return it to service. The 24 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the AC vital bus is powered from its constant voltage source, it is relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible inverter source to the AC vital buses is the preferred source for powering instrumentation trip setpoint devices.

B.1 and B.2

If the inoperable devices or components cannot be restored to OPERABLE status within the required Completion Time, the unit must be Insert 9 brought to a MODE in which ~~the LCO does not apply~~. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~38~~ 12 hours. The allowed Completion Times are reasonable, ~~based on operating experience, to reach the required unit conditions from~~ full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

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

REFERENCES

1. FSAR, Chapter [8].

2. FSAR, Chapter [6].

3. FSAR, Chapter [15].

4. Insert 4

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.

BASES

ACTIONS (continued)

D.1 and D.2

If the inoperable distribution subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the ~~LCO does not apply~~. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE ~~5~~ 4 within ~~36~~ 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. Insert 2

Insert 9

E.1

Condition E corresponds to a level of degradation in the electrical power distribution system that causes a required safety function to be lost. When more than one inoperable electrical power distribution subsystem results in the loss of a required function, the plant is in a condition outside the accident analysis. Therefore, no additional time is justified for continued operation. LCO 3.0.3 must be entered immediately to commence a controlled shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

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

REFERENCES

1. FSAR, Chapter [6].

2. FSAR, Chapter [15].

3. Regulatory Guide 1.93, December 1974.

4. Insert 4

Insert 9

overall plant risk is reduced as justified in WCAP-16294-NP (Ref. 4).

Insert 2

Remaining in the Applicability of the LCO is acceptable since the overall plant risk is lower in MODE 4 than in MODE 5. In MODE 4 there are two means of decay heat removal, which provide diversity and defense in depth. Voluntary entry into MODE 5 may be made since MODE 5 is also acceptable from a risk perspective.

Insert 4

WCAP-16294-NP, "Risk-Informed Evaluation of Changes to Tech Spec Required Action Endstates for Westinghouse NSSS PWRs," August 2005.