NEI

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November 26, 2008

Ms. Tanya M. Mensah
Senior Project Manager
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Response to NRC Request for Additional Information Regarding PWROG Topical Report WCAP-16294-NP, Revision 0, "Risk-Informed Evaluation of Changes to Technical Specification Required Action Endstates for Westinghouse NSSS PWRs" (MD5134).

Project Number: 689

Dear Ms. Mensah:

Attached for NRC review are the responses to the NRC's October 23, 2008, Request for Additional Information (RAI) regarding WCAP-16294-NP, which addresses the endstates risk-informed technical specifications initiative (Initiative 1) for Westinghouse plants. Attachment 1 provides the RAI responses, and Attachment 2 provides proposed markups to WCAP-16294-NP associated with certain RAI responses. A response to previous NRC RAIs on this topical report was provided by NEI's letter to NRC of December 12, 2007.

Please note that the changes in Attachment 2, to WCAP-16294-NP pages 2-1, 6-61, 6-63, 6-64, 6-66, 6-67, 6-69, 6-81, 6-87, 6-90, and 6-92, were made to the markups of those WCAP pages that were transmitted in Attachment 2 of the NEI letter dated December 12, 2007.

The changes to WCAP-16294-NP contained in Attachment 2 of this letter will also be incorporated into the approved version of WCAP-16294-NP, which will be issued as Revision 1, following receipt of the NRC's Final Safety Evaluation. In addition, please note that the final approved version of the WCAP will include related editorial changes such as changes to the table of contents and section number changes due to deleted sections of the WCAP.

Additionally, the Technical Specification and Bases changes justified in WCAP-16294-NP that are included in Attachment B of the WCAP will be deleted from the approved WCAP and will be submitted to the NRC separately via a TSTF traveler.

We appreciate NRC staff's efforts to review this report. Please contact me at 202-739-8083; reb@nei.org should you have any questions.

Sincerely,

Biff Bradley

Attachments

c: Mr. Carl S. Schulten, NRR/ADRO/DIRS/IT, NRC
NRC Document Control Desk

NEI letter dated November 25, 2008

Containment and Ventilation Branch Questions

NRC RAI 1

TS 3.6.4A, Containment Pressure (Atmospheric, Dual, and Ice Condenser) and TS 3.6.4B-B, Containment Pressure (Subatmospheric): The basis for the proposed changes for the containment pressure TS use vague language such as "variations in containment pressure are expected to be small, therefore, any increase above the Technical Specification limit is expected to be small...". No discussion is provided for the basis of the statement. There is no indication of the processes that can cause containment pressure to be greater than or lower than the specified range or if (and why) changes from these processes will be rapid or slow. There is no discussion of any automatic system actuations that will occur if the containment pressure is too high or too low. Please provide a more comprehensive basis for the statement "variations in containment pressure are expected to be small, therefore, any increase above the Technical Specification limit is expected to be small..."

Response to RAI 1

The PWROG withdraws the proposed endstate changes to TS 3.6.4A and TS 3.6.4B. WCAP-16294-NP will be revised to delete the discussions associated with these proposed changes. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 2

TS 3.6.4A, Containment Pressure (Atmospheric, Dual, and Ice Condenser) and TS 3.6.4B-B, Containment Pressure (Subatmospheric): The basis provided for the proposed change discussed states that 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." Please provide additional information that justifies that inadvertent actuation of containment heat removal systems, with containment pressure less than the minimum TS limit, the containment minimum (negative) design pressure would not be exceeded. Include in the discussion atmospheric containment designs that are not provided with vacuum relief systems.

Response to RAI 2

The PWROG withdraws the proposed endstate changes to TS 3.6.4A and TS 3.6.4B. WCAP-16294-NP will be revised to delete the discussions associated with these proposed changes. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 3

TS 3.6.4A, Containment Pressure (Atmospheric, Dual, and Ice Condenser) and TS 3.6.4B-B, Containment Pressure (Subatmospheric): The minimum TS containment pressure is used as input to determining the performance of the emergency core cooling system (ECCS) pumps. Provide a discussion in the basis for the change that there will be sufficient containment pressure for ECCS operation and that the criteria of 10 CFR 50.46 will be satisfied following a loss-of-coolant (LOCA) in Mode 4 with the containment below the minimum pressure limiting condition for operation (LCO). Include core reflood and ECCS pump net positive suction head available (NPSHa) in the discussion.

Response to RAI 3

The PWROG withdraws the proposed endstate changes to TS 3.6.4A and TS 3.6.4B. WCAP-16294-NP will be revised to delete the discussions associated with these proposed changes. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 4

TS 3.6.15, Ice Bed (Ice Condenser): Please provide a discussion in the basis for the change or the reference to a previously submitted evaluation that provides justification that with Ice Bed inoperable there will be a sufficient source of borated water (via the containment sump) for long-term ECCS operation and that the criteria of 10 CFR 50.46 will be satisfied following a LOCA in Mode 4. Include containment spray operation, ECCS pump vortex, and ECCS pump net positive suction head available (NPSHa) in the discussion.

Response to RAI 4

The PWROG withdraws the proposed endstate changes to TS 3.6.15. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 5

TS 3.6.16, Ice Condenser Doors (Ice Condenser): Please provide a discussion or the reference to a previously submitted evaluation that documents that when the Ice Condenser doors are inoperable-open, there will not be excessive sublimation nor obstruction of flow passages that will render the ice bed inoperable based on TS 3.6.15.

Response to RAI 5

The PWROG withdraws the proposed endstate changes to TS 3.6.16. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 6

TS 3.6.16, Ice Condenser Doors (Ice Condenser): Please provide a discussion that documents that when the Ice Condenser doors are determined to be inoperable in the closed position, for a LOCA while in Mode 4, there will be an adequate source of borated water available to the containment sump for long-term ECCS and containment spray heat removal functions in the recirculation mode. The evaluation should include ECCS pump NPSHa and ECCS pump vortex.

Response to RAI 6

The PWROG withdraws the proposed endstate changes to TS 3.6.16. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 7

TS 3.6.17, Divided Barrier Integrity (Ice Condenser): Please provide a discussion of the basis for the change, or reference to a previously submitted evaluation, which provides justification that with the divided barrier inoperable, in the event of a LOCA while in Mode 4, the pressure in the containment lower compartment will be great enough to open the ice condenser doors permitting the steam air mixture to enter and flow through the ice condenser. If the ice condenser doors will not open, two trains of containment spray will be available for control of containment peak temperature and pressure control. Discuss, or reference, previously submitted documentation that show that containment spray alone without the benefit of the ice condenser is sufficient to control peak containment temperature and pressure. Also discuss, or reference previously submitted documentation that demonstrates that without the melt from the ice condenser, there will be an adequate source of borated water available to the containment sump for long-term ECCS and containment spray heat removal functions in the recirculation mode. The evaluation should include ECCS pump NPSHa and ECCS pump vortex.

Response to RAI 7

The PWROG withdraws the proposed endstate changes to TS 3.6.17. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 8

TS 3.6.5B, Containment Air Temperature (Ice Condenser) and TS 3.6.5C, Containment Air Temperature (Subatmospheric): The bases for proposed changes address temperatures above the maximum temperature LCO. Please provide basis that discusses why it is acceptable to be in Mode 4 with the containment below the minimum temperature LCO.

Response to RAI 8

The PWROG withdraws the proposed endstate changes to TS 3.6.5A, TS 3.6.5B, and TS 3.6.5C. WCAP-16294-NP will be revised to delete the discussions associated with these proposed changes. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 9

TS 3.6.8, Shield Building (Dual and Ice Condenser): Please provide a discussion or the reference to a previously submitted evaluation which documents, with the Shield Building inoperable, both trains Shield Building Air Cleanup System (Dual and Ice Condenser) remains operable.

Response to RAI 9

The PWROG withdraws the proposed endstate changes to TS 3.6.8. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 10

TS 3.6.8, Shield Building (Dual and Ice Condenser): It is not clear if containment vacuum relief systems installed in Westinghouse Dual Containment design plants rely on the shield building for proper operation. If the containment vacuum relief draws air from the annulus between the shield building and the containment the system design may be based on a maximum shield building leakage. Please provide a discussion of any role the shield building may perform in the operation of containment vacuum relief systems in Mode 4.

Response to RAI 10

The PWROG withdraws the proposed endstate changes to TS 3.6.8. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 11

TS 3.6.8, Shield Building (Dual and Ice Condenser): The NEI response to NRC Request for Additional Information Regarding PWROG TR WCAP-16294-NP, Revision 0, dated December 12, 2007, revised the Defense-in-Depth Considerations for TS 3.6.8 (TR page 6-81). The change does not appear to be related to any specific RAI. Provide an explanation for the revision and why the change is acceptable.

Response to RAI 11

The PWROG withdraws the proposed endstate changes to TS 3.6.8. WCAP-16294-NP will be revised to delete the discussion associated with this proposed change. Attachment 2 contains the changes to WCAP-16294-NP that reflect these changes.

NRC RAI 12

TR WCAP-16294-NP, Revision 0, states that when in Mode 4 the secondary side steam pressure will be at normal operating pressure. Please verify that when the reactor coolant system (RCS) average temperature is decreased from approximately 560°F in Mode 1 to less than 350°F in Mode 4 the pressure in the secondary side remains at normal operating pressure. If secondary side pressure is not at normal operating pressure in Mode 4 please provide verification that there will be sufficient pressure to operate the turbine driven auxiliary feedwater pump. If secondary side steam pressure in Mode 4 will be less than normal operating pressure in Mode 1 please update all references in TR WCAP-16294-NP, Revision 0, and in the RAI responses.

Response to RAI 12

The secondary side steam pressure decreases as the RCS Tavg is reduced from the hot full power RCS Tavg in Mode 1, to the RCS Tavg in Mode 4. Therefore the secondary side steam pressure in Mode 4 will be less than the normal operating secondary side steam pressure in Mode 1. The turbine driven auxiliary feedwater (TDAFW) pump is designed to operate with a steam pressure of approximately 92 psia for some plants. It should be noted that this change does not impact the evaluations and conclusions contained in WCAP-16294-NP. WCAP-16294-NP will be revised as identified in the mark-ups in Attachment 2 to reflect a reduced secondary side steam pressure in Mode 4.

The requirement to maintain the TDAFW train available to remain in Mode 4 will be addressed by a licensing commitment to include a Tier 2 requirement that will be located in the Technical Specification Bases, a Licensee Controlled Document, or implementing procedures. The addition of this Tier 2 requirement would be contained in the Implementation Guidance that will be issued for implementing this change. If a sufficient steam supply is unavailable during the application of the Mode 4 end state, the unit's configuration risk management program will direct the appropriate actions to be taken. The risk impact is managed through the program in place to implement 10 CFR 50.65(a)(4) and its implementation guidance, NRC Regulatory Guide 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants." Regulatory Guide 1.182 endorses the guidance in Section 11 of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." This program will determine the safest course of action for an emergent condition in Mode 4 that renders the TDAFW train unavailable, and could include proceeding to a Mode 5 endstate in the affected Specifications.

Attachment 2

WCAP-16294-NP Markups to Address NRC RAIs Dated 10/23/08

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

[NEI Letter, 12/12/07]

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

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	Less than 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%

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%

Less than

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	(Less than) 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 Less than	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.

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 will be less than ~~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.

- 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~~ is less than 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.

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

DELETE

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.

DELETE

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

DELETE

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 available ~~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.

DELETE

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

DELETE

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.~~ available 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

DELETE

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.

DELETE

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?~~ available 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

DELETE

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.~~ available. 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

DELETE

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.

DELETE

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 available 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.

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

DELETE

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

DELETE

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~~ available 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.

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~~ 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 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

DELETE

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.

<u>Limiting Condition for Operation</u>

The ice bed shall be operable.

DELETE

<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 B.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 B.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>

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 DELETE

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.

DELETE

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~~ available 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)

DELETE

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.

DELETE

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 available to ~~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.