UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 6, 1997

APPLICANT: Westinghouse Electric Corporation

FACILITY: AP600

SUBJECT: SUMMARY OF MEETING TO DISCUSS WESTINGHOUSE AP600 FIRE PROTECTION ANALYSIS

The subject meeting was held at the Westinghouse Electric Corporation (Westinghouse) office in Rockville, Maryland on January 7, 1997, between Ed Cummins, Jim Winters, and Don Hutchings of Westinghouse and Jeff Holmes and Diane Jackson of the Nuclear Regulatory Commission (NRC) staff. The purpose of the meeting was to discuss the general layout of several plant areas as it related to fire fighting capability and fire protection. Attached are draft markups for proposed changes to the standard safety analysis report sent by Westinghouse via facsimile to facilitate the resolution of open issues. These facsimiles will be followed by a Westinghouse letter to docket the incoming information.

The staff discussed several concerns with Westinghouse.

1) The staff is concerned that a cable routing in a fire area that is surrounded on three sides by another fire area is susceptible to a fire in the second fire area.

2) The staff is concerned that fire pumps and the air compressor for breathing air is susceptible to a fire in the turbine fire area. This equipment is currently located behind fire walls in the turbine building. Westinghouse has defined this as a separate fire area than the fire area that contains the turbine.

3) The staff is concerned that the water supply (75 gpm) for fire fighting for safe shutdown equipment is insufficient for initial fire fighting. The fire water for safe shutdown equipment is currently supplied from the seismically-qualified passive containment cooling system (PCS) tank. (Open Item Tracking System (OITS)# 314 and Key Issue 12.a)

   By letter NSD-NRC-97-4940, dated January 14, 1997, Westinghouse provided its position that the design will remain the same, PCS water will be used for fire water for safe shutdown equipment. The staff will review this letter. Action N

4) The draft standard safety analysis report (SSAR) markup regarding the definition of the "Zone of Influence" is insufficient to address the staff's concern. (OITS# 309 and Key Issue 12.b)

DF03

Attached is the facsimile sent by Westinghouse on January 15, 1997, which provided a draft markup of the SSAR. The staff will review the information. Action N

Westinghouse reviewed with the staff certain cable chases, sprinkler system locations and combustible loadings. Listed below are actions associated with the meeting.

1) The staff will provide a written letter regarding the adequacy of the location of fire pumps and air compressors in the turbine building. Westinghouse will provide an explanation on how they ensure the protection of the fire pumps and air compressor. (OITS# 321) Action N & W

2) Westinghouse will provide information regarding where the sprinkler system is located in relation to cable trays and intended combustible loadings.

   By letter NSD-NRC-97-4951, dated January 23, 1997, Westinghouse provided proprietary drawings indicating the areas of fire suppression, the rating of fire barriers, and fire zone boundaries. The staff will review this information. Action N

3) Westinghouse will provide a sample table of a few fire areas demonstrating the available shutdown capabilities if a fire were to occur in a given fire area. (OITS# 306c)

   Attached are facsimiles sent by Westinghouse on January 17 and 24, 1997, which provided a sample table and SSAR markups related to OITS# 306. The staff will review this information. Action N

4) Westinghouse will provide markups of drawings to show the safety related cable routes in the nuclear island. (OITS# 312) Action W

5) Westinghouse will add a cross-reference in SSAR Section 9A.3 to the plot plan in SSAR Figure 1.2-1.

   Attached is the facsimile sent by Westinghouse on January 15, 1997, which provided a draft markup of the SSAR. The staff will review the information. Action N

original signed by:

Diane T. Jackson, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

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110014

Facsimiles from Westinghouse on

Fire Protection

January 10, 1997	SSAR page 3.4-18 - No SSAR change proposed for OITS 1996 (1 page)
January 13, 1997	SSAR 9.5.3.2.2 Markup for OITS 319 (1 page)
January 14, 1997	SSAR p. 9.5-4 and -5 Markup for OITS 309d (2 pages)
January 15, 1997	SSAR 9A.3 Markup from meeting open item (1 page)
January 17, 1997	SSAR 9A Markups for parts of 306 (18 pages)
January 24, 1997	Example table from meeting open item (3 pages)
January 31, 1997	SSAR p. 9.5-5 and 9A-5 Markups for OITS 309 (3 pages)

SSAR = Standard Safety Analysis Report
OITS = Open Item Tracking System

Attachment

Westinghouse

FAX COVER SHEET

RECIPIENT INFORMATION		SENDER INFORMATION	
DATE:	JANUARY 10, 1997	NAME:	JIM WINTERS
TO:	DIANE JACKSON/TOM KENYON	LOCATION:	ENERGY CENTER - EAST
PHONE:	FACSIMILE:	PHONE:	Office: 412-374-5290
COMPANY:	USNRC	Facsimile:	win: 284-4887 outside: (412)374-4887
LOCATION:			

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The following pages are being sent from the Westinghouse Energy Center, East Tower, Monroeville, PA. If any problems occur during this transmission, please call:

WIN: 284-5125 (Janice) or Outside: (412)374-5125.

COMMENTS:

DIANE/TOM,

HERE IS PAGE FOR JEFF HOLMES THAT SHOULD RESOLVE OUR ACTION ON OPEN ITEM 1996 FROM 12/31/96 TELECON. NO CHANGE TO SSAR IS REQUIRED. DESCRIPTION OF MCR TO RSW FLOODING PROTECTION IS CIRCLED ON THE ATTACHED. WE RECOMMEND NEW "NRC STATUS" OF "ACTION N."

Jim Winters

cc: BUTLER
MCINTYRE
HUTCHINGS
WINTERS

Auxiliary Building Level 4 (Elevation 117'-6")

- **Nonradiologically Controlled Area**

Level 4 of the nonradiologically controlled area includes the main control room, one divisional Class 1E penetration room, one non-Class 1E electrical penetration room, two main steam isolation valve compartments, and one mechanical equipment room.

The doors to these rooms are not water tight. There are no doors from the main steam isolation valve compartments to the Class 1E electrical areas. The main steam isolation valve compartments are only accessible from the turbine building at elevation 135'-3". The mechanical equipment room is only accessible from the turbine building at elevation 117'-6".

The potential for flooding Class 1E electrical areas on this level is limited to fire fighting activities. The Class 1E electrical penetration room and main control room are accessible from a hose station near the east stairwell. While the main control room kitchen and restroom are provided with potable water, the lines are 1 inch and smaller, and are not evaluated for pipe ruptures.

Fire fighting in the control room is done manually using portable extinguishers or a fire hose from a hose station in the east corridor. In the event that a hose is brought into the main control room through the east corridor access doors, water accumulation is limited by flow through the access doors which are open. The threshold of the east corridor access door are at the elevation of the floor slab. Once in the corridor this flow drains, via floor drains, the stairwell and elevator shaft, to level 1. An emergency egress door and stairwell is located on the west end of the main control room which leads down to the remote shutdown workstation. The threshold of the emergency egress door is flush with the raised portion of flooring in the main control room, which is approximately 14 inches above the east corridor entrance. Water being discharged in this area will flow through the porous raised flooring and flow back out the east access doors. The main control room has a normally closed floor drain which can be manually opened to drain water to the auxiliary building non-RCA sump at level 1. The drain paths prevent significant flooding of the adjacent rooms.

In the event of fire fighting activity in the nonClass 1E electrical penetration rooms, the accumulation of water is prevented by floor drains and flows through the stairwell and elevator shaft to level 1.

The mechanical equipment room contains containment isolation valves for the chilled water, compressed air, component cooling water, and passive core cooling (nitrogen) systems. Flooding in the mechanical equipment room due to fire fighting or piping ruptures is directed to the turbine building through the access door at elevation 117'-6" or through floor drains to the turbine building. The maximum flood level for this room

J Winters

Westinghouse

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COMMENTS:

Diane/Tom

This markup should resolve OPOU item 319 from our 12/31/96 telecon on fire protection. It will be included in Revision 11 of the SSAR unless we hear from you. We know of no other actions for 319 and recommend NRC direction to show NRC status as action N.

Jim

cc: Butler
Lindgren
McIntyre
Cummins
Ron Disher
Winters
Hayes
Hutchinson
Jeanne Dunns.

9.5.3.2.2 Emergency Lighting

Emergency lighting is designed to provide the required illumination levels in the areas as described below:

- The Main control room and remote shutdown area each have emergency lighting consists of 120 V ac fluorescent lighting fixtures which are continuously energized. The fixtures are powered from the Class 1E 125 V dc switchboards through the Class 1E 208Y/120 V ac inverters and are isolated through two series fuses. Three hour fire barrier separation is provided between redundant emergency lightning power supplies and cables outside the main control room and the remote shutdown area. The control room lighting complies with the human factor requirements by utilizing semi-indirect, low-glare lighting fixtures and programmable dimming features. The control room emergency lighting is integrated with normal lighting that consists of identical lighting fixtures and dimming features. The emergency lighting system is designed so that, to the extent practical, alternate emergency lighting fixtures are fed from separate divisions of the Class 1E dc and uninterruptible power supply system. Both normal and emergency lighting fixtures, controllers, dimmers and the associated cables used in the main control room and remote-shutdown area are non-Class 1E. The ceiling grid network, raceways and fixtures utilize seismic supports. A single fault cannot interrupt all lighting in both the main control room and the remote shutdown workstation simultaneously.

  Following the 72 hour period after a loss of all ac power sources, the normal and emergency lighting in the main control room and in the remote shutdown area is powered from two transportable ac generators as described in subsection 8.3.1.1.1.

- Emergency lighting in areas outside the main control room and remote shutdown area is accomplished by 8-hour, self-contained, battery pack lighting units. These units are non-Class 1E and provide illumination for safe ingress and egress of personnel following a loss of normal lighting and for those areas which could be involved in power recovery (for example, onsite standby diesel-generators and their controls). In addition, these units are provided in areas where manual actions are required for operation of equipment needed during a fire. These units are normally powered from the non-Class 1E 480/277 V ac motor control centers and they automatically switch to their internal dc source once normal ac power is lost.

9.5.3.2.3 Panel Lighting

Panel lighting is designed to provide lighting in the control room at the safety panels as described below:

- Panel lighting consists of lighting fixtures located on or near safety panels in the control room. The panel lights are continuously energized. The fixtures are powered from the Divisions B and C Class 1E inverters through Class 1E distribution panels.

  The circuits are treated as Class 1E. The panel lighting circuits up to the lighting fixture are classified as associated and are routed in Seismic Category I raceways.

Jeff Hellums

Westinghouse

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COMMENTS:

DIANE / TOM

THIS MARKUP SHOULD RESOLVE ITEM 309(d) from your 1/3/97 letter on FIRE PROTECTION. IT WILL BE INCLUDED IN SSAR REVISION 11 UNLESS WE HEAR FROM YOU.

Jim Winters

cc: LINDGREN
MCINTYRE
CUMMINS
ROAN WISNIC
WINTERS
MUTENINKS
JENNINE EVANS

- Fire barrier separation is not provided within the remote shutdown workstation fire area because the remote shutdown workstation is not required for safe shutdown unless a fire requires evacuation of the main control room.

- Fire barrier separation is not provided ~~within~~ throughout the primary containment fire area (including the middle and upper annulus zones of the shield building) because of the need to satisfy other design requirements, such as allowing for pressure equalization within the containment following a high-energy line break. Fire protection features at least within the containment fire area provide confidence that one train of safe shutdown equipment will remain undamaged following a fire. The quantity of combustible materials is minimized. The use of canned reactor coolant pump motors has eliminated the need for an oil lubrication system. Redundant trains of safe shutdown components are separated whenever possible by existing structural walls, or by distance and equipment arrangement. The fire protection system provides appropriate fire detection and suppression capabilities in a defined fire zone.

Outside of the primary containment and the main control room, the arrangement of plant equipment and routing of cable are such that safe shutdown can be achieved with all components (except those protected by 3-hour fire barriers) in any one fire area rendered inoperable by fire.

Openings and penetrations through fire barriers are protected in accordance with the guidelines of BTP CMEB 9.5-1.

The fire protection analysis contains a description of plant fire areas, fire zones, fire barriers, and the protection of fire barrier openings, as well as a description of the separation between redundant safe shutdown components.

Electrical Cable Design, Routing, and Separation

Electrical cable (including fiber optic cable) and methods of raceway construction are selected in accordance with BTP CMEB 9.5-1. Metal cable trays are used. Rigid metal conduit or metal raceways are used for cable runs not embedded in concrete or buried underground. Flexible metallic tubing is used in short lengths for equipment connections.

The insulating and jacketing material for electrical cables are selected to meet the fire and flame test requirements of IEEE Standard 383 (Reference 3).

The design, routing, and separation of cable and raceways are further described in Section 8.3.

Control of Combustible Materials

The plant is constructed of noncombustible materials to the extent practicable. The selection of construction materials and the control of combustible materials are in accordance with BTP CMEB 9.5-1 and NFPA 803.

temperature. Where structural failures could adversely affect safe shutdown capabilities, this analysis of the fire resistance of structural steel members establishes the need for fireproofing.

Firefighting personnel access routes and life safety escape routes are provided for each fire area. Fire exit routes are clearly marked.

Buildings outside primary containment generally have two enclosed stairways for emergency access. Stairwells serving as escape routes, access routes for firefighting, or access routes to areas containing equipment necessary for safe shutdown of the plant are equipped with emergency lighting. Such stairwells, and elevator shafts, which penetrate fire barrier floors, are enclosed in towers constructed using gypsum boards having a fire resistance rating of at least 2 hours. Openings are protected with approved automatic or self-closing doors having a rating of 1.5 hours.

The main control room is designed to permit rapid detection and location of fires in the underfloor and ceiling spaces and allow ready access for manual firefighting.

Plant Arrangement

The plant is subdivided into fire areas to isolate potential fires and minimize the risk of the spread of fire and the resultant consequential damage from corrosive gases, fire suppression agents, smoke, and radioactive contamination.

Some fire areas are subdivided into fire zones to permit more precise identification of the type and locations of combustible materials, fire detection, and suppression systems. The subdivision into fire zones is based on the configuration of interior walls and floor slabs, and the location of major equipment within each fire area.

Fire barriers are provided in accordance with BTP CMEB 9.5-1 and NFPA 803. Three-hour fire barriers surround fire areas containing safety-related components. The resistance of fire barriers in nonsafety-related areas of the plant may be less than 3 hours, where justified by the fire protection analysis (Appendix 9A).

Three-hour fire barriers provide complete separation of redundant safe shutdown components, including equipment, electrical cables, instrumentation and controls, except where the need for physical separation conflicts with other important requirements, specifically:

- Fire barrier separation is not provided within the main control room fire area because functional requirements make such separation impractical. The risk of fires in the control room is minimized by the reduction in the quantity of electrical cables. Continuous occupancy provides confidence that fires would be quickly detected and suppressed. Should a fire require evacuation of the main control room, the plant can be safely shut down using independent controls at the remote shutdown workstation, located in a separate fire area.

Westinghouse

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COMMENTS:
DIANE/TOM

This markup should resolve item 1) from our 1/7/97 meeting on fire protection. It will be in SSAR Revision 11 unless we hear from you.

Jim Winters

cc: LINDGREN
McINTYRE
CUMMINS
RON VIJUK
WINTERS
HUTCHINGS
JEANNE EVANS

of emergency lighting in locations where these actions are performed and along the access and egress routes thereto.

Emergency Communications

The safe shutdown evaluations consider the need for and availability of emergency communications within the plant following a fire.

9A.2.7.2 Safe Shutdown Methodology

The safe shutdown process, the systems used, and the functional requirements for safe shutdown are described in Section 7.4. As noted above, only safety-related equipment is utilized for safe shutdown. A description of this equipment is provided in the applicable sections.

Table 9A-2 lists the safety-related components used for safe shutdown and their associated electrical divisions. Each fire area is reviewed to identify the potential scope of fire damage and to verify that the capability to achieve and maintain safe shutdown is preserved.

The shutdown process uses controls located in the main control room. In the event of a fire in the main control room, controls located at the remote shutdown workstation are used.

9A.3 Fire Protection Analysis Results

The fire protection analysis is conducted for the following primary plant structures (which are shown on the site plot plan, Figure 1.2-2):

- Nuclear island
- Turbine building
- Annex building
- Radwaste building
- Diesel generator building

Table 9A-3 identifies the type and quantity of combustible materials in each fire area of the primary plant structures and indicates the equivalent fire duration. Fire detection and suppression features are also summarized in Table 9A-3.

Openings through fire barriers for pipe, conduit, and cable trays are sealed or closed to provide a fire resistance rating at least equal to that of the fire barrier itself. Penetration designs conform to the guidelines of BTP CMEB 9.5-1. Fire barrier penetration openings for ventilation are protected by fire dampers having a rating equivalent to that of the fire barrier. For 1-hour rated fire barriers, fire dampers are not required since the duct itself is an adequate barrier. The protection of door openings conforms to the guidelines of BTP CMEB 9.5-1.

Structural steel fireproofing is provided as described in subsection 9.5.1.2.1.1.

January 17, 1997

Diane Jackson / Tom Kenyon

This package provides an SSAR markup to resolve part 1), part 2) & part 4) of Open Item 306 on Fire Protection. It will go into SSAR Revision 11 unless we hear from you.

Jim Winters

cc: Lindgren
Wintons
Hutchings
Jeanne Evans.

Any damage which the fire is capable of causing is assumed to occur immediately. No credit is taken for proper operation of equipment or proper positioning of valves which are not protected from the effects of a postulated fire.

Zone of Influence

A postulated fire does not exceed the boundary of the fire area. For fire areas outside the main control room, remote shutdown workstation, and containment fire areas, all equipment in any one fire area is assumed to be rendered inoperable by the fire and re-entry into the fire area for repairs and operator actions is assumed to be impossible. However, no credit is taken for complete fire damage in cases in which complete damage is beneficial and partial damage is not. Chases for electrical cables, piping or ducts that pass through the fire area but are separated from it by 3-hour fire barriers are outside the zone of influence for that fire area.

Inside the containment fire area, potential fire damage is evaluated by fire zone. All equipment in any one fire zone is assumed to be rendered inoperable by the fire unless the fire protection analysis demonstrates otherwise. Class 1E electrical cables that are located in or pass through the fire zone but are separated from it by a 3-hour fire barrier are outside the zone of influence for that fire zone.

Independence of Affected Fire Areas

Only systems, components, and circuits free of fire damage are credited for achieving safe shutdown for a given fire. Systems, components, and circuits outside the zone of influence are considered free of fire damage if the effects of the fire do not prevent them from performing their required safe shutdown functions.

Event Assumptions

Plant accidents and severe natural phenomena are not assumed to occur concurrently with a postulated fire. Furthermore, a concurrent single active component failure (independent of the fire) is not assumed.

Offsite Power

A loss of offsite power is assumed concurrent with the postulated fire only when the safe shutdown evaluation indicates the fire could initiate the loss of offsite power.

Availability of Nonsafety-Related Systems

Only safety-related components and systems are assumed to be available to perform safe shutdown functions. (This is more stringent than required by BTP CMEB 9.5-1.) Fire protection and smoke control systems are assumed to function as designed to detect and mitigate the effects of the fire.

For each fire area or zone, the safe shutdown evaluation is valid for the worst case fire in the area or zone and initial use of nonsafety-related equipment.

Each

is also valid considering

If offsite power is available, nonsafety-related systems are assumed to continue to operate if a more conservative evaluation would result. ~~The~~ safe shutdown evaluation ~~also considers~~ the possibility that the operator may initiate safe shutdown using available nonsafety-related systems and that, should the fire later cause those systems to fail, safety-related systems may be automatically or manually actuated to continue the safe shutdown process.

Process Monitoring

Direct process signals are provided to monitor the shutdown process and to assist in determining proper actions for operation of the shutdown methods.

Manual Operation

One of the required manual actions to achieve plant shutdown for a postulated fire event in a fire area is to scram the reactor.

Manual actions by operations personnel include manipulation of equipment located anywhere outside the fire area, if accessibility and staffing levels permit such actions. Entry into the fire area for repairs or operator actions is assumed to be impossible.

Although the typical shutdown sequence does not require manual actions by the operator, fire damage may not be sufficient in many cases to trip the plant. The operator may take appropriate actions to expedite an orderly shutdown. These actions are performed in the main control room. If the fire occurs in the main control room, these actions are performed at the remote shutdown workstation

High-Low Pressure Interfaces

NRC Generic Letter 81-12 (Reference 3) requests the identification and evaluation of the interfaces between the high pressure reactor coolant system and low pressure systems such as the normal residual heat removal system. Typically, these high-low pressure interfaces contain two redundant and independent remotely-operated valves in series. These two valves and their ~~associated~~ cable control and power may be subject to a single fire. This fire may potentially cause the two valves to open, resulting in a fire-initiated loss-of-coolant accident (LOCA) through the high-low pressure system interface. Electrically controlled valves which provide such an interface are identified. These interface valves are considered to be required for safe shutdown.

Spurious Actuation of Equipment

Fire-caused damage is assumed to be capable of resulting in the following types of circuit faults: hot shorts, open circuits, and shorts to ground. Spurious actuation of components caused by these circuit faults are evaluated. Components are assumed to be energized or de-energized by one or more of the above circuit faults. For example, valves are assumed to fail open or closed; pumps are assumed to fail running or not running; electrical distribution breakers could fail open or closed. For three-phase ac circuits, the probability of getting a hot short on all three phases in the proper sequence to cause spurious operation of a motor is

fire protection system in fire areas containing those components. This subject is further discussed in Section 3.4.

Drain systems in the radiological controlled area of the nuclear island Annex Building and Radwaste Building drain to fire zones in the nuclear island where there are no safe shutdown components. Fires in these zones due to potential combustible liquid transport by the drains do not affect safe shutdown.

There is no drain path which could drain combustible liquids to the fire areas in the electrical portion of the nuclear island.

For mechanical equipment fire areas in the nonradioactive auxiliary building, fires caused by potential transport of combustible liquid through the drain system are included in the fire hazards analysis.

9A.3.1.1 Containment/Shield Building

This building comprises one fire area - 1000 AF 01. This fire area includes the areas inside containment as well as the valve room for the passive containment cooling system (PCS), the middle annulus, the upper annulus, and the operating deck staging area outside containment.

The fire protection and the safe shutdown analysis for the containment identifies the location and the separation of the safe shutdown components located inside the containment. The safe shutdown components located inside the containment are primarily ~~associated with~~ the passive core cooling system (PXS), the reactor coolant system (RCS), components of the steam generator system (SGS), and containment isolation.

For this evaluation, the containment shield building is divided into the following fire zones. These zones are based on the location of the safe shutdown components including termination boxes ~~associated with~~ for the containment Class 1E electrical penetrations and the primary cable routing pathways that distribute the Class 1E power and instrumentation and control cabling to the safe shutdown components.

Safe Shutdown Evaluation

Table 9A-2 identifies the safe shutdown components located in this fire zone. This compartment is physically separated from other fire zones by structural barriers such that a fire does not propagate to or from this fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the instrumentation in this zone. Although it is unlikely that all of the components would be damaged, a fire in this fire zone is conservatively assumed to disable all of the above instrumentation. Over-temperature ΔT and over-power ΔT instrumentation located in other fire zones is sufficient to perform the applicable functions to achieve and maintain safe shutdown.

9A.3.1.1.2 Fire Zone 1100 AF 11204

This fire zone is comprised of the following room(s):

Room No.	
11104	Reactor coolant drain tank room
11204	Vertical access area

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components contained in this fire zone. This fire zone is physically separated from other fire zones (except 1100 AF 11300B) by structural barriers or labyrinths such that a fire does not propagate to or from this fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the instrumentation in this zone. Although it is unlikely that all of the components would be damaged, a fire in this fire zone is conservatively assumed to disable the passive core cooling system containment floodup level and reactor coolant system hot leg instrumentation. The redundant reactor coolant system hot leg instrumentation located in 1100 AF 11206 and passive core cooling system floodup level instrumentation located in 1100 AF 11105 are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

9A.3.1.1.3 Fire Zone 1100 AF 11206

This fire zone is comprised of the following room(s):

Room No.	
11206	Passive core cooling system valve/accumulator room A

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components contained in this fire zone. This compartment is physically separated from other fire zones by structural barriers such that a fire does not propagate to or from this fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the valves located in this fire zone. A fire in this fire zone is conservatively assumed to disable control of all of the valves and instrumentation in this fire zone. The passive core cooling system safe shutdown components located in fire zones 1100 AF 11207 and 1100 AF 11300B are redundant to those in this fire zone, and are sufficient to perform applicable functions to achieve and maintain safe shutdown. The spent fuel pool cooling system containment isolation valve located outside the containment fire area is redundant to the containment isolation valve inside containment in this fire zone and is sufficient to maintain containment integrity.

Redundant reactor coolant hot leg instruments in fire zone 1100 AF 11204 provide the operator with information required to take corrective action during reduced inventory operation.

9A.3.1.1.4 Fire Zone 1100 AF 11207

This fire zone is comprised of the following room(s):

Room No.	
11207	Passive core cooling system valve/accumulator room B

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire zone. This zone is physically separated from other fire zones by structural barriers such that a fire does not propagate to or from this fire zone. In the case of adjacent fire zone 1100 AF 11208, the accumulator vessel prevents a fire that originates in one zone from propagating to and damaging safe shutdown components located in the other fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the valves in this fire zone. Although it is unlikely that more than one valve would be damaged, a fire in this fire zone is conservatively assumed to disable control of all of the valves. The passive core cooling system safe shutdown components located in fire zone 1100 AF 11206 and 1100 AF 11300A are redundant to those in this fire zone, and are sufficient to perform applicable functions to achieve and maintain safe shutdown.

9A.3.1.1.5 Fire Zone 1100 AF 11208

This fire zone is comprised of the following room(s):

Room No.	
11208	Normal residual heat removal valve room

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this zone. This fire zone is physically separated from other fire zones by structural barriers such that a fire does not propagate to or from this fire zone. Physical separation from fire zone 1100 AF 11207 is provided by the accumulator vessel as described above.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the valves in this zone. Although it is unlikely that more than one valve would be damaged, a fire in this fire zone is conservatively assumed to disable control of all of the valves. During normal power operation, power to the hot leg suction isolation valves is locked out to protect the high-low pressure interface between the reactor coolant system and the normal residual heat removal such that they will be unaffected by the fire in maintaining the reactor coolant pressure boundary. The normal residual heat removal containment isolation valve, located outside the containment fire area, is redundant to the four containment isolation valves in this zone and is sufficient to maintain containment and reactor coolant pressure boundary integrity.

9A.3.1.1.6 Fire Zone 1100 AF 11209

This fire zone is comprised of the following room(s):

Room No.	
11209	Chemical and volume control system room

Safe Shutdown Evaluation

There are no safe shutdown components in this fire zone. No safe shutdown evaluation is required.

9A.3.1.1.7 Fire Zone 1100 AF 11300A

This fire zone is comprised of the following room(s):

Room No.	
11300	Maintenance floor (southeast quadrant)
11400	Maintenance floor mezzanine

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire zone. The quantity and arrangement of combustible materials in this fire zone are such that a fire which damages safe shutdown components in this zone does not propagate to the extent that it damages redundant safe shutdown components in adjacent fire zone 1100 AF 11300B.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the above components. Although the consequences of a fire are expected to be very limited, a fire in this fire zone is conservatively assumed to disable all of the safe shutdown components in this fire zone.

The redundant passive core cooling system, passive containment cooling system and steam generator system safe shutdown components (listed in Table 9A-2), located in fire zone 1100 AF 11300B, are sufficient to perform applicable functions to achieve and maintain safe shutdown.

The primary sampling system and containment air filtration system containment isolation valves, located outside the containment fire area, are redundant to the containment isolation valves in this fire zone and are sufficient to maintain containment integrity.

The redundant reactor coolant system cold leg flow instrumentation located in fire zones 1100 AF 11300B and 1100 AF 11301 is sufficient to perform applicable functions to achieve and maintain safe shutdown.

9A.3.1.1.8 Fire Zone 1100 AF 11300B

This fire zone is comprised of the following room(s):

Room No.	
11300	Maintenance floor (northern part)
11400	Maintenance floor mezzanine (northern part)

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire zone. This fire zone is physically separated from other fire zones (except 1100 AF 11300A and 1100 AF 11500) by structural barriers or labyrinths such that a fire does not propagate to or from this fire zone. The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation in the termination boxes and cable trays. The quantity and arrangement of combustible materials in this fire zone are such that a fire which damages safe shutdown components in this zone does not propagate to the extent that it damages redundant safe shutdown components in fire zones 1100 AF 11300A and 1100 AF 11500.

The division A and C electrical penetrations listed in Table 9A-2 are conservatively assumed to be disabled as a result of a fire in this fire zone. The B and D electrical penetrations listed

in Table 9A-2, and ~~the associated~~ their cable trays routed from the electrical penetrations to the adjacent fire zone 1100 AF 11500, are protected by a 3-hour fire barrier. These two divisions are sufficient to perform applicable functions to achieve and maintain safe shutdown.

The passive core cooling system passive residual heat removal components and the related reactor coolant system/passive residual heat removal heat exchanger outlet temperature and flow instrumentation (listed in Table 9A-2) are conservatively assumed to be disabled as a result of a fire in this fire zone. The automatic depressurization system, core makeup tank, accumulator, and in-containment refueling water storage tank located outside of this fire zone are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

The passive core cooling system core makeup tank, passive containment cooling system, reactor coolant system pressurizer and steam generator system instrumentation located in this fire zone are conservatively assumed to be disabled as a result of a fire in this fire zone. The redundant passive core cooling system core makeup tank, passive containment cooling system, reactor coolant system pressurizer and steam generator system instrumentation (listed in Table 9A-2) located in fire zone 1100 AF 11300A, 1100 AF 11301 and 1100 AF 11500 are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

The reactor coolant system to chemical and volume control system stop valves located in this fire zone are conservatively assumed to be disabled as a result of a fire in this fire zone. The chemical and volume control system containment isolation valves located outside of this fire zone provide backup isolation capability to maintain the reactor coolant pressure boundary.

The redundant reactor coolant system cold leg flow instrumentation located in fire zones 1100 AF 11300A and 1100 AF 11301 is sufficient to perform applicable functions to achieve and maintain safe shutdown.

The chemical and volume control system and the liquid radwaste system containment isolation valves located outside the containment fire area are redundant to the containment isolation valves inside containment in this fire zone and are sufficient to perform the applicable functions to maintain containment integrity.

The redundant steam line pressure instruments located in area 1201 AF 05 for steam generator 1 and in area 1201 AF 06 for steam generator 2 are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

9A.3.1.1.9 Fire Zone 1100 AF 11300C

This fire zone is comprised of the following room(s):

Room No.	
11300	Maintenance floor (access space between containment shell and west wall of refueling water storage tank)

Safe Shutdown Evaluation

There are no safe shutdown components in this fire zone. No safe shutdown evaluation is required.

9A.3.1.1.10 Fire Zone 1100 AF 11301

This fire zone is comprised of the following room(s):

Room No.	
11201	Steam generator compartment 1
11301	Steam generator 1 lower manway area
11401	Steam generator 1 tubesheet area
11501	Steam generator 1 operating deck
11601	Steam generator 1 feedwater nozzle area
11701	Steam generator 1 upper manway area

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire zone. This fire zone is physically separated from other fire zones (except fire zone 1100 AF 11500) by structural barriers or labyrinths such that a fire does not propagate to or from this fire zone. This fire zone borders fire zone 1100 AF 11500 at the top of the steam generator compartment, which is open to the air space above the operating deck. The quantity and arrangement of combustible materials in this fire zone are such that a fire which damages safe shutdown components in this fire zone does not propagate to the extent that it damages redundant safe shutdown components outside this fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the components in this fire zone and the reactor coolant pump motors. Although the consequences of a fire are expected to be very limited, a fire in this fire zone is conservatively assumed to disable all of the safe shutdown components in this fire zone.

The redundant reactor coolant system fourth stage automatic depressurization system valves and hot leg/cold leg instrumentation located in fire zone 1100 AF 11302, and redundant reactor coolant system pressurizer and steam generator system steam generator level instrumentation located in 1100 AF 11300B are sufficient to perform applicable functions to achieve and maintain safe shutdown.

The four divisions of reactor coolant system/reactor coolant pump bearing water temperature instrumentation are assumed to be disabled and would not be available to detect and provide a trip signal on a loss of component cooling water to the pump. If the fire in this fire zone does not disable the pump, the component cooling water flow to the pump will be unaffected by the fire and will continue to provide cooling water to the pump bearings until the pump is tripped by other means.

The reactor coolant system reactor coolant pump shaft speed instruments are conservatively assumed to be disabled. The redundant reactor coolant system cold leg flow instrumentation located in fire zones 1100 AF 11300A and 1100 AF 11300B is sufficient to perform applicable functions to achieve and maintain safe shutdown.

The four reactor coolant system reactor head vent valves are assumed to be disabled. If power is lost while in the closed position, the head vent valves will maintain reactor coolant pressure boundary integrity. Refer to subsection 9A.3.7.1.1 for a discussion on spurious actuation of reactor coolant system reactor head vent valves.

9A.3.1.1.11 Fire Zone 1100 AF 11302

This fire zone is comprised of the following room(s):

Room No.	
11202	Steam generator compartment 2
11302	Steam generator 2 lower manway area
11402	Steam generator 2 tubesheet area
11502	Steam generator 2 operating deck
11602	Steam generator 2 feedwater nozzle area
11702	Steam generator 2 upper manway area

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire zone. This fire zone is physically separated from other fire zones (except fire zone 1100 AF 11500) by structural barriers or labyrinths such that a fire does not propagate to or from this fire zone. This fire zone borders fire zone 1100 AF 11500 at the top of the steam generator compartment, which is open to the air space above the operating deck. The quantity and arrangement of combustible materials in this fire zone are such that a fire which damages safe shutdown components in this fire zone does not propagate to the extent that it damages redundant safe shutdown components outside this fire zone.

The quantity of combustible materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ related to the above components and the reactor coolant pump motors. Although the consequences of a fire are expected to be very limited, a fire in this fire zone is conservatively assumed to disable all of the safe shutdown components in this fire zone.

The redundant reactor coolant system fourth stage automatic depressurization system valves and hot leg/cold leg instrumentation located in fire zone 1100 AF 11301 are sufficient to perform applicable functions to achieve and maintain safe shutdown.

The four divisions of reactor coolant system/reactor coolant pump bearing water temperature instrumentation are assumed to be disabled and would not be available to detect and provide a trip signal on a loss of component cooling water to the pump. If the fire in this fire zone does not disable the pump, the component cooling water flow to the pump will be unaffected

The passive containment cooling system water delivery flow and storage tank level instrumentation are conservatively assumed to be disabled as a result of a fire in this fire zone. The applicable function of verification of passive containment cooling system water delivery can be performed by visual observation via access to the passive containment cooling system air diffuser from the passive containment cooling system valve room.

9A.3.1.1.18 Fire Zone 1270 AF 12701

This fire zone is comprised of the following room(s):

Room No.	
12701	Passive containment cooling system valve room
S06	Stairwell

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire zone. This fire zone is physically separated from other fire zones by structural barriers such that a fire does not propagate to or from this fire zone.

The quantity of combustible related to materials in this fire zone is very low, consisting primarily of cable insulation ~~associated with~~ the valves and instruments in this fire zone. Although it is unlikely that all components would be damaged, a fire in this fire zone is conservatively assumed to disable all of the valves and instruments.

The valves for each passive containment cooling system water delivery path are arranged with a normally open motor-operated valve and normally closed/fail open air-operated valve in series. If the fire causes a loss of power to the valves, the air-operated valves will open and passive containment cooling system flow, which has no adverse impact on achieving and maintaining safe shutdown, will be initiated. Refer to subsection 9A.3.7.1.2 for a discussion of potential spurious actuation of a passive containment cooling system water delivery valve as a result of a fire.

The passive containment cooling system water delivery flow and storage tank level instrumentation are conservatively assumed to be disabled as a result of a fire in this fire zone. The applicable function of verification of passive containment cooling system water delivery can be performed by visual observation via access to the passive containment cooling system air diffuser from the passive containment cooling system valve room or from the upper annulus.

9A.3.1.1.19 Fire Zone 1250 AF 12555

This fire zone is comprised of the following room(s):

Room No.	
12555	Main control room emergency habitability system air storage/operating deck staging area

Safe Shutdown Evaluation

This fire zone is physically separated from other fire zones by structural barriers such that a fire does not propagate to or from this fire zone.

This fire zone contains no components required for safe shutdown after a fire. The pressurized main control room emergency habitability system air storage bottles are not required for safe shutdown after a fire, but are protected from fire-induced overpressure by pressure relief valves.

9A.3.1.2 Auxiliary Building - Nonradiologically Controlled Areas

The safe shutdown portions of systems and components located in the nonradiologically controlled area are ~~associated with~~ the protection and safety monitoring system and the Class 1E dc system, and containment isolation.

The safe shutdown components ~~associated with~~ in the protection and safety monitoring system are the instrumentation and control cabinets located in the nonradiologically controlled area on level 3 (elevation 100′-0″). The safe shutdown components ~~associated with~~ in the Class 1E dc system are the Class 1E batteries on level 1 (elevation 66′-6″) and level 2 (elevation 82′-6″) and the dc electrical equipment, also on level 2.

The nonradiologically controlled areas of the auxiliary building are designed to provide separation between the mechanical and electrical equipment areas.

The piping compartments in the nonradiologically controlled area are the main steam isolation valve compartments on levels 4 and 5 (elevations 117′-6″ and 135′-3″, respectively) and the valve/piping penetration compartment on level 3 (elevation 100′-0″). The mechanical equipment rooms in the nonradiologically controlled area are the HVAC compartments on levels 4 and 5.

The nonradiologically controlled areas of the auxiliary building are also designed to provide separation between the Class 1E and the non-Class 1E electrical equipment.

The Class 1E electrical equipment areas have been designed to prevent the migration of smoke, hot gases, and fire suppressant to the extent that they could adversely affect safe shutdown capabilities, including operator actions. These areas are separated from each other and from other plant areas by 3-hour fire barriers. Smoke from a fire in the turbine building

Fire Detection and Suppression Features

- Fire detectors
- Hose station(s)
- Portable fire extinguishers

Smoke Control Features

Fire dampers close automatically in response to a smoke detector signal or high temperature to control the spread of fire and combustion products. Smoke and hot gases are subsequently removed from the fire area by reopening the fire dampers after a fire. The nuclear island nonradioactive ventilation system exhausts smoke and hot gases from the battery room to the atmosphere.

Fire Protection Adequacy Evaluation

A fire in this fire area is detected by a fire detector which produces an audible alarm locally and both visual and audible alarms in the main control room and the security central alarm station. The fire is extinguished manually using hose streams or portable extinguishers.

The fire resistance of the boundaries of this fire area is greater than the equivalent fire duration, as shown in Table 9A-3. Thus, the fire is contained within the fire area with or without active fire suppression. The battery room is also separated from the other fire zones within this fire area by a 1-hour fire barrier, which limits the spread of fire within the fire area.

The ventilation system does not contribute to the spread of the fire or products of combustion to other fire areas because fire dampers isolate the fire area.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system is not required because there are no such systems in this fire area. See Section 3.4 for a discussion of the consequences of a break in a fire protection line in this fire area.

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire area. The spare batteries may be connected as a backup power source for any one of the four Class 1E electrical divisions. The terminations of the cables to these divisions from the spare batteries are not normally energized or connected, so a fire in this area has no impact on the unconnected divisions. If the spare batteries are being used as a backup to a Class 1E division, then the consequence of a fire in this area is the same as a fire in the battery room of the ~~associated~~ division to which they are connected.

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire area. The electrical equipment in this area is non-Class 1E; however, some division A and C cables are routed through this area. In the event of a fire, the division A and C cabling in this area can be damaged. This damage can result in loss of control of equipment ~~associated~~ serviced by ~~with~~ these cables. Other components ~~associated with the~~ in divisions A and C are not affected.

This postulated fire can disable control of the division A containment isolation valves outside containment. For this event, containment isolation is provided by the redundant containment isolation valves located inside containment outside of this fire area.

Such a fire can also disable control of the division C passive containment cooling system isolation valves. The redundant division B passive containment cooling system isolation valves are not affected. Therefore, the safe shutdown capability of the passive containment cooling system is maintained.

This fire can also disable the division A and C inputs to the reactor trip switchgear. The signals from the remaining two divisions are sufficient to trip the reactor. Furthermore, the reactor can be tripped with the diverse actuation system described in Section 7.7.

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

9A.3.1.2.7 Mechanical/Piping Areas

9A.3.1.2.7.1 Fire Area 1201 AF 04

This fire area consists of two nuclear island nonradioactive ventilation system equipment rooms ~~associated with~~ servicing divisions B and D. Only division D ~~contains~~ is located within the fire area safe shutdown equipment. The fire area is subdivided into the following fire zones:

Fire Zone	Room No.	
• 1241 AF 12405	12405	Lower nuclear island nonradioactive ventilation system divisions B and D equipment room (117′-6″)
• 1251 AF 12505	12505	Upper nuclear island nonradioactive ventilation system divisions B and D equipment room (135′-3″)

There are no systems in this fire area which normally contain radioactive material.

Fire Detection and Suppression Features

- Fire detectors
- Hose station(s)
- Portable fire extinguishers

Smoke Control Features

Fire dampers close automatically on high temperature to control the spread of fire and combustion products. Smoke and hot gases are removed from the fire area by reopening the fire dampers after a fire. The radiologically controlled area ventilation system exhausts smoke and hot gases to the atmosphere.

Fire Protection Adequacy Evaluation

A fire in this fire area is detected by fire detectors which produces an audible alarm locally and both visual and audible alarms in the main control room and the security central alarm station. The fire is extinguished manually using hose streams or portable extinguishers.

The fire resistance of the boundaries of this fire area is greater than the equivalent fire duration, as shown in Table 9A-3. Thus, the fire is contained within the fire area with or without active fire suppression.

The ventilation system does not contribute to the spread of the fire or products of combustion to other fire areas because fire dampers isolate the fire area.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system which drains to this fire area are bounded by the consequences of a break in a fire protection line in this fire area. See Section 3.4.

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire area. The electrical equipment in this area is non-Class 1E; however, some division A and C cables are routed through this area. In the event of a fire, the division A and C cabling in this area can be damaged. This damage can result in loss of control of equipment ~~associated with~~ these cables served by. Other components ~~associated with the~~ in divisions A and C are not affected.

The spent fuel pool cooling system and normal residual heat removal containment isolation valves are conservatively assumed to be disabled as a result of a fire in this fire area. The redundant spent fuel pool cooling system and normal residual heat removal containment isolation valves located inside containment are outside of this fire area and are sufficient to perform the applicable functions to achieve and maintain safe shutdown.

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system is not required because there are no such systems in this fire area. See Section 3.4 for a discussion of the consequences of a break in a fire protection line in this fire area.

Safe Shutdown Evaluation

There are no safe shutdown components in this area, so a fire in this area has no impact on safe shutdown. The electrical equipment in this area is non-Class 1E; however, some division A and C cables are routed through this area. In the event of a fire, the division A and C cabling in this area can be damaged. This damage can result in loss of control of equipment ~~associated with~~ serviced by these cables. Other components ~~associated with the~~ in divisions A and C are not affected. Safe shutdown is possible from equipment in other fire areas.

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

9A.3.1.3.1.3 Fire Area 1204 AF 01

This fire area is subdivided into the following fire zones:

Fire Zone	Room No.	
• 1214 AF 12354	12354	Mid-annulus access room
• 1234 AF 12351	12351	Maintenance floor staging area
• 1234 AF 12352	12352	Personnel hatch
• 1244 AF 12452	12452	Containment air filtration system penetration room
• 1244 AF 12454	12454	Containment air filtration system/spent fuel pool cooling system/primary sampling system penetration room
• 1254 AF 12553	12553	Personnel access area
• 1254 AF 12554	12551	Security room
	12554	Security room
• 1264 AF 12651	12651	Radiologically controlled area ventilation system equipment room

Fire Detection and Suppression Features

- Fire detectors
- Hose station(s)
- Portable fire extinguishers

Smoke Control Features

Fire dampers close automatically on high temperature to control the spread of fire and combustion products. If the radiologically controlled area ventilation system is not affected by the fire, smoke and hot gases are removed from the fire area by reopening the fire damper(s)

Fire Protection Adequacy Evaluation

A fire in this fire area is detected through the operation of the dry pipe sprinkler system which produces an audible alarm locally and both visual and audible alarms in the main control room and the security central alarm station. The fire is extinguished by the automatic dry pipe sprinkler system. Water from the sprinklers rapidly fills and cools the small diked area under the tank. If necessary, the fire can also be extinguished manually.

The equivalent fire duration for this fire area exceeds the fire resistance of the fire area boundaries, as shown in Table 9A-3. However, the 3-hour fire resistance of the fire area boundaries provides sufficient time in which to extinguish the fire.

The ventilation system does not contribute to the spread of the fire or products of combustion to other fire areas because fire dampers isolate the area.

9A.3.7 Special Topics

9A.3.7.1 Evaluation of Spurious Actuation

The potential for spurious actuation of equipment as a result of fire damage to electrical circuits is considered for each fire area containing safety-related equipment. As discussed in subsection 9A.2.7.1, one spurious actuation or signal is postulated at a time (except for high-low pressure interfaces). Principal spurious actuation are discussed below. In no case does the spurious actuation of equipment prevent safe shutdown.

9A.3.7.1.1 High-Low Pressure Interfaces

NRC Generic Letter 81-12 requests the identification and evaluation of high-low pressure interfaces between the reactor coolant system and interfacing systems such as the normal residual heat removal system. Per the Generic Letter, these interfaces typically contain two redundant and independent motor-operated valves in series. On a typical pressurized water reactor plant, these two valves and their ~~associated~~ cable control and power may be subject to a single fire. Potential high-low pressure system interfaces of particular interest are discussed below.

Reactor Coolant System Valve Actuation

NRC Generic Letter 81-12 specifically addresses the reactor coolant/residual heat removal system interface on pressurized water reactors. For AP600, the reactor coolant system to normal residual heat removal system interface is similar to the typical pressurized water reactor configuration. However, the normal residual heat removal system is not a safety-related system and is not required for safe shutdown. To preclude the spurious opening of the interface valves as a result of a fire, the power to the valves is locked out during power operations. Thus, spurious actuation of the reactor coolant system to normal residual heat removal system interface valves does not occur and the safe shutdown capability is not affected.

Passive Core Cooling System Passive Residual Heat Removal Heat Exchanger Inlet Valve Actuation

One normally open valve is provided to isolate the inlet line to the passive residual heat removal heat exchanger. Spurious closure of this valve is assumed to occur where a fire affects ~~the associated~~ its electrical circuity. Such a fire can occur in fire areas or fire zones through which the applicable electrical cables are routed. Spurious closure of this valve disables the passive residual heat removal heat exchanger. Safe shutdown proceeds using the automatic depressurization system as described in subsection 7.4.1.

Passive Containment Cooling System Valve Actuation

Two valves in series isolate each of the two discharge flow paths from the passive containment cooling system storage tank. For purposes of system reliability, one valve in each flow path is normally open and the other is normally closed. Electrical division assignments are shown in Table 9A-2.

Spurious actuation of one of these valves is assumed to occur where a fire affects ~~the associated~~ its electrical circuity. Such a fire can occur in an electrical equipment fire area, in the passive containment cooling system valve room, or in fire areas or fire zones through which the applicable electrical cables are routed.

Spurious actuation of one of these valves causes a passive containment cooling system flow path to be disabled or inadvertently opened, depending on which valve is affected. If a normally closed valve spuriously opens, passive containment cooling system water delivery from that flow path will be initiated which does not adversely affect the capability to achieve and maintain safe shutdown. If one of the normally open valves were spuriously closed to prevent passive containment cooling system water delivery through that flow path when called upon during the safe shutdown process, the redundant passive containment cooling system water delivery flow path would be sufficient to achieve and maintain safe shutdown.

Containment Isolation Valve Actuation

Spurious actuation of a containment isolation valve is assumed to occur where a fire affects ~~the associated~~ its electrical circuitry. Each containment penetration has redundant means of containment isolation.

Reactor Trip Switchgear

The reactor trip switchgear receives signals from each of the four Class 1E electrical divisions. The signals are de-energized to trip. Also, two out of four signals are required to trip. There are two redundant sets of trip switchgear in separate fire areas. There is no single spurious signal which could prevent the reactor from being tripped.

Westinghouse

FAX COVER SHEET

RECIPIENT INFORMATION		SENDER INFORMATION	
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COMMENTS:

DIANE

Here is an example table for Jeff. Recognize that this is not required by the STP but if he wants a table like this, please find out if this example meets his needs.

Jim Winters

Example Table for AP600 Fire Hazards Analysis

	Reactivity Control	Decay Heat Removal	Reactor Coolant Makeup	Reactor Pressure Control	Process Monitoring	Support Systems
AP600	Control Rods Core Makeup Tanks Borated Injection - CMT/Acc/IRWST	PRHR and PCCS ADS and CMT / Acc / IRWST and PCCS	CMT ADS and CMT / Acc / IRWST	Safety Valves	PAMS B1 Variables	Class 1E and DC UPS Protection and Safety Monitoring System (PMS)
1100 AF 01 / 1100 AF 11105 Neutron Detectors Cont. Level Instrument (B)	Control Rods Core Makeup Tanks Borated Injection - CMT/Acc/IRWST	PRHR and PCCS	CMT ADS and CMT / Acc / IRWST	Safety Valves	PAMS B1 Variables Cont. Level Instruments (A,C)	Class 1E and DC UPS PMS
1100 AF 01 / 1100 AF 11204 Cont. Level Instruments (A&C) Hot Leg 1 Level & Pressure Instruments (A&C)	Control Rods Core Makeup Tanks Borated Injection - CMT/Acc/IRWST	PRHR and PCCS	CMT ADS and CMT / Acc / IRWST	Safety Valves	PAMS B1 Variables Cont. Level Instruments (B) Hot Leg 2 Level & Pressure Instruments (B&D)	Class 1E and DC UPS PMS

Example Table for AP600 Fire Hazards Analysis

	Reactivity Control	Decay Heat Removal	Reactor Coolant Makeup	Reactor Pressure Control	Process Monitoring	Support Systems
1100 AF 01 / 1100 AF 11206 PXS Valves Powered by Division B/D Cont. Isolation Valve (Inside Cont.) Hot Leg 2 Level & Pressure	Control Rods (Auto or Manual) Core Makeup Tanks (Valves Powered by A/C) Borated Injection - CMT/Acc/IRWST (Valves Powered by A/C)	PRHR and PCCS Cont. Isolation Valve (Outside Cont.)	CMT (Valves Powered by A/C) ADS and CMT / Acc / IRWST (Valves Powered by A/C)	Safety Valves	PAMS B1 Variables Hot Leg 1 Level & Pressure Instruments	Class 1E and DC UPS PMS

Example Table for AP600 Fire Hazards Analysis

	Reactivity Control	Decay Heat Removal	Reactor Coolant Makeup	Reactor Pressure Control	Process Monitoring	Support Systems
1100 AF 01 / 1100 AF 11300B PRHR Control Valves (A&B) CMT B and Level Instruments IRWST Level Instruments (B&D) PRHR Flow (B&C) and Outlet Temp. (C) Pzr Pressure and Level Instruments (A&C) Cold Leg Flow (A&C) SG Level & Steamline Pressure Instruments (A&C) Cont. Isol. Valves Inside Cont. (A/C)	Control Rods (Auto or Manual) Core Makeup Tanks (CMT A) Borated Injection - CMT/Acc/IRWST (CMT A, IRWST Level Instruments A&C)	ADS and CMT / Acc / IRWST and PCCS (CMT A, IRWST Level Instruments A&C) Cont. Isol. Valves Outside Cont (B/D)	CMT ADS and CMT / Acc / IRWST (CMT A, IRWST Level Instruments A&C)	Safety Valves	PAMS B1 Variables Core Exit T/Cs Pzr Pressure and Level Instruments (B&D) Cold Leg Flow (B&D) SG Level & Steamline Pressure Instruments (B&D)	Class 1E and DC UPS PMS

Westinghouse

FAX COVER SHEET

RECIPIENT INFORMATION		SENDER INFORMATION	
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Cover + Pages 1 + 3

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COMMENTS: DIANE

THIS MARKUP SHOULD RESOLVE ITEMS ASSOCIATED WITH OPEN ITEM 309.

THESE ITEMS INCLUDE FIRST AND THIRD BULLETS FOR 309 IN JOHN'S NOTES FROM 11/19 LETTER, 12.b. OF YOUR 12/6 KEY ISSUES LETTER, (a) and (b) for 309 IN YOUR 1/3/97 LETTER AND (a) and (b) for 309 IN YOUR 1/8/97 LETTER. THIS WILL BE IN SSAR REVISION 11 UNLESS WE HEAR FROM YOU.

Jim Winters

cc: LINDGREN
MCINTYRE
CUMMINS
RON VIJUK
HUTCHINES
BARRY SLOANE
JEANNE EVANS

- Fire barrier separation is not provided within the remote shutdown workstation fire area because the remote shutdown workstation is not required for safe shutdown unless a fire requires evacuation of the main control room.

Complete — necessary to define a fire area — which define fire zones

- Fire barrier separation is not provided within the primary containment fire area (including the middle and upper annulus zones of the shield building) because of the need to satisfy other design requirements, such as allowing for pressure equalization within the containment following a high-energy line break. Fire protection features within the containment fire area provide confidence that one train of safe shutdown equipment will remain undamaged following a fire. The quantity of combustible materials is minimized. The use of canned reactor coolant pump motors has eliminated the need for an oil lubrication system. Redundant trains of safe shutdown components are separated whenever possible by existing structural walls, or by distance in any fire zone. The fire protection system provides appropriate fire detection and suppression capabilities.

If cables of a safety-related division must pass through a fire zone of an unrelated division, they are protected by fire barriers.

Outside of the primary containment and the main control room, the arrangement of plant equipment and routing of cable are such that safe shutdown can be achieved with all components (except those protected by 3-hour fire barriers) in any one fire area rendered inoperable by fire.

Openings and penetrations through fire barriers are protected in accordance with the guidelines of BTP CMEB 9.5-1.

The fire protection analysis contains a description of plant fire areas, fire zones, fire barriers, and the protection of fire barrier openings, as well as a description of the separation between redundant safe shutdown components.

Electrical Cable Design, Routing, and Separation

Electrical cable (including fiber optic cable) and methods of raceway construction are selected in accordance with BTP CMEB 9.5-1. Metal cable trays are used. Rigid metal conduit or metal raceways are used for cable runs not embedded in concrete or buried underground. Flexible metallic tubing is used in short lengths for equipment connections.

The insulating and jacketing material for electrical cables are selected to meet the fire and flame test requirements of IEEE Standard 383 (Reference 3).

The design, routing, and separation of cable and raceways are further described in Section 8.3.

Control of Combustible Materials

The plant is constructed of noncombustible materials to the extent practicable. The selection of construction materials and the control of combustible materials are in accordance with BTP CMEB 9.5-1 and NFPA 803.

Any damage which the fire is capable of causing is assumed to occur immediately. No credit is taken for proper operation of equipment or proper positioning of valves which are not protected from the effects of a postulated fire.

INSERT 1

Zone of Influence

INSERT 2

A postulated fire does not exceed the boundary of the fire area. For fire areas outside the main control room, remote shutdown workstation, and containment fire areas, all equipment in any one fire area is assumed to be rendered inoperable by the fire and re-entry into the fire area for repairs and operator actions is assumed to be impossible. However, no credit is taken for complete fire damage in cases in which complete damage is beneficial and partial damage is not. Chases for electrical cables, piping or ducts that pass through the fire area but are separated from it by 3-hour fire barriers are outside ~~the zone of influence for~~ that fire area.

~~Inside the containment fire area, potential fire damage is evaluated by fire zone.~~ All equipment in any one fire zone is assumed to be rendered inoperable by the fire unless the fire protection analysis demonstrates otherwise. Class 1E electrical cables that are located in or pass through the fire zone but are separated from it by a 3-hour fire barrier are outside ~~the zone of influence for~~ that fire zone.

INSERT 3

INSERT 4

Independence of Affected Fire Areas

Only systems, components, and circuits free of fire damage are credited for achieving safe shutdown for a given fire. Systems, components, and circuits outside the zone of influence are considered free of fire damage if the effects of the fire do not prevent them from performing their required safe shutdown functions.

Event Assumptions

Plant accidents and severe natural phenomena are not assumed to occur concurrently with a postulated fire. Furthermore, a concurrent single active component failure (independent of the fire) is not assumed.

Offsite Power

A loss of offsite power is assumed concurrent with the postulated fire only when the safe shutdown evaluation indicates the fire could initiate the loss of offsite power.

Availability of Nonsafety-Related Systems

Only safety-related components and systems are assumed to be available to perform safe shutdown functions. (This is more stringent than required by BTP CMEB 9.5-1.) Fire protection and smoke control systems are assumed to function as designed to detect and mitigate the effects of the fire.

INSERT 1

Fire Barriers

As described in subsection 9.5.1.2.1.1, non-combustible fire barriers are provided in accordance with BTP CMEB 9.5-1 and NFPA 803 (Reference 2). The equivalent fire barrier ratings are shown in Figures 9A-1 through 9A-5. Fire barriers or equivalent structural features form the boundaries of fire areas. For most fire zones in containment, fire barriers separate redundant equipment. If cables of a safety-related division must pass through or adjacent to a fire area or fire zone of an unrelated division, they are protected by fire barriers.

INSERT 2

Fire Areas

Fire areas are three dimensional spaces designed to contain a fire that may exist within them. They are surrounded by fire barriers, structure equivalent to fire barriers, fire barrier penetration protection, and other devices, such as those within the heating and air conditioning ducts, that isolate a fire to within the fire area.

INSERT 3

Outside containment, zone of influence is not defined. A fire outside containment is assumed to affect its entire fire area. Inside the containment fire area, the zone of influence is defined as the entire fire zone containing the fire.

In containment, fire zones are usually bounded by physical structures equivalent to a 3-hour fire barrier. In some cases, other fire protection features apply, such as distance or lack of fuel. For example, fire zone 1100 AF 11300A has no physical barrier between it and fire zone 1100 AF 11300B. This is due to the fact that all combustibles are at the extreme ends of these fire zones and are separated by more than 40 feet. There will be no communication of a fire from one fire zone to the other. Other examples include fire zones 1100 AF 11301 and 1100 AF 11302 which are open at their tops into fire zone 1100 AF 11500. Fire zone 1100 AF 11500 is the open upper containment. With no fuel sources over fire zones 1100 AF 11301 and 1100 AF 11302, there will be no fire communication between these zones and fire zone 1100 AF 11500.

INSERT 4

Fire Zones

Fire zones are three dimensional spaces within fire areas. Fire zones are identified uniquely to indicate that they have fire protection features or attributes different than other fire zones in a given area. For example, this difference may be due to different sprinkler coverage due to different fuel loadings. In containment, fire zones are identified to establish "zones of influence".