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DCP/NRC1254
NSD-NRC-98-5568
Docket No.: 52-003

February 11, 1998

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: T. R. QUAY

SUBJECT: AP600 RESPONSE TO FSER OPEN ITEMS

Dear Mr. Quay:

Enclosed with this letter are the Westinghouse responses to FSER open items on the AP600. A summary of the enclosed responses is provided in Table 1. Included in the table is the FSER open item number, the associated OITS number, and the status to be designated in the Westinghouse status column of OITS.

The NRC should review the enclosures and inform Westinghouse of the status to be designated in the "NRC Status" column of OITS.

Please contact me on (412) 374-4334 if you have any questions concerning this transmittal.

Susan Tanto for
Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

jml

Enclosure

cc: W. C. Huffman, NRC (Enclosure)
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Table 1
List of FSER Open Items Included in Letter DCP/NRC1254

FSER Open Item	OITS Number	Westinghouse status in OITS
410.414F(R1)	6520	CONFIRM-W
480.1115F(R1)	6492	CONFIRM-W

Enclosure to Westinghouse
I DCP/NRC1254

bruary 11, 1998

Question 410.414F (OITS - 6520) REVISION 1 TO RESPONSE

The staff's comments on the main control room habitability system technical specification are reflected in the mark-up to TS 3.7.6 provided in enclosure 2 to this letter. Westinghouse is requested to incorporate these changes. This is an open item.

Response: REVISION 1

Items a through g summarize the changes provided in the NRC mark-up. A response is provided for each item.

a) LCO Condition D (LCO and Bases)

Condition D is marked up to add Required Action D.2: Be in MODE 4 with a Completion Time of 12 hours.

Response

The AP600 Required Actions D.1 (Be in MODE 3 (within 6 hours)) and D.2 (Be in MODE 5 (within 36 hours)) are consistent with STS NUREG-1431. NUREG-1431 does not include any precedents for specification of MODE 4 in actions which end in MODE 5. The most directly applicable NUREG-1431 precedent is LCO 3.7.10, Control Room Emergency Filtration System (CREFS), Condition B, which is identical to the existing AP600 Condition D.

No changes to AP600 Technical Specifications are required.

b) SR 3.7.6.1 (LCO and Bases)

SR 3.7.6.1 is marked up to change the temperature to ≤ 75°F.

The second sentence of the SR 3.7.6.1 Bases is marked as follows:

> The surveillance limit of 75°F is the initial MCR envelope heat sink temperature used in the VES thermal analysis.

Response

The requested changes will be incorporated in the AP600 Technical Specifications.

c) SR 3.7.6.5 (LCO and Bases)

SR 3.7.6.5 is marked up to change dampers to valves.

The first sentence of the SR 3.7.6.5 Bases is marked up to change devices to valves.

Response

The requested changes will be incorporated in the AP600 Technical Specifications.

d) SR 3.7.6.9

SR 3.7.6.9 is marked up to read as follows:

> Verify that one VES air delivery train maintains an 1/8 inch water gauge positive pressure in the MCR envelope relative to the adjacent areas at the required air addition flow rate of 60 ± 5 scfm using the safety related compressed air emergency air storage tanks.

The Bases discussion of SR 3.7.6.9 is marked up to reflect the pressure and flow rate requirements.

Response

The NRC requested additions to SR 3.7.6.9 and the associated Bases will be incorporated as shown in the attached AP600 markup (SR renumbered as SR 3.7.6.10 in the markup).

e) SR 3.7.6.10

New surveillance, SR 3.7.6.10, has been added as follows:

Verify that the air quality of the air storage tanks meets the requirements of Appendix C, Table C-1 of ASHRAE Standard 62.

Frequency - Quarterly

Response

SR 3.7.6.10 will be added as requested, except that the Frequency will be specified as 92 days, and the surveillance will be placed in order with the existing surveillances according to Frequency as SR 3.7.6.5 (and the subsequent SRs renumbered), consistent with NUREG-1431.

The following Bases discussion of this new surveillance is included in the mark-up:

SR 3.7.6.5

Verification that the air quality of the air storage tanks meets the requirements of Appendix C, Table C-1 of ASHRAE Standard 62 is required every 92 days. If air has not been added to the air storage tanks since the previous verification, verification may be accomplished by confirmation of the acceptability of the previous surveillance results along with examination of the documented record of air make-up. The Purpose of ASHRAE Standard 62 states: "This standard specifies minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health effects." Verification of the initial air quality (in combination with the other surveillances) ensures that breathable air is available for 11 MCR occupants for at least 72 hours.

f) SR 3.7.6.11

A new surveillance, SR 3.7.6.11, is proposed in the NRC mark-up.

Verify that the maximum unfiltered air in-leakage (infiltration) into the MCR envelope under accident conditions is 5 scfm when the VES is operating and 140 scfm when only VBS is operating during "high" gaseous radioactivity signal in accordance with ASTM E741.

Response

Considering that the existing MCR VES pressurization surveillance demonstrates the integrity of the envelope, additional testing for MCR in-leakage is not needed. See response to RAI 410.379F.

g) Bases Mark-up

In addition to the LCO-related Bases changes discussed above, the NRC Bases mark-up includes changes to the VES system description and to the initial MCR temperature (75°F).

Response

The NRC-proposed Bases changes are in general agreement with the Bases mark-up provided by Westinghouse letter DCP/NRC1071, dated October 10, 1997. A new Bases mark-up has been prepared which combines the NRC and Westinghouse mark-ups.

SSAR Revision: See attached markup.

RAI 410.414 F

3.7 PLANT SYSTEMS

3.7.6 Main Control Room Habitability System (VES)

LCO 3.7.6 THE ~~Two~~ Main Control Room (MCR) Habitability System ~~trains~~ shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One VES ~~train~~ VALVE OR DAMPER inoperable.	A.1 Restore VES ~~train~~ to OPERABLE status.	7 days
B. MCR air temperature not within limit.	B.1 Restore MCR air temperature to within limit.	24 hours
C. Loss of integrity of MCR pressure boundary.	C.1 Restore MCR pressure boundary to OPERABLE status	24 hours
D. Required Action and associated Completion Time of Conditions A, B, or C not met in MODE 1, 2, 3, or 4.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours
E. Required Action and associated Completion Time of Conditions A, B, or C not met during movement of irradiated fuel.	E.1 Suspend CORE ALTERATIONS. AND E.2 Suspend movement of irradiated fuel assemblies.	Immediately Immediately

(continued)

410.414F(R1)-4

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. ~~Two~~ VES ~~trains~~ inoperable in MODE 1, 2, 3, or 4.	F.1 Be in MODE 3.	6 hours
	AND	
	F.2 Be in MODE 4.	12 hours
	AND	
	F.3 Restore ~~one~~ VES ~~train~~ to OPERABLE status.	36 hours
G. ~~Two~~ VES ~~trains~~ inoperable during movement of irradiated fuel.	G.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	G.2 Suspend movement of irradiated fuel assemblies.	Immediately

RAI 410.414F

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.6.1	Verify Main Control Room air temperature is ≤ ~~78~~ 75 °F.	24 hours
SR 3.7.6.2	Verify that the compressed air storage tanks are pressurized to [≥ 3400 psig].	24 hours
SR 3.7.6.3	Verify that each VES air delivery isolation valve is OPERABLE.	In accordance with the Inservice Testing Program
SR 3.7.6.4	Verify that each VES air header manual isolation valve is in an open position.	31 days
INSERT SR 3.7.6.5		
SR 3.7.6.~~5~~ 6	Verify that all VBS Main Control Room isolation ~~dampers~~ VALVES are OPERABLE and will close upon receipt of an actual or simulated actuation signal.	24 months
SR 3.7.6.~~6~~ 7	Verify that each VES pressure relief isolation valve within the MCR pressure boundary is OPERABLE.	In accordance with the Inservice Testing Program
SR 3.7.6.~~7~~ 8	Verify that each VES pressure relief damper is OPERABLE.	24 months

(continued)

INSERT SR 3.7.6.5 PAGE 3.7-14

SR 3.7.6.5

Verify that the air quality of the air storage tanks meets the requirements of Appendix C, Table C-1 of ASHRAE Standard 62.

Frequency - 92 days

RAI 410.414 F REV. 1

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.6.~~8~~ 9	Verify that the self contained pressure regulating valve in each VES ~~train~~ AIR DELIVERY FLOW PATH is OPERABLE.	In accordance with the Inservice Testing Program
SR 3.7.6.~~9~~ 10 REPLACE WITH INSERT	~~Verify that one VES air delivery train maintains a positive pressure in the MCR, relative to the adjacent areas, at the required air addition flowrate.~~	24 months

RAI 410.414F LCO 3.7.6 Main Control Room Habitability System (VES)

INSERT SR 3.7.6.10 PAGE 3.7-15

SR 3.7.6.10

Verify that one VES air delivery flow path maintains an 1/8 inch water gauge positive pressure in the MCR envelope relative to the adjacent areas at the required air addition flow rate of 60 ± 5 scfm using the safety related compressed air emergency air storage tanks.

410.414F(R1)-9

RAI 410 414F

B 3.7 PLANT SYSTEMS

B 3.7.6 Main Control Room Emergency Habitability System

BASES

BACKGROUND

The Main Control Room Habitability System (VES) provides a protected environment from which operators can control the plant following an uncontrolled release of radioactivity. The system is designed to operate following a Design Basis Accident (DBA) which requires protection from the release of radioactivity. In these events, the Nuclear Island Non-Radioactive Ventilation System (VBS) would continue to function if AC power is available. If AC power is lost or a High-2 main control room (MCR) radiation signal is received, the VES is actuated. The major functions of the VES are: 1) to provide forced ventilation to deliver an adequate supply of breathable air for the MCR occupants; 2) to provide forced ventilation to maintain the MCR at a 1/8 inch water gauge positive pressure with respect to the surrounding areas; and 3) to limit the temperature increase of the MCR equipment and facilities that must remain functional during an accident, via the heat absorption of passive heat sinks.

The VES consists of ~~two redundant trains each with~~ TWO AIR DELIVERY FLOW PATHS, compressed air storage tanks, ~~and~~ THE associated valves, piping, and instrumentation. ~~Each set of~~ tanks contains enough breathable air to supply the required air flow to the MCR for at least 72 hours. The VES system is designed to maintain CO_2 concentration less than 0.5% for up to 11 MCR occupants. ~~With both trains operating. With one train operating, VES maintains CO_2 concentration less than 0.5% for up to 5 MCR occupants, and maintains CO_2 concentration less than 1.0% for up to 11 MCR occupants.~~

Sufficient thermal mass exists in the surrounding concrete structure (including walls, ceiling and floors) to absorb the heat generated inside the MCR, which is initially at or below 72°F. Heat sources inside the MCR include operator workstations, emergency lighting and occupants. Sufficient insulation is provided surrounding the MCR pressure boundary to preserve the minimum required thermal capacity of the heat sink. The insulation also limits the heat gain from the adjoining areas following the loss of VBS cooling.

75

(continued)

410.414F(R1)-1

RAI 410.414 F

BASES

BACKGROUND (continued)

~~If the VBS remains unavailable following the 72 hour period, cooling of the MCR air is achieved by portable air coolers.~~

INSERT

The compressed air storage tanks are initially pressurized to 3400 psig. During operation of the VES, a self contained pressure regulating valve maintains a constant downstream pressure regardless of the upstream pressure. An orifice downstream of the regulating valve is used to control the air flow rate into the MCR. The MCR is maintained at a 1/8 inch water gauge positive pressure to minimize the infiltration of airborne contaminants from the surrounding areas.

APPLICABLE SAFETY ANALYSES

~~Two redundant sets of~~ THE compressed air storage tanks are sized such that ~~each~~ THE set of tanks has a combined capacity that provides at least 72 hours of VES operation.

Operation of the VES is automatically initiated by either of two safety related signals: 1) undervoltage to Class 1E battery charger, or 2) high-2 particulate or iodine radioactivity.

In the event of a loss of all AC power, the VES functions to provide ventilation, pressurization, and cooling of the MCR pressure boundary.

In the event of a high level of gaseous radioactivity outside of the MCR, the VBS continues to operate to provide pressurization and filtration functions. The MCR air supply downstream of the filtration units is monitored by a safety related radiation detector. Upon ~~exceeding a predetermined~~ AN undervoltage to Class 1E battery charger or high-2 particulate or iodine radioactivity setpoint, a safety related signal is generated to isolate the MCR from the VBS and to initiate air flow from the VES storage tanks. Isolation of the VBS consists of closing safety related ~~dampers~~ VALVES in the supply and exhaust ducts that penetrate the MCR pressure boundary. VES air flow is initiated by a safety related signal which opens the isolation valves in the VES supply lines.

The VES functions to mitigate a DBA or transient that either assumes the failure of or challenges the integrity of the fission product barrier.

(continued)

410.414F (R1) - 11

RAI 410.414F LCO 3.7.6 Main Control Room Habitability System (VES)

INSERT BACKGROUND PAGE B 3.7-27

In the unlikely event that power to the VBS is unavailable for more than 72 hours, MCR envelope habitability is maintained by operating one of the two MCR ancillary fans to supply outside air to the MCR envelope.

410.414F(R1)-12

RAI 410.414F

BASES

APPLICABLE SAFETY ANALYSES (continued)

The VES satisfies the requirements of Criterion 3 of the NRC Policy Statement.

LCO

The VES limits the MCR temperature rise and maintains the MCR at a positive pressure relative to the surrounding environment.

Two ~~independent and redundant VES trains~~ AIR DELIVERY FLOW PATHS are required to be OPERABLE to ensure that at least one is available, assuming a single failure~~, disables the other train~~.

The VES is considered OPERABLE when the individual components necessary to deliver a supply of breathable air to the MCR are OPERABLE~~, in both trains~~. This includes components listed in SR 3.7.6.2 through 3.7.6.8. In addition, the MCR pressure boundary must be maintained, including the integrity of the walls, floors, ceilings, ~~duct work~~, electrical and mechanical penetrations, and access doors.

APPLICABILITY

The VES is required to be OPERABLE in MODES 1, 2, 3, and 4 and during movement of irradiated fuel because of the potential for a fission product release following a DBA. The VES is not required to be OPERABLE in MODES 5 and 6 when irradiated fuel is not being moved because accidents resulting in fission product release are not postulated.

ACTIONS

A.1

When ~~one~~ A VES ~~train~~ VALVE OR DAMPER is inoperable, action is required to restore the COMPONENT ~~system~~ to OPERABLE status. A Completion Time of 7 days is permitted to restore the ~~train~~ to OPERABLE status before action must be taken to reduce power. The Completion Time of 7 days is based on engineering judgment, considering the low probability of an accident that would result in a significant radiation release from the fuel, the low probability of not containing the radiation, and that the remaining ~~train~~ COMPONENTS can provide the required capability.

(continued)

410.414F(R1)-13

RAI 410.414F

BASES

ACTIONS (continued)

B.1

When the main control room air temperature is outside the acceptable range during VBS operation, action is required to restore it to an acceptable range. A Completion Time of 24 hours is permitted based upon the availability of temperature indication in the MCR. It is judged to be a sufficient amount of time allotted to correct the deficiency in the nonsafety ventilation system before shutting down.

C.1

If the MCR pressure boundary is damaged or otherwise degraded, action is required to restore the integrity of the pressure boundary and restore it to OPERABLE status within 24 hours. A Completion Time of 24 hours is permitted based upon operating experience. It is judged to be a sufficient amount of time allotted to correct the deficiency in the pressure boundary.

D.1 and D.2

In MODES 1, 2, 3, or 4 if Conditions A, B, or C cannot be restored to OPERABLE status within the required Completion Time, the plant must be placed in a MODE that minimizes accident risk. This is done by entering MODE 3 within 6 hours and MODE 5 within 36 hours.

E.1 and E.2

During movement of irradiated fuel assemblies, if the ~~inoperable VES train cannot be restored to OPERABLE status,~~ C Required Actions A.1, B.1, or C.1 cannot be completed within the required Completion Time, the movement of fuel and core alterations must be suspended. Performance of Required Action E.1 and E.2 shall not preclude completion of actions to establish a safe condition.

F.1, F.2, and F.3

THE PLANT

If ~~both~~ THE VES ~~trains are~~ IS inoperable in MODES 1, 2, 3, or 4, the VES may not be capable of performing the intended function, ~~and~~ must be brought to MODE 4, where the probability and consequences of an event are minimized, and THE ACCOMPLISHED ~~one~~ VES ~~train~~ must be restored to OPERABLE status within 36 hours. This is ~~done~~ by ~~entering~~ PLACING THE PLANT MODE 3 within 6 hours and MODE 4 within ~~24~~ 12 hours.

(continued)

410.414F (R1)-14

RAI 410.414F

BASES

ACTIONS (continued)

G.1 and G.2

During movement of irradiated fuel assemblies with ~~two~~ THE VES ~~trains~~ inoperable, the Required Action is to immediately suspend activities that present a potential for releasing radioactivity that might enter the MCR. This places the plant in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.6.1

The MCR air temperature is checked at a frequency of 24 hours to verify that the VBS is performing as required to maintain the initial condition temperature assumed in the safety analysis, and to ensure that the MCR temperature will not exceed the required conditions after loss of VBS cooling. The surveillance limit of ~~78~~ 75°F is the ~~nominal temperature. The safety analysis value of 80°F includes a 2°F measurement uncertainty.~~ The 24 hour Frequency is acceptable based on the availability of temperature indication in the MCR.

INITIAL HEAT SINK TEMPERATURE ASSUMED IN THE VES TO RWAL ANALYSIS.

SR 3.7.6.2

Verification every 24 hours that compressed air storage tanks are pressurized to [≥ 3400 psig] is sufficient to ensure that there will be an adequate supply of breathable air to maintain MCR habitability for a period of 72 hours. The Frequency of 24 hours is based on the availability of pressure indication in the MCR.

SR 3.7.6.3

VES air delivery isolation valves are required to be verified as OPERABLE. The Frequency required is in accordance with the Inservice Testing Program.

SR 3.7.6.4

VES air header isolation valves are required to be verified open at 31 day intervals. This SR is designed to ensure that the pathways for supplying breathable air to the MCR are available should loss of VBS occur. These valves should be closed only during required testing or maintenance of downstream components, or to preclude complete depressurization of the system should the VES isolation valves in the air delivery line open inadvertently or begin to leak.

(continued)

410.414F(R1)-15

INSERT SR 3.7.6.5

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.6.~~5~~6

Verification that all VBS isolation ~~devices~~ VALVES are operable and will actuate upon demand is required every 24 months to ensure that the MCR can be isolated upon loss of VBS operation.

SR 3.7.6.~~6~~7

Verification that each VES pressure relief isolation valve within the MCR pressure boundary is OPERABLE is required in accordance with the Inservice Testing Program. The SR is used in combination with SR 3.7.6.7 to ensure that adequate vent area is available to mitigate MCR overpressurization.

SR 3.7.6.~~7~~8

Verification that the VES pressure relief damper is OPERABLE is required at 24 month intervals. The SR is used in combination with SR 3.7.6.6 to ensure that adequate vent area is available to mitigate MCR overpressurization.

SR 3.7.6.~~8~~9

Verification of the operability of the self-contained pressure regulating valve in each VES ~~train~~ AIR DELIVERY FLOW PA is required in accordance with the Inservice Testing Program. This is done to ensure that a sufficient supply of air is provided as required, and that uncontrolled air flow into the MCR will not occur.

SR 3.7.6.~~9~~10

REPLACE WITH INSERT

This ~~SR~~ requires the performance of a system performance test of the VES to verify MCR pressurization capabilities. The system performance test demonstrates that the MCR pressurization assumed in dose analysis is maintained. Although the likelihood that system performance would degrade when time is low, it is considered prudent to periodically verify system performance. The System Level Operability Testing Program provides specific test requirements and acceptance criteria.

(continued)

410.414F (R1) - 16

RAI 410.414F LCO 3.7.6 Main Control Room Habitability System (VES)

INSERT BASES SR 3.7.6.5 PAGE 3.7-31

SR 3.7.6.5

Verification that the air quality of the air storage tanks meets the requirements of Appendix C, Table C-1 of ASHRAE Standard 62 is required every 92 days. If air has not been added to the air storage tanks since the previous verification, verification may be accomplished by confirmation of the acceptability of the previous surveillance results along with examination of the documented record of air make-up. The Purpose of ASHRAE Standard 62 states: "This standard specifies minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health effects." Verification of the initial air quality (in combination with the other surveillances) ensures that breathable air is available for 11 MCR occupants for at least 72 hours.

INSERT BASES SR 3.7.6.10 PAGE 3.7-31

SR 3.7.6.10

Per reference 1, a functional test is required to establish that one VES air delivery flow path, using the safety related compressed air storage tanks, pressurizes the MCR envelope to at least a positive 1/8 inch water gauge pressure relative to the surrounding spaces at the required air addition flow rate of 65 ± 5 scfm. The test need not last 72 hours, only long enough to demonstrate the ability to achieve the required differential pressure. The MCR envelope leakage rate must be within the design capacity of the VES to pressurize the MCR for 72 hours. One air delivery flow path is tested on an alternating basis. The system performance test demonstrates that the MCR pressurization assumed in dose analysis is maintained.

Rev 3

BASES (continued)

REFERENCES

1. AP600 SSAR, Section 6.4, "Main Control Room Habitability Systems."

2. AP600 SSAR, Section 9.4.1, "Nuclear Island Non-Radioactive Ventilation System."

3. SECY-95-132, "Policy and Technical Issues Associated With The Regulatory Treatment of Non-Safety Systems (RTNSS) In Passive Plant Designs (SECY-94-084)," May 22, 1995.

410.414F(R1)-18

Question 480.1115F (OITS - 6492) REVISION 1 TO RESPONSE

LCO 3.6.9 pH Adjustment

Becaus Westinghouse Standard Technical Specifications (STS) NUREG-1431, do not have an equiva LCO for comparison to the AP600 LCO 3.6.9, "pH Adjustment." SCSB compared AP600 LCO 3.6.9 to LCO 3.5.5, "Trisodium Phosphate," of the Combustion Engineering Standard Technical Specifications. AP600 LCO 3.6.9 is not consistent with the corresponding Combustion Engineering Standard (STS) nor is the LCO consistent with its own Bases. The following are open items for this technical specification:

(a) The LCO 3.6.9 is not consistent with the LCO Bases description nor is it consistent with CE STS 3.5.5. The LCO simply states that the pH adjustment shall be operable The LCO Bases and the CE STS discuss the minimum acceptable volume of TSP in the actual LCO. This is an open item.

(b) Action B: The Required Action B.2.2 is not consistent with the CE STS. Action B.2.2 states that if 70 percent of the TSP is verified to be available, then the plant can remain in Mode 3 until the basket is restored to 100 percent of the limit specified in SR 3.6.9.1. The Bases states that this alternative is acceptable because the required volume is based on severe accident conditions and that no Mode 3 DBAs are predicted to result in a significant fission product release. The staff does not consider this alternative acceptable because the DBA source term would not significantly change if one changed the initial conditions from Mode 1 to Mode 3. This is an open item.

(c) The LCO 3.6.9 Bases Background states that natural circulation of water inside containment, following a LOCA, is driven by the core decay heat and provides mixing to achieve a uniform pH. Sections 6.3.2.1.4 and 6.3.2.2.4 of the SSAR, which are referenced at the bottom of the paragraph containing this statement, fail to support this assumption. This is an open item.

(d) The LCO 3.6.9 Bases discussion on the Applicable Safety analyses fails to mention that the LOCA radiological consequences analysis takes credit for iodine retention in the sump solution based on the sump solution pH being greater than or equal to 7.0. This is a deviation from the CE STS and is an open item.

(e) The LCO Bases discussion on the Surveillance Requirements fails to discuss the bases of the surveillance period. This is an open item.

(f) The testing described in Bases Surveillance Requirement 3.6.9.2 is not consistent with the CE STS. This is an open item.

Response: REVISION 1

(a) The minimum required TSP volume (≥ [240 ft^3]) will be specified in the LCO and associated Bases. A mark-up of the AP600 Technical Specification revisions is provided in the attachment.

(b) AP600 Required Action B.2.2 will be deleted. A mark-up of the AP600 Technical Specification revisions is provided in the attachment.

(c) Reference 2, SSAR Section 6.3.2.2.4, states the following, which supports the Bases discussion:

> "Good mixing with the sump water is expected due to both basket construction and because the baskets are placed in locations conducive to recirculation flows post-accident."

The existing references are correct. No AP600 Technical Specification changes are required.

(d) The AP600 Applicable Safety Analyses section states:

> "Adjusting the sump water to neutral or alkaline pH will augment the retention of iodine, and thus reduce the iodine available to leak to the environment."

"Neutral or alkaline pH" is equivalent to a pH ≥ 7.0. Therefore, as requested, this existing statement will be modified by inserting "(pH ≥ 7.0)" following "neutral or alkaline pH."

A mark-up of the AP600 Technical Specification revisions is provided in the attachment.

(e) The following CE STS SR 3.5.5.1 statements will be added to the SR 3.6.9.1 Bases (18 months changed to 24 months for AP600 fuel cycle):

> The periodic verification is required every 24 months, since access to the TSP baskets is only feasible during outages, and normal fuel cycles are scheduled for 24 months. Operating experience has shown this Surveillance Frequency acceptable due to the margin in the volume of TSP placed in the containment building.

A mark-up of the AP600 Technical Specification revisions is provided in the attachment.

(f) The portion of the CE STS test for TSP solubility (without agitation, within a time limit) was not included in the AP600 Bases surveillance description.

As requested, the AP600 Bases will be revised to add the TSP solubility requirements including the 4 hour time limit and no agitation. The first paragraph of the SR 3.6.9.2 Bases will be revised to be the same as the CE Bases. The existing second paragraph is equivalent to the CE Bases discussion of the TSP weight and water volume requirements. A new paragraph, will also be added to the AP600 SR 3.6.9.2 Bases which incorporates the last four sentences of the CE Bases discussion.

SSAR Revision: See attached markup.

3.6 CONTAINMENT SYSTEMS

3.6.9 pH Adjustment

LCO 3.6.9 The pH adjustment BASKETS shall ~~be OPERABLE~~ CONTAIN ≥ [240 ft³] OF TRISODIUM PHOSPHATE (TSP).

RAI 480.1115F(6)

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. The volume of trisodium phosphate not within limit.	A.1 Restore volume of trisodium phosphate to within limit.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2.1 Be in MODE 5.	84 hours
RAI 480.1115F(6)	OR	
	B.2.2 Verify the available volume of trisodium phosphate meets 70% of the limit specified in SR 3.6.9.1.	84 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.9.1	Verify that the pH adjustment baskets contain at least [240 ft^3] of TSP ($Na_3PO_4 \cdot 12\ H_2O$).	24 months
SR 3.6.9.2	Verify that a sample from the pH adjustment baskets provides adequate pH adjustment of the post-accident water.	24 months

B 3.6 CONTAINMENT

B 3.6.9 pH Adjustment

BASES

BACKGROUND

The Passive Core Cooling System (PXS) includes two pH adjustment baskets which provide adjustment of the pH of the water in the containment following an accident where the containment floods.

Following an accident with a large release of radioactivity, the containment pH is automatically adjusted to greater than or equal to 7.0, to enhance iodine retention in the containment water. Chemical addition is necessary to counter the affects of the boric acid contained in the safety injection supplies and acids produced in the post-LOCA environment (nitric acid from the irradiation of water and air and hydrochloric acid from irradiation and pyrolysis of electric cable insulation). The desired pH values significantly reduce formation of elemental iodine in the containment water, which reduces the production of organic iodine and the total airborne iodine in the containment. This pH adjustment is also provided to prevent stress corrosion cracking of safety related containment components during long-term cooling.

Dodecahydrate trisodium phosphate (TSP) contained in baskets provides a passive means of pH control for such accidents. The baskets are made of stainless steel with a mesh front that readily permits contact with water. These baskets are located inside containment at an elevation that is below the minimum floodup level. The baskets are placed at least a foot above the floor to reduce the chance that water spills will dissolve the TSP. Natural recirculation of water inside the containment, following a LOCA, is driven by the core decay heat and provides mixing to achieve a uniform pH. The dodecahydrate form of TSP ($Na_3PO_4 \cdot 12H_2O$) is initially loaded into the baskets because it is hydrated and will undergo less physical and chemical change than would anhydrous Na3PO4 as a result of the humidity inside containment. (Refs. 1 and 2)

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

In the event of a Design Basis Accident (DBA), iodine may be released from the fuel to containment. To limit this iodine release from containment, the pH of the water in the containment sump is adjusted by the addition of TSP. (pH ≥ 7.0) Adjusting the sump water to neutral or alkaline pH will augment the retention of the iodine, and thus reduce the iodine available to leak to the environment. RAI 480.1115F(d)

pH adjustment satisfies Criterion 3 of the NRC Policy Statement.

LCO
RAI 480.1115F(a)

The requirement to maintain the pH adjustment baskets ~~OPERABLE~~ with ≥ [240 ft³] ~~the required volume~~ of TSP assures that for DBA releases of iodine into containment, the pH of the containment sump will be adjusted to enhance the retention of the iodine.

A required volume is specified instead of mass because it is not feasible to weigh the TSP in the containment. The minimum required volume is based on the manufactured density of TSP. This is conservative because the density of TSP may increase after installation due to compaction.

APPLICABILITY

In MODES 1, 2, 3, and 4 a DBA could cause release of radioactive iodine to containment requiring pH adjustment. The pH adjustment baskets assist in reducing the airborne iodine fission product inventory available for 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 of these MODES. Thus, pH adjustment is not required to be OPERABLE in MODES 5 and 6.

ACTIONS

A.1

If the TSP volume in the baskets is not within limits, the iodine retention may be less than that assumed in the accident analysis for the limiting DBA. Due to the very low probability that the volume of TSP may change, the variations is expected to be minor such that the required

(continued)

BASES

ACTIONS

A.1 (continued)

capability is substantially available. The 72 hour Completion Time for restoration to within limits is consistent with times applied to minor degradations of ECCS parameters.

B.1, B.2.1, and B.2.2

If the Required Actions and associated Completion Times are not met, the plant must be brought to MODE 5 where the probability and consequences on an event are minimized. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 84 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.

RAI 480.1115F (b)

An alternative to cooling the plant to MODE 5 conditions is to verify within a Completion Time of 84 hours that 70% of the required TSP volume is available while in MODE 3. The reduced TSP volume is adequate for MODE 3, considering that the required volume is based on severe accident conditions and that no MODE 3 DBAs are predicted to result in a significant fission product release.

DELETE

SURVEILLANCE REQUIREMENTS

SR 3.6.9.1

The minimum amount of TSP is [240] ft^3. A volume is specified since it is not feasible to weigh the TSP contained in the pH adjustment baskets. This volume is based on providing sufficient TSP to buffer the post accident containment water to a minimum pH of 7.0. Additionally, the TSP volume is based on treating the maximum volume of post accident water ([765,500] gallons) containing the maximum amount of boron ([3007] ppm) as well as other sources of acid. The minimum required mass of TSP is [11,550] pounds.

The minimum required volume of TSP is based on this minimum required mass of TSP, the minimum density of TSP plus margin to account for degradation of TSP during plant operation. The minimum TSP density is based on the manufactured

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.6.9.1 (continued)

density, since the density may increase and the volume decrease, during plant operation, due to agglomeration from humidity inside the containment. The minimum required TSP volume also has about 10% margin to account for degradation of TSP during plant operation.

INSERT →

RAI 480.1115F(e)

SR 3.6.9.2

REPLACE WITH INSERT →

RAI 480.1115(f) (REV. 1)

~~Testing must be performed to ensure the buffering ability of the TSP after exposure to the containment environment. A representative sample of ≤ [1.25] grams of TSP from one of the baskets is submerged in ≥ 1 liter of water at a boron concentration of ≥ [3007] ppm at the standard temperature of 25 ± 5°C. The solution pH should be raised to ≥ 7.0.~~

~~The minimum required amount of TSP [11,550] pounds is sufficient to buffer the maximum amount of boron [3007] ppm, the maximum amount of other acids and the maximum amount of water [765,500] gallons that can exist in the containment following an accident and achieve a minimum pH of 7.0. Of this amount of TSP, [7124] pounds is required to buffer the boron, without consideration for other sources of acid. The representative sample weight is based on [7124] pounds of TSP plus about 10% margin to account for degradation of TSP during plant operation.~~

REFERENCES

1. SSAR Section 6.3.2.1.4, Containment pH Control.
2. SSAR Section 6.3.2.2.4, pH Adjustment Baskets.
3. SSAR Section 15.6.5.3.1, Identification of Cause and Accident Description.

AP600 TECHNICAL SPECIFICATIONS
RAI 480.1115F (e) & (f)

LCO 3.6.9 pH Adjustment

INSERTS

BASES PAGE B 3.6-51 SR 3.6.9.1

. verification is required every 24 months, since access to the TSP ba s only feasible during outages, and normal fuel cycles are scheduled for 24 months. Operating experience has shown this Surveillance Frequency acceptable due to the margin in the volume of TSP placed in the containment building.

BASES PAGE B 3.6-51 SR 3.6.9.2

Testing Must be performed to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. A representative sample of [1.25] grams of TSP from one of the baskets in containment is submerged in ≥ 1 liter of water at a boron concentration of [3007] ppm and at the standard temperature of 25 ± 5°C. Without agitation, the solution pH should be raised to ≥ 7.0 within 4 hours.

The minimum required amount of TSP is sufficient to buffer the maximum amount of boron [3007] ppm, the maximum amount of other acids and the maximum amount of water [765,500] gallons that can exist in the containment following an accident and achieve a minimum pH of 7.0. Of this amount of TSP, [7124] pounds is required to buffer the boron, without consideration of other sources of acid. The representative sample weight is based on [7124] pounds of TSP plus about 10% margin to account for degradation of TSP during plant operation.

Agitation of the test solution is prohibited, since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved TSP to naturally diffuse through the sample solution. In the post LOCA sump area, rapid mixing would occur due to liquid flow, significantly decreasing the actual amount of time before the required pH is achieved This would ensure compliance with the Standard Review Plan requirement of a pH ≥ 7.0 by the onset of recirculation after a LOCA.