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NSRA-APSL-93-0097
Docket No.: STN-52-003

March 30, 1993

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

ATTENTION: R. W. BORCHARDT

SUBJECT: WESTINGHOUSE RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION ON THE AP600

Dear Mr. Borchardt:

Enclosed are three copies of the Westinghouse responses to NRC requests for additional information on the AP600 from your letter of January 26, 1993. This transmittal is a partial response to that letter. A listing of the NRC requests for additional information responded to in this letter is contained in Attachment A. The Westinghouse responses to the remainder of the requests for additional information contained in your letter of January 26, 1993 will be provided prior to May 29, 1993.

If you have any questions on this material, please contact Mr. Brian A. McIntyre at 412-374-4334.

Nicholas J. Liparulo, Manager
Nuclear Safety & Regulatory Activities

/nja

Enclosure

cc: B. A. McIntyre - Westinghouse
F. Hasselberg - NRC

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ET-NRC-93-3849
ATTACHMENT A
AP600 RAI RESPONSES
SUBMITTED MARCH 30, 1993

RAI No.	Issue
410.095	HVAC conformance to SRP
410.096	Control room ventilation system (WCAP-13053)
410.097	VBS support for control room design basis
410.103	Diesel generator Building HVAC (WCAP-13053)
410.105	Turbine building closed cooling water system
630.006	LCOs for passive systems
630.008	Tech spec topical reports
720.041R01	Release frequencies

Question 410.95

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Provide a detailed specific conformance analysis for each of the HVAC subsystems in Sections 9.4.1-9.4.3 and 9.4.6-9.4.11 of the SSAR against the following guidelines of the Standard Review Plan (NUREG-0800): Sections 3.4.1 for flood protection, 3.5.1.1 for protection against internally-generated missiles, 3.5.2 for protection against externally-generated missiles, and 3.6.1 for protection against high- and moderate-energy pipe breaks. This analysis should be in greater detail than the information provided in Section 3.0 of the SSAR.

Response:

The following AP600 HVAC systems are non-safety-related systems:

- Nuclear island nonradioactive ventilation system (Subsection 9.4.1)
- Annex/auxiliary buildings nonradioactive HVAC system (Subsection 9.4.2)
- Radiologically controlled area ventilation (Subsection 9.4.3)
- Containment recirculation cooling system (Subsection 9.4.6)
- Containment air filtration system (Subsection 9.4.7)
- Radwaste building HVAC (Subsection 9.4.8)
- Turbine building ventilation system (Subsection 9.4.9)
- Diesel generator building heating and ventilation system (Subsection 9.4.10)
- Health physics and hot machine shop HVAC system (Subsection 9.4.11)

These systems perform no safety-related functions and the failure of these systems or their components will not affect the ability of the AP600 safety-related systems to perform their intended safety-related functions. Therefore, the guidelines of the Standard Review Plan (NUREG-0800), Section 3.4.1 for flood protection, Section 3.5.1.1 for protection against internally-generated missiles, Section 3.5.2 for protection against externally-generated missiles, and Section 3.6.1 for protection against high-and moderate-energy pipe breaks are not applicable to these systems.

The nuclear island nonradioactive ventilation, annex/auxiliary buildings nonradioactive HVAC, and diesel generator building heating and ventilation systems perform functions that support the non-safety-related defense-in-depth systems. An industry effort is currently underway to resolve the key licensing issues pertaining to the regulatory

treatment of non-safety-related systems that perform defense-in-depth functions. The final resolution of this issue and resulting outcomes are expected to apply to the portions of these non-safety-related HVAC systems that perform the defense-in-depth functions.

SSAR Revision: NONE

AP600

Question 410.96

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

WCAP-13053 states that the nuclear island nonradioactive ventilation system (VBS) for the control room area ventilation system has been designed to be non-safety-related (see Section 9.4.1). An exception to Position C.1 of Regulatory Guide 1.29 has been taken. The staff concludes that it may be necessary to maintain the filtration function of the CRAVS in order to meet GDC 19. Therefore, justify the non-safety designation of this system by demonstrating that GDC-19 can be met using a non-safety CRAVS or provide a safety-related CRAVS.

Demonstrate that the system is capable of withstanding the effects of earthquakes through conformance with the guidelines of Position C.1 of Regulatory Guide 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

Response:

Demonstrate that the system is capable of withstanding the effect of earthquakes through conformance with the guidelines of Position C.1 of R.G. 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

With the exception of the main control room (MCR) isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. Therefore, the VBS is not designed to perform the filtration function of CRAVS during or following a design basis accident, as required by SRP 6.4 and GDC 19. Conformance to GDC 19 and MCR operator habitability requirements under accident conditions is provided by the main control room emergency habitability system (VES).

The VES is designed to satisfy nuclear safety-related system redundant train design and seismic Category I requirements. VES is sized to deliver the required airflow rate to the MCR to meet ventilation and pressurization requirements for 72 hours. A refilling connection is provided for each train to allow for operation beyond 72 hours. The MCR passive heat sink is designed to limit the temperature rise inside the MCR during the 72-hour period following a loss of VBS operation. In the unlikely event that power to the VBS is not available for more than 72 hours, MCR cooling is provided by portable cooling units brought in from offsite (see the response to Q471.3 for further details). The portable units are standard commercial units and are sized to maintain long-term occupancy of personnel in the MCR. The MCR is provided with Quality Group C, seismic Category I penetrations for heat rejection and with power supply connections for the portable units. Therefore, conformance to GDC 19 and MCR operator habitability requirements under accident conditions is met. The detailed description of the VES is in SSAR Section 6.4.

The VBS compliance with the applicable regulatory positions is discussed in SSAR Appendix 1A and in the following paragraphs.

Compliance with Position C.1 of RG 1.29 does not apply, except for the MCR isolation dampers, because the VBS does not perform any other safety-related functions. The MCR isolation dampers are designed to meet seismic Category I requirements.

Compliance with Position C.2 of R.G. 1.29 is satisfied because the non-safety-related portions of the VBS inside the MCR are designed to meet seismic Category II requirements so that the failure of VBS components during an SSE will not reduce the functioning of any safety-related plant features.

Compliance with GDC 2 is satisfied because the MCR isolation dampers are designed for seismic Category I requirements. A tornado damper is installed in the VBS outside air intake to maintain safe habitability for personnel within the control room and safe environmental conditions for tornado-protected equipment. The isolation and tornado dampers are located inside a seismic Category I structure. Compliance with GDC 2 is not applicable to the remaining non-safety-related portions of the VBS.

SSAR Revision: NONE

Question 410.97

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Demonstrate how the requirements of GDC 4, "Environmental and Missile Design Basis," are met by the VBS to maintain environmental conditions in the control room within the design limits of the essential equipment located therein for normal, transient, or accident conditions (see Section 9.4.1).

Response:

The main control room (MCR) is located at elevation 117'-6" of the auxiliary building, which is a missile-protected seismic Category I structure. Conformance to GDC 4 tornado missile requirements is discussed in SSAR Section 3.3. Conformance to GDC 4 internally generated missile requirements is discussed in SSAR Section 3.5.

With the exception of the MCR isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. The MCR isolation dampers are located in the MCR envelope and are protected from missiles. The VBS has no other safety-related design function.

The VBS is designed to provide conditioned air for ventilation and cooling to maintain a suitable environment for personnel comfort and equipment operation during normal plant operation. The VBS is designed with redundant equipment and components that are connected to standby, onsite ac power sources. During or following an anticipated transient, if ac power is available, the VBS is designed to provide a reliable source of ventilation and cooling for personnel comfort and equipment operation. See SSAR Subsection 9.4.1 for a description of the VBS.

The requirement to maintain environmental conditions in the control room within the design limits of the essential equipment during a DBA is provided by the main control room emergency habitability system (VES). See SSAR Subsection 6.4 and the response to Q410.096 for a description of VES operation.

SSAR Revision: NONE

Question 410.103

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Section 9.4.10 of the SSAR, "Diesel Generator Building Heating and Ventilation System (VGS)," falls under the review guidelines of Section 9.4.5 of the SRP, "ESF Ventilation System." WCAP-13053 indicates that information will be provided on the ESF ventilation system later. Section 9.4.10 of the SSAR does not address the system's conformance with the guidelines of Section 9.4.5 of the SRP.

The staff concludes that this HVAC system should be evaluated as an ESF ventilation system as part of the design-in-depth concept. Therefore, this system should conform with the guidance of Section 9.4.5 of the SRP. Demonstrate that this system conforms with the guidelines of (1) R.G. 1.29 (to show it meets GDC 2), (2) Position C.2 of R.G. 1.52 and Positions C.1 and C.2 of R.G. 1.140 (to show it meets GDC 60), and (3) NUREG/CR-0660 (to show it meets GDC 17). Also, demonstrate that this system conforms with GDC 4. The system P&IDs, flow diagrams, component data, and system description should reflect corresponding details as identified in Section 9.4.5 of the SRP, as applicable. Table 3.2-3 of the SSAR should reflect appropriate equipment information.

Provide an equipment operability evaluation for the diesel generator building areas served by VGS to demonstrate that they can withstand a 150°F temperature environment (as identified in Section 9.4.10 of the SSAR). Address the habitability concerns inside these areas for the elevated temperatures.

Provide justification for the provisions in the VGS design of only two 50-percent-capacity roof-mounted exhaust fans for each diesel generator room and the normal ventilation system having only one 100-percent-capacity primary air handling unit versus fully redundant capacity units to satisfy the single failure criteria.

Response:

The AP600 onsite standby power system (ZOS) includes two diesel-generators housed in the diesel-generator building. The ZOS and the diesel-generators are not safety related and are not essential for the safe shutdown of the reactor nor are they necessary to prevent or mitigate the consequences of an accident. The diesel-generator building heating and ventilation system (VZS), which supports the operation of the ZOS, is therefore also not safety related. Because the VZS is not required to "maintain a controlled environment in areas containing safety-related equipment" and the areas served by the VZS do not contain "equipment essential for the safe shutdown of the reactor or necessary to prevent or mitigate the consequences of an accident," the VZS does not fall within the scope of SRP 9.4.5 Engineered Safety Feature Ventilation System. SSAR Subsection 9.4.10 does not therefore address SRP 9.4.5 compliance.

WCAP-13053 has been superseded by WCAP-13054, Rev. 1, which indicates that SRP 9.4.5 is not applicable to the AP600.

GDC 2 applies to structures, systems, and components important to safety. Since neither the ZOS nor the VZS is important to safety, compliance with RG 1.29 is not required for the VZS.

RG 1.52 applies only to post-accident engineered safety feature (ESF) atmosphere cleanup systems designed to mitigate the consequences of postulated accidents. The VZS is not safety related, is not an ESF system, and is not required to mitigate the consequences of postulated accidents. RG 1.52 is therefore not applicable to VZS.

RG 1.140 applies to atmosphere cleanup systems designed to collect airborne radioactive materials during normal plant operation. The diesel-generator building does not contain any radioactive materials and does not interface with any building or system that contains radioactive materials. The VZS, therefore, is not required to collect airborne radioactive materials, so RG 1.140 is not applicable.

GDC 17 applies to onsite electric power systems provided to permit functioning of structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 17 is not applicable to the VZS. Conformance to NUREG/CR-0660 is also therefore not required. The information contained in NUREG/CR-0660 has been considered in the design of the VZS.

GDC 4 applies to structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 4 is not applicable to the VZS.

SSAR Subsection 9.4.10.1 incorrectly identified the diesel-generator area as being maintained at 150°F with the diesel-generator off. The actual design room temperature is 105°F with the diesel generator off. The SSAR will be corrected to reflect this response as shown by the highlighted portion of the following excerpt from Subsection 9.4.10.1.

The VZS is not safety related; therefore, the single failure criteria is not applicable. However, the two 50 percent capacity exhaust fans for each diesel-generator room and one 10C percent-capacity primary air handling unit provide adequate redundancy for onsite standby power system operation on a system train basis. Failure of a single exhaust fan or primary air handling unit associated with a diesel generator train will not affect the operation of the other diesel-generator train. Therefore, at least one diesel-generator train will be fully operational should a single fan failure occur.

The last paragraph of SSAR Subsection 9.4.10.1.2 will be revised as follows:

SSAR Revision:

The systems are designed to maintain room temperature conditions as follows:

Area	Design Minimum	Temperature Maximum
Diesel Generator Area		
Diesel Generator On	None	130°F
Diesel Generator Off	50°F	105°F
Service Module		
Diesel Generator On	50°F	105°F
Diesel Generator Off	50°F	105°F

Question 410.105

Section 9.2.8 of the SSAR states that the turbine building closed cooling water system provides a continuous supply of cooling water to turbine plant equipment at a temperature of 95°F or less. The heat sink for the system is the SWS. Section 9.2.1.2.2 of the SSAR states that upon loss of control air or electric power, the SWS valves to the CCWS heat exchangers fail to an open position while the turbine building closed cooling water system heat exchangers valves fail to a closed position. Discuss the emergency preparedness considerations for maintaining the turbine building closed loop cooling capability if the SWS is degraded because of a weather change or SWS valve malfunction.

Response:

The turbine building closed cooling water system neither serves nor supports any plant safety-related function. The system provides heat removal capability to turbine building mechanical systems; the heat sink for this system is the service water system. If service water is degraded or lost, the plant load would have to be adjusted or the plant would have to be shut down by the plant operators to minimize potential damage to turbine building mechanical components during the shutdown.

See SSAR Subsection 9.2.1 for a description of the service water system.

SSAR Revision: NONE

Question 630.6

In order to address the unique design features of the AP600, Westinghouse states that it is considering including new limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shutdown), and the passive containment cooling system. Submit the LCOs for this equipment and these systems, or provide a schedule for doing so.

Response:

Subsection 16.1.3.5 of Technical Specifications included in the AP600 SSAR Section 16.1 includes the Technical Specifications for the passive core cooling system components with the exception of the automatic depressurization system valves. Subsection 16.1.3.4.12 includes the Technical Specifications for the automatic depressurization system valves. Subsection 16.1.3.6.6 includes the Technical Specifications for the passive containment cooling system. These subsections contain the Technical Specifications including the limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shut down), and the passive containment cooling system.

Page 16.1-2 of the AP600 SSAR discusses the possibility of modifying the LCOs for these passive, safety-related components. Because of recent industry developments relevant to Technical Specifications for these components, modification of these LCOs is not planned.

SSAR Subsection 16.1.1 will be revised as follows:

SSAR Revision:

Completion Times and Surveillance Frequencies

Some LCOs presented in the AP600 Technical Specifications do not include Completion Times (except for Immediately) or Surveillance Requirement Frequencies (except for surveillances that must be performed during shutdown - 24 months). The Completion Times and Surveillance Frequencies specified in Draft NUREG 1431 have been extended to similar Actions and Surveillance Requirements in AP600. However, these times are, generally, overly conservative for the AP600 design, and longer times based on deterministic criteria and PRA evaluation can be justified. These Completion Times and Surveillance Requirement Frequencies may also take credit for structures, systems, and components used in the PRA evaluation. The times will be consistent with the assumptions made in the PRA evaluation. Deterministic criteria and PRA evaluation can be used to establish Completion Times and Surveillance Requirement Frequencies rather than extend to AP600 the times currently specified in Draft NUREG 1431.

~~Additionally, conditional Required Actions and Completion Times are being considered for future development for a small number of LCOs. The determination of the conditional Required Actions may require modification of~~

~~certain Required Actions for these Technical Specifications. Some of the LCOs identified for this development include the passive, safety-related systems, such as:~~

~~Automatic Depressurization Valves~~
~~Core Makeup Tanks~~
~~Passive Residual Heat Removal System – Operating~~
~~Passive Residual Heat Removal System – Shutdown~~
~~Passive Containment Cooling System~~

Shutdown Completion Times/Mode Definitions

The AP600 plant design is different from current Westinghouse designs in that the systems normally used for mode reduction are non-safety systems and, therefore, are not covered by LCO requirements in Technical Specifications. The passive safety systems, which shut down the plant, require a longer period of time to accomplish mode changes and cannot reduce the RCS temperature to below 200 °F. The mode Definitions, LCO 3.0.3, and mode reduction Required Actions specified in these Technical Specifications are based on use of the passive safety systems.

Question 630.8

For each of the topical reports referenced in the Westinghouse STS Bases (Revision 0) that are similarly used in the Chapter 16 TS submittal for the AP600, provide specific justification for applying the topical reports to the AP600 design consistent with the staff's requirements for adopting the individual topical reports.

Response:

The following topical reports are referenced in the AP600 Technical Specifications:

- WCAP-8746-A, "Design Basis For Overtemperature delta-T and the Overpower delta-T Trips," March 1977

  This WCAP provides a basis for the overtemperature delta-T and the overpower delta-T trips for Westinghouse plants. The report is referenced in Subsection 16.1.2.2.1 since it includes the methodology for determining the setpoints for these reactor trips. This WCAP is applicable to the AP600.

- WCAP-9273-NP-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.

  WCAP-9273-NP-A is the nonproprietary version of WCAP-9272 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-8403, "Power Distribution Control and Load Following Procedures," September 1974.

  WCAP-8403 is applicable to the AP600 as referenced in Subsection 4.3.4 of the AP600 SSAR.

- WCAP-10217, "Relaxation of Constant Axial Offset Control: F_Q Surveillance Technical Specification," June 1983.

  WCAP-10217 is the nonproprietary version of WCAP-10216 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-10271-P-A, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," May 1986.
  WCAP-10271-P-A, Supplement 2, Revision 1, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," June 1990.

  These WCAPs are applicable to the reactor trip and engineered safety functions actuated by the AP600 protection and monitoring system. The applicability of the methodologies provided in these WCAPS to digital equipment has been approved by the NRC via a safety evaluation report issued on the Sequoyah Nuclear Plant, Unit 1 Docket.

- WCAP-7769, "Topical Report on Overpressure Protection."

  WCAP-7769, Revision 1 dated June 1972, is applicable to the AP600 as referenced in Subsection 15.2.9 of the AP600 SSAR.

- WCAP-7924-A, "Basis for Heatup and Cooldown Limit Curves," April 1975.

  WCAP-7924-A provides the methodology used to generate the AP600 heatup and cooldown limit curves.

Reference 2 to technical specification B.3.4.6 will be revised as follows:

SSAR Revision:

2. WCAP-7769, "Topical Report on Overpressure Protection," Revision 1, June 1972.

Question 720.41

Provide a listing of the Level 1 sequences assigned to each release class and their respective frequencies.

Response (Revision 1):

Tables 1 to 4 provide a listing of the sequences assigned to each of the four fission product release classes utilized in the AP600 PRA. Only sequences contributing at least 3 percent to the frequency of a release class are included. The following information is presented for each sequence.

1. The sequence contribution to the release frequency of a particular fission release class (both the absolute magnitude and relative contribution, columns 2 and 3 in the tables).

2. Sequence description indicating the availability of key systems, and success or failure of operator actions during the sequence (column 4 in the tables).

3. Identification of the path taken by the sequence at key nodes in the event trees used for core melt quantification and fission product release (containment event tree) quantification (column 5 in the tables). ('SUC' or 'DEL' implies success or upward branching at a node, and 'SYS' or 'OTH' implies the opposite.)

4. The accident class (defined in Table G-1 of the AP600 PRA report) to which the sequence belongs.

PRA Revision: NONE

TABLE 1

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.8E-08	26.8	SI Line Break Event Occurs	IEV-S1S	IIIBE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Success of 1 of 1 Core Makeup Tank	DEL-CM1A	
			Failure of 1 of 1 Gravity Injection Line	SYS-IW1A	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
2	4.4E-08	17.3	Loss of Feedwater Without Scram (ATWS) Event Occurs	IEV-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment Isolation System Functions	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
3	3.2E-08	12.5	PRHR Heat Exchanger Tube Rupture Event Occurs	IEV-S2P	IIIBR
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRT	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			CVCS Makeup Fails	SYS-CSLOCA	
			PRHR Isolation Failure Following PRHR Tube Rupture	SYS-PRI1	
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
4	2.9E-08	11.2	Vessel Rupture Event Occurs	IEV-VR	IIIC
			Containment Is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
5	1.5E-08	5.8	Large LOCA Event Occurs	IEV-A	IIIBE
			Failure of 2 of 2 Gravity Injection Lines	SYS-IW2AB	
			Both Core Makeup Tanks Work	DEL-CM2L	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
6	1.3E-08	5.3	Small LOCA Event Occurs	IEV-S2	IIIBR
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Passive RHR System Works	DEL-PRL	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
	2.0E-07	80.0	Total for the Above 6 Sequences		
	2.5E-07		Total Frequency for the Release Class - OK (From At-Power Conditions Only)		

TABLE 2

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	3.0E-08	54.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
2	1.4E-08	24.6	Loss of Feedwater to Steam Generator Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Avai' ble in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
3	7.4E-09	13.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Both Core Makeup Tanks Function	DEL-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADA	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1A	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity tc Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
4	1.4E-09	2.6	Secondary to Primary Side Power Mismatch Initiating Event Occurs	IEV-TM	IA

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
5	1.2E-09	2.2	Spurious "S" Signal Initiating Event Occurs	IEV-TS	IA
			Failure to Supply Startup Feedwater to 1 of 2 Steam Generators	SYS-SFW	
			Failure of PRHR System to Remove Decay Heat From RPV	SYS-PRT	
			Failure to Trip All Four RCS Pumps	SYS-RCSL	
			Both Core Makeup Tanks Function	DEL-CM2T	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
	---	---	---		
	5.4E-08	98.0	Total for the Above 5 Sequences		
	5.5E-08		Total Frequency for the Release Class - OKP (From At-Power Conditions Only)		

TABLE 3

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.6E-09	32.9	Consequential SG Tube Rupture Initiating Event Occurs#	SYS-IECV2	VIE
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	
2	2.4E-09	11.9	Steam Generator Tube Rupture Initiating Event Occurs	IEV-V2	VIE
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	
3	2.3E-09	11.3	Loss of Feedwater Without Scram Initiating Event Occurs	SYS-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
4	2.0E-09	9.9	Turbine/Reactor Trip /Low RCS Flow Initiating Event Occurs	SYS-TT	IA
			Condenser and Startup Feed Water, and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
5	1.5E-09	7.5	Vessel Rupture Initiating Event Occurs	SYS-VR	IIIC
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
6	7.2E-10	3.6	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
7	6.6E-10	3.3	Consequential SG Tube Rupture Initiating Event Occurs	SYS-IECV2	VIE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Failure of Gravity Injection Lines	SYS-IW2AB	
			Normal RHR Fails to Operate in Injection Mode (LOCA/Transient)	SYS-RNR	
	---	---	---		
	1.6E-08	80.0	Total for the Above 7 Sequences		
	2.0E-08		Total Frequency for the Release Class - CI (From At-Power Conditions Only)		

During Events Initiated by a Steam Line Break or Stuck Open Secondary-Side Relief Valve

TABLE 4

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	4.4E-10	58.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IIIBE
			Failure of I&C (Boards)	CCX-HARD1	
			Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs)	CCX-AV-LA	
			ADS Failure (Operator Fails to Perform Manual ADS Actuation)	LPM-MAN03	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CIC	
			Water is Available for the Passive Containment Cooling System	DEL-PCT	
			Not Enough Water in the Reactor Cavity to Cool the Core Debris	SYS-CC3BE	
2	1.3E-10	17.8	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IIIBE
			Failure of I&C (Boards)	CCX-HARD1	
			Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs)	CCX-AV-LA	
			ADS Failure (Operator Fails to Perform Manual ADS Actuation)	LPM-MAN03	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CIC	
			Water is Available for the Passive Containment Cooling System	DEL-PCT	
			Not Enough Water in the Reactor Cavity to Cool the Core Debris After RV Failure	SYS-CC3BE	

TABLE 4 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
	5.7E-10	76.0	Total for the Above 2 Sequences		
	7.5E-10		Total Frequency for the Release Class - CC (From At-Power Conditions Only)		

Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

ET-NRC-93-3849
NSRA-APSL-93-0097
Docket No.: STN-52-003

March 30, 1993

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

ATTENTION: R. W. BORCHARDT

SUBJECT: WESTINGHOUSE RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION ON THE AP600

Dear Mr. Borchardt:

Enclosed are three copies of the Westinghouse responses to NRC requests for additional information on the AP600 from your letter of January 26, 1993. This transmittal is a partial response to that letter. A listing of the NRC requests for additional information responded to in this letter is contained in Attachment A. The Westinghouse responses to the remainder of the requests for additional information contained in your letter of January 26, 1993 will be provided prior to May 29, 1993.

If you have any questions on this material, please contact Mr. Brian A. McIntyre at 412-374-4334.

Nicholas J. Liparulo, Manager
Nuclear Safety & Regulatory Activities

/nja

Enclosure

cc: B. A. McIntyre - Westinghouse
F. Hasselberg - NRC

0679A

ET-NRC-93-3849
ATTACHMENT A
AP600 RAI RESPONSES
SUBMITTED MARCH 30, 1993

RAI No.	Issue
410.095	HVAC conformance to SRP
410.096	Control room ventilation system (WCAP-13053)
410.097	VBS support for control room design basis
410.103	Diesel generator Building HVAC (WCAP-13053)
410.105	Turbine building closed cooling water system
630.006	LCOs for passive systems
630.008	Tech spec topical reports
720.041R01	Release frequencies

Question 410.95

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Provide a detailed specific conformance analysis for each of the HVAC subsystems in Sections 9.4.1-9.4.3 and 9.4.6-9.4.11 of the SSAR against the following guidelines of the Standard Review Plan (NUREG-0800): Sections 3.4.1 for flood protection, 3.5.1.1 for protection against internally-generated missiles, 3.5.2 for protection against externally-generated missiles, and 3.6.1 for protection against high- and moderate-energy pipe breaks. This analysis should be in greater detail than the information provided in Section 3.0 of the SSAR.

Response:

The following AP600 HVAC systems are non-safety-related systems:

- Nuclear island nonradioactive ventilation system (Subsection 9.4.1)
- Annex/auxiliary buildings nonradioactive HVAC system (Subsection 9.4.2)
- Radiologically controlled area ventilation (Subsection 9.4.3)
- Containment recirculation cooling system (Subsection 9.4.6)
- Containment air filtration system (Subsection 9.4.7)
- Radwaste building HVAC (Subsection 9.4.8)
- Turbine building ventilation system (Subsection 9.4.9)
- Diesel generator building heating and ventilation system (Subsection 9.4.10)
- Health physics and hot machine shop HVAC system (Subsection 9.4.11)

These systems perform no safety-related functions and the failure of these systems or their components will not affect the ability of the AP600 safety-related systems to perform their intended safety-related functions. Therefore, the guidelines of the Standard Review Plan (NUREG-0800), Section 3.4.1 for flood protection, Section 3.5.1.1 for protection against internally-generated missiles, Section 3.5.2 for protection against externally-generated missiles, and Section 3.6.1 for protection against high-and moderate-energy pipe breaks are not applicable to these systems.

The nuclear island nonradioactive ventilation, annex/auxiliary buildings nonradioactive HVAC, and diesel generator building heating and ventilation systems perform functions that support the non-safety-related defense-in-depth systems. An industry effort is currently underway to resolve the key licensing issues pertaining to the regulatory

treatment of non-safety-related systems that perform defense-in-depth functions. The final resolution of this issue and resulting outcomes are expected to apply to the portions of these non-safety-related HVAC systems that perform the defense-in-depth functions.

SSAR Revision: NONE

Question 410.96

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

WCAP-13053 states that the nuclear island nonradioactive ventilation system (VBS) for the control room area ventilation system has been designed to be non-safety-related (see Section 9.4.1). An exception to Position C.1 of Regulatory Guide 1.29 has been taken. The staff concludes that it may be necessary to maintain the filtration function of the CRAVS in order to meet GDC 19. Therefore, justify the non-safety designation of this system by demonstrating that GDC-19 can be met using a non-safety CRAVS or provide a safety-related CRAVS.

Demonstrate that the system is capable of withstanding the effects of earthquakes through conformance with the guidelines of Position C.1 of Regulatory Guide 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

Response:

Demonstrate that the system is capable of withstanding the effect of earthquakes through conformance with the guidelines of Position C.1 of R.G. 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

With the exception of the main control room (MCR) isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. Therefore, the VBS is not designed to perform the filtration function of CRAVS during or following a design basis accident, as required by SRP 6.4 and GDC 19. Conformance to GDC 19 and MCR operator habitability requirements under accident conditions is provided by the main control room emergency habitability system (VES).

The VES is designed to satisfy nuclear safety-related system redundant train design and seismic Category I requirements. VES is sized to deliver the required airflow rate to the MCR to meet ventilation and pressurization requirements for 72 hours. A refilling connection is provided for each train to allow for operation beyond 72 hours. The MCR passive heat sink is designed to limit the temperature rise inside the MCR during the 72-hour period following a loss of VBS operation. In the unlikely event that power to the VBS is not available for more than 72 hours, MCR cooling is provided by portable cooling units brought in from offsite (see the response to Q471.3 for further details). The portable units are standard commercial units and are sized to maintain long-term occupancy of personnel in the MCR. The MCR is provided with Quality Group C, seismic Category I penetrations for heat rejection and with power supply connections for the portable units. Therefore, conformance to GDC 19 and MCR operator habitability requirements under accident conditions is met. The detailed description of the VES is in SSAR Section 6.4.

The VBS compliance with the applicable regulatory positions is discussed in SSAR Appendix 1A and in the following paragraphs.

Compliance with Position C.1 of RG 1.29 does not apply, except for the MCR isolation dampers, because the VBS does not perform any other safety-related functions. The MCR isolation dampers are designed to meet seismic Category I requirements.

Compliance with Position C.2 of R.G. 1.29 is satisfied because the non-safety-related portions of the VBS inside the MCR are designed to meet seismic Category II requirements so that the failure of VBS components during an SSE will not reduce the functioning of any safety-related plant features.

Compliance with GDC 2 is satisfied because the MCR isolation dampers are designed for seismic Category I requirements. A tornado damper is installed in the VBS outside air intake to maintain safe habitability for personnel within the control room and safe environmental conditions for tornado-protected equipment. The isolation and tornado dampers are located inside a seismic Category I structure. Compliance with GDC 2 is not applicable to the remaining non-safety-related portions of the VBS.

SSAR Revision: NONE

Question 410.97

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Demonstrate how the requirements of GDC 4, "Environmental and Missile Design Basis," are met by the VBS to maintain environmental conditions in the control room within the design limits of the essential equipment located therein for normal, transient, or accident conditions (see Section 9.4.1).

Response:

The main control room (MCR) is located at elevation 117'-6" of the auxiliary building, which is a missile-protected seismic Category I structure. Conformance to GDC 4 tornado missile requirements is discussed in SSAR Section 3.3. Conformance to GDC 4 internally generated missile requirements is discussed in SSAR Section 3.5.

With the exception of the MCR isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. The MCR isolation dampers are located in the MCR envelope and are protected from missiles. The VBS has no other safety-related design function.

The VBS is designed to provide conditioned air for ventilation and cooling to maintain a suitable environment for personnel comfort and equipment operation during normal plant operation. The VBS is designed with redundant equipment and components that are connected to standby, onsite ac power sources. During or following an anticipated transient, if ac power is available, the VBS is designed to provide a reliable source of ventilation and cooling for personnel comfort and equipment operation. See SSAR Subsection 9.4.1 for a description of the VBS.

The requirement to maintain environmental conditions in the control room within the design limits of the essential equipment during a DBA is provided by the main control room emergency habitability system (VES). See SSAR Subsection 6.4 and the response to Q410.096 for a description of VES operation.

SSAR Revision: NONE

Question 410.103

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Section 9.4.10 of the SSAR, "Diesel Generator Building Heating and Ventilation System (VGS)," falls under the review guidelines of Section 9.4.5 of the SRP, "ESF Ventilation System." WCAP-13053 indicates that information will be provided on the ESF ventilation system later. Section 9.4.10 of the SSAR does not address the system's conformance with the guidelines of Section 9.4.5 of the SRP.

The staff concludes that this HVAC system should be evaluated as an ESF ventilation system as part of the design-in-depth concept. Therefore, this system should conform with the guidance of Section 9.4.5 of the SRP. Demonstrate that this system conforms with the guidelines of (1) R.G. 1.29 (to show it meets GDC 2), (2) Position C.2 of R.G. 1.52 and Positions C.1 and C.2 of R.G. 1.140 (to show it meets GDC 60), and (3) NUREG/CR-0660 (to show it meets GDC 17). Also, demonstrate that this system conforms with GDC 4. The system P&IDs, flow diagrams, component data, and system description should reflect corresponding details as identified in Section 9.4.5 of the SRP, as applicable. Table 3.2-3 of the SSAR should reflect appropriate equipment information.

Provide an equipment operability evaluation for the diesel generator building areas served by VGS to demonstrate that they can withstand a 150°F temperature environment (as identified in Section 9.4.10 of the SSAR). Address the habitability concerns inside these areas for the elevated temperatures.

Provide justification for the provisions in the VGS design of only two 50-percent-capacity roof-mounted exhaust fans for each diesel generator room and the normal ventilation system having only one 100-percent-capacity primary air handling unit versus fully redundant capacity units to satisfy the single failure criteria.

Response:

The AP600 onsite standby power system (ZOS) includes two diesel-generators housed in the diesel-generator building. The ZOS and the diesel-generators are not safety related and are not essential for the safe shutdown of the reactor nor are they necessary to prevent or mitigate the consequences of an accident. The diesel-generator building heating and ventilation system (VZS), which supports the operation of the ZOS, is therefore also not safety related. Because the VZS is not required to "maintain a controlled environment in areas containing safety-related equipment" and the areas served by the VZS do not contain "equipment essential for the safe shutdown of the reactor or necessary to prevent or mitigate the consequences of an accident," the VZS does not fall within the scope of SRP 9.4.5 Engineered Safety Feature Ventilation System. SSAR Subsection 9.4.10 does not therefore address SRP 9.4.5 compliance.

WCAP-13053 has been superseded by WCAP-13054, Rev. 1, which indicates that SRP 9.4.5 is not applicable to the AP600.

GDC 2 applies to structures, systems, and components important to safety. Since neither the ZOS nor the VZS is important to safety, compliance with RG 1.29 is not required for the VZS.

RG 1.52 applies only to post-accident engineered safety feature (ESF) atmosphere cleanup systems designed to mitigate the consequences of postulated accidents. The VZS is not safety related, is not an ESF system, and is not required to mitigate the consequences of postulated accidents. RG 1.52 is therefore not applicable to VZS.

RG 1.140 applies to atmosphere cleanup systems designed to collect airborne radioactive materials during normal plant operation. The diesel-generator building does not contain any radioactive materials and does not interface with any building or system that contains radioactive materials. The VZS, therefore, is not required to collect airborne radioactive materials, so RG 1.140 is not applicable.

GDC 17 applies to onsite electric power systems provided to permit functioning of structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 17 is not applicable to the VZS. Conformance to NUREG/CR-0660 is also therefore not required. The information contained in NUREG/CR-0660 has been considered in the design of the VZS.

GDC 4 applies to structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 4 is not applicable to the VZS.

SSAR Subsection 9.4.10.1 incorrectly identified the diesel-generator area as being maintained at 150°F with the diesel-generator off. The actual design room temperature is 105°F with the diesel generator off. The SSAR will be corrected to reflect this response as shown by the highlighted portion of the following excerpt from Subsection 9.4.10.1.

The VZS is not safety related; therefore, the single failure criteria is not applicable. However, the two 50 percent capacity exhaust fans for each diesel-generator room and one 100-percent-capacity primary air handling unit provide adequate redundancy for onsite standby power system operation on a system train basis. Failure of a single exhaust fan or primary air handling unit associated with a diesel generator train will not affect the operation of the other diesel-generator train. Therefore, at least one diesel-generator train will be fully operational should a single fan failure occur.

The last paragraph of SSAR Subsection 9.4.10.1.2 will be revised as follows:

SSAR Revision:

The systems are designed to maintain room temperature conditions as follows:

Area	Design Temperature Minimum	Maximum
Diesel Generator Area		
Diesel Generator On	None	130°F
Diesel Generator Off	50°F	105°F
Service Module		
Diesel Generator On	50°F	105°F
Diesel Generator Off	50°F	105°F

Question 410.105

Section 9.2.8 of the SSAR states that the turbine building closed cooling water system provides a continuous supply of cooling water to turbine plant equipment at a temperature of 95°F or less. The heat sink for the system is the SWS. Section 9.2.1.2.2 of the SSAR states that upon loss of control air or electric power, the SWS valves to the CCWS heat exchangers fail to an open position while the turbine building closed cooling water system heat exchangers valves fail to a closed position. Discuss the emergency preparedness considerations for maintaining the turbine building closed loop cooling capability if the SWS is degraded because of a weather change or SWS valve malfunction.

Response:

The turbine building closed cooling water system neither serves nor supports any plant safety-related function. The system provides heat removal capability to turbine building mechanical systems; the heat sink for this system is the service water system. If service water is degraded or lost, the plant load would have to be adjusted or the plant would have to be shut down by the plant operators to minimize potential damage to turbine building mechanical components during the shutdown.

See SSAR Subsection 9.2.1 for a description of the service water system.

SSAR Revision: NONE

Question 630.6

In order to address the unique design features of the AP600, Westinghouse states that it is considering including new limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shutdown), and the passive containment cooling system. Submit the LCOs for this equipment and these systems, or provide a schedule for doing so.

Response:

Subsection 16.1.3.5 of Technical Specifications included in the APo00 SSAR Section 16.1 includes the Technical Specifications for the passive core cooling system components with the exception of the automatic depressurization system valves. Subsection 16.1.3.4.12 includes the Technical Specifications for the automatic depressurization system valves. Subsection 16.1.3.6.6 includes the Technical Specifications for the passive containment cooling system. These subsections contain the Technical Specifications including the limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shut down), and the passive containment cooling system.

Page 16.1-2 of the AP600 SSAR discusses the possibility of modifying the LCOs for these passive, safety-related components. Because of recent industry developments relevant to Technical Specifications for these components, modification of these LCOs is not planned.

SSAR Subsection 16.1.1 will be revised as follows:

SSAR Revision:

Completion Times and Surveillance Frequencies

Some LCOs presented in the AP600 Technical Specifications do not include Completion Times (except for Immediately) or Surveillance Requirement Frequencies (except for surveillances that must be performed during shutdown - 24 months). The Completion Times and Surveillance Frequencies specified in Draft NUREG 1431 have been extended to similar Actions and Surveillance Requirements in AP600. However, these times are, generally, overly conservative for the AP600 design, and longer times based on deterministic criteria and PRA evaluation can be justified. These Completion Times and Surveillance Requirement Frequencies may also take credit for structures, systems, and components used in the PRA evaluation. The times will be consistent with the assumptions made in the PRA evaluation. Deterministic criteria and PRA evaluation can be used to establish Completion Times and Surveillance Requirement Frequencies rather than extend to AP600 the times currently specified in Draft NUREG 1431.

~~Additionally, conditional Required Actions and Completion Times are being considered for future development for a small number of LCOs. The determination of the conditional Required Actions may require modification of~~

~~certain Required Actions for these Technical Specifications. Some of the LCOs identified for this development include the passive, safety-related systems, such as:~~

~~Automatic Depressurization Valves~~
~~Core Makeup Tanks~~
~~Passive Residual Heat Removal System - Operating~~
~~Passive Residual Heat Removal System - Shutdown~~
~~Passive Containment Cooling System~~

Shutdown Completion Times/Mode Definitions

The AP600 plant design is different from current Westinghouse designs in that the systems normally used for mode reduction are non-safety systems and, therefore, are not covered by LCO requirements in Technical Specifications. The passive safety systems, which shut down the plant, require a longer period of time to accomplish mode changes and cannot reduce the RCS temperature to below 200 °F. The mode Definitions, LCO 3.0.3, and mode reduction Required Actions specified in these Technical Specifications are based on use of the passive safety systems.

Question 630.8

For each of the topical reports referenced in the Westinghouse STS Bases (Revision 0) that are similarly used in the Chapter 16 TS submittal for the AP600, provide specific justification for applying the topical reports to the AP600 design consistent with the staff's requirements for adopting the individual topical reports.

Response:

The following topical reports are referenced in the AP600 Technical Specifications:

- WCAP-8746-A, "Design Basis For Overtemperature delta-T and the Overpower delta-T Trips," March 1977

  This WCAP provides a basis for the overtemperature delta-T and the overpower delta-T trips for Westinghouse plants. The report is referenced in Subsection 16.1.2.2.1 since it includes the methodology for determining the setpoints for these reactor trips. This WCAP is applicable to the AP600.

- WCAP-9273-NP-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.

  WCAP-9273-NP-A is the nonproprietary version of WCAP-9272 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-8403, "Power Distribution Control and Load Following Procedures," September 1974.

  WCAP-8403 is applicable to the AP600 as referenced in Subsection 4.3.4 of the AP600 SSAR.

- WCAP-10217, "Relaxation of Constant Axial Offset Control: F_Q Surveillance Technical Specification," June 1983.

  WCAP-10217 is the nonproprietary version of WCAP-10216 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-10271-P-A, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," May 1986.
  WCAP-10271-P-A, Supplement 2, Revision 1, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," June 1990.

  These WCAPs are applicable to the reactor trip and engineered safety functions actuated by the AP600 protection and monitoring system. The applicability of the methodologies provided in these WCAPS to digital equipment has been approved by the NRC via a safety evaluation report issued on the Sequoyah Nuclear Plant, Unit 1 Docket.

- WCAP-7769, "Topical Report on Overpressure Protection "

  WCAP-7769, Revision 1 dated June 1972, is applicable to the AP600 as referenced in Subsection 15.2.9 of the AP600 SSAR.

- WCAP-7924-A, "Basis for Heatup and Cooldown Limit Curves," April 1975.

  WCAP-7924-A provides the methodology used to generate the AP600 heatup and cooldown limit curves.

Reference 2 to technical specification B.3.4.6 will be revised as follows:

SSAR Revision:

2. WCAP-7769, "Topical Report on Overpressure Protection," Revision 1, June 1972.

Question 720.41

Provide a listing of the Level 1 sequences assigned to each release class and their respective frequencies.

Response (Revision 1):

Tables 1 to 4 provide a listing of the sequences assigned to each of the four fission product release classes utilized in the AP600 PRA. Only sequences contributing at least 3 percent to the frequency of a release class are included. The following information is presented for each sequence.

1. The sequence contribution to the release frequency of a particular fission release class (both the absolute magnitude and relative contribution, columns 2 and 3 in the tables).

2. Sequence description indicating the ... lability of key systems, and success or failure of operator actions during the sequence (column 4 in the tabl...

3. Identification of the path taken by the sequence at key nodes in the event trees used for core melt quantification and fission product release (containment event tree) quantification (column 5 in the tables). ('SUC' or 'DEL' implies success or upward branching at a node, and 'SYS' or 'OTH' implies the opposite.)

4. The accident class (defined in Table G-1 of the AP600 PRA report) to which the sequence belongs.

PRA Revision: NONE

TABLE 1

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.8E-08	26.8	SI Line Break Event Occurs	IEV-S1S	IIIBE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Success of 1 of 1 Core Makeup Tank	DEL-CM1A	
			Failure of 1 of 1 Gravity Injection Line	SYS-IW1A	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
2	4.4E-08	17.3	Loss of Feedwater Without Scram (ATWS) Event Occurs	IEV-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment Isolation System Functions	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
3	3.2E-08	12.5	PRHR Heat Exchanger Tube Rupture Event Occurs	IEV-S2P	IIIBR
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRT	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			CVCS Makeup Fails	SYS-CSLOCA	
			PRHR Isolation Failure Following PRHR Tube Rupture	SYS-PRI1	
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
4	2.9E-08	11.2	Vessel Rupture Event Occurs	IEV-VR	IIIC
			Containment Is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
5	1.5E-08	5.8	Large LOCA Event Occurs	IEV-A	IIIBE
			Failure of 2 of 2 Gravity Injection Lines	SYS-IW2AB	
			Both Core Makeup Tanks Work	DEL-CM2L	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
6	1.3E-08	5.3	Small LOCA Event Occurs	IEV-S2	IIIBR
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Passive RHR System Works	DEL-PRL	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
	2.0E-07	80.0	Total for the Above 6 Sequences		
	2.5E-07		Total Frequency for the Release Class - OK (From At-Power Conditions Only)		

TABLE 2

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	3.0E-08	54.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
2	1.4E-08	24.6	Loss of Feedwater to Steam Generator Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
3	7.4E-09	13.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Both Core Makeup Tanks Function	DEL-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADA	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1A	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
4	1.4E-09	2.6	Secondary to Primary Side Power Mismatch Initiating Event Occurs	IEV-TM	IA

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
5	1.2E-09	2.2	Spurious "S" Signal Initiating Event Occurs	IEV-TS	IA
			Failure to Supply Startup Feedwater to 1 of 2 Steam Generators	SYS-SFW	
			Failure of PRHR System to Remove Decay Heat From RPV	SYS-PRT	
			Failure to Trip All Four RCS Pumps	SYS-RCSL	
			Both Core Makeup Tanks Function	DEL-CM2T	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
	---	---	---		
	5.4E-08	98.0	Total for the Above 5 Sequences		
	5.5E-08		Total Frequency for the Release Class - OKP (From At-Power Conditions Only)		

TABLE 3

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - C!

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.6E-09	32.9	Consequential SG Tube Rupture Initiating Event Occurs[#] Automatic ADS Actuation Fails Full RCS Depressurization Automatic ADS Actuation Fails Partial RCS Depressurization Both Core Makeup Tanks Work Passive RHR System Works	SYS-IECV2 SYS-ADS SYS-ADV DEL-CM2SL DEL-PRL	VIE
2	2.4E-09	11.9	Steam Generator Tube Rupture Initiating Event Occurs Automatic ADS Actuation Fails Full RCS Depressurization Automatic ADS Actuation Fails Partial RCS Depressurization Both Core Makeup Tanks Work Passive RHR System Works	IEV-V2 SYS-ADS SYS-ADV DEL-CM2SL DEL-PRL	VIE
3	2.3E-09	11.3	Loss of Feedwater Without Scram Initiating Event Occurs Reactor Trip Function Failure AMSAC System Fails (Results in RV Rupture) Containment is Breached (As a Consequence of RV Rupture)	SYS-TFA SYS-CE SYS-AMSAC OTH-CNB	IIIC
4	2.0E-09	9.9	Turbine/Reactor Trip /Low RCS Flow Initiating Event Occurs Condenser and Startup Feed Water, and Passive RHR Systems Fail Failure of Both Core Makeup Tanks	SYS-TT SYS-XCSP SYS-CM2AB	IA

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-ADI	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
5	1.5E-09	7.5	Vessel Rupture Initiating Event Occurs	SYS-VR	IIIC
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
6	7.2E-10	3.6	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-ADI	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
7	6.6E-10	3.3	Consequential SG Tube Rupture Initiating Event Occurs	SYS-IECV2	VIE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Failure of Gravity Injection Lines	SYS-IW2AB	
			Normal RHR Fails to Operate in Injection Mode (LOCA/Transient)	SYS-RNR	
	---	---	---		
	1.6E-08	80.0	Total for the Above 7 Sequences		
	2.0E-08		Total Frequency for the Release Class - CI (From At-Power Conditions Only)		

During Events Initiated by a Steam Line Break or Stuck Open Secondary-Side Relief Valve

TABLE 4

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	4.4E-10	58.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IIIBE
			Failure of I&C (Boards)	CCX-HARD1	
			Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs)	CCX-AV-LA	
			ADS Failure (Operator Fails to Perform Manual ADS Actuation)	LPM-MAN03	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CIC	
			Water is Available for the Passive Containment Cooling System	DEL-PCT	
			Not Enough Water in the Reactor Cavity to Cool the Core Debris	SYS-CC3BE	
2	1.3E-10	17.8	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IIIBE
			Failure of I&C (Boards)	CCX-HARD1	
			Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs)	CCX-AV-LA	
			ADS Failure (Operator Fails to Perform Manual ADS Actuation)	LPM-MAN03	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CIC	
			Water is Available for the Passive Containment Cooling System	DEL-PCT	
			Not Enough Water in the Reactor Cavity to Cool the Core Debris After RV Failure	SYS-CC3BE	

TABLE 4 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
	---	---	---		
	5.7E-10	76.0	Total for the Above 2 Sequences		
	7.5E-10		Total Frequency for the Release Class - CC (From At-Power Conditions Only)		

Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

ET-NRC-93-3849
NSRA-APSL-93-0097
Docket No.: STN-52-003

March 30, 1993

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

ATTENTION: R. W. BORCHARDT

SUBJECT: WESTINGHOUSE RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION ON THE AP600

Dear Mr. Borchardt:

Enclosed are three copies of the Westinghouse responses to NRC requests for additional information on the AP600 from your letter of January 26, 1993. This transmittal is a partial response to that letter. A listing of the NRC requests for additional information responded to in this letter is contained in Attachment A. The Westinghouse responses to the remainder of the requests for additional information contained in your letter of January 26, 1993 will be provided prior to May 29, 1993.

If you have any questions on this material, please contact Mr. Brian A. McIntyre at 412-374-4334.

Nicholas J. Liparulo, Manager
Nuclear Safety & Regulatory Activities

/nja

Enclosure

cc: B. A. McIntyre - Westinghouse
F. Hasselberg - NRC

0679A

ET-NRC-93-3849
ATTACHMENT A
AP600 RAI RESPONSES
SUBMITTED MARCH 30, 1993

RAI No.	Issue
410.095	HVAC conformance to SRP
410.096	Control room ventilation system (WCAP-13053)
410.097	VBS support for control room design basis
410.103	Diesel generator Building HVAC (WCAP-13053)
410.105	Turbine building closed cooling water system
630.006	LCOs for passive systems
630.008	Tech spec topical reports
720.041R01	Release frequencies

Question 410.95

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Provide a detailed specific conformance analysis for each of the HVAC subsystems in Sections 9.4.1-9.4.3 and 9.4.6-9.4.11 of the SSAR against the following guidelines of the Standard Review Plan (NUREG-0800): Sections 3.4.1 for flood protection, 3.5.1.1 for protection against internally-generated missiles, 3.5.2 for protection against externally-generated missiles, and 3.6.1 for protection against high- and moderate-energy pipe breaks. This analysis should be in greater detail than the information provided in Section 3.0 of the SSAR.

Response:

The following AP600 HVAC systems are non-safety-related systems:

- Nuclear island nonradioactive ventilation system (Subsection 9.4.1)
- Annex/auxiliary buildings nonradioactive HVAC system (Subsection 9.4.2)
- Radiologically controlled area ventilation (Subsection 9.4.3)
- Containment recirculation cooling system (Subsection 9.4.6)
- Containment air filtration system (Subsection 9.4.7)
- Radwaste building HVAC (Subsection 9.4.8)
- Turbine building ventilation system (Subsection 9.4.9)
- Diesel generator building heating and ventilation system (Subsection 9.4.10)
- Health physics and hot machine shop HVAC system (Subsection 9.4.11)

These systems perform no safety-related functions and the failure of these systems or their components will not affect the ability of the AP600 safety-related systems to perform their intended safety-related functions. Therefore, the guidelines of the Standard Review Plan (NUREG-0800), Section 3.4.1 for flood protection, Section 3.5.1.1 for protection against internally-generated missiles, Section 3.5.2 for protection against externally-generated missiles, and Section 3.6.1 for protection against high-and moderate-energy pipe breaks are not applicable to these systems.

The nuclear island nonradioactive ventilation, annex/auxiliary buildings nonradioactive HVAC, and diesel generator building heating and ventilation systems perform functions that support the non-safety-related defense-in-depth systems. An industry effort is currently underway to resolve the key licensing issues pertaining to the regulatory

treatment of non-safety-related systems that perform defense-in-depth functions. The final resolution of this issue and resulting outcomes are expected to apply to the portions of these non-safety-related HVAC systems that perform the defense-in-depth functions.

SSAR Revision: NONE

Question 410.96

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

WCAP-13053 states that the nuclear island nonradioactive ventilation system (VBS) for the control room area ventilation system has been designed to be non-safety-related (see Section 9.4.1). An exception to Position C.1 of Regulatory Guide 1.29 has been taken. The staff concludes that it may be necessary to maintain the filtration function of the CRAVS in order to meet GDC 19. Therefore, justify the non-safety designation of this system by demonstrating that GDC-19 can be met using a non-safety CRAVS or provide a safety-related CRAVS.

Demonstrate that the system is capable of withstanding the effects of earthquakes through conformance with the guidelines of Position C.1 of Regulatory Guide 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

Response:

Demonstrate that the system is capable of withstanding the effect of earthquakes through conformance with the guidelines of Position C.1 of R.G. 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

With the exception of the main control room (MCR) isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. Therefore, the VBS is not designed to perform the filtration function of CRAVS during or following a design basis accident, as required by SRP 6.4 and GDC 19. Conformance to GDC 19 and MCR operator habitability requirements under accident conditions is provided by the main control room emergency habitability system (VES).

The VES is designed to satisfy nuclear safety-related system redundant train design and seismic Category I requirements. VES is sized to deliver the required airflow rate to the MCR to meet ventilation and pressurization requirements for 72 hours. A refilling connection is provided for each train to allow for operation beyond 72 hours. The MCR passive heat sink is designed to limit the temperature rise inside the MCR during the 72-hour period following a loss of VBS operation. In the unlikely event that power to the VBS is not available for more than 72 hours, MCR cooling is provided by portable cooling units brought in from offsite (see the response to Q471.3 for further details). The portable units are standard commercial units and are sized to maintain long-term occupancy of personnel in the MCR. The MCR is provided with Quality Group C, seismic Category I penetrations for heat rejection and with power supply connections for the portable units. Therefore, conformance to GDC 19 and MCR operator habitability requirements under accident conditions is met. The detailed description of the VES is in SSAR Section 6.4.

The VBS compliance with the applicable regulatory positions is discussed in SSAR Appendix 1A and in the following paragraphs.

Compliance with Position C.1 of RG 1.29 does not apply, except for the MCR isolation dampers, because the VBS does not perform any other safety-related functions. The MCR isolation dampers are designed to meet seismic Category I requirements.

Compliance with Position C.2 of R.G. 1.29 is satisfied because the non-safety-related portions of the VBS inside the MCR are designed to meet seismic Category II requirements so that the failure of VBS components during an SSE will not reduce the functioning of any safety-related plant features.

Compliance with GDC 2 is satisfied because the MCR isolation dampers are designed for seismic Category I requirements. A tornado damper is installed in the VBS outside air intake to maintain safe habitability for personnel within the control room and safe environmental conditions for tornado-protected equipment. The isolation and tornado dampers are located inside a seismic Category I structure. Compliance with GDC 2 is not applicable to the remaining non-safety-related portions of the VBS.

SSAR Revision: NONE

Question 410.97

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Demonstrate how the requirements of GDC 4, "Environmental and Missile Design Basis," are met by the VBS to maintain environmental conditions in the control room within the design limits of the essential equipment located therein for normal, transient, or accident conditions (see Section 9.4.1).

Response:

The main control room (MCR) is located at elevation 117'-6" of the auxiliary building, which is a missile-protected seismic Category I structure. Conformance to GDC 4 tornado missile requirements is discussed in SSAR Section 3.3. Conformance to GDC 4 internally generated missile requirements is discussed in SSAR Section 3.5.

With the exception of the MCR isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. The MCR isolation dampers are located in the MCR envelope and are protected from missiles. The VBS has no other safety-related design function.

The VBS is designed to provide conditioned air for ventilation and cooling to maintain a suitable environment for personnel comfort and equipment operation during normal plant operation. The VBS is designed with redundant equipment and components that are connected to standby, onsite ac power sources. During or following an anticipated transient, if ac power is available, the VBS is designed to provide a reliable source of ventilation and cooling for personnel comfort and equipment operation. See SSAR Subsection 9.4.1 for a description of the VBS.

The requirement to maintain environmental conditions in the control room within the design limits of the essential equipment during a DBA is provided by the main control room emergency habitability system (VES). See SSAR Subsection 6.4 and the response to Q410.096 for a description of VES operation.

SSAR Revision: NONE

Question 410.103

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Section 9.4.10 of the SSAR, "Diesel Generator Building Heating and Ventilation System (VGS)," falls under the review guidelines of Section 9.4.5 of the SRP, "ESF Ventilation System." WCAP-13053 indicates that information will be provided on the ESF ventilation system later. Section 9.4.10 of the SSAR does not address the system's conformance with the guidelines of Section 9.4.5 of the SRP.

The staff concludes that this HVAC system should be evaluated as an ESF ventilation system as part of the design-in-depth concept. Therefore, this system should conform with the guidance of Section 9.4.5 of the SRP. Demonstrate that this system conforms with the guidelines of (1) R.G. 1.29 (to show it meets GDC 2), (2) Position C.2 of R.G. 1.52 and Positions C.1 and C.2 of R.G. 1.140 (to show it meets GDC 60), and (3) NUREG/CR-0660 (to show it meets GDC 17). Also, demonstrate that this system conforms with GDC 4. The system P&IDs, flow diagrams, component data, and system description should reflect corresponding details as identified in Section 9.4.5 of the SRP, as applicable. Table 3.2-3 of the SSAR should reflect appropriate equipment information.

Provide an equipment operability evaluation for the diesel generator building areas served by VGS to demonstrate that they can withstand a 150°F temperature environment (as identified in Section 9.4.10 of the SSAR). Address the habitability concerns inside these areas for the elevated temperatures.

Provide justification for the provisions in the VGS design of only two 50-percent-capacity roof-mounted exhaust fans for each diesel generator room and the normal ventilation system having only one 100-percent-capacity primary air handling unit versus fully redundant capacity units to satisfy the single failure criteria.

Response:

The AP600 onsite standby power system (ZOS) includes two diesel-generators housed in the diesel-generator building. The ZOS and the diesel-generators are not safety related and are not essential for the safe shutdown of the reactor nor are they necessary to prevent or mitigate the consequences of an accident. The diesel-generator building heating and ventilation system (VZS), which supports the operation of the ZOS, is therefore also not safety related. Because the VZS is not required to "maintain a controlled environment in areas containing safety-related equipment" and the areas served by the VZS do not contain "equipment essential for the safe shutdown of the reactor or necessary to prevent or mitigate the consequences of an accident," the VZS does not fall within the scope of SRP 9.4.5 Engineered Safety Feature Ventilation System. SSAR Subsection 9.4.10 does not therefore address SRP 9.4.5 compliance.

WCAP-13053 has been superseded by WCAP-13054, Rev. 1, which indicates that SRP 9.4.5 is not applicable to the AP600.

GDC 2 applies to structures, systems, and components important to safety. Since neither the ZOS nor the VZS is important to safety, compliance with RG 1.29 is not required for the VZS.

RG 1.52 applies only to post-accident engineered safety feature (ESF) atmosphere cleanup systems designed to mitigate the consequences of postulated accidents. The VZS is not safety related, is not an ESF system, and is not required to mitigate the consequences of postulated accidents. RG 1.52 is therefore not applicable to VZS.

RG 1.140 applies to atmosphere cleanup systems designed to collect airborne radioactive materials during normal plant operation. The diesel-generator building does not contain any radioactive materials and does not interface with any building or system that contains radioactive materials. The VZS, therefore, is not required to collect airborne radioactive materials, so RG 1.140 is not applicable.

GDC 17 applies to onsite electric power systems provided to permit functioning of structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 17 is not applicable to the VZS. Conformance to NUREG/CR-0660 is also therefore not required. The information contained in NUREG/CR-0660 has been considered in the design of the VZS.

GDC 4 applies to structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 4 is not applicable to the VZS.

SSAR Subsection 9.4.10.1 incorrectly identified the diesel-generator area as being maintained at 150°F with the diesel-generator off. The actual design room temperature is 105°F with the diesel generator off. The SSAR will be corrected to reflect this response as shown by the highlighted portion of the following excerpt from Subsection 9.4.10.1.

The VZS is not safety related; therefore, the single failure criteria is not applicable. However, the two 50 percent capacity exhaust fans for each diesel-generator room and one 100-percent-capacity primary air handling unit provide adequate redundancy for onsite standby power system operation on a system train basis. Failure of a single exhaust fan or primary air handling unit associated with a diesel generator train will not affect the operation of the other diesel-generator train. Therefore, at least one diesel-generator train will be fully operational should a single fan failure occur.

The last paragraph of SSAR Subsection 9.4.10.1.2 will be revised as follows:

SSAR Revision:

The systems are designed to maintain room temperature conditions as follows:

Area	Design Minimum	Temperature Maximum
Diesel Generator Area		
Diesel Generator On	None	130°F
Diesel Generator Off	50°F	105°F
Service Module		
Diesel Generator On	50°F	105°F
Diesel Generator Off	50°F	105°F

Question 410.105

Section 9.2.8 of the SSAR states that the turbine building closed cooling water system provides a continuous supply of cooling water to turbine plant equipment at a temperature of 95°F or less. The heat sink for the system is the SWS. Section 9.2.1.2.2 of the SSAR states that upon loss of control air or electric power, the SWS valves to the CCWS heat exchangers fail to an open position while the turbine building closed cooling water system heat exchangers valves fail to a closed position. Discuss the emergency preparedness considerations for maintaining the turbine building closed loop cooling capability if the SWS is degraded because of a weather change or SWS valve malfunction.

Response:

The turbine building closed cooling water system neither serves nor supports any plant safety-related function. The system provides heat removal capability to turbine building mechanical systems; the heat sink for this system is the service water system. If service water is degraded or lost, the plant load would have to be adjusted or the plant would have to be shut down by the plant operators to minimize potential damage to turbine building mechanical components during the shutdown.

See SSAR Subsection 9.2.1 for a description of the service water system.

SSAR Revision: NONE

Question 630.6

In order to address the unique design features of the AP600, Westinghouse states that it is considering including new limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shutdown), and the passive containment cooling system. Submit the LCOs for this equipment and these systems, or provide a schedule for doing so.

Response:

Subsection 16.1.3.5 of Technical Specifications included in the AP600 SSAR Section 16.1 includes the Technical Specifications for the passive core cooling system components with the exception of the automatic depressurization system valves. Subsection 16.1.3.4.12 includes the Technical Specifications for the automatic depressurization system valves. Subsection 16.1.3.6.6 includes the Technical Specifications for the passive containment cooling system. These subsections contain the Technical Specifications including the limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shut down), and the passive containment cooling system.

Page 16.1-2 of the AP600 SSAR discusses the possibility of modifying the LCOs for these passive, safety-related components. Because of recent industry developments relevant to Technical Specifications for these components, modification of these LCOs is not planned.

SSAR Subsection 16.1.1 will be revised as follows:

SSAR Revision:

Completion Times and Surveillance Frequencies

Some LCOs presented in the AP600 Technical Specifications do not include Completion Times (except for Immediately) or Surveillance Requirement Frequencies (except for surveillances that must be performed during shutdown - 24 months). The Completion Times and Surveillance Frequencies specified in Draft NUREG 1431 have been extended to similar Actions and Surveillance Requirements in AP600. However, these times are, generally, overly conservative for the AP600 design, and longer times based on deterministic criteria and PRA evaluation can be justified. These Completion Times and Surveillance Requirement Frequencies may also take credit for structures, systems, and components used in the PRA evaluation. The times will be consistent with the assumptions made in the PRA evaluation. Deterministic criteria and PRA evaluation can be used to establish Completion Times and Surveillance Requirement Frequencies rather than extend to AP600 the times currently specified in Draft NUREG 1431.

~~Additionally, conditional Required Actions and Completion Times are being considered for future development for a small number of LCOs. The determination of the conditional Required Actions may require modification of~~

~~certain Required Actions for these Technical Specifications. Some of the LCOs identified for this development include the passive, safety-related systems, such as:~~

~~Automatic Depressurization Valves~~
~~Core Makeup Tanks~~
~~Passive Residual Heat Removal System - Operating~~
~~Passive Residual Heat Removal System - Shutdown~~
~~Passive Containment Cooling System~~

Shutdown Completion Times/Mode Definitions

The AP600 plant design is different from current Westinghouse designs in that the systems normally used for mode reduction are non-safety systems and, therefore, are not covered by LCO requirements in Technical Specifications. The passive safety systems, which shut down the plant, require a longer period of time to accomplish mode changes and cannot reduce the RCS temperature to below 200 °F. The mode Definitions, LCO 3.0.3, and mode reduction Required Actions specified in these Technical Specifications are based on use of the passive safety systems.

Question 630.8

For each of the topical reports referenced in the Westinghouse STS Bases (Revision 0) that are similarly used in the Chapter 16 TS submittal for the AP600, provide specific justification for applying the topical reports to the AP600 design consistent with the staff's requirements for adopting the individual topical reports.

Response:

The following topical reports are referenced in the AP600 Technical Specifications:

- WCAP-8746-A, "Design Basis For Overtemperature delta-T and the Overpower delta-T Trips," March 1977

  This WCAP provides a basis for the overtemperature delta-T and the overpower delta-T trips for Westinghouse plants. The report is referenced in Subsection 16.1.2.2.1 since it includes the methodology for determining the setpoints for these reactor trips. This WCAP is applicable to the AP600.

- WCAP-9273-NP-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.

  WCAP-9273-NP-A is the nonproprietary version of WCAP-9272 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-8403, "Power Distribution Control and Load Following Procedures," September 1974.

  WCAP-8403 is applicable to the AP600 as referenced in Subsection 4.3.4 of the AP600 SSAR.

- WCAP-10217, "Relaxation of Constant Axial Offset Control: F_Q Surveillance Technical Specification," June 1983.

  WCAP-10217 is the nonproprietary version of WCAP-10216 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-10271-P-A, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," May 1986.
  WCAP-10271-P-A, Supplement 2, Revision 1, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," June 1990.

  These WCAPs are applicable to the reactor trip and engineered safety functions actuated by the AP600 protection and monitoring system. The applicability of the methodologies provided in these WCAPS to digital equipment has been approved by the NRC via a safety evaluation report issued on the Sequoyah Nuclear Plant, Unit 1 Docket.

- WCAP-7769, "Topical Report on Overpressure Protection."

  WCAP-7769, Revision 1 dated June 1972, is applicable to the AP600 as referenced in Subsection 15.2.9 of the AP600 SSAR.

- WCAP-7924-A, "Basis for Heatup and Cooldown Limit Curves," April 1975.

  WCAP-7924-A provides the methodology used to generate the AP600 heatup and cooldown limit curves.

Reference 2 to technical specification B.3.4.6 will be revised as follows:

SSAR Revision:

2. WCAP-7769, "Topical Report on Overpressure Protection," Revision 1, June 1972.

Question 720.41

Provide a listing of the Level 1 sequences assigned to each release class and their respective frequencies.

Response (Revision 1):

Tables 1 to 4 provide a listing of the sequences assigned to each of the four fission product release classes utilized in the AP600 PRA. Only sequences contributing at least 3 percent to the frequency of a release class are included. The following information is presented for each sequence.

1. The sequence contribution to the release frequency of a particular fission release class (both the absolute magnitude and relative contribution, columns 2 and 3 in the tables).

2. Sequence description indicating the availability of key systems, and success or failure of operator actions during the sequence (column 4 in the tables).

3. Identification of the path taken by the sequence at key nodes in the event trees used for core melt quantification and fission product release (containment event tree) quantification (column 5 in the tables). ('SUC' or 'DEL' implies success or upward branching at a node, and 'SYS' or 'OTH' implies the opposite.)

4. The accident class (defined in Table G-1 of the AP600 PRA report) to which the sequence belongs.

PRA Revision: NONE

TABLE 1

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.8E-08	26.8	SI Line Break Event Occurs	IEV-S1S	IIIBE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Success of 1 of 1 Core Makeup Tank	DEL-CM1A	
			Failure of 1 of 1 Gravity Injection Line	SYS-IW1A	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
2	4.4E-08	17.3	Loss of Feedwater Without Scram (ATWS) Event Occurs	IEV-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment Isolation System Functions	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
3	3.2E-08	12.5	PRHR Heat Exchanger Tube Rupture Event Occurs	IEV-S2P	IIIBR
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRT	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			CVCS Makeup Fails	SYS-CSLOCA	
			PRHR Isolation Failure Following PRHR Tube Rupture	SYS-PRI1	
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
4	2.9E-08	11.2	Vessel Rupture Event Occurs	IEV-VR	IIIC
			Containment Is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
5	1.5E-08	5.8	Large LOCA Event Occurs	IEV-A	IIIBE
			Failure of 2 of 2 Gravity Injection Lines	SYS-IW2AB	
			Both Core Makeup Tanks Work	DEL-CM2L	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
6	1.3E-08	5.3	Small LOCA Event Occurs	IEV-S2	IIIBR
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Passive RHR System Works	DEL-PRL	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
	2.0E-07	80.0	Total for the Above 6 Sequences		

2.5E-07 Total Frequency for the Release Class - OK (From At-Power Conditions Only)

TABLE 2

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	3.0E-08	54.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
2	1.4E-08	24.6	Loss of Feedwater to Steam Generator Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
3	7.4E-09	13.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Both Core Makeup Tanks Function	DEL-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADA	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1A	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
4	1.4E-09	2.6	Secondary to Primary Side Power Mismatch Initiating Event Occurs	IEV-TM	IA

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
5	1.2E-09	2.2	Spurious "S" Signal Initiating Event Occurs	IEV-TS	1A
			Failure to Supply Startup Feedwater to 1 of 2 Steam Generators	SYS-SFW	
			Failure of PRHR System to Remove Decay Heat From RPV	SYS-PRT	
			Failure to Trip All Four RCS Pumps	SYS-RCSL	
			Both Core Makeup Tanks Function	DEL-CM2T	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
	---	---	---		
	5.4E-08	98.0	Total for the Above 5 Sequences		
	5.5E-08		Total Frequency for the Release Class - OKP (From At-Power Conditions Only)		

TABLE 3

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.6E-09	32.9	Consequential SG Tube Rupture Initiating Event Occurs#	SYS-IECV2	VIE
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	
2	2.4E-09	11.9	Steam Generator Tube Rupture Initiating Event Occurs	IEV-V2	VIE
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	
3	2.3E-09	11.3	Loss of Feedwater Without Scram Initiating Event Occurs	SYS-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
4	2.0E-09	9.9	Turbine/Reactor Trip /Low RCS Flow Initiating Event Occurs	SYS-TT	IA
			Condenser and Startup Feed Water, and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
5	1.5E-09	7.5	Vessel Rupture Initiating Event Occurs	SYS-VR	IIIC
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
6	7.2E-10	3.6	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
7	6.6E-10	3.3	Consequential SG Tube Rupture Initiating Event Occurs	SYS-IECV2	VIE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Failure of Gravity Injection Lines	SYS-IW2AB	
			Normal RHR Fails to Operate in Injection Mode (LOCA/Transient)	SYS-RNR	
	---	---	---		
	1.6E-08	80.0	Total for the Above 7 Sequences		
	2.0E-08		Total Frequency for the Release Class - CI (From At-Power Conditions Only)		

During Events Initiated by a Steam Line Break or Stuck Open Secondary-Side Relief Valve

TABLE 4

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	4.4E-10	58.6	Turbine/Reactor Trip Initiating Event Occurs Failure of I&C (Boards) Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs) ADS Failure (Operator Fails to Perform Manual ADS Actuation) Operator Fails to Open Recirc MOVs On High Hot Leg Temperature Containment is NOT Impaired Water is Available for the Passive Containment Cooling System Not Enough Water in the Reactor Cavity to Cool the Core Debris	IEV-TT CCX-HARD1 CCX-AV-LA LPM-MAN03 SYS-IWF DEL-CIC DEL-PCT SYS-CC3BE	IIIBE
2	1.3E-10	17.8	Loss of Feedwater to SG Initiating Event Occurs Failure of I&C (Boards) Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs) ADS Failure (Operator Fails to Perform Manual ADS Actuation) Operator Fails to Open Recirc MOVs On High Hot Leg Temperature Containment is NOT Impaired Water is Available for the Passive Containment Cooling System Not Enough Water in the Reactor Cavity to Cool the Core Debris After RV Failure	IEV-TF CCX-HARD1 CCX-AV-LA LPM-MAN03 SYS-IWF DEL-CIC DEL-PCT SYS-CC3BE	IIIBE

TABLE 4 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
	---	---	---		
	5.7E-10	76.0	Total for the Above 2 Sequences		
	7.5E-10		Total Frequency for the Release Class - CC (From At-Power Conditions Only)		

Westinghouse Electric Corporation
Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

ET-NRC-93-3849
NSRA-APSL-93-0097
Docket No.: STN-52-003

March 30, 1993

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

ATTENTION: R. W. BORCHARDT

SUBJECT: WESTINGHOUSE RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION ON THE AP600

Dear Mr. Borchardt:

Enclosed are three copies of the Westinghouse responses to NRC requests for additional information on the AP600 from your letter of January 26, 1993. This transmittal is a partial response to that letter. A listing of the NRC requests for additional information responded to in this letter is contained in Attachment A. The Westinghouse responses to the remainder of the requests for additional information contained in your letter of January 26, 1993 will be provided prior to May 29, 1993.

If you have any questions on this material, please contact Mr. Brian A. McIntyre at 412-374-4334.

Nicholas J. Liparulo, Manager
Nuclear Safety & Regulatory Activities

/nja

Enclosure

cc: B. A. McIntyre - Westinghouse
F. Hasselberg - NRC

0879A

ET-NRC-93-3849
ATTACHMENT A
AP600 RAI RESPONSES
SUBMITTED MARCH 30, 1993

RAI No.	Issue
410.095	HVAC conformance to SRP
410.096	Control room ventilation system (WCAP-13053)
410.097	VBS support for control room design basis
410.103	Diesel generator Building HVAC (WCAP-13053)
410.105	Turbine building closed cooling water system
630.006	LCOs for passive systems
630.008	Tech spec topical reports
720.041R01	Release frequencies

Question 410.95

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Provide a detailed specific conformance analysis for each of the HVAC subsystems in Sections 9.4.1-9.4.3 and 9.4.6-9.4.11 of the SSAR against the following guidelines of the Standard Review Plan (NUREG-0800): Sections 3.4.1 for flood protection, 3.5.1.1 for protection against internally-generated missiles, 3.5.2 for protection against externally-generated missiles, and 3.6.1 for protection against high- and moderate-energy pipe breaks. This analysis should be in greater detail than the information provided in Section 3.0 of the SSAR.

Response:

The following AP600 HVAC systems are non-safety-related systems:

- Nuclear island nonradioactive ventilation system (Subsection 9.4.1)
- Annex/auxiliary buildings nonradioactive HVAC system (Subsection 9.4.2)
- Radiologically controlled area ventilation (Subsection 9.4.3)
- Containment recirculation cooling system (Subsection 9.4.6)
- Containment air filtration system (Subsection 9.4.7)
- Radwaste building HVAC (Subsection 9.4.8)
- Turbine building ventilation system (Subsection 9.4.9)
- Diesel generator building heating and ventilation system (Subsection 9.4.10)
- Health physics and hot machine shop HVAC system (Subsection 9.4.11)

These systems perform no safety-related functions and the failure of these systems or their components will not affect the ability of the AP600 safety-related systems to perform their intended safety-related functions. Therefore, the guidelines of the Standard Review Plan (NUREG-0800), Section 3.4.1 for flood protection, Section 3.5.1.1 for protection against internally-generated missiles, Section 3.5.2 for protection against externally-generated missiles, and Section 3.6.1 for protection against high-and moderate-energy pipe breaks are not applicable to these systems.

The nuclear island nonradioactive ventilation, annex/auxiliary buildings nonradioactive HVAC, and diesel generator building heating and ventilation systems perform functions that support the non-safety-related defense-in-depth systems. An industry effort is currently underway to resolve the key licensing issues pertaining to the regulatory

treatment of non-safety-related systems that perform defense-in-depth functions. The final resolution of this issue and resulting outcomes are expected to apply to the portions of these non-safety-related HVAC systems that perform the defense-in-depth functions.

SSAR Revision: NONE

Question 410.96

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

WCAP-13053 states that the nuclear island nonradioactive ventilation system (VBS) for the control room area ventilation system has been designed to be non-safety-related (see Section 9.4.1). An exception to Position C.1 of Regulatory Guide 1.29 has been taken. The staff concludes that it may be necessary to maintain the filtration function of the CRAVS in order to meet GDC 19. Therefore, justify the non-safety designation of this system by demonstrating that GDC-19 can be met using a non-safety CRAVS or provide a safety-related CRAVS.

Demonstrate that the system is capable of withstanding the effects of earthquakes through conformance with the guidelines of Position C.1 of Regulatory Guide 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

Response:

Demonstrate that the system is capable of withstanding the effect of earthquakes through conformance with the guidelines of Position C.1 of R.G. 1.29 in order to meet GDC 2. Also, demonstrate how the VBS conforms with the guidance of Position C.2 of R.G. 1.29 for the non-safety-related portions of the system.

With the exception of the main control room (MCR) isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. Therefore, the VBS is not designed to perform the filtration function of CRAVS during or following a design basis accident, as required by SRP 6.4 and GDC 19. Conformance to GDC 19 and MCR operator habitability requirements under accident conditions is provided by the main control room emergency habitability system (VES).

The VES is designed to satisfy nuclear safety-related system redundant train design and seismic Category I requirements. VES is sized to deliver the required airflow rate to the MCR to meet ventilation and pressurization requirements for 72 hours. A refilling connection is provided for each train to allow for operation beyond 72 hours. The MCR passive heat sink is designed to limit the temperature rise inside the MCR during the 72-hour period following a loss of VBS operation. In the unlikely event that power to the VBS is not available for more than 72 hours, MCR cooling is provided by portable cooling units brought in from offsite (see the response to Q471.3 for further details). The portable units are standard commercial units and are sized to maintain long-term occupancy of personnel in the MCR. The MCR is provided with Quality Group C, seismic Category I penetrations for heat rejection and with power supply connections for the portable units. Therefore, conformance to GDC 19 and MCR operator habitability requirements under accident conditions is met. The detailed description of the VES is in SSAR Section 6.4.

The VBS compliance with the applicable regulatory positions is discussed in SSAR Appendix 1A and in the following paragraphs.

Compliance with Position C.1 of RG 1.29 does not apply, except for the MCR isolation dampers, because the VBS does not perform any other safety-related functions. The MCR isolation dampers are designed to meet seismic Category I requirements.

Compliance with Position C.2 of R.G. 1.29 is satisfied because the non-safety-related portions of the VBS inside the MCR are designed to meet seismic Category II requirements so that the failure of VBS components during an SSE will not reduce the functioning of any safety-related plant features.

Compliance with GDC 2 is satisfied because the MCR isolation dampers are designed for seismic Category I requirements. A tornado damper is installed in the VBS outside air intake to maintain safe habitability for personnel within the control room and safe environmental conditions for tornado-protected equipment. The isolation and tornado dampers are located inside a seismic Category I structure. Compliance with GDC 2 is not applicable to the remaining non-safety-related portions of the VBS.

SSAR Revision: NONE

Question 410.97

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Demonstrate how the requirements of GDC 4, "Environmental and Missile Design Basis," are met by the VBS to maintain environmental conditions in the control room within the design limits of the essential equipment located therein for normal, transient, or accident conditions (see Section 9.4.1).

Response:

The main control room (MCR) is located at elevation 117'-6" of the auxiliary building, which is a missile-protected seismic Category I structure. Conformance to GDC 4 tornado missile requirements is discussed in SSAR Section 3.3. Conformance to GDC 4 internally generated missile requirements is discussed in SSAR Section 3.5.

With the exception of the MCR isolation dampers, the nuclear island nonradioactive ventilation system (VBS) is not a nuclear safety-related ventilation system. The MCR isolation dampers are located in the MCR envelope and are protected from missiles. The VBS has no other safety-related design function.

The VBS is designed to provide conditioned air for ventilation and cooling to maintain a suitable environment for personnel comfort and equipment operation during normal plant operation. The VBS is designed with redundant equipment and components that are connected to standby, onsite ac power sources. During or following an anticipated transient, if ac power is available, the VBS is designed to provide a reliable source of ventilation and cooling for personnel comfort and equipment operation. See SSAR Subsection 9.4.1 for a description of the VBS.

The requirement to maintain environmental conditions in the control room within the design limits of the essential equipment during a DBA is provided by the main control room emergency habitability system (VES). See SSAR Subsection 6.4 and the response to Q410.096 for a description of VES operation.

SSAR Revision: NONE

Question 410.103

For Q410.95-Q410.104, demonstrate how the AP600 design meets applicable GDCs by providing failure modes and effects analyses and other requested details, as identified in applicable SRP section(s) review methodology.

Section 9.4.10 of the SSAR, "Diesel Generator Building Heating and Ventilation System (VGS)," falls under the review guidelines of Section 9.4.5 of the SRP, "ESF Ventilation System." WCAP-13053 indicates that information will be provided on the ESF ventilation system later. Section 9.4.10 of the SSAR does not address the system's conformance with the guidelines of Section 9.4.5 of the SRP.

The staff concludes that this HVAC system should be evaluated as an ESF ventilation system as part of the design-in-depth concept. Therefore, this system should conform with the guidance of Section 9.4.5 of the SRP. Demonstrate that this system conforms with the guidelines of (1) R.G. 1.29 (to show it meets GDC 2), (2) Position C.2 of R.G. 1.52 and Positions C.1 and C.2 of R.G. 1.140 (to show it meets GDC 60), and (3) NUREG/CR-0660 (to show it meets GDC 17). Also, demonstrate that this system conforms with GDC 4. The system P&IDs, flow diagrams, component data, and system description should reflect corresponding details as identified in Section 9.4.5 of the SRP, as applicable. Table 3.2-3 of the SSAR should reflect appropriate equipment information.

Provide an equipment operability evaluation for the diesel generator building areas served by VGS to demonstrate that they can withstand a 150°F temperature environment (as identified in Section 9.4.10 of the SSAR). Address the habitability concerns inside these areas for the elevated temperatures.

Provide justification for the provisions in the VGS design of only two 50-percent-capacity roof-mounted exhaust fans for each diesel generator room and the normal ventilation system having only one 100-percent-capacity primary air handling unit versus fully redundant capacity units to satisfy the single failure criteria.

Response:

The AP600 onsite standby power system (ZOS) includes two diesel-generators housed in the diesel-generator building. The ZOS and the diesel-generators are not safety related and are not essential for the safe shutdown of the reactor nor are they necessary to prevent or mitigate the consequences of an accident. The diesel-generator building heating and ventilation system (VZS), which supports the operation of the ZOS, is therefore also not safety related. Because the VZS is not required to "maintain a controlled environment in areas containing safety-related equipment" and the areas served by the VZS do not contain "equipment essential for the safe shutdown of the reactor or necessary to prevent or mitigate the consequences of an accident," the VZS does not fall within the scope of SRP 9.4.5 Engineered Safety Feature Ventilation System. SSAR Subsection 9.4.10 does not therefore address SRP 9.4.5 compliance.

WCAP-13053 has been superseded by WCAP-13054, Rev. 1, which indicates that SRP 9.4.5 is not applicable to the AP600.

GDC 2 applies to structures, systems, and components important to safety. Since neither the ZOS nor the VZS is important to safety, compliance with RG 1.29 is not required for the VZS.

RG 1.52 applies only to post-accident engineered safety feature (ESF) atmosphere cleanup systems designed to mitigate the consequences of postulated accidents. The VZS is not safety related, is not an ESF system, and is not required to mitigate the consequences of postulated accidents. RG 1.52 is therefore not applicable to VZS.

RG 1.140 applies to atmosphere cleanup systems designed to collect airborne radioactive materials during normal plant operation. The diesel-generator building does not contain any radioactive materials and does not interface with any building or system that contains radioactive materials. The VZS, therefore, is not required to collect airborne radioactive materials, so RG 1.140 is not applicable.

GDC 17 applies to onsite electric power systems provided to permit functioning of structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 17 is not applicable to the VZS. Conformance to NUREG/CR-0660 is also therefore not required. The information contained in NUREG/CR-0660 has been considered in the design of the VZS.

GDC 4 applies to structures, systems, and components important to safety. Both the ZOS and the VZS are not safety related; therefore, GDC 4 is not applicable to the VZS.

SSAR Subsection 9.4.10.1 incorrectly identified the diesel-generator area as being maintained at 150°F with the diesel-generator off. The actual design room temperature is 105°F with the diesel generator off. The SSAR will be corrected to reflect this response as shown by the highlighted portion of the following excerpt from Subsection 9.4.10.1.

The VZS is not safety related; therefore, the single failure criteria is not applicable. However, the two 50 percent capacity exhaust fans for each diesel-generator room and one 100-percent-capacity primary air handling unit provide adequate redundancy for onsite standby power system operation on a system train basis. Failure of a single exhaust fan or primary air handling unit associated with a diesel generator train will not affect the operation of the other diesel-generator train. Therefore, at least one diesel-generator train will be fully operational should a single fan failure occur.

The last paragraph of SSAR Subsection 9.4.10.1.2 will be revised as follows:

SSAR Revision:

The systems are designed to maintain room temperature conditions as follows:

Area	Design Minimum	Temperature Maximum
Diesel Generator Area		
Diesel Generator On	None	130°F
Diesel Generator Off	50°F	105°F
Service Module		
Diesel Generator On	50°F	105°F
Diesel Generator Off	50°F	105°F

Question 410.105

Section 9.2.8 of the SSAR states that the turbine building closed cooling water system provides a continuous supply of cooling water to turbine plant equipment at a temperature of 95°F or less. The heat sink for the system is the SWS. Section 9.2.1.2.2 of the SSAR states that upon loss of control air or electric power, the SWS valves to the CCWS heat exchangers fail to an open position while the turbine building closed cooling water system heat exchangers valves fail to a closed position. Discuss the emergency preparedness considerations for maintaining the turbine building closed loop cooling capability if the SWS is degraded because of a weather change or SWS valve malfunction.

Response:

The turbine building closed cooling water system neither serves nor supports any plant safety-related function. The system provides heat removal capability to turbine building mechanical systems; the heat sink for this system is the service water system. If service water is degraded or lost, the plant load would have to be adjusted or the plant would have to be shut down by the plant operators to minimize potential damage to turbine building mechanical components during the shutdown.

See SSAR Subsection 9.2.1 for a description of the service water system.

SSAR Revision: NONE

Question 630.6

In order to address the unique design features of the AP600, Westinghouse states that it is considering including new limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shutdown), and the passive containment cooling system. Submit the LCOs for this equipment and these systems, or provide a schedule for doing so.

Response:

Subsection 16.1.3.5 of Technical Specifications included in the AP600 SSAR Section 16.1 includes the Technical Specifications for the passive core cooling system components with the exception of the automatic depressurization system valves. Subsection 16.1.3.4.12 includes the Technical Specifications for the automatic depressurization system valves. Subsection 16.1.3.6.6 includes the Technical Specifications for the passive containment cooling system. These subsections contain the Technical Specifications including the limiting conditions for operation (LCOs) for the following passive, safety-related systems: the automatic depressurization valves, the core makeup tanks, the passive residual heat removal systems (operating and shut down), and the passive containment cooling system.

Page 16.1-2 of the AP600 SSAR discusses the possibility of modifying the LCOs for these passive, safety-related components. Because of recent industry developments relevant to Technical Specifications for these components, modification of these LCOs is not planned.

SSAR Subsection 16.1.1 will be revised as follows:

SSAR Revision:

Completion Times and Surveillance Frequencies

Some LCOs presented in the AP600 Technical Specifications do not include Completion Times (except for Immediately) or Surveillance Requirement Frequencies (except for surveillances that must be performed during shutdown - 24 months). The Completion Times and Surveillance Frequencies specified in Draft NUREG 1431 have been extended to similar Actions and Surveillance Requirements in AP600. However, these times are, generally, overly conservative for the AP600 design, and longer times based on deterministic criteria and PRA evaluation can be justified. These Completion Times and Surveillance Requirement Frequencies may also take credit for structures, systems, and components used in the PRA evaluation. The times will be consistent with the assumptions made in the PRA evaluation. Deterministic criteria and PRA evaluation can be used to establish Completion Times and Surveillance Requirement Frequencies rather than extend to AP600 the times currently specified in Draft NUREG 1431.

~~Additionally, conditional Required Actions and Completion Times are being considered for future development for a small number of LCOs. The determination of the conditional Required Actions may require modification of~~

~~certain Required Actions for these Technical Specifications. Some of the LCOs identified for this development include the passive, safety-related systems, such as:~~

~~Automatic Depressurization Valves~~
~~Core Makeup Tanks~~
~~Passive Residual Heat Removal System – Operating~~
~~Passive Residual Heat Removal System – Shutdown~~
~~Passive Containment Cooling System~~

Shutdown Completion Times/Mode Definitions

The AP600 plant design is different from current Westinghouse designs in that the systems normally used for mode reduction are non-safety systems and, therefore, are not covered by LCO requirements in Technical Specifications. The passive safety systems, which shut down the plant, require a longer period of time to accomplish mode changes and cannot reduce the RCS temperature to below 200 °F. The mode Definitions, LCO 3.0.3, and mode reduction Required Actions specified in these Technical Specifications are based on use of the passive safety systems.

Question 630.8

For each of the topical reports referenced in the Westinghouse STS Bases (Revision 0) that are similarly used in the Chapter 16 TS submittal for the AP600, provide specific justification for applying the topical reports to the AP600 design consistent with the staff's requirements for adopting the individual topical reports.

Response:

The following topical reports are referenced in the AP600 Technical Specifications:

- WCAP-8746-A, "Design Basis For Overtemperature delta-T and the Overpower delta-T Trips," March 1977

  This WCAP provides a basis for the overtemperature delta-T and the overpower delta-T trips for Westinghouse plants. The report is referenced in Subsection 16.1.2.2.1 since it includes the methodology for determining the setpoints for these reactor trips. This WCAP is applicable to the AP600.

- WCAP-9273-NP-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.

  WCAP-9273-NP-A is the nonproprietary version of WCAP-9272 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-8403, "Power Distribution Control and Load Following Procedures," September 1974.

  WCAP-8403 is applicable to the AP600 as referenced in Subsection 4.3.4 of the AP600 SSAR.

- WCAP-10217, "Relaxation of Constant Axial Offset Control: F_Q Surveillance Technical Specification," June 1983.

  WCAP-10217 is the nonproprietary version of WCAP-10216 which is applicable to the AP600 and referenced as such in Subsection 4.3.4 of the SSAR.

- WCAP-10271-P-A, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," May 1986.
  WCAP-10271-P-A, Supplement 2, Revision 1, "Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation System," June 1990.

  These WCAPs are applicable to the reactor trip and engineered safety functions actuated by the AP600 protection and monitoring system. The applicability of the methodologies provided in these WCAPS to digital equipment has been approved by the NRC via a safety evaluation report issued on the Sequoyah Nuclear Plant, Unit 1 Docket.

- WCAP-7769, "Topical Report on Overpressure Protection."

  WCAP-7769, Revision 1 dated June 1972, is applicable to the AP600 as referenced in Subsection 15.2.9 of the AP600 SSAR.

- WCAP-7924-A, "Basis for Heatup and Cooldown Limit Curves," April 1975.

  WCAP-7924-A provides the methodology used to generate the AP600 heatup and cooldown limit curves.

Reference 2 to technical specification B.3.4.6 will be revised as follows:

SSAR Revision:

2. WCAP-7769, "Topical Report on Overpressure Protection," Revision 1, June 1972.

Question 720.41

Provide a listing of the Level 1 sequences assigned to each release class and their respective frequencies.

Response (Revision 1):

Tables 1 to 4 provide a listing of the sequences assigned to each of the four fission product release classes utilized in the AP600 PRA. Only sequences contributing at least 3 percent to the frequency of a release class are included. The following information is presented for each sequence.

1. The sequence contribution to the release frequency of a particular fission release class (both the absolute magnitude and relative contribution, columns 2 and 3 in the tables).

2. Sequence description indicating the availability of key systems, and success or failure of operator actions during the sequence (column 4 in the tables).

3. Identification of the path taken by the sequence at key nodes in the event trees used for core melt quantification and fission product release (containment event tree) quantification (column 5 in the tables). ('SUC' or 'DEL' implies success or upward branching at a node, and 'SYS' or 'OTH' implies the opposite.)

4. The accident class (defined in Table G-1 of the AP600 PRA report) to which the sequence belongs.

PRA Revision: NONE

TABLE 1

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.8E-08	26.8	SI Line Break Event Occurs	IEV-S1S	IIIBE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Success of 1 of 1 Core Makeup Tank	DEL-CM1A	
			Failure of 1 of 1 Gravity Injection Line	SYS-IW1A	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
2	4.4E-08	17.3	Loss of Feedwater Without Scram (ATWS) Event Occurs	IEV-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment Isolation System Functions	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
3	3.2E-08	12.5	PRHR Heat Exchanger Tube Rupture Event Occurs	IEV-S2P	IIIBR
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRT	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			CVCS Makeup Fails	SYS-CSLOCA	
			PRHR Isolation Failure Following PRHR Tube Rupture	SYS-PRI1	
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
4	2.9E-08	11.2	Vessel Rupture Event Occurs	IEV-VR	IIIC
			Containment Is Not Breached (As a Consequence of RV Rupture)	SUC-CNB	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
5	1.5E-08	5.8	Large LOCA Event Occurs	IEV-A	IIIBE
			Failure of 2 of 2 Gravity Injection Lines	SYS-IW2AB	
			Both Core Makeup Tanks Work	DEL-CM2L	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	

TABLE 1 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OK

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
6	1.3E-08	5.3	Small LOCA Event Occurs	IEV-S2	IIIBR
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Passive RHR System Works	DEL-PRL	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			RCS Depressurization Attempt After the Onset Core Melt Succeeds	DEL-ADTLT	
			Recirc MOVs are Opened on High Hot Leg Temperature	DEL-IWF	
			Containment is Isolated	DEL-CIC	
			Water is Available for Passive Containment Cooling System	DEL-PCT	
	2.0E-07	80.0	Total for the Above 6 Sequences		
	2.5E-07		Total Frequency for the Release Class - OK (From At-Power Conditions Only)		

TABLE 2

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	3.0E-08	54.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
2	1.4E-08	24.6	Loss of Feedwater to Steam Generator Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
3	7.4E-09	13.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Both Core Makeup Tanks Function	DEL-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADA	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1A	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After Vessel Failure	DEL-CC1A2	
4	1.4E-09	2.6	Secondary to Primary Side Power Mismatch Initiating Event Occurs	IEV-TM	IA

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
5	1.2E-09	2.2	Spurious "S" Signal Initiating Event Occurs	IEV-TS	IA
			Failure to Supply Startup Feedwater to 1 of 2 Steam Generators	SYS-SFW	
			Failure of PRHR System to Remove Decay Heat From RPV	SYS-PRT	
			Failure to Trip All Four RCS Pumps	SYS-RCSL	
			Both Core Makeup Tanks Function	DEL-CM2T	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	

TABLE 2 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - OKP

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CID	
			Water is NOT Available for Passive Containment Cooling System	SYS-PCT	
			Sufficient Water is Available in the Reactor Cavity to Keep the Core Debris Cooled After RV Failure	DEL-CC1A2	
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	5.4E-08	98.0	Total for the Above 5 Sequences		
	5.5E-08		Total Frequency for the Release Class - OKP (From At-Power Conditions Only)		

TABLE 3

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	6.6E-09	32.9	Consequential SG Tube Rupture Initiating Event Occurs#	SYS-IECV2	VIE
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	
2	2.4E-09	11.9	Steam Generator Tube Rupture Initiating Event Occurs	IEV-V2	VIE
			Automatic ADS Actuation Fails Full RCS Depressurization	SYS-ADS	
			Automatic ADS Actuation Fails Partial RCS Depressurization	SYS-ADV	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	
3	2.3E-09	11.3	Loss of Feedwater Without Scram Initiating Event Occurs	SYS-TFA	IIIC
			Reactor Trip Function Failure	SYS-CE	
			AMSAC System Fails (Results in RV Rupture)	SYS-AMSAC	
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
4	2.0E-09	9.9	Turbine/Reactor Trip /Low RCS Flow Initiating Event Occurs	SYS-TT	IA
			Condenser and Startup Feed Water, and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
5	1.5E-09	7.5	Vessel Rupture Initiating Event Occurs	SYS-VR	IIIC
			Containment is Breached (As a Consequence of RV Rupture)	OTH-CNB	
6	7.2E-10	3.6	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IA
			Condensate, Startup Feedwater and Passive RHR Systems Fail	SYS-XCSP	
			Failure of Both Core Makeup Tanks	SYS-CM2AB	
			Manual ADS Actuation Fails Full RCS Depressurization	SYS-ADT	
			Manual ADS Actuation Fails Partial RCS Depressurization	SYS-AD1	
			Reactor Depressurization Attempt After the Onset Core Melt Fails	SYS-ADTLT	
			Containment is Impaired	SYS-CID	
7	6.6E-10	3.3	Consequential SG Tube Rupture Initiating Event Occurs	SYS-IECV2	VIE
			Automatic ADS Actuation Results in Full RCS Depressurization	DEL-ADS	
			Both Core Makeup Tanks Work	DEL-CM2SL	
			Passive RHR System Works	DEL-PRL	

TABLE 3 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CI

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
			Failure of Gravity Injection Lines	SYS-IW2AB	
			Normal RHR Fails to Operate in Injection Mode (LOCA/Transient)	SYS-RNR	
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	1.6E-08	80.0	Total for the Above 7 Sequences		
	2.0E-08		Total Frequency for the Release Class - CI (From At-Power Conditions Only)		

During Events Initiated by a Steam Line Break or Stuck Open Secondary-Side Relief Valve

TABLE 4

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIPTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
1	4.4E-10	58.6	Turbine/Reactor Trip Initiating Event Occurs	IEV-TT	IIIBE
			Failure of I&C (Boards)	CCX-HARD1	
			Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs)	CCX-AV-LA	
			ADS Failure (Operator Fails to Perform Manual ADS Actuation)	LPM-MAN03	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CIC	
			Water is Available for the Passive Containment Cooling System	DEL-PCT	
			Not Enough Water in the Reactor Cavity to Cool the Core Debris	SYS-CC3BE	
2	1.3E-10	17.8	Loss of Feedwater to SG Initiating Event Occurs	IEV-TF	IIIBE
			Failure of I&C (Boards)	CCX-HARD1	
			Failure of Passive RHR & Core Makeup Tanks (CCF of AOVs)	CCX-AV-LA	
			ADS Failure (Operator Fails to Perform Manual ADS Actuation)	LPM-MAN03	
			Operator Fails to Open Recirc MOVs On High Hot Leg Temperature	SYS-IWF	
			Containment is NOT Impaired	DEL-CIC	
			Water is Available for the Passive Containment Cooling System	DEL-PCT	
			Not Enough Water in the Reactor Cavity to Cool the Core Debris After RV Failure	SYS-CC3BE	

TABLE 4 (Continued)

DOMINANT SEQUENCES CONTRIBUTING TO FISSION PRODUCT RELEASE CLASS - CC

NO.	SEQUENCE FREQ.	PERCENT CONTRIB	SEQUENCE DESCRIFTION	SEQUENCE IDENTIFIER	ACCIDENT CLASS
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	5.7E-10	76.0	Total for the Above 2 Sequences		
	7.5E-10		Total Frequency for the Release Class - CC (From At-Power Conditions Only)		