9.5.1 Fire Protection Program

The fire protection criteria for the AP600 are specified in SECY-90-016, SECY-93-087, and SECY-94-084. In addition, 10 CFR 52.48 specifies that the design will comply with the requirements specified in 10 CFR 50.48, "Fire protection," and GDC 3, "Fire protection," of Appendix A to 10 CFR Part 50. Conformance with the SRP is addressed in 10 CFR 50.34(g), which specifies that applications include an evaluation of the facility against the SRP. The fire protection guidance for nuclear power plants specified in the SRP is provided in BTP CMEB 9.5-1 "Guidelines for Fire Protection for Nuclear Power Plants." In addition to the guidance specified in the BTP, consistent with the technical positions stated in SECY-90-016, SECY-93-087, and Section 9.3 of NUREG-1242, "NRC Review of Electric Power Research Institute's Advanced Light Water Reactor Utility Requirements Document," Volume 3, the staff specified that the advanced light-water reactors shall provide an enhanced level of fire protection to ensure that safe shutdown can be achieved assuming all equipment in any one fire area is rendered inoperative as a result of fire damage, and that reentry into the fire area by plant personnel for repairs or operator actions is not possible. The control room and the containment are excluded from this criterion, provided an independent alternative shutdown capability is provided for a control room fire, and that fire protection for redundant divisions located inside containment is provided to ensure that one shutdown division will be free of fire damage following a fire inside the containment. The design must also ensure that smoke, hot gases, and fire suppressants do not migrate into other fire areas to the extent that they could adversely affect safe-shutdown capabilities, including operator actions. The NRC staff interpretations and positions related to fire protection which are published in generic communications were used as applicable in the review of the AP600. In addition, the applicable National Fire Protection Association (NFPA) codes, standards and recommended practices were applied to the fire protection systems and features provided in the AP600 design.

The following evaluation is based on the staff's review of the markup of Revision 18 of the SSAR dated March 6, 1998. Westinghouse substantially revised the AP600 fire protection design since the staff issued the DSER. Therefore, the evaluation documented herein replaces the DSER in its entirety.

The staff identified a concern regarding the AP600 fire protection design in the Advanced FSER. This concern was identified in a letter to Mr. Nicholas J. Liparulo from Jack W. Roe, dated April 8, 1998. The staff was concerned that the design appears not to meet the intent of Commission policy identified in SECY 93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs." SECY 93-087 states that passive plant designs are to be reviewed using the newest industry standards endorsed by the NRC. Concerns regarding this issue centered on the location of the fire pumps in the turbine building. Specifically, the fire pumps should be protected against possible interruption of service caused by explosion and fire as specified by NFPA 20. Westinghouse was requested to reassess the fire pump location and layout to demonstrate how they provide an equivalent level of facility fire safety comparable to that of pumps at operating plants and in the recently certified evolutionary plant designs. Also, Westinghouse was asked to reassess how the AP600 design addresses the latest fire protection standards endorsed by the NRC. This was FSER Open Item 9.5.1-1.

In response to Open Item 9.5.1-1, SSAR, Revision 23 reassessed the AP600 fire pump location. As part of this reassessment, Westinghouse revised the fire pump design such that the diesel-driven fire pump, which had been previously located in the turbine building, is relocated to a separate prefabricated structure located in the yard. The staff concludes that

the revised fire pump location meets the applicable regulatory review guidance and provides an equivalent level of fire safety compared to that of pumps at operating plants and the certified evolutionary plant designs. The staff reviewed the AP600 design using guidance and criteria consistent with current NRC fire protection criteria; therefore, the staff concludes that the AP600 fire protection design is acceptable. Open Item 9.5.1-1 is closed.

9.5.1.1 Fire Protection Program Requirements

9.5.1.1.a Fire Protection Program

The establishment of a fire protection program at the facility for the protection of structures, systems, and components important to safety, and the procedures, equipment and personnel required to implement the program is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(a).

9.5.1.1.b Fire Hazard Analysis

Westinghouse has provided the fire hazard analysis for the AP600 design in Section 9.5.1 and Appendix 9A of the SSAR. This analysis demonstrates that the plant will maintain the ability to perform safe shutdown functions, minimize radioactive releases to the environment, identify fire hazards and appropriate protection, and verify that NRC fire protection guidelines have been met. The revision of the fire hazard analysis to reflect the actual plant configuration is the responsibility of the COL applicant. This is COL Action Item 9.5.1-2.

The staff has determined that the design commitments in the following figures of SSAR Section 9.5.1, Appendix 9A, Fire Protection Analysis, if considered for a change by a COL applicant or licensee will require NRC review and approval prior to implementation of the change. The commitment identified below should be listed in the proposed rule certifying the AP600 design as Tier 2* information.

AP600 SSAR	DESCRIPTION
Figure 9A-1	Nuclear Island Fire Area Plan
Figure 9A-2	Turbine Island Fire Area Plan
Figure 9A-3	Annex I & II Building Fire Area Plan
Figure 9A-4	Radwaste Building Fire Area Plan
Figure 9A-5	Diesel Generator Building Fire Area Plan

9.5.1.1.c Fire Suppression System Design Basis

The fire suppression systems located inside the containment and outlying buildings are subject to a single active failure or crack that could impair both the primary and backup fire suppression capabilities, which is not in accordance with the guidance specified in the BTP. The fire suppression systems located inside the containment are qualified to seismic Category I criteria, which reduces the potential for a failure of the system. The buildings outside containment do not contain safety-related equipment, or present an exposure hazard to structures containing

safety-related equipment. Manual fire suppression capability using hose lines connected to the outside hydrants of the yard main can be provided in the event of a failure of the interior fire suppression systems. On the basis of the seismic qualification of the fire suppression system located inside containment, the finding that there is no safety-related equipment in the outlying buildings, and that there is manual suppression capability using the outside hydrants, the staff concludes that this alternative means of protection is acceptable. The staff also concludes that Westinghouse identified no other exceptions from the guidance specified in the BTP related to fire suppression system design basis and is, therefore, acceptable. This is Deviation 9.5.1-1.

9.5.1.1.d Alternative/Dedicated Shutdown

Westinghouse concluded that alternative or dedicated shutdown capability is not necessary. In Generic Letter (GL) 86-10, the staff stated its position that, for the purpose of analysis to Section III.G.2 of Appendix R to 10 CFR Part 50 criteria, the safe shutdown capability is defined as one of the two normal safe shutdown trains. Therefore, the staff concludes that the safety-related PXS and PCS used to achieve and maintain safe shutdown following a fire in the AP600 are acceptable as an alternative/dedicated shutdown method for fire areas where the normal shutdown systems have not been protected in accordance with the guidance prescribed in the BTP.

9.5.1.1.e Implementation of Fire Protection Program

The implementation of the fire protection program prior to receiving fuel onsite for fuel storage areas, and for the entire unit prior to reactor startup is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(b).

9.5.1.2 Administrative Controls

The establishment of administrative controls to maintain the performance of the fire protection systems and personnel is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(c).

9.5.1.3 Fire Brigade

The establishment of a site fire brigade trained and equipped for fire fighting to ensure adequate manual fire fighting capability for all plant areas containing structures, systems, or components important to safety is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(d).

9.5.1.4 Quality Assurance Program

The establishment of a quality assurance program to ensure that the guidelines for the design, procurement, installation, and testing, as well as the administrative controls for fire protection systems are satisfied is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(e).

9.5.1.5 General Plant Guidelines

9.5.1.5.a Building Design

The safety-related structures, the containment and auxiliary building non-RCAs, are separated from non-safety-related structures, the turbine building, annex building, radwaste building, diesel generator building, and auxiliary building (RCAs), by barriers having a minimum fire resistance rating of three hours. With the exception of the control room, the remote shutdown workstation, and the containment, fire barriers with a minimum fire resistance rating of three hours are provided to separate redundant divisions of the passive safety-related systems.

Openings through fire barriers for pipe conduit and cable trays are sealed with noncombustible materials to provide a fire resistance rating equal to that required by the barrier, qualified in accordance with the criteria specified in the BTP. Penetrations for ventilation systems are protected in accordance with the criteria specified in NFPA 90A, “Air Conditioning Systems.” Doors installed in fire barriers are qualified in accordance with the criteria specified in NFPA 80, “Fire Doors and Windows.” Inspection and maintenance of fire doors, access to keys for the fire brigade, and the marking of exit routes is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(f).

Personnel access and egress routes are provided for each fire area. Stairwells outside containment serving as access or egress routes are enclosed in gypsum towers with a minimum fire resistance rating of two hours equipped with self-closing doors with a fire resistance rating of one and a half hours. The BTP specifies that stair towers should be enclosed in masonry or concrete towers; however, there are no missile hazards in the vicinity of the subject stairwells. Therefore, the alternative protection provides an equivalent level of safety as that prescribed in the BTP and is, therefore, acceptable. This is Deviation 9.5.1-2.

There are no cable spreading rooms in the AP600 design. Therefore, the guidance specified in the BTP addressing separation of cable spreading rooms is not applicable. Gaseous suppression systems are not used in the AP600 design. Therefore, the guidance specified in the BTP addressing gaseous suppression systems is not applicable.

Interior finish, wall, ceiling, structural components, thermal insulation, radiation shielding, and soundproofing materials used in the AP600 are noncombustible. Metal deck roof construction is noncombustible and listed as Class I in the Factory Mutual Approval Guide. With the exception of the combustible cable insulation installed in the underfloor and ceiling spaces in the control room, technical support center and remote shutdown workstation, the concealed spaces are free of combustible materials. The BTP specifies that concealed spaces should be devoid of combustibles. Fire detection is provided in the concealed areas containing cables, and the cables used in the plant are qualified in accordance with the criteria specified in IEEE 1202, “Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies.” The alternative protection provides an equivalent level of safety as that specified in the BTP and is, therefore, acceptable. This is Deviation 9.5.1-3.

Transformers installed in safety-related areas are either dry type or contain a noncombustible liquid. Outdoor transformers are located at least 15.2 m (50 ft) from other structures or are separated by blank fire walls with a minimum fire resistance rating of three hours. Outdoor oil-filled transformers are provided with oil containment or drainage away from structures.

Floor drains of adequate capacity are provided in areas containing safety-related equipment to remove fire suppression water discharged from fixed or manual fire suppression systems. The collection and sampling of water drainage from areas that may contain radioactivity is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(g).

Drains installed in areas containing combustible liquids are equipped with backflow prevention to preclude the flow of combustible liquids into areas containing safety-related equipment.

With the exception of the gypsum stair towers and cable insulation installed in the concealed spaces of the main control room, technical support center, and remote shutdown workstation, Westinghouse identified no exceptions from the guidance specified in the BTP; therefore, the staff finds the design acceptable.

9.5.1.5.b Safe Shutdown Capability
9.5.1.5.c Alternative or Dedicated Shutdown Capability

The NRC staff developed the following criteria for the protection of safe and cold shutdown capability following a single fire in any fire area of the AP600:

- Safe shutdown following a fire is defined for the AP600 as the ability to achieve and maintain the reactor coolant system (RCS) temperature below 215.6 °C (420 °F) without venting of the primary coolant from the RCS. This is a departure from the criteria applied to the evolutionary plant designs, and the existing plants where safe shutdown for fires applies to both hot and cold shutdown capability. This is Deviation 9.5.1-4.

- Cold shutdown for the AP600 is defined as the ability to achieve and maintain the RCS below 93.3 °C (200 °F), consistent with the criteria applicable to the evolutionary designs and existing plants.

The use of the non-safety-related normal shutdown systems and/or the safety-related passive systems are acceptable to the staff to achieve and maintain safe shutdown following a fire. The safety-related passive systems are considered an alternate/dedicated shutdown method as described in the BTP for fire areas where the normal shutdown systems have not been protected in accordance with the guidance prescribed in the BTP. Consistent with the fire protection criteria for the advance light-water reactors specified in SECY-90-016 and SECY-93-087, redundant divisions of these systems shall be separated such that a fire in any fire area outside of the containment or the MCR will not impair the plant's capability to achieve and maintain safe shutdown as defined above, assuming a loss of all equipment in the affected fire area.

Consideration in the safe shutdown analysis upon personnel entry into the affected fire area to repair or operate equipment to achieve safe shutdown is prohibited as prescribed in SECY-90-16. Personnel entry into the affected fire area to repair or operate equipment necessary to achieve and maintain cold shutdown of the AP600 is acceptable, as a result of the unique capability of the AP600 to remain in safe shutdown using only passive systems for an extended period of time.

The criteria concerning cold shutdown capability deviates from the criteria applied to the evolutionary reactor designs, but is consistent with the criteria applicable to existing plants. To enhance the survivability of the normal safe shutdown and cold shutdown capability in the event

of a fire, and to reduce the reliance on the infrequently utilized safety-related passive systems, automatic suppression shall be provided in those fire areas outside containment where a fire could damage the normal shutdown capability, or result in a spurious operation of equipment that could result in a venting of the RCS. This criterion is unique to the AP600 and does not ensure that the normal shutdown capability will be free of fire damage, or that the equipment necessary to achieve and maintain cold shutdown can be repaired within 72 hours. This is Deviation 9.5.1-5.

As a result of the inability of the fire brigade to rapidly enter the AP600 containment in the event of a fire, and the potential for damage to safety-related and normal shutdown equipment, in addition to potential spurious actuation(s) resulting in a venting of primary coolant from the RCS, the protection of circuits and equipment inside containment should be enhanced beyond the criteria specified in BTP CMEB 9.5.1 for existing plants, consistent with the staff's technical position stated in Section 9.3 of NUREG-1242.

Fire areas outside of the containment or the MCR containing redundant equipment and circuits necessary to achieve and maintain cold shutdown using the normal systems specified in Table 9.5.1-4 of the SSAR have been provided with automatic suppression in accordance with the criteria specified in Section 9.5.1.5.c above, and are therefore, acceptable.

In Section 9.5.1.3 of the SSAR, Westinghouse states that manual partial opening and closing of one of the first stage automatic depressurization system (ADS) valves to reduce RCS pressure to allow initiation of the normal RNS will be used in one fire area in the event that the CVS is not available. The use of the first-stage ADS results in a controlled venting of the RCS to the IRWST and does not result in an increase in containment pressure or temperature. The use of the first stage ADS as described above is acceptable as an alternative shutdown method.

Westinghouse provided adequate fire protection of the equipment and circuits located inside containment that are required for safe shutdown to provide reasonable assurance that one division of safety-related equipment will remain free of fire damage, in accordance with the criteria specified above. Hose stations for manual suppression are provided inside containment; however, because of the potential hazard associated with personnel entry into containment during a plant transient, the response of the plant fire brigade may be significantly delayed. Therefore, no credit for manual suppression of fires inside containment during power operations is considered acceptable by the staff. In fire zone 1100 AF 11300B, Westinghouse provided a manually actuated water spray system over the non-safety-related open cable trays in this zone. Both divisions of the passive residual heat removal (PRHR) control valves and PRHR flow transmitters are located in this zone in close proximity to each other. These valves are separated by a noncombustible steel or steel composite barrier. There are no exposed cables in fire zone 100 AF 11300A, which is adjacent to fire zone 1100 AF 11300B. Westinghouse has provided reasonable assurance that one division of the normal or passive safe shutdown capability located inside containment will be maintained free of fire damage; therefore, this aspect of the design is acceptable.

Westinghouse included the reactor head vents for consideration as a high/low pressure interface in accordance with the guidance provided in GL 81-12. Inside containment the cables for the control of one head vent valve in each flow path are routed in separate conduits to prevent a spurious actuation of both valves in the flow path. In areas outside containment, the control room, and the remote shutdown workstation, the power and control circuits are located in separate fire areas. The soft controls located in the control room and remote work stations are not susceptible to fire induced spurious actuation. The dedicated switches located in the

control room are located on separate panels, such that a fire may short the switches on one panel, but the unaffected panel will be deenergized before spurious actuation of two valves in the same flow path. Therefore, the Westinghouse resolution of this issue is acceptable.

The spurious actuation of ADS resulting from of hot shorts of control circuits of motor operated valves from a fire in the MCR, remote shutdown workstation, DC equipment rooms, and Class 1E penetration rooms were addressed by Westinghouse. Separation and prompt operator actions are credited to minimize the potential for spurious actuation of ADS. The spurious actuation of ADS does not result in an unrecoverable plant configuration. Therefore, the Westinghouse resolution of this issue is acceptable.

9.5.1.5.d Control of Combustibles

Safety-related systems are separated from concentrations of combustible materials where practicable. Where separation is not possible, appropriate fire protection based on the fire hazard analysis is provided. The BTP specifies that bulk gas storage tanks should not be located inside structures containing safety-related equipment. Breathing air storage tanks are located in the auxiliary building non-RCA. These tanks are safety-related and are provided with over pressure protection and are, therefore, acceptable. High-pressure gas storage containers are located in accordance with the guidance prescribed in the BTP. This is Deviation 9.5.1-6.

The control of the use of compressed gases inside structures is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(h).

The use of plastic materials in the plant is minimized through design and administrative controls. The storage of flammable liquids complies with the criteria specified in NFPA 30, “Flammable Liquids Code.”

Hydrogen lines in safety-related areas are designed to seismic Category 1 requirements. The design of the plant hydrogen system complies with the criteria specified in NFPA 50A, “Gaseous Hydrogen Systems.”

With the exception of the breathing air storage tanks for the MCR, Westinghouse identified no exceptions from the guidance specified in the BTP and is, therefore, acceptable.

9.5.1.5.e Cable Construction

Cable trays, conduit, and other electrical raceways are constructed of noncombustible and metallic materials in accordance with the criteria specified in the BTP. Electrical raceways are only used for cables.

Safety-related cable trays located outside of containment are separated from redundant divisions and non-safety-related areas by three-hour fire rated barriers. Cable trays located inside containment containing safety-related cables are enclosed in noncombustible steel or steel composite materials. Safety-related cable trays are provided with line-type heat detection and are designed to allow wetting with fire suppression water without causing electrical faults. With the exception of the containment, safety-related cable trays are accessible for manual firefighting. In fire zone 1100 AF 11300B, Westinghouse provided a manually actuated water spray system over the non-safety-related open cable trays in this zone.

Electrical cable is qualified in accordance with the criteria specified in IEEE 1202, “Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies.” Miscellaneous storage and piping for combustible liquids or gases are located so as to not present an exposure hazard to safety-related systems.

Westinghouse provided reasonable assurance that one division of the safety-related cables will remain free of fire damage. The staff finds this aspect of the design acceptable.

9.5.1.5.f Ventilation

The ventilation system is designed such that smoke and other products of combustion following a fire can be discharged to an area that will not affect safety-related equipment. With the exception of the nuclear island nonradioactive ventilation system equipment rooms, main steam isolation compartments, and elevator shaft, all other fire areas located in the non-RCA portion of the auxiliary building can use the auxiliary building ventilation system to exhaust smoke directly to the outside. For these areas, and for the containment and RCA portions of the auxiliary building, portable fans and ductwork will be used for smoke removal. The routing of the portable ductwork will not enter any other fire area that contains safety-related equipment. In the diesel generator building, automatic suppression, and smoke and heat ventilation capability is provided. In lieu of providing separate smoke and heat vents in the ancillary diesel generator room of the annex building, automatic suppression is provided. Roof-mounted smoke and heat vents as well as partial area automatic suppression are provided in the turbine building.

The release of smoke and hot gases to the environment is monitored in accordance with the guidance specified in RG 1.101. Westinghouse evaluated the ventilation systems to ensure that inadvertent operation or single failures will not violate the RCAs of the plant.

The power supply and control for the ventilation systems are routed outside of the fire area served by the system. Air intakes for ventilation systems serving areas containing safety-related equipment are located remote from the exhaust air outlets and smoke vents of other fire areas.

There are no safety-related ventilation systems in the AP600 design; therefore, the guidance related to engineered safety feature filters and gaseous suppression systems are not applicable to the AP600.

Westinghouse evaluated the smoke control capability of the normal ventilation system against the criteria specified in NFPA 92A, “Recommended Practice for Smoke Control Systems,” including stair tower pressurization in the auxiliary building. Specifically, Westinghouse provided dedicated fans to maintain the minimum design pressure difference across the doors in the stair towers S01 and S02, in accordance with the guidance specified in NFPA 92A. Therefore, the Westinghouse resolution of this issue is acceptable.

9.5.1.5.g Lighting and Communication

Emergency lighting in the MCR and remote shutdown workstation is powered by the Class 1E dc and uninterruptable power supply that has an expected duration of 72 hours in the event of a loss of normal ac power. A loss of the emergency lighting in either the MCR or the remote shutdown workstation will not result in a loss of the emergency lighting in the other area. The emergency lighting in other plant areas is provided by 8-hour battery-powered, fixed,

self-contained units to provide safe ingress and egress of personnel and the operation of equipment following a fire, in the event of a loss of the normal lighting. Portable battery-powered lighting is provided for emergency use by plant personnel. This is Deviation 9.5.1-7.

Fixed emergency communications are provided at selected locations, independent of the normal plant communications system.

Portable radio communication for use by the plant fire brigade is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(i).

Westinghouse demonstrated that the emergency lighting and communications provided in the event of a fire provide a level of protection equivalent to that specified in the BTP and is, therefore, acceptable.

9.5.1.6 Fire Detection and Suppression

The COL applicant is responsible for ensuring that any deviations from the applicable NFPA codes and standards in addition to those specified in the SSAR, are incorporated into the final safety analysis report (FSAR) with appropriate technical justification. This is COL Action Item 9.5.1-3.

9.5.1.6.a Fire Detection

Fire detection systems designed and installed in accordance with the criteria specified in NFPA 72, “Protective Signaling Systems,” is provided in all plant areas that contain or present a potential fire exposure to safety-related equipment. Westinghouse identified no exceptions from the guidance specified in the BTP and, therefore, this aspect of the design is acceptable.

9.5.1.6.b Fire Protection Water Supply

An underground yard fire main loop, separate from the sanitary or service water system, and designed and installed in accordance with the criteria specified in NFPA 24, “Private Fire Service Mains,” is provided for the AP600. In addition, indicating isolation valves are provided to permit maintenance or repair of the fire main and outside hydrants without interrupting the water supply to both the primary and backup fire suppression capability to areas that contain or present an exposure to safety-related equipment. Westinghouse states that the AP600 design is a single-unit plant; therefore, Cross-connections at multi-unit sites is not part of the AP600 design.

Two redundant 100-percent capacity fire pumps (one diesel and one electric, 7571 L/min [2000 gpm] each) which are designed and installed in accordance with the criteria specified in NFPA 20, “Centrifugal Fire Pumps,” have been provided. The electric fire pump is separated from the balance of the turbine building by three-hour fire rated construction. The diesel fire pump is located in a separate structure in the yard. An electric driven jockey pump is provided to maintain system pressure.

The outside manual hose installation is sufficient to provide an effective hose stream to any onsite location that could present a fire exposure hazard to structures containing safety-related equipment. Fire hydrants are installed approximately every 76.2 m (250 ft) on the yard main.

Hose houses are provided in accordance with the criteria specified in NFPA 24. Threads compatible with the local fire department are provided on all hydrants, hose couplings and standpipe risers.

Four water storage tanks are used for supplying the fire protection water demand. The primary fire water storage tank has a capacity of 1,230.3 kL (325,000 gallons), and the secondary fire water storage tank has a capacity of 1,514.2 kL (400,000 gallons). The PCS tank can supply 68.2 kL (18,000 gallons) by gravity feed to the seismic standpipe and fixed water spray system located inside containment. The passive containment cooling ancillary water storage tank can supply a minimum of 68.2 kL (18,000 gallons) via the motor driven recirculation pumps (378.5 L/min (100 gpm) capacity each) to the seismic standpipe and fixed water spray system located inside containment, in the event the PCS supply is not available. The primary and secondary fire water storage tanks comply with the criteria specified in NFPA 22, "Water Tanks." The PCS tank and the ancillary passive containment cooling tank, which supplies the seismically qualified standpipes, are not designed in accordance with the criteria specified in NFPA 22. These tanks are seismically qualified, safety-related water storage tanks and are acceptable for fire protection use. In addition, a manually operated valve connecting the seismic standpipe to the yard loop is provided. The passive containment cooling water recirculation pumps are not designed and installed in accordance with the criteria specified in NFPA 20. These deviations from the NFPA standards will not adversely affect the performance of the seismically qualified portions of the fire protection water supply system and are, therefore, acceptable. These are Deviations 9.5.1-8, -9, and -10.

The fire protection water supply from the primary fire water storage tanks is dedicated for fire protection purposes. The secondary fire protection water storage tank is used to supply the containment spray following a severe accident. This deviation provides adequate defense in depth and will not adversely affect the performance of the fire protection water supply and is, therefore, acceptable. This is Deviation 9.5.1-11.

9.5.1.6.c Sprinkler and Standpipe Systems

Automatic sprinkler systems are designed and installed in accordance with the criteria specified in NFPA 13, "Installation of Sprinkler Systems," with the exception of providing individual fire department connections to each sprinkler system. Because the sprinkler systems are supplied by the plant's fire protection water supply, individual connections are not necessary. This deviation is acceptable. This is Deviation 9.5.1-12.

Standpipes for each building are designed and installed in accordance with the criteria specified in NFPA 14, "Installation of Standpipe and Hose Systems," for Class III service with the exceptions of (1) the water supply to the standpipe inside containment is manually operated, and (2) the containment isolation valves controlling the water supply to standpipes inside containment are not listed by an independent testing laboratories for fire protection service. The staff concludes that these deviations from the code will not adversely affect the performance of the hose station and standpipe system and are, therefore, acceptable. These are Deviations 9.5.1-13, and -14.

9.5.1.6.d Halon Systems

Halon fire suppression systems are not used in the design of the AP600, therefore, the guidance specified in the BTP is not applicable.

9.5.1.6.e Carbon Dioxide Systems

Carbon dioxide fire suppression systems are not used in the design of the AP600. Therefore, the guidance specified in the BTP is not applicable.

9.5.1.6.f Portable Fire Extinguishers

Portable fire extinguishers are provided in accordance with the criteria specified in NFPA 10, "Portable Fire Extinguishers." Westinghouse identified no exceptions from the guidance specified in the BTP. The staff finds this acceptable.

9.5.1.7 Specific Plant Areas

9.5.1.7.a Primary and Secondary Containment

Fire protection for the containment is provided as specified in Westinghouse's fire hazard analysis. A lube oil collection system for the RCPs is not required as the four RCPs do not contain oil. Operation of the fire protection suppression systems located inside containment will not compromise the integrity of the containment or other safety-related systems. Smoke and heat detection is provided in the primary containment; smoke detection is provided in the annulus. Manual hose stations are provided in the primary containment and in the lower annulus. Redundant divisions of safety-related cables located in the middle annulus are separated by three-hour fire barriers. Division B and D cables are located in the upper annulus, and Division A and C cables are located in the lower annulus.

Westinghouse provided adequate fire protection inside primary containment to provide reasonable assurance that one division of safe-shutdown equipment and cables will remain free of fire damage. Hose stations for manual suppression are provided inside containment, however, because of the potential hazard associated with personnel entry into containment during a plant transient, the response of the plant fire brigade may be significantly delayed. Therefore, no credit for manual suppression of fires inside containment during power operations is considered acceptable by the staff. Westinghouse provided a manual (operated from the MCR) water spray system in zone 1100 AF 11300B over the exposed cable trays located in this fire zone. Westinghouse identified no exceptions from the guidance specified in the BTP. The staff finds this acceptable.

Fire protection inside containment during refueling and maintenance is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(j).

9.5.1.7.b Control Room

The MCR complex is separated from other plant areas by three-hour rated fire barriers. The MCR fire zone is separated from the shift supervisors office and kitchen fire zone by one-hour fire barriers. Fire detection is provided in the general area and subfloor areas. Manual hose stations and portable fire extinguishers are provided for fire suppression. Smoke removal is provided by the nonradioactive ventilation system. Breathing apparatus is provided for control room personnel. The above provisions are in accordance with the BTP. Automatic suppression is not provided in the control room or peripheral rooms in this fire area. Fire detection is not provided in the cabinets or consoles. These deviations are acceptable as the control room is continuously occupied, the area fire hazard is low, manual suppression

capability is available, and the remote shutdown workstation is located in a separate fire area. These are Deviations 9.5.1-15, and -16.

The staff concludes that the deviations from the guidance specified in the BTP do not adversely affect safety and are, therefore, acceptable.

9.5.1.7.c Cable Spreading Room

There are no cable spreading rooms in the AP600. Therefore, the guidance specified in the BTP is not applicable.

9.5.1.7.d Plant Computer Rooms

There are no computers performing safety-related functions in the MCR complex. Non-safety-related computers outside the MCR are separated from safety-related areas by three-hour fire barriers.

The integrated protection cabinets, engineered safety features actuation cabinets, and protection logic cabinets are located in the instrumentation and control rooms which are separated from other plant areas and from redundant divisions by three-hour fire rated barriers. Automatic fire detection, portable fire extinguishers, and manual hose stations are provided. Floor drains are provided for the removal of firefighting water. Smoke removal using the nuclear island nonradioactive ventilation system or portable fans and ductwork, is provided for these areas. Westinghouse identified no exceptions from the guidance specified in the BTP and is, therefore, acceptable.

9.5.1.7.e Switchgear Rooms

The instrumentation and control, penetration, and reactor trip switchgear rooms are separated from other plant areas and from redundant divisions by three-hour fire rated barriers. Automatic fire detection, portable fire extinguishers, and manual hose stations are provided. Floor drains are provided for the removal of firefighting water. Smoke removal using the nuclear island nonradioactive ventilation system or portable fans and ductwork is provided for these areas. Westinghouse identified no exceptions from the guidance specified in the BTP. The staff finds this acceptable.

9.5.1.7.f Remote Safety-related Panels

Safety-related panels outside of the control room are separated from other plant areas by three-hour fire barriers. Automatic fire detection, portable fire extinguishers, and manual hose stations are provided. Remote shutdown panels located in the remote shutdown workstation can be electrically isolated from the MCR by a transfer switch. The control of combustible materials in these areas is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(k).

Westinghouse identified no deviations from the guidance specified in the BTP. The staff finds this acceptable.

9.5.1.7.g Safety-Related Battery Rooms

Safety-related battery rooms are separated from each other and other plant areas by three-hour fire rated barriers. Switchgear and invertors are not located in the battery rooms as specified in the SRP. Automatic fire detection is provided in the battery rooms. Portable extinguishers and hose stations are readily available outside the battery rooms. Ventilation systems are capable of maintaining the hydrogen concentration in the battery rooms below 2 percent. A loss of the battery room ventilation system alarms in the MCR. Westinghouse identified no exceptions from the guidance specified in the BTP. Therefore, the staff finds it acceptable.

9.5.1.7.h Turbine Building

The turbine building is separated from adjacent structures containing safety-related equipment by fire barriers with a minimum rating of three hours. The fire barriers are designed to maintain structural integrity in the event of a collapse of the turbine building. Openings and penetrations are minimized and are not located in proximity to the turbine lube oil system or generator hydrogen cooling system. Westinghouse identified no exceptions from the guidance specified in the BTP. The staff finds this acceptable.

9.5.1.7.i Diesel Generators
9.5.1.7.j Diesel Fuel Storage

The standby diesel generators are located in a separate structure, remote from safety-related areas, and separated from each other by three-hour fire barriers. The ancillary diesel generators are located in the same fire area, but are separated from other plant areas containing safety-related equipment by three-hour fire barriers. This deviation regarding the lack of three-hour separation between the ancillary diesels, which are not safety-related, does not adversely affect safety and is, therefore, acceptable. This is Deviation 9.5.1-17.

Automatic fire suppression is provided in the diesel generator and fuel storage rooms and is designed to actuate during diesel operation without affecting the diesel. Automatic detection is provided in the diesel generator service modules only; the dry pipe sprinklers provide detection in the diesel generator and fuel storage rooms. This deviation does not adversely affect safety and is, therefore, acceptable. This is Deviation 9.5.1-18.

Portable extinguishers and manual hose stations are readily available outside the fuel storage area. Drainage for firefighting water and a means for manual venting of smoke is provided.

The diesel generator day tanks have a capacity of 5,678 L (1,500 gallons). The tanks for the standby diesel generators are located in separate fire areas enclosed with three-hour fire barriers. The fuel tanks for the ancillary diesels have a capacity of 1,514 L (400 gallons) and are located in the same fire area as the diesels. The fuel storage areas are provided with automatic dry pipe sprinkler protection. The fuel tank enclosure is capable of containing the entire contents of the tank.

In view of the foregoing, the deviations identified by Westinghouse do not adversely affect safety and are, therefore, acceptable.

9.5.1.7.k Safety-related Pumps

There are no safety-related pumps required for safe shutdown following a fire in the design of the AP600. Therefore, the guidance specified in the BTP is not applicable.

9.5.1.7.l New Fuel Storage Area

The new fuel storage pit is provided with automatic fire detection, hose stations, and portable extinguishers; automatic suppression is not provided. Floor drains are provided to prevent the accumulation of water that could result in an inadvertent criticality. The new fuel storage pit is located in the same fire area (1200 AF 02) as the rail car bay/filter storage area. The rail car bay/filter storage area is provided with automatic suppression. Westinghouse identified no exceptions from the guidance specified in the BTP. Therefore, the staff finds the fire protection design for the new fuel storage area acceptable.

9.5.1.7.m Spent Fuel Pool Area

The fuel-handling area is provided with automatic fire detection, hose stations and portable extinguishers; automatic suppression is not provided. The fuel-handling area is located in the same fire area (1200 AF 02) as the rail car bay/filter storage area. The rail car bay/filter storage area is provided with automatic suppression. Westinghouse identified no exceptions from the guidance specified in the BTP. Therefore, the staff finds the fire protection design for the spent fuel pool area acceptable.

9.5.1.7.n Radwaste and Decontamination

The radwaste building is separated from other plant areas containing safety-related equipment by three-hour fire rated barriers. Automatic fire suppression is provided in the mobile systems facility, waste accumulation room, and packaged waste storage room. Fire detection and hose stations are provided throughout the radwaste building.

The cask washdown pit and the waste disposal container area are located in the same fire area (1200 AF 02) as the rail car bay/filter storage area. The rail car bay/filter storage area is provided with automatic suppression. As described above, Westinghouse identified no exceptions from the guidance specified in the BTP. Therefore, the staff finds the fire protection design for the radwaste and decontamination areas acceptable.

9.5.1.7.o Safety-related Water Tanks

The core makeup tanks, IRWST, and PCS tank are not susceptible to damage from an exposure fire. Westinghouse identified no exceptions from the guidance specified in the BTP. Therefore, the staff finds the fire protection design for the safety related water tanks acceptable.

9.5.1.7.p Records Storage Area

Records storage areas are located and protected such that a fire in these areas will not affect safety-related systems or equipment. Westinghouse identified no exceptions to the guidance specified in the BTP. Therefore, the staff finds the fire protection design for the records storage area acceptable.

9.5.1.7. q Cooling Towers

The cooling towers are not used as the ultimate heat sink or for fire protection purposes, therefore, the guidance specified in the BTP is not applicable.

Fire protection for cooling towers is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(l).

9.5.1.7.r Miscellaneous Areas

Miscellaneous areas such as shops, warehouses, auxiliary boiler rooms, fuel oil tanks, and flammable and combustible liquid storage tanks are located and protected such that a fire or the effects of a fire will not affect any safety-related equipment. These areas are outside of the containment, which is separated from other plant areas by a 3-hour fire barrier. Westinghouse identified no deviations from the guidance specified in the BTP. Therefore, the staff finds the fire protection design for these areas acceptable.

9.5.1.8 Special Protection Guidelines

9.5.1.8.a Storage of Oxygen-Acetylene Fuel Gases

The proper storage of welding gas cylinders is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(m).

9.5.1.8.b Storage Areas for Ion Exchange Resins

The proper storage of ion exchange resins is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(n).

9.5.1.8.c Hazardous Chemicals

The proper storage of hazardous chemicals is the responsibility of the COL applicant. This is COL Action Item 9.5.1-1(o).

9.5.1.8.d Materials Containing Radioactivity

Materials that collect and contain radioactivity such as spent resins, charcoal filters, and HEPA filters are stored in closed metal containers. Westinghouse identified no deviations from the guidance specified in the BTP. Therefore, the staff finds the fire protection design associated with the storage of these materials acceptable.

9.5.1.9 Evaluation of DSER Open Items and COL Action Items

DSER Open Item 9.5.1.2-1

Westinghouse did not include the remote shutdown workstation as an area where separate redundant divisions will not be separated by three-hour rated fire barriers. Further information regarding the remote shutdown workstation is required to determine the acceptability of the Westinghouse passive fire protection design. This was identified as DSER Open Item 9.5.1.2-1.

In Section 9.5.1.2.1.1 of the SSAR, “Plant Fire Prevention and Control Features, Plant Arrangement,” Westinghouse states that fire barrier separation is not provided within the remote shutdown workstation fire area because the remote shutdown workstation is not required unless a fire requires evacuation of the MCR. A fire in the remote shutdown work station is not postulated to occur simultaneously with a fire in the MCR. Therefore, the staff finds this acceptable; therefore, DSER Open Item 9.5.1.2-1 is closed.

DSER Open Item 9.5.1.2-2

Additional information concerning fire protection features (such as detection, suppression, structural walls, and/or distances between redundant safe-shutdown equipment) is needed to determine the acceptability of the AP600 design concerning fire protection inside primary containment. This was identified as DSER Open Item 9.5.1.2-2.

Westinghouse provided additional information in Section 9.5.1.2.1.1 of the SSAR, “Plant Fire Prevention and Control Features, Plant Arrangement,” and in Table 9.5.1-1, “Guidelines 166 - 174,” regarding primary and secondary containment. A discussion of primary and secondary containment is in Section 9.5.1.7.a of this report, including the requirement that the COL applicant is responsible for fire protection inside containment during refueling and maintenance. The staff finds this acceptable; therefore, DSER Open Item 9.5.1.2-2 is closed.

DSER Open Item 9.5.1.3-1

Westinghouse should provide more detail regarding detector capability and exceptions to the guidance specified in the BTP. This was identified as DSER Open Item 9.5.1.3-1.

In Table 9.5.1-1, “Guidelines 112 -120,” and Section 9.5.1.2.1.2 of the SSAR, Westinghouse described the fire detection and alarm system. The staff finds this acceptable, therefore, DSER Open Item 9.5.1.3-1 is closed.

DSER Open Item 9.5.1.3-2

Guideline 137 (BTP CMEB 9.5-1, Section C.6.b (9)) states that two separate fresh water supplies with a minimum of 1,135.6 kL (300,000 gallons) each should be used for fire service. On the basis of the information provided, it is not clear whether the second fire protection water storage tank also contains a dedicated 1,135.6 kL (300,000 gallons) storage capacity for fire service. Additional information will be required to determine the acceptability of the fire protection water supply. This was identified as DSER Open Item 9.5.1.3-2.

In Table 9.5.1-2 of the SSAR, Westinghouse states that the primary fire water tank has 1,135.6 kL (300,000 gallons) of water dedicated for fire protection and the secondary fire water tank has 1,135.6 kL (300,000 gallons) of water available to fire protection. In Section 9.5.1.2.3, Westinghouse provided additional information on the fire protection water supply (see Section 9.5.1.6.b of this report for more information). The staff finds this acceptable, therefore, DSER Open Item 9.5.1.3-2 is closed.

DSER Open Item 9.5.1.3-3

Additional information regarding the design of the sprinkler system based on results of the fire protection analysis is needed for the staff to make its determination regarding the

Westinghouse design of automatic fire suppression systems. This was identified as DSER Open Item 9.5.1.3-3.

In Section 9.5.1.2.1.4, Westinghouse stated that the automatic sprinkler and water spray systems are provided in accordance with the applicable requirements in NFPA 13 and NFPA 15 and describes the AP600 automatic water suppression systems (see Section 9.5.1.6.c of this report for more information). The staff finds this information acceptable; therefore, DSER Open Item 9.5.1.3-3 is closed.

DSER Open Item 9.5.1.3-4

The staff requires the following additional information:

- availability of the water dedicated to the manual hose stations from the passive containment water storage tank
- the pressure required to produce at least two effective hose streams inside containment utilizing the passive containment water storage tank
- assurance that no possibility exists for channeling water from fire-extinguishing operations in one redundant fire area into another redundant fire area

This was identified as DSER Open Item 9.5.1.3-4.

In Section 9.5.1.2.1.5 of the SSAR, “Manual Fire Suppression Systems,” Westinghouse stated that the seismic standpipe system supply is from a portion of the PCS allocated for fire protection. This volume of water is sufficient to supply two hose streams, each with a flow of 285 L/min (75 gpm), for two hours. In addition the PCS ancillary water storage tank has a quantity of water dedicated to fire protection to supply two hose streams, each with a flow of 284 L/min (75 gpm), for two hours. In Section 9.5.1.1.1 of the SSAR, “Safety Design Basis’” Westinghouse stated that floor drains are sized to remove the expected fire fighting water flow without flooding safety related equipment (see Section 9.5.1.6.a of this report for more information). The staff finds this information acceptable; therefore, DSER Open Item 9.5.1.3-4 is closed.

DSER Open Item 9.5.1.4-1

Westinghouse had not provided sufficient information to enable the staff to determine whether the control room emergency lights and the remote shutdown work station emergency lights will be electrically and physically protected from a fire. Additional information was required for the staff to determine the acceptability of AP600 emergency lighting. This was identified as DSER Open Item 9.5.1.4-1.

In Section 9.5.3.2.2 of the SSAR, “Emergency Lighting,” Westinghouse stated that the MCR and remote shutdown area are provided with three-hour fire barrier separation between redundant emergency lighting power supplies and cables outside the MCR and remote shutdown area. 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 uninterruptable power supply system. The staff finds this acceptable; therefore, DSER Open Item 9.5.1.4-1 is closed.

DSER Open Item 9.5.1.4-2

In Table 9.5.1-1, under BTP CMEB 9.5-1 Guideline 111, Westinghouse did not indicate whether it commits to meeting the emergency communication guidelines of Section C.5.g(4) of BTP CMEB 9.5-1 regarding the use of a portable radio communications system by the fire brigade and other operational personnel required to achieve safe plant shutdown. Additional information was required from Westinghouse for the staff to determine the acceptability of the AP600 portable radio communications systems for the fire brigade and other operations personnel. This was identified as DSER Open Item 9.5.1.4-2.

In Table 9.5.1-1, Westinghouse indicated that the COL applicant will address how it will comply with Guideline 111, regarding a portable radio communication system. Section 9.5.1.5.g of this report provides a discussion of communications including the requirement that the COL applicant is responsible for portable radio communication for the use of the fire brigade. The staff finds this acceptable; therefore, DSER Open Item 9.5.1.4-2 is closed.

DSER Open Item 9.5.1.4-3

In Table 9.5.1-1 of the SSAR, under BTP CMEB Guideline 32, Westinghouse stated that the AP600 is expected to conform to the guidelines or their intent. The COL applicant will need to provide additional information. The guidelines also indicate that the procedures and administrative controls governing the fire protection program during plant operations are developed for specific plants and covered in the COL application. The staff asked Westinghouse to provide additional information concerning reserve air to permit quick and complete replenishment of exhausted air supply bottles as they are returned. They also asked Westinghouse to identify the location of air compressors or other equipment such as cascading air bottles that will be used to replenish the breathing air, as specified in BTP 9.5.1.3.c. This additional information was necessary for the staff to determine the acceptability of the fire brigade emergency breathing air. This was identified as DSER Open Item 9.5.1.4-3.

In Table 9.5.1-1, Westinghouse indicated that satisfying Guideline 32 is the responsibility of the COL applicant. In satisfying Guideline 32, Westinghouse stated that a breathing air compressor and receiver are provided in the compressed and instrument air system to replenish the exhausted air supply bottle used by the fire brigade. Additionally, an equivalent six-hour supply of reserve air (e.g., the 12 additional SCBA bottles) will be maintained in an area located outside of the turbine building. Further information was also provided in Section 9.3.1 of the SSAR. Westinghouse also stated in Note 2 of Table 9.5.1-1 that procedures and administrative controls governing the fire protection programs during plant operation are the responsibility of the COL applicant. Additionally, COL Action Item 9.5.1-1, in part, as described in this report, states that the COL applicant is responsible for the establishment of administrative controls to maintain the performance of the fire protection systems and personnel. The staff finds this acceptable; therefore, DSER Open Item 9.5.1.4-3 is closed.

DSER Open Item 9.5.1.4-4

Westinghouse had not provided sufficient information regarding floor drains sized to remove water flow without flooding safety-related equipment. The staff required additional information regarding the acceptability of the AP600 design for curbs and drains. This was identified as DSER Open Item 9.5.1.4-4.

In Table 9.5.1-1, Westinghouse states that they comply with Guidelines 65-68, and 70, regarding drains. Guideline 69 refers to the gaseous suppression system which does not apply to the AP600. Guideline 71 refers to the drainage of potentially radioactive water and is the responsibility of the COL applicant. Section 9.5.1.5.a of this report provides a discussion of drains including the requirement that the COL applicant is responsible for the collection and sampling of potentially radioactive water (see Section 9.5.1.9 of this report for additional information). The staff finds this acceptable; therefore, DSER Open Item 9.5.1.4-4 is closed.

DSER Open Item 9.5.1.4-5

On the basis of the current AP600 design (i.e., as of the date of issuance of the DSER) concerning smoke control features, it is not clear how smoke will be prevented from migrating to other fire areas. Therefore, the staff requested additional information from Westinghouse to clarify how smoke and hot gases will not adversely affect safe shutdown, including operator action, for all safe shutdown and safety-related areas. Additional information concerning the AP600 smoke-control features was required for the staff to determine the acceptability of the smoke-control features. This was identified as DSER Open Item 9.5.1.4-5.

In Section 9.5.1.2.2 of the SSAR, “System Operation,” and Section 9.5.1.3, “Safety Evaluation (Fire Protection Analysis),” Westinghouse stated that the fire protection analysis includes a discussion regarding the control and removal of smoke and hot gases for each fire area. Section 9.5.1.5.f of this report provides a discussion of ventilation system. Based on that discussion, the staff finds this acceptable; therefore, DSER Open Item 9.5.1.4-5 is closed.

DSER Open Item 9.5.1.4-6

Westinghouse had not described the protection provided regarding the inadvertent operation of fire protection systems. Therefore, additional information from Westinghouse was required for the staff to determine the acceptability of the AP600 design concerning interaction with other systems. This was identified as DSER Open Item 9.5.1.4-6.

In Section 9A.2.6 of the SSAR, “Fire Protection System Integrity,” Westinghouse stated that for all areas containing safety related equipment, the potential for a credible inadvertent actuation of the automatic suppression systems has been determined and the consequences evaluated. The staff finds that there are no automatic suppression systems in safety related areas; therefore, DSER Open Item 9.5.1.4-6 is closed.

DSER Open Item 9.5.1.4-7

Additional information was required from Westinghouse for the staff to determine the acceptability of the preoperational acceptance test for all active components of the entire fire protection system(s). This was identified as DSER Open Item 9.5.1.4-7.

In Section 9.5.1.4 of the SSAR, Westinghouse stated that preoperational testing will be in accordance with the initial test program, as described in Chapter 14 , which includes the fire protection system. The fire pumps will be initially tested by the manufacturer in accordance with NFPA 20 to verify pressure integrity and performance. The staff finds this acceptable; therefore, DSER Open Item 9.5.1.4-7 is closed.

COL Action Item 9.5.1.2-1

The COL applicant's maintenance program is to be developed to ensure that fire-rated assemblies (such as fire doors, fire dampers, and penetration seals) will be maintained in accordance with their respective NFPA codes or manufacturer's instructions. The staff will review the COL applicant's maintenance program on a plant-specific basis. This was identified as COL Action Item 9.5.1.2-1.

In Section 9.5.1.2.1.1, Westinghouse described the plant fire protection and control features. COL Action Item 9.5.1-1, as identified in this report, requires the establishment of a fire protection program at the facility, which includes the protection of structures, systems, and components important to safety. COL Action Item 9.5.1-2, as identified in this report, requires an update to the fire hazard analysis, which will demonstrate that the plant will maintain its ability to perform safe shutdown and other functions. COL Action Item 9.5.1-1, in part, as identified in this report, addresses maintenance of fire doors, access to keys, and exit routes. These COL action items supersede COL Action Item 9.5.1.2-1; therefore, COL Action Item 9.5.1.2-1 is dropped.

COL Action Item 9.5.1.3-1

In Table 9.5.1-1 of the SSAR, under BTP CMEB 9.5-1 Guidelines 121-144, Westinghouse committed to follow the BTP CMEB 9.5-1 guidelines but noted that, because of conflicting design considerations, there may be a need to take exception to specific guidance. The COL applicant will identify and address these deviations in the fire hazards analysis.

In Table 9.5.1-1 of the SSAR, under BTP CMEB 9.5-1 Guidelines 164-165, Westinghouse indicated that extinguishers will be provided in areas that contain or present a fire exposure hazard to safety-related equipment, in accordance with the guidelines of NFPA 10. The staff expects that these deviations to BTP CMEB 9.5-1 and/or NFPA 10 will be addressed in the Fire hazards analysis submitted by the COL applicant. The staff will review the deviations to BTP CMEB 9.5-1, Section C.6.f, and/or NFPA 10 on a plant-specific basis. This was identified as COL Action Item 9.5.1.3-1.

In Section 9.5.1.8 of the SSAR, Westinghouse stated that the COL applicant will address BTP CMEB 9.5-1 issues identified in Table 9.5.1-1 by the acronym “WA,” and that the COL applicant will address updating the list of NFPA exceptions after design certification, if necessary. In Table 9.5.1-1, Westinghouse indicated in Note 3 that, for Guidelines 133, 150, 153, and 164, it fully intended to comply with the NFPA standards referenced in Section 9.5.5, as they apply to the AP600; however, because of conflicting design considerations, there may be a need to take exception to specific guidance. Known exceptions to NFPA requirements are identified in SSAR Table 9.5.1-3. The COL applicant will address updating the list of NFPA exceptions after design certification, if necessary. The staff finds this acceptable. COL Action Item 9.5.1-2, as described in this report, includes the requirement to revise the fire hazard analysis to reflect the actual plant configuration. COL Action Item 9.5.1-3, as described in this report, includes the requirement to incorporate any deviations from NFPA codes and standards, with appropriate justification, into the FSAR. These COL action items supersede COL Action Item 9.5.1.3-1; therefore, COL Action Item 9.5.1.3-1 is dropped.

COL Action Item 9.5.1.5-1

Westinghouse indicated that the procedures and administrative controls governing the fire protection program during plant operation are developed for specific plants and covered in the COL application. The staff will perform a detailed review of the administrative controls during the plant-specific licensing process of a COL application referencing the AP600 system design. Items of interest under the administrative controls review will include the following:

- control of combustible materials such as combustible/flammable liquids and gases, fire-retardant-treated wood, plastic materials, and dry ion-exchange resins
- transient combustible materials and general housekeeping, including health physics materials
- open-flame and hot-work permits, and cutting and welding operations
- quality assurance with respect to fire protection system(s) components, installation, maintenance, and operation
- qualification of fire protection engineering personnel, fire brigade members, and fire protection system(s) maintenance and testing personnel
- instruction, training, and drills provided to fire brigade members

These items were identified as COL Action Item 9.5.1.5-1.

In Section 9.5.1.2.1.1, "Plant Fire Protection and Control Features, Control of Combustible Materials," Westinghouse described its controls and states that the control of construction and combustible materials are in accordance with BTP CMEB 9.5-1 and NFPA 803. In Table 9.5.1-1, Westinghouse addressed Guidelines 77-83, regarding the control of combustibles.

In Section 9.5.1.7 of the SSAR, "Quality Assurance," Westinghouse commits that the quality assurance controls were applied to the activities involved in the design, and will be applied to the activities involved in the procurement, installation, testing, and maintenance of fire protection systems for safety-related areas, in accordance with the programs outlined in Chapter 17. Additionally, in Table 9.5.1-1, Westinghouse designates the COL applicant to address Guidelines 30-34, regarding the fire brigade.

In Section 9.5.1.6, Westinghouse stated that the qualification requirement for individuals responsible for training fire fighting personnel is the responsibility of the COL applicant. In Section 9.5.1.8, Westinghouse stated that the COL applicant will address qualification requirements for individuals responsible for the development of the fire protection program, training of firefighting personnel, the administrative procedures and controls governing the fire protection program during plant operation, and fire protection system maintenance.

The staff finds the above statements in the SSAR acceptable. A discussion of the control of combustibles is in Section 9.5.1.5.d and 9.5.1.7.f of this report, including the requirement that the COL applicant is responsible for the control of combustible material in the remote shutdown panels. COL Action Item 9.5.1-1, in part, as described in this report, requires the COL applicant

to establish a site fire brigade trained and equipped to fight and to establish a quality assurance program to ensure that the guidelines for the design, procurement, installation and testing, and the administrative control for fire protection systems are satisfied. The staff also finds the COL action items supersede COL Action Item 9.5.1.5-1; therefore, COL Action Item 9.5.1.5-1 is dropped.

Applicable National Fire Protection Association Codes, Standards and Recommended Practices

NFPA 10 - Portable Extinguishers
NFPA 13 - Sprinkler Systems
NFPA 14 - Standpipe and Hose Systems
NFPA 20 - Centrifugal Fire Pumps
NFPA 22 - Water Tanks
NFPA 24 - Private Fire Service Mains
NFPA 30 - Flammable Liquids Code
NFPA 50A Gaseous Hydrogen Systems
NFPA 80 - Fire Doors and Windows
NFPA 90A - Air Conditioning Systems
NFPA 92A - Recommended Practice for Smoke Control Systems

SUMMARY OF APPROVED DEVIATIONS AND COL ACTION ITEMS

I. Approved Deviations

9.5.1 - 1 - Single failure of primary and backup fire suppression inside containment.
9.5.1 - 2 - Gypsum stair towers.
9.5.1 - 3 - Cable insulation in concealed spaces of the control room, technical support center, remote shutdown workstation.
9.5.1 - 4 - Definition of safe shutdown.
9.5.1 - 5 - Achievement of cold shutdown in 72 hours.
9.5.1 - 6 - Breathing air storage tanks located in the auxiliary building.
9.5.1 - 7 - Self contained emergency lighting in the control room and remote shutdown workstation.
9.5.1 - 8 - PCS tanks compliance with NFPA 22.
9.5.1 - 9 - Manual connection between seismic standpipe and yard loop.
9.5.1 - 10 - PCS recirculation pumps compliance with NFPA 20.
9.5.1 - 11 - Fire department connections to the sprinkler systems.
9.5.1 - 12 - Manual operation of standpipe inside containment.
9.5.1 - 13 - Containment isolation valves not listed for fire protection service.
9.5.1 - 14 - Automatic suppression of peripheral rooms in control room complex.
9.5.1 - 15 - Fire detection in MCR cabinets and consoles.
9.5.1 - 16 - Fire separation of ancillary diesels.
9.5.1 - 17 - Fire detection in diesel generator rooms.
9.5.1 - 18 - Automatic detection not provided in the D/G and fuel storage rooms.

II. COL Action Items

9.5.1 - 1(a) - Fire protection program.
9.5.1 - 1(b) - Implementation of fire protection program.
9.5.1 - 1(c) - Administrative controls.
9.5.1 - 1(d) - Fire brigade.

9.5.1 - 1(e) - Quality assurance program.
9.5.1 - 1(f) - Inspection and maintenance of fire doors, keys for the fire brigade, and marking of exit routes.
9.5.1 - 1(g) - Sampling of water drainage for contamination following a fire.
9.5.1 - 1(h) - Control of combustibles.
9.5.1 - 1(i) - Portable radio communications for the fire brigade.
9.5.1 - 1(j) - Fire protection inside containment during refueling and maintenance.
9.5.1 - 1(k) - Control of combustibles in areas containing safety-related equipment.
9.5.1 - 1(l) - Cooling tower fire protection.
9.5.1 - 1(m) - Storage of welding gas cylinders.
9.5.1 - 1(n) - Storage of ion exchange resins.
9.5.1 - 1(o) - Storage of hazardous chemicals.
9.5.1 - 2 - Fire hazard analysis.
9.5.1 - 3 - Deviations from NFPA codes and standards.