Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6206
Direct fax: 724-940-8505
e-mail: sisk1rb@westinghouse.com

Your ref: Docket No. 52-006
Our ref: DCP_NRC_002742

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Subject: AP1000 Response to Request for Additional Information (SRP 6)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 6. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAI(s):

RAI-SRP 6.4-SPCV-14 R1

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Request for Additional Information on SRP Section 6

D063
NRO

cc:	D. Jaffe	-	U.S. NRC	1E
	E. McKenna	-	U.S. NRC	1E
	P. Kallan	-	U.S. NRC	1E
	P. Donnelly	-	U.S. NRC	1E
	T. Spink	-	TVA	1E
	P. Hastings	-	Duke Power	1E
	R. Kitchen	-	Progress Energy	1E
	A. Monroe	-	SCANA	1E
	P. Jacobs	-	Florida Power & Light	1E
	C. Pierce	-	Southern Company	1E
	E. Schmiech	-	Westinghouse	1E
	G. Zinke	-	NuStart/Entergy	1E
	R. Grumbir	-	NuStart	1E
	D. Lindgren	-	Westinghouse	1E

ENCLOSURE 1

Response to Request for Additional Information on SRP Section 6

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP 6.4-SPCV-14
Revision: 1

Question:
The Technical Specification 3.7.6 Condition for 'VES inoperable' has been modified to specify a condition for 'One bank of VES air tanks (8 tanks) inoperable.' The completion time to increase pressure in the Operable tanks to the upper portion of the system operating band is 12 hours. The completion time is 7 days to restore VES to operable status.

At 75% VES air capacity (54 hours); the system no longer accomplishes the safety function for 72 hours. The VBS supplemental filtration is not safety-related. The applicant's RTNSS systems (ancillary fans) may not be available in 54 hours. Increasing the pressure in the OPERABLE tanks is not a reviewed operating condition and may not be advisable with a degraded system. Additionally, restoring or replacing an inoperable tank is a relatively simple evolution and it is not clear why 7 days is needed to complete this action.

The applicant needs to explain why such a long completion time is appropriate for the loss of a safety function and explain why such a long completion time is needed to restore the operability.

Westinghouse Response (Revision 1):

Based on discussions with the Staff at a public meeting held on 12/15/2009 and 1/8/2010, Westinghouse is voluntarily revising this response. Additional required actions have been added to LCO 3.7.6 condition D to provide confidence that the main control room envelope can be maintained habitable for 72 hours following a design basis accident during a condition where one bank of VES emergency air storage tanks are not available. The additional action requires confirmation that the VBS main control room (MCR) ancillary fans and supporting equipment are available within 24 hours of a bank of VES emergency air tanks out of service.
Action D.1 has also been clarified. Action D.1 has been revised to require verification of the pressure in the unaffected banks of air tanks. The pressure in the affected tanks should be verified to be above 3400 psig within 2 hours. Reference to increasing the pressure in the operable tanks above 3400 psig to the upper portion of the system operating band has been removed from action D.1 and the associated bases.

Westinghouse Response (Revision 0):

The modification to the Technical Specification 3.7.6, enhances the ability to perform online maintenance on an individual air bank (there are 4 banks, each of which contain 8 tanks). DCD 6.4.2.3 states that "The air storage tanks are constructed of forged, seamless pipe, with no welds, and conform to Section VIII and Appendix 22 of the ASME Code. The design pressure of the air storage tanks is 4000 psi. The storage tanks collectively contain a minimum storage

capacity of 314,132 scf of air at a minimum pressure of 3400 psig." The tank construction and connections drastically decrease the likelihood of leakage at these sources.

Any leakage that would cause the system to enter the Technical Specification of "One bank of VES air tanks (8 tanks) inoperable" would most likely be at the safety-relief valves (V040A/B/C/D). The air bank with the excessively leaking relief valve will be individually isolated and depressurized to allow the safety-relief valve to be replaced. Because only the air bank with the leaking safety-relief valve is isolated, the remaining 3 air banks will be at or above the minimum operating pressure of the system. The maintenance on an individual air bank can be done without affecting the other 3 banks in any way. The pressure in the operable tanks will not be increased. The operable tanks are credited as maintaining a normal minimum pressure of 3400 psig.

The time limit of 7 days for this Technical Specification is acceptable based on engineering considerations with regards to 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 components and compensatory systems can provide the required capability to maintain the MCRE habitable. If one bank of tanks is taken out of service, 75% of the system will still be available to supply air to the control room in the event of an accident. Dose calculations have been performed to verify that the MCR dose limits will remain within the requirements of GDC 19 if 75% (54 hour supply of breathable compressed air) of VES is available and compensatory measures, through the use of the ancillary fans, are taken at 54 hours for the remainder of the event. The MCR ancillary fans are located in the auxiliary building as indicated in Tier 1 Table 2.7.1-5 of the DCD and will be available if required 54 hours after the initiation of VES.

The Tech Spec Bases 3.7.6 as submitted in RAI-SRP 6.4 SPCV-06, Rev. 0 are marked up to include that GDC 19 requirements are met with 54 hours of VES with compensatory measures taken at 54 hours.

References: None.

Design Control Document (DCD) Revision: (Revision 0, 1)

3.7 PLANT SYSTEMS

3.7.6 Main Control Room Habitability System (VES)

LCO 3.7.6 The Main Control Room (MCR) Habitability System shall be OPERABLE.

- NOTE -

The main control room envelope (MCRE) boundary may be opened intermittently under administrative control.

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

ACTIONS

- NOTE -

LCO 3.0.8 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One VES valve or damper inoperable.	A.1 Restore VES valve or damper to OPERABLE status.	7 days
B. MCR air temperature not within limit.	B.1 Restore MCR air temperature to within limit.	24 hours
C. VES inoperable due to inoperable MCRE boundary in MODE 1, 2, 3, or 4.	C.1 Initiate action to implement mitigating actions. AND	Immediately
	C.2 Verify mitigating actions ensure MCRE occupant exposures to radiological, chemical, and smoke	24 hours

		hazards will not exceed limits.	
		AND	
	C.3	Restore MCRE boundary to OPERABLE status	90 days
D. One bank of VES air tanks (8 tanks) inoperable	D.1	Verify pressure in the OPERABLE tanks is at least 3400 psig.	2 hours
	AND		
	D.2	Verify VBS MCR ancillary fans and supporting equipment are available	24 hours
	AND		
	D.3	Restore VES to OPERABLE status.	7 days

Tech Spec Bases 3.7.6

B 3.7.6 Main Control Room Emergency Habitability System (VES)
BASES

BACKGROUND

The Main Control Room Habitability System (VES) provides a protected environment from which occupants can control the plant following an uncontrolled release of radioactivity, hazardous chemicals, or smoke. 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 envelope (MCRE) 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 (Ref. 4) for the MCRE occupants; 2) to provide forced ventilation to maintain the MCRE at a 1/8 inch water gauge positive pressure with respect to the surrounding areas; 3) provide passive filtration to filter contaminated air in the MCRE; and 4) 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 compressed air storage tanks, two air delivery flow paths, an eductor, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines),associated valves or dampers, piping, and instrumentation. The tanks contain enough breathable air to supply the required air flow to the MCRE for at least 72 hours. The VES system is designed to maintain CO_2 concentration less than 0.5% for up to 11 MCRE occupants.

The MCRE is the area within the confines of the MCRE boundary that contains the spaces that control room occupants inhabit to control the unit during normal and accident conditions. This area encompasses the main control area, operations work area, operational break room, shift supervisor's office, kitchen, and toilet facilities (Ref. 1). The MCRE is protected during normal operation, natural events, and accident conditions. The MCRE boundary is the combination of walls, floor, roof, electrical and mechanical penetrations, and access doors. The OPERABILITY of the MCRE boundary must be maintained to ensure that the inleakage of unfiltered air into the MCRE will not exceed the inleakage assumed in the licensing basis analysis of design basis accident (DBA) consequences to MCRE occupants. The MCRE and its boundary are

defined in the Main Control Room Envelope Habitability Program.

Sufficient thermal mass exists in the surrounding concrete structure (including walls, ceiling and floors) to absorb the heat generated inside the MCRE, which is initially at or below 75°F. Heat sources inside the MCRE include operator workstations, emergency lighting and occupants. Sufficient insulation is provided surrounding the MCRE 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.

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 MCRE.

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 MCRE. The MCRE is maintained at a 1/8 inch water gauge positive pressure to minimize the infiltration of airborne contaminants from the surrounding areas. The VES operation in maintaining the MCRE habitable is discussed in Ref. 1.

BASES

APPLICABLE SAFETY ANALYSES

The compressed air storage tanks are sized such that 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 the following safety related signal: 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 MCRE pressure boundary.

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

BASES

The VES provides protection from smoke and hazardous chemicals to the MCRE occupants. The analysis of hazardous chemical releases demonstrates that the toxicity limits are not exceeded in the MCRE following a hazardous chemical release (Ref. 1). The evaluation of a smoke challenge demonstrates that it will not result in the inability of the MCRE occupants to control the reactor either from the control room or from the remote shutdown room (Ref. 2).

The VES functions to mitigate a DBA or transient that either assumes the failure of or challenges the integrity of the fission product barrier. The VES satisfies the requirements of Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

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

Two air delivery flow paths are required to be OPERABLE to ensure that at least one is available, assuming a single failure.

The VES is considered OPERABLE when the individual components necessary to deliver a supply of breathable air to the MCR are OPERABLE. This includes components listed in SR 3.7.6.2 through 3.7.6.9. In addition, the MCRE pressure boundary must be maintained, including the integrity of the walls, floors, ceilings, electrical and mechanical penetrations, and access doors.

In order for the VES to be considered OPERABLE, the MCRE boundary must be maintained such that the MCRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analysis for DBAs, and that MCRE occupants are protected from hazardous chemicals and smoke.

LCO (continued)

The LCO is modified by a Note allowing the MCRE boundary to be opened intermittently under administrative controls. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be proceduralized and consist of stationing a dedicated individual at the opening who is in continuous communication with the operators in the MCRE. This individual will have a method to rapidly

BASES

close the opening and to restore the MCRE boundary to a condition equivalent to the design condition when a need for MCRE isolation is indicated.

APPLICABILITY

In MODES 1, 2, 3, and 4 and during movement of irradiated fuel assemblies, the VES must be OPERABLE to ensure that the MCRE will remain habitable during and 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

LCO 3.0.8 is applicable while in MODE 5 or 6. Since irradiated fuel assembly movement can occur in MODE 5 or 6, the ACTIONS have been modified by a Note stating that LCO 3.0.8 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, the fuel movement is independent of shutdown reactor operations. Entering LCO 3.0.8 while in MODE 5 or 6 would require the optimization of plant safety, unnecessarily.
A.1

When a VES valve or damper is inoperable, action is required to restore the component to OPERABLE status. A Completion Time of 7 days is permitted to restore the valve or damper 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 components can provide the required capability.
B.1

When the MCRE 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

ACTIONS (continued)

upon the availability of temperature indication in the MCRE. 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, C.2, and C.3

If the unfiltered inleakage of potentially contaminated air past the MCRE boundary and into the MCRE can result in MCRE occupant radiological

dose greater than the calculated dose of the licensing basis analyses of DBA consequences (allowed to be up to 5 rem TEDE), or inadequate protection of MCRE occupants from hazardous chemicals or smoke, the MCRE boundary is inoperable. Actions must be taken to restore an OPERABLE MCRE boundary within 90 days.

During the period that the MCRE boundary is considered inoperable, action must be initiated to implement mitigating actions to lessen the effect on MCRE occupants from the potential hazards of a radiological or chemical event or a challenge from smoke. Actions must be taken within 24 hours to verify that in the event of a DBA, the mitigating actions will ensure that MCRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of DBA consequences, and that MCRE occupants are protected from hazardous chemicals and smoke. These mitigating actions (i.e., actions that are taken to offset the consequences of the inoperable MCRE boundary) should be preplanned for implementation upon entry into the condition, regardless of whether entry is intentional or unintentional. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of mitigating actions. The 90 day Completion Time is reasonable based on the determination that the mitigating actions will ensure protection of MCRE occupants within analyzed limits while limiting the probability that MCRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA. In addition, the 90 day Completion Time is a reasonable time to diagnose, plan and possibly repair, and test most problems with the MCRE boundary.

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

If one bank of VES air tanks (8 tanks out of 32 total) is inoperable, then VES is able to supply air to the MCR for 54 hours (75% of the required 72 hours). If VES is actuated, operator must take actions to maintain habitability of the MCR once the air in the tanks has been exhausted. The VBS supplemental filtration mode or MCR ancillary fans are both capable of maintaining the habitability of the MCR after 54 hours.

With one bank of VES air tanks inoperable, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE VES air tanks, along with compensatory operator actions,

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are adequate to protect the main control room envelope habitability. The 7 day Completion Time is based on engineering judgment, considering the low probability of an accident that would result in a significant radiation release from the reactor core, the low probability radioactivity release, and that the remaining components and compensatory systems can provide the required capability. Dose calculations verify that the MCR dose limits will remain within the requirements of GDC 19 with the compensatory actions taken at 54 hours.

PRA Revision: None.

Technical Report (TR) Revision: None.