9.5 Other Auxiliary Systems

9.5.1 Fire Protection

The purpose of the fire protection program (FPP) is to protect plant systems and equipment which provide the capability to safely shut down the reactor, maintain it in a safe shutdown condition, control radioactive releases to the environment, and prevent personnel injury and property damage in the event of a fire.

The FPP consists of fire protection system (FPS) design features, personnel, equipment, and procedures to provide defense-in-depth protection of public health and safety. The program is implemented during station operations by the prevention, detection, annunciation, confinement, and extinguishment of fire. Administrative controls, training, inspection, testing, and quality assurance (QA) provide reasonable assurance of the operability of the program.

The FPP, including administrative controls and the fire brigade, are implemented prior to receiving fuel on site for fuel storage areas and for the entire station prior to reactor startup.

9.5.1.1 Design Basis

The development and implementation of the FPP is in accordance with:

- 10 CFR 50.48 - Fire Protection.
- 10 CFR Part 50, Appendix A, GDC 3 - Fire Protection.
- 10 CFR Part 50, Appendix A, GDC 5 - Sharing of Structures, Systems, and Components.
- 10 CFR Part 50, Appendix A, GDC 19 - Control Room.
- 10 CFR Part 50, Appendix A, GDC 23 - Protection System Failure Modes.
- 10 CFR Part 50, Appendix A, GDC 56 - Primary Containment Isolation.
- NUREG-0800, Standard Review Plan 9.5.1 - Fire Protection Program (Reference 37).
- RG 1.29 - Seismic Design Classification, Revision 4.
- RG 1.189 - Fire Protection for Nuclear Power Plants, Revision 1.

The FPP is designed to:

- Prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition.

- Isolate combustible materials and limit the spread of fire by subdividing plant buildings into fire areas separated by fire barriers.
- Provide the capability to rapidly detect, control, and promptly extinguish fires that do occur.
- Provide protection for structures, systems, and components (SSC) important to safety so that a fire, not promptly extinguished, will not prevent the safe shutdown of the plant or result in the release of radioactive materials to the environment.
- Maintain one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) free of fire damage assuming all equipment in any one fire area will be rendered inoperable by fire, and post-fire re-entry for repairs or operator actions is not possible. Because of its physical configuration, the main control room (MCR) is excluded from this approach, but an independent alternative shutdown capability that is physically and electrically independent of the MCR is included in the design.
- Provide fire protection features for redundant shutdown systems in the Reactor Building (RB) that will make sure to the extent practicable that one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage.
- Separate redundant trains of safety-related equipment used to mitigate the consequences of a design basis accident (but not required for safe shutdown following a fire) so that a fire within one train will not damage a redundant train.
- Prevent smoke, hot gases, or fire suppressant agents from migrating from one fire area to another to the extent they could adversely affect safe shutdown capabilities, including operator actions.
- Prevent failure or inadvertent operation of the FPS from impairing the safety capability of SSC important to safety.
- Preclude the loss of structural support, due to warping or distortion of building structural members caused by the heat from a fire, to the extent that such a failure could adversely affect safe shutdown capabilities.
- Provide floor drains sized to remove expected firefighting water flow without flooding safety-related equipment.
- Provide firefighting personnel access and life safety escape routes for each fire area.
- Provide emergency lighting and communications to facilitate safe shutdown following a fire.
- Limit the radiological release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) to as low as reasonably achievable and to not exceed applicable regulatory limits.

- Provide backup water supply to CCWS surge tanks after seismic event (post seven days).
- Provide backup water supply to SCWS expansion tanks after seismic event (post seven days).

The FPS is classified as non-safety related. The fire protection containment isolation valves and associated piping are classified as safety-related and are subject to Seismic Category I design requirements per RG 1.29, Regulatory Position 1.o. The FPS portion of the containment isolation system meets the containment isolation requirements of GDC 56. The FPS water supply storage tanks, pumps, and portions of the distribution piping that provide fire protection flow to standpipes located in areas containing Seismic Category I equipment are subject to seismic design requirements per RG 1.29, Regulatory Position 2.

The portions of the FPS that provide containment isolation or water to the standpipes that protect those areas of the plant, containing Seismic Category I equipment used for safe plant shutdown, are required to remain functional during and following seismic events up to a safe shutdown earthquake. Other portions of the FPS are not required to remain functional following a plant accident or natural phenomena.

The FPS is designed to perform the following functions:

- Detect fires and provide operator indication of the location.
- Provide the capability to extinguish fires in plant areas, to protect site personnel, limit fire damage, and protect safe shutdown capabilities.
- Supply fire suppression water at a flow and pressure sufficient to meet the largest hydraulic demand of any automatic sprinkler or water spray system with an additional 500 gpm for fire hose use, for a minimum of two hours.
- Maintain 100 percent of fire pump design capacity, assuming failure of the largest fire pump or the loss of offsite power.
- Following an SSE, provide water to hose stations for manual firefighting in areas containing Seismic Category I plant safe shutdown equipment.
- Containment isolation.

The fire protection analysis (see Appendix 9A) evaluates the adequacy of fire protection for systems and plant areas.

9.5.1.2 Program Description

9.5.1.2.1 General Description

The FPP and design of the FPS comply with applicable codes and standards.

In general, the FPP complies with the provisions specified in NFPA 804 (Reference 42) as they relate to the protection of post-fire safe-shutdown capability and the mitigation of a radiological release resulting from a fire. However, the NRC has not formally endorsed NFPA 804, and some the guidance in the NFPA standard may conflict with regulatory requirements. When conflicts occur, the applicable regulatory requirements and guidance will govern.

Deviations from NFPA code requirements will be identified and justified by the COL applicant as part of the final Fire Hazards Analysis.

In accordance with SRP 9.5.1, "the standards of record related to the design and installation of fire protection systems and features sufficient to satisfy NRC requirements in all new reactor designs are those NFPA codes and standards in effect 6 months prior to the submittal of the application under 10 CFR Part 50 or 10 CFR Part 52. The codes/standards of record are governed by the DC (within 6 months of the DC document submittal date) for aspects of the FPP described in the DC."

"The COL should use industry codes and standards within 6 months of the COL application date for any aspects of the FPP not covered in the DC."

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189 is a point-by-point description of the conformance of the U.S. EPR Fire Protection Program (FPP) with the guidelines of RG 1.189, including alternative designs.

The FPS detects fires and provides fire extinguishment capability using fixed automatic and manual suppression systems, manual hose streams, and portable fire fighting equipment. The FPS consists of a number of fire detection and fire suppression subsystems, including:

- Detection systems for early detection and notification of a fire.
- A water supply system including storage tanks, fire pumps, yard main, and interior distribution piping headers.
- Fixed automatic and manually-actuated fire suppression systems.
- Manual fire suppression systems and equipment, including hydrants, standpipes, hose stations, and portable fire extinguishers.

The fire detection and suppression systems are described later in this section.

A COL applicant that references the U.S. EPR design certification will provide a description and simplified Fire Protection System piping and instrumentation diagrams for site-specific systems.

Plant Fire Prevention and Control Features

Plant Arrangement

In accordance with GDC 3, SSC important to safety must be designed and located to minimize the probability and effect of fires and explosions. The requirements of GDC 3 are met, in part, by compartmentation of the plant into separate fire areas. Specifically, based on the hazards and the need for physical separation of SSC important to safety, the plant is segregated into separate fire areas by passive, fire-rated structural barriers (i.e., walls, floors, and ceilings). In some instances, such as the RB, fire areas may be sub-divided into fire zones based on physical separation, location of plant equipment, or for fire hazard analysis purposes. These fire areas and zones serve the primary purpose of confining the effects of fires to a single compartment or area, thereby minimizing the potential for adverse effects from fires on redundant SSC important to safety. Each of the four divisions of systems in the Safeguard Buildings (SB), Essential Service Water Buildings, and Emergency Power Generating Buildings (EPGB) are separated by three hour rated structural fire barriers. Outside of the MCR and the RB, each of the four redundant trains of emergency core cooling is separated by three hour rated structural fire barriers.

The plant layout also provides adequate means of access to all plant areas for manual fire suppression activities and to allow safe access and egress for personnel. The layout and travel distances of access and egress routes meet the intent of NFPA 101 (Reference 18) to the extent practicable. Potential delays in plant access or egress due to security locking systems are considered.

The MCR is designed to permit rapid detection and suppression of fires, including the sub-floor and ceiling spaces.

The computer rooms outside the MCR in SB 2 and SB 3 contain non-safety-related computers. These computer rooms are separated from each other and other areas of the plant by three-hour fire rated barriers. The interfaces for the digital control system for each of the four safety divisions are located in the instrumentation and control cabinet rooms in their respective SBs. The instrumentation and control rooms are separated from each other by three-hour fire rated barriers. Automatic fire detection and manual fire protection by standpipe and hose and portable extinguishers are provided for each computer room and instrumentation and control cabinet rooms.

Architectural and Structural Features

Materials used in plant construction are non-combustible or heat resistant to the extent practicable in accordance with GDC 3. Walls, floors, roofs, including structural materials, suspended ceilings, thermal insulation, radiation shielding materials, soundproofing, and interior finishes are non-combustible or meet applicable qualification test acceptance criteria unless identified and suitably justified. ASTM

E84 (Reference 29), NFPA 253 (Reference 22), and NFPA 703 (Reference 25) are considered when evaluating the qualification of interior surface and finish materials. Concealed spaces are devoid of combustibles unless identified and suitably justified.

Individual fire areas are separated by passive, fire-rated structural barriers (i.e., walls, floors and ceilings). Structural fire barriers are of non-combustible construction. Structural fire barriers are designed and installed to meet specific fire resistance ratings using assemblies qualified by fire tests. The qualification fire tests are conducted in accordance with, and meet the acceptance criteria of NFPA 251 (Reference 20) or ASTM E119 (Reference 30) The guidance from RG 1.189 was considered for specifying the fire resistance ratings of fire area boundaries.

The cooling towers comply with Regulatory Guide 1.189, Regulatory Position C.6.2.6. The Essential Service Water Cooling Tower Structure is of noncombustible construction. The Circulating Water System Cooling Tower Structure is either of noncombustible construction or is located and protected in such a way that a fire will not adversely affect any systems or equipment important to safety. A COL applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.6, Cooling Towers.

Except for specialty doors and closure devices, penetrations in fire area boundaries are provided with listed fire-rated door assemblies, shutter assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire rating of the fire barrier. Fire door assemblies, fire dampers, and fire shutters used in two-hour rated fire barriers are listed for not less than a 1.5 hour rating. However, where approved full-scale fire tests demonstrate that protection of fire barrier penetrations is not necessary; protection of such openings is not required. Fire doors and dampers conform to the applicable portions of the following NFPA standards:

- NFPA 80 – Standard for Fire Doors and Fire Windows (Reference 14).
- NFPA 252 – Standard Methods of Tests of Door Assemblies (Reference 21).
- NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems (Reference 16).
- NFPA 92A – Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences (Reference 17).
- UL 555 – Standard for Fire Dampers (Reference 35).
- NFPA 101 – Life Safety Code (Reference 18).

Except for specialty doors and closure devices, cable openings, piping openings and building joints are provided with penetration seals having a fire resistance rating consistent with the designated fire rating of the fire barrier. Such penetration seals meet the requirements of ASTM E814 (Reference 31), UL 1479 (Reference 36), or IEEE Std 634 (Reference 33) and IEEE Std 1202 (Reference 34). Materials used for penetration seals are a limited-combustible or non-combustible material in accordance with NFPA 259 (Reference 23).

Openings inside conduits that penetrate fire rated barriers are sealed in a manner that maintains the fire rating of the barrier. Internal conduit seal locations are substantiated by fire testing.

Openings inside conduits that penetrate barriers required to provide environmental isolation or pressure differentials are sealed with designs substantiated by pressure testing.

Specialty doors, closure devices or sealing components that are part of a fire barrier but are not listed or fire rated will be evaluated and justified as part of the final Fire Hazards Analysis (FHA). This activity will be performed by the COL applicant as part of the final FHA (refer to Section 9.5.1.3).

Electrical System Design and Electrical Separation

Electrical system design and electrical separation is provided in accordance with the criteria specified in NUREG-0800 SRP 9.5.1 (Reference 37) and RG 1.189. As described in SRP 9.5.1 (Reference 37) and SECY-90-016 (Reference 38), the U.S.EPR design meets the enhanced fire protection criteria. Appendix A of SRP 9.5.1 (Reference 37) describes the criteria:

"Evolutionary advanced light water reactor (ALWR) designers must ensure that safe shutdown can be achieved assuming that all equipment in any one fire area will be rendered inoperable by fire and that re-entry into the fire area for repairs and operator actions is not possible. Because of its physical configuration, the control room is excluded from this approach, provided that an independent alternative shutdown capability that is physically and electrically independent of the control room is included in the design. Evolutionary ALWRs must provide fire protection for redundant shutdown systems in the reactor containment building that will ensure, to the extent practical, that one shutdown division will be free of fire damage. Additionally, the evolutionary ALWR designers must ensure that smoke, hot gases or fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator actions."

The fire protection shutdown capability demonstrates that the required number of trains of equipment necessary to achieve and maintain safe shutdown remains available in the event of a fire at any location within the plant. RG 1.189 specifies that redundant systems used to mitigate the consequences of design basis accidents but are not necessary for safe shutdown may be lost to a single exposure fire. However, protection should be provided so that a fire within only one such system will not damage the redundant system. Therefore, the following separation criteria apply only to the electrical cabling needed to support the systems that are used for safe shutdown. The other redundant Class IE and associated cables meet the separation criteria of RG 1.75. When the electrical cabling is covered by separation criteria required for both safe shutdown and accident mitigation, the more stringent separation criteria would apply.

The separation criteria given in the previous paragraphs are employed for all plant areas with the exception of the MCR, cable spreading areas, and the RB:

- The MCR is located in Division 2 of the SB. The MCR is excluded from the separation criteria because all four safety divisions of instrumentation and controls are present. Therefore, alternative shutdown capability is provided. This alternative shutdown capability is provided using the remote shutdown station (RSS) located in Division 3 of the SB, which is physically and electrically independent of the MCR.

  The MCR together with its adjacent room complex is one common fire area separated from other areas of the plant by floor, walls, and roof having minimum fire resistance ratings of three hours. Peripheral rooms are separated from the MCR including the shift office by noncombustible construction with a fire-resistance rating of one hour. All other openings/penetrations through the barriers afforded protective devices as required (fire doors, penetration seals) meet a fire rating of one hour. All cables that enter the MCR terminate in the MCR. Specifically, no cables are routed through the MCR from one area to another. Cables enter the MCR by rising up from the cable spreading areas to the MCR sub-floor area. The sub-floor area is approximately 18 inches high and constitutes part of the MCR fire area. Because of the potential difficulty in accessing the MCR sub-floor areas for manual firefighting, the sub-floor areas are protected with a manually-actuated clean agent fire extinguishing system. Cable separation in the MCR sub-floor area meets the separation requirements in RG 1.75. Refer to Section 7.1.2.4.5.

- The cables to the MCR are routed through the cable floor. The cable floor is a separate fire area from the MCR assigned to Division 2 of the SBs. Safety-related cables from each of the other three divisions (1, 3, and 4) are routed from the cable floor to the MCR sub-floor area in the MCR via separate non-combustible cable ducts having a minimum fire resistance rating of three hours. Similarly, the RSS is located in its own fire area that is separated from other areas of the plant by floor, walls, and ceiling having minimum fire resistance ratings of three hours. The RSS cable floor is its own fire area assigned to Division 3 of the SBs. Safety-related cables from each of the other three divisions (1, 2, and 4) are also routed from the RSS cable floor to the RSS via separate non-combustible cable ducts having a minimum fire resistance rating of three hours.

- Postfire safe shutdown systems in the Fuel Building (FB) are separated by three hour rated structural fire barriers.

- The RB is a combination of the annulus area and the containment. The RB annulus area is used for cable connections between the four SBs and the RB, and for additional routing of mainly non-safety-related cables as well as physical protection of cables to the connected buildings. As such, the annulus area contains cabling allocated to all four safety divisions. The cable connections between SBs 1-4 and the divisional assigned components inside the RB are routed from the cable rooms in SBs via airtight penetrations to the annulus. In the annulus, the cables are routed to the connection boxes on both sides of the containment penetrations. Fire protection for redundant divisions is provided to make sure that one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. Train separation in the annulus is provided by three hour rated fire barriers or a combination of spatial separation and defense-in-depth fire protection features such as fire barriers, fire rated cable, fire detection, fire suppression, and administrative controls to prevent storage of transient combustibles in the annulus. The containment contains all four divisions of electrical equipment and cabling. Train separation is provided by a combination of spatial separation, physical barriers, and defense-in-depth fire protection features such as fire detection and suppression systems. Fire protection for redundant divisions is provided to provide reasonable assurance that one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. To comply with the criteria of RG 1.189, separation inside the RB is based on separation as previously described or separation of cables and equipment and associated non-safety-related circuits of redundant success paths is provided by a non-combustible radiant energy shield having a minimum fire rating of 30 minutes.

- Cable trays are constructed of metal. Only metallic tubing is used for conduits. Thin-wall metallic tubing is not used. Flexible metallic tubing is only used in short lengths. Electrical raceways are constructed in accordance with the guidelines specified in SRP 9.5.1 and RG 1.189. 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 containing safety-related cables located inside containment are enclosed in non-combustible steel or steel composite materials.

Fire Safe Shutdown Capability

The U.S. EPR design provides a defense-in-depth postfire safe shutdown capability in accordance with the NRC acceptance criteria specified in NUREG-0800, SRP 9.5.1, Revision 5, including its Appendix A, and RG 1.189, Revision 1.

Implementation of Criteria

With the exception of the containment, the U.S. EPR design accommodates the requirement that all equipment and cables within a fire area are considered rendered inoperable by the assumed fire and that postfire safe shutdown will be achieved via components and systems independent of the fire area under consideration. In addition, postfire re-entry into a fire affected area for repairs or operator manual actions is not permitted.

The advantage of the U.S. EPR design is that redundant systems credited to support post-fire safe shutdown are separated such that a minimum of one success path of structures, systems, and components necessary to achieve hot standby (HSB) and cold shutdown (CSD) is free of fire damage without crediting system repair capabilities. The term “success path” utilized in the design of the U.S. EPR is equivalent to the term “one shutdown division” discussed in SECY 90-016 (Reference 38).

A fire in the MCR may result in the necessity to evacuate the area, either due to loss of equipment control or environmental considerations. In this case, the RSS will be used to achieve postfire safe shutdown.

Inside containment, a combination of separation and fire protection features to the extent practical provide assurance that the required number of shutdown system divisions will be available to support postfire safe shutdown.

The U.S. EPR design provides reasonable assurance that adequate systems and equipment are available to achieve the following objectives:

- Reactor coolant system process variables will be maintained within those predicted for a loss of normal AC power.
- The fission product boundary integrity shall not be affected (i.e., no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary).
- One success path of the system necessary to achieve and maintain HSB conditions from either the MCR or RSS is free of fire damage.

The U.S. EPR postfire safe shutdown performance goals established to make sure that compliance with these objectives are the same whether performing actions from the MCR or RSS and are specified as follows:

- Reactivity control: The reactivity control function shall be capable of achieving and maintaining CSD reactivity conditions.
- Reactor coolant makeup: The reactor coolant makeup function shall be capable of maintaining the reactor coolant level within the level indication of the pressurizer.
- Reactor heat removal: The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.
- Process monitoring: The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the previously listed functions.
- Support: The supporting functions shall be capable of providing the process cooling, lubrication, and other activities necessary to permit operation of equipment used for safe shutdown functions.

The diverse design of the U.S. EPR plant makes sure that systems and equipment are available to accomplish the previously listed performance goals.

A COL applicant that references the U.S. EPR design certification will perform an as-built, post-fire Safe Shutdown Analysis, which includes final plant cable routing, fire barrier ratings, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The post-fire Safe Shutdown Analysis will demonstrate that safe shutdown performance objectives are met prior to fuel loading and will include a post-fire safe shutdown circuit analysis based on the methodology described in NEI 00-01, “Guidance for Post-Fire Safe-Shutdown Circuit Analysis” (Reference 39).

Cold Shutdown and Allowable Repairs

RG 1.189, Revision 1 allows fire damage to redundant systems necessary to achieve CSD provided that at least one success path can be repaired or otherwise made operable within 72 hours using onsite capability, or within the time period required to achieve CSD conditions, if less than 72 hours. Although repairs to equipment necessary to achieve and maintain CSD may be permitted per the RG, the U.S. EPR design provides the capability to achieve cold shutdown conditions within 72 hours without the need for repairs to facilitate the use of one success path. This is the case whether CSD is achieved from the MCR or RSS. In addition, when shutdown is accomplished from either operating location, systems and equipment necessary to achieve CSD have the capability of being powered from onsite sources.

Spurious Operation of Components

The U.S. EPR plant digital control system design makes extensive use of fiber optic cable. The inherent design features of the digital control system and its associated fiber optic wiring eliminate fire-induced spurious actuations as a concern for the U.S. EPR plant. In support of this position, the Standard Review Plan (Reference 37), Section 9.5.1, Appendix A, Subsection 6.2, Item f, recognizes that on a macroscopic level the use of fiber optic cable reduces the overall likelihood of hot shorts and spurious actuations. Therefore, fire-induced failures of fiber optic wiring leading to spurious component actuations are not considered credible for the U.S. EPR Plant.

For those components where spurious actuation may be a concern, the U.S. EPR design provides reasonable assurance that one shutdown success path remains free of fire damage for a single fire in any single fire area by utilizing a deterministic analytical approach. In accordance with RG 1.189, components whose fire-induced spurious actuation could adversely impact safe shutdown are addressed and appropriate protection provided. The methodology employed in determining the potential type and number of spurious actuations to consider in any given fire area is that identified in NEI 00-01, Revision 1 (Reference 39). The NRC has endorsed NEI

00-01 via Regulatory Issue Summary 2005-30 as providing an acceptable deterministic analytical methodology to address spurious actuations. Consequently, these documents provide the basis and assumptions considered for spurious actuations for the U.S. EPR design.

Operator Manual Actions

For the U.S. EPR Plant, an operator manual action is defined as an action that takes place outside of the MCR in support of achieving and maintaining HSB from within the MCR. Operator manual actions associated with the credited shutdown success path are not required to achieve and maintain HSB.

Associated Circuits of Concern

Associated circuits of concern are those circuits containing cables that do not meet separation requirements and:

- Share a common power source with shutdown equipment that is not electrically protected from the circuit of concern by coordinated breakers, fuses or similar devices.
- Are directly connected to circuits of equipment that would adversely affect the shutdown capability if spuriously operated.
- Share a common enclosure with the shutdown cables that (1) is not electrically protected by circuit breakers, fuses or similar devices; or (2) will allow propagation of fire into the common enclosure.

The U.S. EPR plant provides circuit coordination for non-safe shutdown loads on shared buses and load centers. Cable installed in the plant complies with IEEE Std 1202, or equivalent, to preclude the potential for fire propagation. Non-shutdown cables that share a common enclosure with shutdown cables are electrically protected to provide reasonable assurance that faults are interrupted prior to cable damage. By virtue of this provision, the U.S. EPR plant design provides reasonable assurance that secondary fires do not occur as a result of fire-induced faults.

Shutdown/Low Power Operations

Per RG 1.189, Revision 1, Section 5.6, shutdown operations are defined as refueling or maintenance outages. The U.S. EPR design provides reasonable assurance that fuel integrity is protected by permanent plant systems during refueling operations or maintenance outages. The primary fuel cooling systems are spent fuel cooling and the residual heat removal system. One or both systems are used depending on the location of fuel.

For the U.S. EPR, low power operations is considered to be startup. For the purposes of analysis, startup operation is considered the same as power operation. Therefore, the analysis for postfire shutdown is the same for both modes of operation.

Communications

For the purposes of fire fighting and operational post-fire safe shutdown activities, the U.S. EPR plant relies on the portable wireless communication system described in Section 9.5.2.2.1 The system is multi-channeled and is capable of interfacing with the public address and digital telephone systems. Use of the portable wireless communication system does not interfere with the communications capabilities of the plant security force. Fixed components of the portable wireless communication system are protected as necessary from fire damage to provide effective communication capability in all vital plant areas. It is not anticipated, with the use of low power portable radios, that the exclusion zones will be wide enough to compromise effective communications within any vital area. In the event that specific exclusion zones are identified, an alternative means of communications via one of the fixed communication systems is provided. The type and location of the required communication system devices for use in the exclusion zones is determined on an as-needed basis so that these are free of fire effects for any fire area that requires communication. The intent of RG 1.189, Regulatory Position 4.1.7(b) guidance will be met in all vital areas. Section 9.5.2.2.1 addresses capabilities of the portable wireless communication system and potential EMI/RFI effects.

RG 1.189, Regulatory Position 4.1.7 considers the portable radio communication system to be separate from the fixed emergency communication systems. The public address communication system fulfills the requirement for a fixed emergency communication system per Regulatory Position 4.1.7.a. This regulatory position does not require a fixed emergency communication system to be dedicated to fire protection. The fixed emergency communication system only needs to be independent of the normal plant communication system. Sections 9.5.2.1 and 9.5.2.2 address the public address communication system design and capabilities. The public address communication system is installed at preselected locations and is independent of the normal fixed digital communication system. As independent, separate, and not dedicated to fire protection, the public address communication system does not need to meet the electrical separation requirements in RG 1.189, Regulatory Position 5.3, with regard to other communication systems.

Emergency Lighting

Section 9.5.3 contains design information for the U.S. EPR lighting system.

Portable hand-held, eight-hour rated lights are provided for use by the fire brigade in accordance with RG 1.189, Rev. 1, Section 4.1.6.2b. The egress route from the MCR to the RSS is illuminated by independent fixed, self-contained eight-hour rated battery powered lighting units. Other post-fire safe shutdown activities performed by operators outside the MCR and RSS are supported by independent fixed, self-contained eight-hour rated battery lighting units at the task locations and in access and egress routes.

An alternative approach to fixed, self-contained eight-hour rated battery powered lighting units is taken for illuminating the MCR and RSS in support of post-fire safe shutdown. Both locations are illuminated by the special emergency lighting system. The special emergency lighting system receives power from redundant emergency diesel generator backed uninterruptible power supplies, thus providing continuous illumination. In the event a fire outside the MCR or RSS adversely affects special emergency lighting equipment, cables, or power supplies, adequate special emergency lighting is available in the MCR or RSS, as necessary, to facilitate post-fire safe shutdown of the plant.

Ventilation System Design Considerations

The design of the heating, ventilation and air conditioning (HVAC) systems are in accordance with SRP 9.5.1 (Reference 37) and RG 1.189. Safety-related HVAC systems are also designed in accordance with NFPA 90A (Reference 16). The HVAC design provides reasonable assurance that smoke, hot gases, or fire suppression agents (e.g., gaseous suppression agents) will not migrate into other fire areas and adversely affect safe shutdown capabilities, including operator actions.

The HVAC systems ventilate, exhaust, or isolate fire areas under fire conditions so that products of combustion do not spread to other fire areas. Ducts penetrating through fire area boundaries are provided with automatic fire dampers that have a fire rating equivalent to the rating of the barrier, or the ducts have a fire rating equivalent to the rating of the barrier and have no openings. Dampers are designed and tested to provide reasonable assurance of their operability under airflow conditions. Where practical, ventilation power and control cables for mechanical ventilation systems are located outside of the fire area served by the systems. Fresh air supply intakes to areas containing equipment or systems important to safety are located remote from the exhaust outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with products of combustion.

The release of smoke and gases, containing radioactive materials, to the environment is monitored in accordance with RG 1.101. Where possible, isolation is provided where the release of smoke and gases could contain radioactive materials in a fire condition. However, where venting is required, filtration equipment used to reduce doses is designed or protected to withstand the smoke and heat resulting from the fire. Ventilation systems designed to exhaust potentially radioactive smoke or gases have been evaluated to make sure that inadvertent operation or single failures do not violate the radiologically controlled areas.

Plant operations staff is protected from the effects of fire and fire suppression (e.g., gaseous suppression agents) to provide reasonable assurance of safe shutdown of the plant including operator manual actions. The arrangement of the MCR, egress pathways and the RSS provides habitability in these areas. During normal operation and for a radiological event, the MCR is maintained at positive pressure with respect to adjacent areas. Upon receipt of a smoke detection alarm (detector located in the outside air inlet), the outside air inlet isolation damper located at the detector is placed in the closed position so that any fires in these outside and adjacent areas will not affect the habitability of the MCR. Upon receipt of a smoke detection alarm (detector located at the discharge of one of the CRACS recirculation cooling units), the respective CRACS recirculation cooling unit is shut down from the MCR and the fire dampers automatically close (fuse link) to provide isolation. Smoke and heat removal throughout the facility is provided by portable systems or by manual operation of the non-safety-related HVAC systems.

A smoke confinement system (SCS) Nuclear Island (NI) is provided to maintain habitability of the select egress paths between the MCR and RSS. See Section 9.4.13 for a detail description and operation of the SCS. The design of the smoke confinement systems complies with NFPA 92A (Reference 17) and NFPA 204 (Reference 19). Egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire.

The smoke confinement system is normally in a standby mode and is automatically actuated by the fire alarm system or manually actuated as required. The smoke confinement system consists of the SBs 2 and 3 interconnecting passageway supply and exhaust air subsystem, which provides outside air to pressurize the SBs 2 and 3 interconnecting passageway and the safeguard escape ladder shaft. The primary purpose of this system is to prevent in-leakage of smoke from adjacent areas.

Portable smoke exhaust fan systems (i.e., smoke ejectors) are also available for the controlled removal of heat, smoke, and other products of combustion from these and other areas of the plant.

Control of Smoke, Hot Gases, and Fire Suppressant

RG 1.189, Section 8.2 stipulates that new reactor designs should ensure that smoke, hot gases or fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe-shutdown capabilities, including operator actions. To confirm that these objectives are satisfied for the U.S. EPR, a smoke effects analysis is performed. The analysis considers the location of redundant safe shutdown (SSD) equipment and components, the proximity of fire area boundaries, ventilation system operation, potential effluent types and quantities resulting from a fire, potential effluent migration paths, and the sensitivity of redundant SSD equipment and components to potential effluents.

For most areas of the plant, standard fire barriers and associated components (e.g., fire doors, fire dampers and penetration seals) provide the primary means to prevent migration of smoke, hot gas and fire suppressant between fire areas. Fire doors and fire dampers are in accordance with NPFA 80 (Reference 14). Penetration seals in fire barriers are qualified for an F-rating equivalent to the hourly fire rating of the associated barrier. Penetration seal F-ratings will be determined by testing in accordance with the requirements of ASTM E814 (Reference 31), UL 1479 (Reference 36) or IEEE Std. 634 (Reference 33).

Where more robust fire barriers are deemed necessary to achieve these objectives, enhanced fire barrier features are used, as necessary, to control smoke, hot gas and fire suppressant migration. Enhanced fire barrier features may include smoke doors and smoke dampers to limit smoke propagation. Smoke doors are in accordance with NFPA 105 (Reference 43). Ventilation penetrations in enhanced fire barriers are protected by combination fire and smoke rated dampers, or by fire rated dampers and separate smoke control dampers. Smoke dampers and combination fire/smoke dampers are in accordance with NFPA 80 (Reference 14). Smoke dampers and combination fire/smoke dampers in enhanced fire barriers that are relied upon to control effluent migration will either close on smoke detection or will be closed via operator actions from the Control Room in response to an alarm from the fire detection system.

In the event of a Control Room evacuation, passage from the Control Room to the Remote Shutdown Panel is via the safeguard escape ladder shaft and the interconnecting passageway, which are protected by the smoke confinement system (SCS). The SCS egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire.

Fire Detection and Alarm System

The plant fire detection and alarm system meets the guidance provided by SRP 9.5.1 of Reference 37, RG 1.189, NFPA 72 (Reference 13), and NFPA 70 (Reference 12).

The plant fire alarm system provides monitoring of all fire alarm detection devices and circuits, suppression system supervision and releasing when applicable, and plant specific area personnel notification. The plant fire alarm system annunciates a fire alarm, suppression and water supply system supervisory alarms, and overall fire alarm system trouble conditions at the main fire alarm panel located in the MCR.

The plant fire alarm system is provided with both an electrically supervised primary and secondary power source that transfers automatically to the secondary source upon the loss of the primary source. The loss of either power source annunciates a trouble condition to the main alarm panel in the MCR.

Fire detectors respond to smoke, flame, heat, or the products of combustion. Fire detectors are installed in accordance with NFPA 72 (Reference 13) and the manufacturer recommendations. Specification of the most appropriate type of fire detector is determined as part of the fire protection analysis based on consideration of the type of hazard, type of combustion products, detector response characteristics, and noted others (see Appendix 9A).

Fire Water Supply System

The site fire protection water supply system meets the guidance provided by SRP 9.5.1 (Reference 37), RG 1.189, and applicable NFPA standards. Two separate 100 percent dedicated capacity freshwater storage tanks, meeting the applicable portions of NFPA 22 (Reference 6), are provided. The tanks are interconnected so that the fire pumps can take suction from one or both, and a failure in one tank or its piping will not cause both tanks to drain. The capacity of each tank is based on the largest hydraulic flowrate for a period of two hours, but not less than 300,000 gallons. In the event that the portion of one tank dedicated to fire protection use is depleted, means are provided to refill either tank within eight hours. Automated tank level indication is provided for both tanks to make sure that the capacity dedicated to fire protection use is available.

A COL applicant that references the U.S. EPR design certification will describe the program used to monitor and maintain an acceptable level of quality in the fire protection system freshwater storage tanks.

The portion of each tank dedicated to fire protection use is based on a 500 gpm outside hose stream allowance plus the largest hydraulic demand of any individual sprinkler system or fixed water spray (or deluge system) in accordance with NFPA 13 (Reference 2) or NFPA 15 (Reference 4).

Failure or rupture of one or both water storage tanks (when the FPS is in standby) will not significantly impair the safety capability of SSC important to safety.

The site fire pump arrangement meets the applicable portions of NFPA 20 (Reference 5). Three 100 percent capacity fire pumps (i.e., one electric motor-driven and two diesel engine-driven) are provided. The capacity of each fire pump is adequate to supply a 500 gpm outside hose stream allowance and the largest flowrate required by any individual sprinkler or fixed water spray (or deluge system), with the hydraulically least demanding portion of the underground fire main yard loop assumed to be out of service. Individual fire pump connections to the underground fire main yard loop are provided, with sectionalizing valves between connections. An electric motor-driven jockey pump is provided to automatically maintain fire protection water supply system pressure independent of the fire pumps.

Alarm indication provided in the MCR includes, but is not limited to, these functions:

- Fire protection water storage tank low level.
- Fire pump running.
- Fire pump driver availability.
- Fire pump failure to start.
- Fire protection water supply system low pressure.

Each fire pump and its associated driver and controls are separated from each other and the plant by three hour fire-rated barriers. A separate fuel line and fuel oil storage tank is provided for each diesel engine-driven fire pump. Means other than sight tubes are provided for continuous indication of the amount of fuel oil in each storage tank. The floor around each fire pump and its associated driver and controls is pitched and adequate means for drainage are provided.

An underground fire main yard loop designed in accordance with NFPA 24 (Reference 7) is provided to furnish anticipated water requirements.

Control and sectionalizing valves are provided to isolate portions of the fire main yard loop for maintenance or repair without simultaneously shutting off the water supply to both fixed fire suppression systems, and standpipe and hose systems are provided for manual backup. Fixed fire suppression systems and standpipe and hose systems are connected to the main yard loop so that a single active failure or a pipe crack or break will not impair both primary and backup fire suppression capability.

Failure or rupture of any portion of the underground fire main yard loop will not significantly impair the safety capability of SSC important to safety.

Outside fire hydrants are provided approximately every 250 feet on the main yard loop. Additional hydrants are located near the entrances to the Essential Service Water Pump Building (ESWPB) and the Circulating Water Pump Building (CWPB). Valves are provided to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the plant fire protection water supply capability. Hose houses equipped with fire hose and combination nozzle and other equipment specified by Reference 7 are provided at intervals not exceeding 1000 feet, or alternatively, mobile means are provided which contain fire hose and the associated equipment specified by NFPA 24 (Reference 7). Threads compatible with those used by local fire departments are used on fire hydrants hose couplings and standpipe system risers.

The FPS piping headers, fed from each end, are provided inside plant buildings or groups of buildings to supply both fixed fire suppression systems and standpipe and hose systems. As such, the supply headers are considered as an extension of the fire main yard loop.

The fire protection water supply system utilizes a three-ring header design as shown in Figure 9.5.1-1—Fire Water Distribution System.

Failure or rupture of any portion of building supply headers will not significantly impair the safety capability of SSC important to safety.

See information on seismically qualified standpipe and hose systems in the "Manual Fire Suppression Systems" portion within this section for additional requirements on the fire water supply system.

Automatic Fire Suppression Systems

Where automatic fire suppression systems are provided, they are designed and installed in accordance with the guidance provided by SRP 9.5.1 (Reference 37), RG 1.189, and applicable NFPA standards.

Failure, rupture, or inadvertent actuation of fire suppression systems will not significantly impair the safety capability of SSC important to safety.

Automatic sprinkler systems designed and installed in accordance with NFPA 13 (Reference 2) are provided for the following hazards:

- EPGB:
  - Diesel Engine Hall.

Fixed deluge water spray systems designed and installed in accordance with NFPA 15 (Reference 4) are provided for the following hazards:

- 1-2EPGB and 3-4EPGB:
  - EDG main fuel oil tanks (automatic actuation).
- RB:
  - Reactor coolant pumps (RCP) (manual actuation from the MCR).

Clean agent fire extinguishing systems designed and installed in accordance with NFPA 2001 (Reference 28) are provided for these:

- Safeguard buildings electrical (2-3 SB).
  - MCR sub-floor area.

Because the MCR is occupied at all times while the plant is operating, and the sub-floor area having a relatively small volume so that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel, the design of the clean agent fire extinguishing system installed in the MCR sub-floor area is of manual-only actuation. While NFPA 2001 (Reference 28) requires clean agent fire extinguishing systems to be automatically actuated via a signal from the fire detection system, the standard does allow such systems to be of manual-only actuation if acceptable to the authority having jurisdiction.

The boundary of the MCR cable sub-floor area is adequately sealed to prevent a loss of clean agent, or the clean agent quantity is designed to compensate for loss of agent. The operational requirements of the ventilation system, including agent distribution, maintenance of agent concentration during the soak time, and overpressure protection are integrated into the clean agent system design. The toxicity of the clean agent, including potential corrosive characteristics or effects of thermal decomposition products was considered. Measures are provided to verify the agent quantity of the storage cylinders and containers.

The clean agent fire extinguishing system is designed in accordance with NFPA 2001 and will deliver the design concentration within 10 seconds and hold the design concentration for at least 15 minutes, which is the time required for effective emergency action by trained personnel.

Manual Fire Suppression Systems

Manual firefighting capability is provided throughout the plant to limit the extent of fire damage. Standpipe systems, hydrants and portable equipment consisting of hoses, nozzles, and extinguishers are provided for use by fire brigade personnel. Manual fire suppression systems and equipment are designed and installed in accordance with the guidance from SRP 9.5.1 (Reference 37), RG 1.189, and applicable NFPA standards.

Interior manual hose installations are provided so that each plant location that contains, or could present a fire exposure hazard to, equipment important to safety can be reached with at least one effective hose stream. For all plant power block buildings on all floors, Class III standpipe systems, designed and installed in accordance with NFPA 14 (Reference 3) are provided with hose connections equipped with a maximum of 100 feet of 1.5 inch diameter woven-jacket, lined fire hose, and suitable nozzles. Hose stations are located to facilitate access and use for firefighting operations. Alternative hose stations are provided if a fire hazard could block access to a single hose station serving a plant area.

Supply water distribution capability is provided for reasonable assurance of an adequate water flowrate and nozzle pressure for all hose stations. Hose station pressure reducers are provided where necessary for the safety of plant fire brigade members and offsite fire department personnel.

Automatic standpipe systems are provided throughout except in the Reactor Building and including the Reactor Annulus. Automatic standpipe systems are attached to a water supply capable of supplying the system demand at all times and requiring no action other than opening a hose valve to provide water at hose connections. The Reactor Building, including the Reactor Annulus, have semiautomatic standpipe systems that are attached to a water supply capable of supplying the system demand at all times, but requiring activation of motor-operated control valves to provide full water supply to hose connections. In the inner Reactor Containment Building the inboard and outboard containment isolation, motor-operated control valves are normally kept closed and are only opened during a fire emergency requiring the use of the standpipe system in the Reactor Containment Building. In the Reactor Annulus there are two supply connections to the annulus standpipe system with a motor-operated control valve in each connection. These are normally kept closed and only opened during a fire emergency requiring the use of the standpipe system in the Reactor Annulus. In addition, each of the control valves for the Reactor Annulus standpipe system has a 1 inch by-pass line which will keep the standpipe filled and pressurized.

The proper type of hose nozzle provided for each hose station is based on the fire hazards in the area. Combination spray or straight-stream nozzles are not used in plant areas where a straight stream could cause unacceptable damage or present an electrical hazard to firefighting personnel. UL listed electrically safe fixed fog nozzles are provided in areas where high-voltage shock hazards exist. All nozzles have full shutoff capability.

Fire hose meets the applicable criteria of NFPA 1961 (Reference 26) and is hydrostatically tested in accordance with the applicable guidance of NFPA 1962 (Reference 27).

Standpipe and hose systems in areas containing equipment required for safe plant shutdown following an SSE are designed to be functional following an SSE and capable of providing flow to at least two hose stations (approximately 75 gpm per hose stream). The standpipe and hose stations in these areas, the water supply and distribution piping, and the supports and valves, as a minimum, satisfy ASME B31.1 (Reference 32). This is accomplished by manually realigning valves to isolate non-seismically qualified portions of the FPS from the seismic portions of the system and manually starting the diesel fire pumps.

To comply with this requirement, portions of the fire protection water supply and water distribution system are designed to satisfy, as a minimum, the following requirements:

- Seismic design of the fire water storage tanks is in accordance with AWWA D100-2005 (Reference 45), referenced by NFPA 22 (Reference 6), "Standard for Water Tanks for Private Fire Protection," (refer to RG 1.189).

- The fire pump house (Part of USG) is designed in accordance with ASCE 43-05 (Reference 44), with the seismic demand on the structure calculated for the site SSE.

- The two diesel fire pump drivers and fuel tanks, including their attachments and supports, are designed for seismic loads in accordance with ASCE 43-05. The limiting acceptable deformation, displacement or stress for the equipment support structures is characterized by Limit State C of the standard. Seismic demand on the SSC being evaluated is based on the SSE for the site. The diesel pumps are design to be started manually following an SSE utilizing the pump batteries. Isolation valves which isolate the diesel fire pumps from the motor driven fire pump are designed to remain functional so that the cross connections to the motor driven pump can be manually closed after an SSE.

- Seismic design of the battery racks and anchors is in accordance with ASCE 43-05. The limiting acceptable deformation, displacement or stress for the battery support structures, including the anchorage, is characterized by Limit State C of the standard. Seismic demand on the SSC being evaluated is based on the SSE for the site.

- The portion of the underground fire main which supplies fire protection water to the seismically qualified standpipe and hose system is designed to remain functional following an SSE. Isolation valves between seismically qualified portions of the underground fire main and non-seismically qualified portions must remain functional following an SSE so that they can be manually closed.

- The portion of the inside fire water distribution system which supplies fire protection water to the seismically qualified standpipe and hose system is designed to remain functional following an SSE. Isolation valves between seismically qualified portions of the inside fire water distribution system and non-seismically qualified portions must remain functional following an SSE so that they can be manually closed.

Failure or rupture of standpipe and hose systems will not significantly impair the safety capability of SSC important to safety.

Portable fire extinguishers are provided in all plant areas that contain or could present a fire exposure to equipment important to safety. The number, size, and type of fire extinguishers are provided in accordance with NFPA 10 (Reference 1). In instances where radiological considerations may affect firefighting operations, portable fire extinguishers are pre-staged outside of the immediate area. Extinguishers are installed with due consideration given to possible adverse effects on equipment important to safety in the area.

Failure or rupture of portable fire extinguishers will not significantly impair the safety capability of SSC important to safety.

9.5.1.2.2 Alternative Compliance With Regulatory Guide 1.189

The following provides a summary of those compliance issues where “Alternate Compliance” is indicated in Table 9.5.1-1.

Fire Areas

Generally, fire areas comply with RG 1.189, Regulatory Position 4.1.2.1. Alternative compliance is provided for certain specialty doors and certain penetration seals.

Openings inside conduits that penetrate fire rated barriers are sealed in a manner that maintains the fire rating of the barrier. Internal conduit seal locations are substantiated by fire testing. Specialty doors, closure devices or sealing components that are part of a fire barrier but are not listed or fire rated will be evaluated and justified as part of the final FHA. This activity will be performed by the COL applicant as part of the final FHA (refer to Section 9.5.1.3).

Control Room Complex

Generally, the control room complex complies with RG 1.189, Regulatory Positions 6.1.2 and 6.1.2.1. Alternative compliance is provided because of:

1. The lack of automatic water suppression for the peripheral rooms in the control room complex and,
2. The gaseous fire suppression system being manually actuated via a local hand switch actuation by MCR operators, in lieu of automatic activation of the fire detection system for the sub-floor in the MCR. This is to preclude concerns regarding inadvertent activation of this fire extinguishing system.

The lack of automatic water suppression systems for the peripheral rooms in the control room complex is acceptable due to the control room complex being constantly manned and area wide automatic smoke detection being provided throughout, including within cabinets and consoles. Manual fire suppression is provided by standpipe and hose and portable extinguishers. Combustible materials and ignition sources are controlled and limited in the MCR complex by administrative procedures to those required for operation.

Having the suppression system for the MCR sub-floor being manually actuated instead of automatically actuated is acceptable based on the MCR being manned at all times the plant is operating, and the relatively small volume of the sub-floor area, which provides reasonable assurance that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel.

Electrical Cable System Fire Detection and Suppression

Generally, electrical cable systems comply with RG 1.189, Regulatory Position 4.1.3.3. Alternative compliance is provided due to the lack of a fixed fire suppression system.

The U.S. EPR is a four divisional design. Generally, the cable systems for each of the four divisions outside the MCR, RSS and RB are in divisional buildings (i.e., Safeguards and Emergency Diesel Generator Buildings and Essential Service Water Cooling Tower Structures). The buildings are separated from each other and other areas of the plant either by three-hour fire-rated barriers or the buildings are separated by sufficient distance to maintain adequate separation between divisions. Where a cable system for a safety division is located in a redundant divisional building such as the Division 2 main steam isolation valve cable systems in SB 1, or for redundant divisional cable systems in the FB, the redundant cable systems divisions are separated by three-hour fire-rated barriers. The RB annulus contains four safety divisions. Divisional separation is provided by three-hour fire-rated barriers or a combination of spatial separation and defense-in-depth fire protection features, such as fire barriers, fire-rated cable, fire detection, fire suppression and administrative controls to provide at least one success path of SSCs necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. Fire detection is provided in areas containing cables important to safety. Cable trays are accessible for manual fire fighting and manual fire protection is provided by hand hose and portable extinguisher capability.

Separation of each safety division from redundant divisions and the four safety divisions make it so that the loss of any one division does not impact safe shutdown capability. At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operations, etc., in progress. The unit is assumed to be operating at full power under normal conditions and normal lineups. This is consistent with NEI 00-01, “Guidance for Post Fire Safe Shutdown Circuit Analysis” (Ref. 39). There is a high probability that even with a loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.

The U.S. EPR design utilizes electrical cable construction that has met the acceptance criteria of the IEEE 1202 (Reference 34) test standard (or an equivalent standard) for prevention of flame propagation. IEEE 1202 is a vertical flame propagation test protocol. It is widely recognized that a vertical cable orientation represents a more severe fire test exposure than a horizontal cable orientation. Moreover, the NRC RES Fire Research Branch has stated, “The FT-4 / Vertical Flame Test, included in standard(s) IEEE 1202-1991…is the most rigorous of the 20kW (70000 BTU/hr) tests…What makes this test the most difficult to pass of the 20kW (70000 BTU/hr) tests is its low acceptable damage length of 4.9 ft (1.5m).” Therefore, the ability of cables qualified to the IEEE 1202 test standard (or an equivalent standard) to prevent fire propagation of fire along the length of cables routed in trays located within a given fire area or zone.

Cable Design

Cable design generally complies with RG 1.189, Regulatory Position 4.1.3.1. Alternative compliance is provided for instances where special purpose cabling may not be qualified to IEEE 1202.

The U.S. EPR design generally utilizes electrical cable construction that meets the acceptance criteria of IEEE 1202. Instances where special purpose cabling does not comply with IEEE 1202 will be evaluated and justified as part of the final fire hazards analysis (FHA).

Electrical Cabinets

Generally, fire areas comply with RG 1.189, Regulatory Position 4.1.3.6. Alternative compliance is provided due to the lack of a fixed fire suppression system in rooms containing electrical cabinets important to safety and the lack of detection inside cabinets except in the MCR.

The U.S. EPR is a four divisional design. Generally, electrical cabinets for each of the four divisions outside the MCR, RSS and RB are in divisional buildings (i.e., Safeguards and Emergency Diesel Generator Buildings and Essential Service Water Cooling Tower Structures). The buildings are separated from each other and other areas of the plant either by three-hour fire-rated barriers or the buildings are separated by sufficient distance to maintain adequate separation between divisions. Where electrical cabinets for a safety division are located in a redundant divisional building, such as the division 2 MSIV cabinets in the SB 1 or for redundant divisional electrical cabinets in the FB, the electrical cabinets are separated by three-hour fire-rated barriers. Area smoke detection is provided where safety-related electrical cabinets are located and manual fire protection is provided by hand hose and portable extinguisher capability.

Separation of each safety division from redundant cabinets and the four safety divisions make it so that the loss of any one safety division does not impact safe shutdown capability. At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operations, etc., in progress. The unit is assumed to be operating at full power under normal conditions and normal lineups. This is consistent with NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis" (Ref. 39). There is a high probability that even with a loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.

Fire Stops for Cable Routing

The U.S. EPR design does not comply with RG 1.189, Regulatory Position 4.2.3.3, Fire Stops for Cable Routing. Alternative compliance is provided based on the following justification.

The U.S. EPR utilizes cables throughout the plant that have passed the flame propagation criteria of IEEE Std 1202. Self-ignition of these electrical cables is not considered credible because of the protective devices (e.g., fuses, circuit breakers) provided and analyzed to be properly sized. While these cables are still considered combustible, they will not propagate fire unless subjected to an external fire involving other combustibles in the vicinity of the cable trays. In this case, the fire stops would be of little, if any value, in stopping the spread of fire. Fire stops would not stop the spread of fire in the area of influence of the exposure fire (i.e., area of the fire where temperatures are high enough to propagate fire along the cable trays) because they are only designed to prevent fire spread in the cable trays. Also, the IEEE Std 1202 qualified cables outside of the area of influence of the exposure fire would keep the fire from propagating and essentially serve the same purpose as the fire stops.

Containment Fire Suppression

The U.S. EPR design generally complies with RG 1.189, Regulatory Position 6.1.1.2. Alternative compliance is provided for the reactor coolant pump (RCP) spray deluge systems that are manually actuated.

The spray deluge systems that are manually actuated are acceptable due to detection located in the same area as the RCP spray deluge systems being able to alert the main control room (MCR) of a fire at the RCPs so that the spray systems can be actuated without undue delay. Also, having the systems in an automatic mode presents an unacceptable potential source of flooding in containment.

Cable Spreading Room

Generally, the cable floor where all four safety divisions are routed to the MCR and the RSS complies with RG 1.189, Regulatory Position 6.1.3. Alternative compliance is provided due to the lack of a fixed fire suppression system for the cable floor rooms.

The U.S. EPR does not have cable spreading rooms. Cables to the MCR are routed through the cable floor. The cable floor is a separate fire area from the MCR assigned to Division 2 of the SBs. Safety-related cables from each of the other three Divisions (1, 3, and 4) are routed from the cable floor to the MCR sub-floor area in the MCR via separate non-combustible cable ducts having a minimum fire resistance rating of three hours. Similarly, the RSS is located in its own fire area that is separated from other areas of the plant by floor, walls and ceiling having minimum fire resistance ratings of three hours. The RSS cable floor is its own fire area assigned to Division 3 of the SBs.

Safety-related cables from each of the other three Divisions (1, 2, and 4) are also routed from the RSS cable floor to the RSS via separate non-combustible cable ducts having a minimum fire resistance rating of three hours.

Area-wide smoke detection is provided for the cable floor rooms and manual suppression is provided in the form of standpipe and hose and portable fire extinguishers. Combustibles are limited and the quantity of such is much less than anticipated in a cable spreading room because the majority of cables in this area are contained in noncombustible 3 hour fire-rated ducts.

Switchgear Rooms

Generally the plant switchgear rooms comply with RG 1.189 Regulatory Position 6.1.5. Alternative compliance is provided due to the lack of a fixed fire suppression system for these rooms.

The U.S. EPR is a four division design. Each of the four divisional switchgear rooms is located in separate divisional Safeguard Buildings. Switchgear rooms are separated from other areas of the plant and Safeguard Buildings are separated from each other by three hour-rated fire barriers. Area-wide smoke detection is provided throughout the switchgear rooms and manual hose stations and portable extinguishers are provided throughout the facility.

Having each divisional switchgear room in a fully separate building from redundant switchgear divisions, and the fact that there are four safety divisions, provides reasonable assurance that the loss of any one switchgear room does not to impact safe shutdown capability. There is a high probability that even with loss of one division from fire, an extra division beyond the minimum required for safe shutdown would be available.

9.5.1.3 Safety Evaluation – Fire Protection Analysis

The overall FPP allows the plant to maintain the ability to perform safe shutdown functions and minimize radioactive releases to the environment in the event of a fire. A major element of this program is the evaluation of potential fire hazards throughout the plant and the effect of postulated fires on safety-related plant areas. See Appendix 9A for the fire protection analysis.

The fire protection analysis evaluates the fire hazards for each area of the plant. Areas are evaluated with consideration of:

- The fuel loading, considering both in-situ and transient combustibles.
- The potential ignition sources and the expected fire severity levels.
- The consequences of postulated fires.

- The fire protection defense-in-depth features provided and the adequacy of these features to protect SSC important to safety.
- The means to ventilate exhaust or isolate each fire area and their adequacy.
- The effect on SSC important to safety due to normal or inadvertent operation of fire suppression systems, the loss of capability to ventilate, exhaust, or isolate due to a fire and flooding associated with automatic and manual fire suppression activities, including inadvertent operation or fire suppression system failure.
- The emergency lighting and plant communication systems and the adequacy of these systems to support fire suppression and safe shutdown activities.

The fire protection analysis includes a set of fire area drawings and a summary of the analysis methodology for each fire area.

A COL applicant that references the U.S. EPR design certification will evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will be performed prior to fuel loading and will consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The applicant will describe how this as-built evaluation will be performed and documented, and how the NRC will be made aware of deviations from the FSAR, if any.

A COL applicant that references the U.S. EPR design certification will perform a supplemental Fire Protection Analysis for site-specific areas of the plant not analyzed by the FSAR.

9.5.1.4 Inspection and Testing Requirements

The FPP addresses the inspection, testing, and maintenance of FPS and features. Disabled or impaired FPS and features are controlled by a permit system. Procedures and practices also establish appropriate compensatory actions for FPS or features out-of-service or impaired.

Test plans are established that provide routine functional testing of FPS and components. NFPA 25 (Reference 8) is considered in the development of the maintenance procedures. Fire barriers and installed assemblies and penetrations are periodically inspected and active components such as fire dampers and doors are functionally tested.

The FPP provides reasonable assurance that qualified personnel perform inspection, testing and maintenance of FPS.

9.5.1.5 Fire Probabilistic Risk Assessment

In accordance with 10 CFR 52.47(a)(v), as part of the design certification process, a fire probabilistic risk assessment (PRA), specific to the U.S. EPR design is performed (refer to Section 19.1.2.3.4 and Section 19.1.5.3). The fire PRA is performed using state-of-the-art methods, tools, and data. Guidance from NUREG/CR-6850 (Reference 40) is used, as judged applicable to the bounding assessment.

9.5.1.6 Fire Protection Program

The FPP consists of the fire protection organization, administrative policies, fire prevention controls, applicable administrative, operations, maintenance and emergency procedures, QA, access to fire areas for fire fighting and fire brigade, and emergency response capability.

The primary objective of the FPP is to minimize the probability and consequences of postulated fires. The program requires passive and active fire protection features to provide certainty that the SSC necessary to achieve and maintain safe plant shutdown, with or without offsite power, remains available.

Additionally, an FPP objective is to minimize the potential for fire events to impact safety functions such as reactivity control, decay heat removal, and spent fuel pool cooling or result in the release of radioactive materials during non-power modes. Implementation of the site-specific FPP described in part herein will be in accordance with RG 1.189, Regulatory Position 1 and is the responsibility of the COL applicant (refer to Section 13.4).

9.5.1.6.1 Fire Prevention

Plant Design and Modification Practices

Plant design and modification procedures include fire protection considerations that are in accordance with RG 1.189, Regulatory Position 2.1.2. The procedures contain provisions that evaluate the impacts of modifications on installed FPS and features, safe shutdown capability, potential for fire induced release of radioactive materials, and the potential to increase or modify (i.e., in a potentially adverse manner) the plant fire hazards. Procedures and practices related to the physical modification of the plant contain provisions that provide reasonable assurance that the modification process will not have adverse affects on the fire protection of the plant SSC important to safety and during the implementation of the modification, an adequate fire protection impairment program is in place.

Combustible Control Practices

Administrative procedures strictly control the use of flammable, combustible and hazardous materials in plant areas important to safety. Bulk storage of combustible and hazardous materials is not permitted inside or adjacent to buildings or systems important to safety. Use and control of transient combustible and hazardous materials (e.g., combustible liquids, wood and plastic products, dry ion exchange resins, hazardous chemicals) are governed by administrative control measures.

Combustible materials in the RSS and MCR are controlled and limited by administrative procedures to those required for operation.

Plant administrative procedures clearly define the use, handling and storage of flammable and combustible liquids and gases. Flammable and combustible liquids are stored in accordance with NFPA 30 (Reference 9). Compressed and liquefied flammable gases are stored in accordance with applicable NFPA codes.

Storage and use practices for hydrogen are in accordance with guidance from NFPA 55 (Reference 11). Hydrogen lines in safety-related areas are designed to Seismic Category I.

Ventilation systems designed to maintain the hydrogen concentration below one percent by volume are provided for battery rooms.

The turbine lubrication oil system, located in the Turbine Building, is separated from areas containing SSC important to safety by three hour rated fire barriers. In addition, the turbine lubrication oil system is protected with automatic fixed fire suppression systems to maintain barrier integrity and make sure that a major Turbine Building fire does not adversely affect the ability to maintain operator control and safely shut down the plant. Automatic wet pipe sprinkler systems are provided for areas beneath the turbine operating floor, in the oil discharge tank room and lube oil room; and for lube oil lines above the turbine operating floor, including the turbine lagging/skirt and other areas that could accumulate oil as a result of a spill. Automatic pre-action sprinkler systems are provided for the turbine generator/exciter bearings and automatic water spray systems are provided for the hydrogen seal oil unit and lube oil drainage trenches.

Transformers located within buildings containing SSC important to safety are of the dry type or are insulated and cooled with non-combustible liquid. Outside oil-filled transformers are separated from plant buildings by either distance or fire barriers. Where the distance from transformer to plant building is less than 50 feet, three-hour fire rated barriers without openings are provided for separation. In addition, each of the outdoor transformers is provided with an automatic deluge water spray system. Oil spill confinement is provided for each transformer by a gravel-filled, secondary containment and drainage system with adequate capacity to collect spilled oil and fire water. NFPA 80A (Reference 15) is considered in the development of the qualification fire barriers where exterior hazards exit.

The diesel fuel oil main storage tanks and the diesel fuel oil service (i.e., day) tanks associated with the EDGs are located within the EPGBs that they serve. Each diesel fuel storage tank and diesel day tank are separated from the remaining portions of the building by three hour rated fire barriers. Potential spills from the tanks are confined by enclosures sized to accommodate more than the entire inventory of each tank. Automatic fire detection system capability is provided throughout the EPGBs. Additionally, each diesel fuel oil main storage tank and diesel day tank are protected by an automatic deluge (i.e., water spray) fire suppression system. Adequate drainage measures are provided for removing fire protection water and diesel fuel oil.

The reactor building internal structure walls form cubicles for each of the four RCPs. These cubicles are adjacent to, but separate from, each of the steam generator (SG) cubicles. The RCPs are physically separated from each other by either distance and/or solid concrete walls. The RCP motors are located above the RCPs and are separated by solid concrete walls. At the lower level (elevation +5 feet) below the RCPs, where there are no walls separating the RCPs, the RCPs are separated by more than 40 feet. The RCP motors each contain an upper and lower bearing that have independent oil lubrication systems. Both lubrication systems have an internal oil supply reservoir that is cooled with water via an oil cooler. The lower bearing has a cooling coil located within the reservoir. The upper bearing has an oil cooler remotely located from the reservoir. In addition, the upper lube oil reservoir is equipped with an external oil lift system remotely located from the reservoir, which is operated during the normal starting and stopping of the RCP motor. In the event of a lube oil leak, a low oil level alarm is displayed in the MCR. Additionally, the ability to confine and safely drain the lube oil leakage is provided via an RCP lube oil collection system at each pump designed in accordance with RG 1.189, Position 7.1. A description of the lube oil collection system is provided in Section 5.4.1.2.2.

Automatic fire detection system coverage is provided in the area surrounding each RCP. Additionally, the RCPs are protected by fixed water spray systems, which are manually actuated from the MCR. These water spray systems provide water spray coverage over the surface area of the RCPs.

Control of Radioactive Materials

Materials that collect or contain radioactivity, such as spent ion exchange resins and filters, are protected and stored in accordance with RG 1.189.

Ignition Source Control Practices

Design, installation, modification, maintenance and operational procedures, and practices control potential ignition sources such as electrical equipment (i.e., permanent and temporary), hot work activities (e.g., open flame, welding, cutting and grinding), reactive chemicals, static electricity, and smoking.

- Hot work involving open flame or spark producing activities such as cutting, welding and grinding operations are governed by a permit system as required by station administrative controls. NFPA 51B (Reference 10) guidance is considered in developing hot work administrative controls. Each task is reviewed, the work area is protected, and personnel that are trained to perform fire watch and suppress incipient fires are present during and after the work.

- Engineering design practices provide certainty that the electrical equipment is properly designed and installed in accordance with industry standards; head generating equipment or equipment with hot surfaces is properly cooled or separated from combustible materials; and systems containing flammable and combustible liquids or gases are properly designed and located to minimize the exposure of these materials to ignition sources.

- Procedures and practices provide reasonable assurance that temporary power sources connected to plant systems are reviewed, evaluated, and documented including determination that the temporary service does not impact SSC important to safety.

- Procedures and practices enable the control of temporary heating devices. Use of space heaters and maintenance equipment in plant areas are strictly controlled and reviewed by fire protection personnel.

- Procedures and practices provide reasonable assurance that temporary heating devices are properly installed and separated from combustible materials and surfaces.

- Potential ignition sources are controlled and limited in the MCR complex by administrative procedures.

Plant Cleanliness Practices

Plant cleanliness is maintained through administrative procedures and practices. Routine inspections are performed to make sure that plant conditions do not present unnecessary fire hazards or hazards to safe access to and egress from areas containing equipment important to safety. Operational and maintenance practices provide for timely response and cleanup for spills of chemicals or flammable and combustible liquids: removal of waste, refuse, scrap, and other combustibles resulting from daily operations and maintenance; and inspection of plant areas to verify that fire protection requirements are properly implemented.

9.5.1.6.2 Fire Protection Program

The FPP organization structure and the responsibilities for its establishment and implementation are in accordance with RG 1.189. The COL applicant is responsible for determining the individual position responsible for the organizational functions described herein (refer to Section 13.1).

The individual with overall responsibility for the FPP has management control over all organizations involved in fire protection activities. Formulation and verification of FPP implementation may be delegated to a staff composed of personnel prepared by training and experience in fire protection and personnel prepared by training and experience in nuclear plant safety to provide a comprehensive approach in directing the FPP for the plant.

The following organizational positions have been established for the FPP:

- An upper-level manager is responsible for formulating, implementing, and assessing the effectiveness of the FPP.
- Additional managers are directly responsible for formulating, implementing, and periodically assessing the effectiveness of the FPP. Results of these assessments and recommendations are reported to the upper-level manager responsible for the FPP.
- An onsite manager is responsible for the overall administration of the FPP which provides a single point of control and contact for all contingencies.
- The fire protection engineer:
  - The responsibility for implementation of the FPP has been delegated to the fire protection engineer. The fire protection engineer is an individual knowledgeable through education, training, or experience (or a combination of the three) in fire protection and nuclear safety. Other personnel are available to assist the fire protection engineer as necessary.
  - The fire protection engineer is delegated responsibility for development and administration of the FPP including, but not limited to, administrative controls, periodic fire prevention inspections, FPS and FPS equipment inspections and testing, evaluations of work activities for transient fire loads, identification of fire protection training requirements, prefire planning, indoctrination training for all plant contractor personnel, and fire fighting training for operating plant personnel and the fire brigade.
- The nuclear training manager:
  - Responsible for developing, scheduling and presenting fire protection training in accordance with the requirements of the FPP.
- An onsite individual, responsible for fire protection QA:
  - This person verifies the effective implementation of the FPP by planned inspections and scheduled audits, and the prompt reporting of the results of these inspections and audits to cognizant management personnel.

- The plant fire brigade for fighting fires:
  - The authority and responsibility of each fire brigade position relative to fire protection is clearly defined and corresponds with the actions required by the firefighting procedures.
  - Fighting fires is the primary responsibility of the fire brigade members and their other responsibilities do not adversely affect their (the fire brigade members) ability to perform a required fire fighting function.
  - The size of the fire brigade is based on the functions required to fight credible and challenging fires for each operating shift with allowance for injuries, but includes at least five members per shift.
  - Fire brigade staffing accounts for all operational and emergency response demands on shift personnel in the event of a significant fire.

9.5.1.6.3 Fire Protection Training and Personnel Qualifications

Fire Protection Engineer

The individual responsible for developing and implementing the overall FPP is designated as the fire protection engineer. The fire protection engineer meets the educational and experience requirements necessary to be considered eligible for member grade (or professional member) status in the Society of Fire Protection Engineers (SFPE) or is a member (professional member) in the SFPE.

Fire Brigade Members

Fire brigade members must complete initial training and qualification requirements before serving on the plant fire brigade. This initial training includes individual responsibilities, identification of the type and location of fire hazards, and associated types of fires that could occur including the toxic and corrosive characteristics of expected products of combustion. The training identifies the location, proper use of fire fighting equipment, the correct method of fighting each type of fire including those in confined spaces, and familiarization with plant layout. The training also covers the proper use of communication, lighting, ventilation, and emergency breathing equipment. Also covered are a detailed review of firefighting strategies and procedures, and a review of the latest plant modifications and corresponding changes in firefighting plans. Fire brigade leaders receive instruction on the direction and coordination of firefighting activities. Fire brigade members must also complete on-going training and qualification. This training includes:

- Successful completion of an annual physical examination.
- Attendance to monthly on-shift training, when scheduled.
- Attendance at quarterly fire fighting training.

- Participation in quarterly drills (minimum two drills per year).
- Annual participation in a practice session that provides experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions.
- Successful completion of a fit test for self-contained breathing apparatus every year.

The fire brigade leader and at least two brigade members have sufficient training and knowledge of plant systems to understand the effects of fire and fire suppressants on safe shutdown capability. The fire brigade leader possesses an operator's license or has the equivalent knowledge of plant systems, so that they can competently assess the potential safety consequences of a fire and advise MCR personnel.

Fire Protection System Operation, Testing and Maintenance

Functional groups responsible for FPS operation, maintenance, and testing are qualified by training and experience, and understand functions of the system.

Training of the Fire Brigade

The personnel responsible for the training of the fire brigade are qualified by knowledge, suitable training, and experience.

General Employee Training

Each nuclear plant employee has a responsibility to prevent, detect, and suppress fires. General site employee training introduces all personnel to the elements of the site-specific FPP, including the responsibilities of the FPP staff. Training includes information on the types of fires and related extinguishing agents, specific fire hazards at the site, and actions in the event of a fire suppression system actuation. General employee training provides specific instruction to site and contractor personnel on appropriate actions to be taken upon discovering a fire, actions to be taken upon hearing a fire alarm, administrative controls on the use of combustibles and ignition sources, and actions necessary in the event of a combustible liquid spill or gas release or leaks.

Fire Watch Training

Fire watch training provides instruction on fire watch duties, responsibilities, and required actions for both one hour roving and continuous fire watches. Fire watch qualification includes hands-on training in a practice fire with the extinguishing equipment to be used while on fire watch, and includes record keeping requirements.

9.5.1.6.4 Fire Brigade Organization, Training, and Records

The plant fire brigade must have a minimum of five qualified members on-site at all times. The fire brigade shall not include the minimum shift crew necessary for safe shutdown or any personnel required for other essential functions during a fire emergency. The fire brigade consists of a fire brigade leader who is assigned to the fire brigade and is qualified to assume command of a fire emergency and direct fire-fighting activities. The fire brigade also consists of an additional four fire brigade members who are qualified, trained, and equipped to respond to fire related emergencies.

Fire brigade drills are performed in the plant so that the fire brigade can practice as a team. Drills are performed at least quarterly for each shift fire brigade and each fire brigade member participates in at least two drills annually. At least one drill for each shift's fire brigade per year is unannounced. Persons planning and authorizing an unannounced drill must make sure that the responding shift fire brigade members are not aware that a drill is being planned until it has begun. At least one drill per year is performed on a "back shift" for each shift's fire brigade.

The drills are preplanned to establish training objectives and the drills are critiqued. Members of the management staff responsible for plant safety and fire protection plan and critique unannounced drills. Performance deficiencies of a fire brigade or of individual fire brigade members are remedied by scheduling additional training. Unsatisfactory drill performance is followed by a repeat drill within 30 days. At three-year intervals, qualified individuals independent of the plant staff critique a randomly selected unannounced drill.

Drills include the following:

- The effectiveness of the fire alarms, time required to notify and assemble the fire brigade, and selection, placement and use of equipment and firefighting strategies are assessed.
- Each brigade member's knowledge of his or her role in the firefighting strategy for the area assumed to contain the fire and the brigade member's conformance with established plant firefighting procedures and use of firefighting equipment, including self-contained emergency breathing apparatuses, communication, lighting and ventilation is assessed.
- The simulated use of firefighting equipment required to cope with the situation and type of fire selected for the drill is evaluated. The area and type of fire chosen for the drill vary from drill to drill to simulate fires in various areas of the plant. The situation selected simulates the size and arrangement of a fire that could reasonably occur in the area selected, allowing for fire development during the

time required to respond, obtain equipment and organize for the fire, assuming loss of automatic suppression capability.

- The brigade leader's direction of the firefighting effort is assessed with regard to thoroughness, accuracy and effectiveness.

The plant fire brigade coordinates training with the local fire department so that responsibilities and duties are delineated in advance. This coordination is part of the training course and is included in the training for the local fire department staff. The local fire department is invited to participate in drills at least annually.

Fire brigade members receive training as outlined in this section and in Section 9.5.1.6.3. Records of fire brigade member physical examinations, training drills, and critiques are maintained on file for a minimum of three years. NFPA 600 (Reference 24) is used as guidance in the organization and training of the fire brigade.

Fire brigade equipment, including personal protective equipment for structural firefighting, is provided for the plant fire brigade in accordance with RG 1.189. Each fire brigade member is equipped with a helmet (with face shield), turnout coat, bunker pants, footwear, gloves, protective hood, emergency communications equipment, portable lights, portable smoke removal equipment, self-contained breathing apparatus and portable extinguishers. All equipment conforms to appropriate NFPA standards and is stored in accordance with manufacturer's recommendations. An adequate inventory of firefighting equipment is maintained to outfit a full complement of brigade members with consideration of the possibility of sustained fire response operations (i.e., multiple crews).

9.5.1.6.5 Quality Assurance

The overall plant quality assurance plan (QAP) includes the QA program for fire protection. The QAP provides reasonable assurance that the fire protection systems are designed, fabricated, erected, tested, maintained and operated so that they will function as intended. As stated in Section 17.5, the QAP for the design of the U.S. EPR is addressed in AREVA NP Topical Report ANP-10266-A (Reference 41). The AREVA QAP implements quality requirements for the fire protection system in accordance with RG 1.189, Regulatory Position 1.7, directly by reference.

As stated in Section 17.2, a COL applicant that references the U.S. EPR design certification will provide the Quality Assurance Programs associated with the construction and operations phase. The program description to be provided by the applicant also includes a description of the fire protection system quality assurance program to be applied during fabrication, erection, installation and operations.

9.5.1.7 References

1. NFPA 10, “Standard for Portable Fire Extinguishers,” National Fire Protection Association Standards, 2007.
2. NFPA 13, “Standard for Installation of Sprinkler Systems,” National Fire Protection Association Standards, 2007.
3. NFPA 14, “Standard for the Installation of Standpipe and Hose Systems,” National Fire Protection Association Standards, 2007.
4. NFPA 15, “Standard for Water Spray Fixed Systems for Fire Protection,” National Fire Protection Association Standards, 2007.
5. NFPA 20, “Standard for the Installation of Stationary Pumps for Fire Protection,” National Fire Protection Association Standards, 2007.
6. NFPA 22, “Standard for Water Tanks for Private Fire Protection,” National Fire Protection Association Standards, 2003.
7. NFPA 24, “Standard for Installation of Private Fire Service Mains and Their Appurtenances,” National Fire Protection Association Standards, 2007.
8. NFPA 25, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,” National Fire Protection Association Standards, 2002.
9. NFPA 30, “Flammable and Combustible Liquids Code,” National Fire Protection Association Standards, 2003.
10. NFPA 51B, “Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,” National Fire Protection Association Standards, 2003.
11. NFPA 55, “Standard for the Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks,” National Fire Protection Association Standards, 2005.
12. NFPA 70, “National Electrical Code,” National Fire Protection Association Standards, 2005.
13. NFPA 72, “National Fire Alarm Code,” National Fire Protection Association Standards, 2007.
14. NFPA 80, “Standard for Fire Doors and Other Opening Protectives,” National Fire Protection Association Standards, 2007.
15. NFPA 80A, “Recommended Practices for Protection of Buildings from Exterior Fire Exposures,” National Fire Protection Association Standards, 2007.
16. NFPA 90A, “Standard for the Installation of Air Conditioning and Ventilation Systems,” National Fire Protection Association Standards, 2002.

17. NFPA 92A, “Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences,” National Fire Protection Association Standards, 2006.

18. NFPA 101, “Life Safety Code,” National Fire Protection Association Standards, 2006.

19. NFPA 204, “Standard for Smoke and Heat Venting,” National Fire Protection Association Standards, 2007.

20. NFPA 251, “Standard Methods of Tests of Fire Resistance of Building Construction and Materials,” National Fire Protection Association Standards, 2006.

21. NFPA 252, “Standard Methods of Fire Tests of Door Assemblies,” National Fire Protection Association Standards, 2003.

22. NFPA 253, “Standard Methods of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source,” National Fire Protection Association Standards, 2006.

23. NFPA 259, “Standard Test Method for Potential Heat of Building Materials,” National Fire Protection Association Standards, 2003.

24. NFPA 600, “Standard on Industrial Fire Brigades,” National Fire Protection Association Standards, 2005.

25. NFPA 703, “Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials,” National Fire Protection Association Standards, 2006.

26. NFPA 1961, “Standard on Fire Hose,” National Fire Protection Association Standards, 2007.

27. NFPA 1962, “Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose,” National Fire Protection Association Standards, 2003.

28. NFPA 2001, “Standard on Clean Agent Fire Extinguishing Systems,” National Fire Protection Association Standards, 2004.

29. ASTM E84-07, “Standard Test Methods for Surface Burning Characteristics of Building Materials,” American Society for Testing and Materials, 1997.

30. ASTM E119, “Standard Test Methods for Fire Test of Building Construction and Materials,” American Society for Testing and Materials, 2007.

31. ASTM E814, “Standard Test Method for Fire Tests of Through-Penetration Fire Stops,” American Society for Testing and Materials, 2006.

32. ASME B31.1, “Power Piping” - B31.1ab-2004 (including 2005 & 2006 Addenda), The American Society of Mechanical Engineers.

33. IEEE Std 634, "IEEE Standard Cable Penetration Fire Stop Qualification Test," Institute of Electrical and Electronics Engineers, Inc., 2004.

34. IEEE Std 1202, "IEEE Standard for Flame-Propagation Testing of Wire and Cable," Institute of Electrical and Electronics Engineers, Inc., 2006.

35. UL 555, "Standard for Fire Dampers," Underwriters Laboratories, 2006.

36. UL 1479, "Standard for Fire Tests of Through-Penetration Firestops," Underwriters Laboratories 2003.

37. NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, U.S. Nuclear Regulatory Commission, 2007.

38. SECY 90-016, "Evolutionary Light-Water Reactor (QA) Certification Issues and Their Relationship to Current Regulatory Requirements," U.S. Nuclear Regulatory Commission, 1990.

39. NEI 00-01, Revision 1, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Nuclear Energy Institute, 2001.

40. NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities," U.S. Nuclear Regulatory Commission, September 2005.

41. ANP-10266-A, "AREVA NP Inc. Quality Assurance Plan (QAP) for Design Certification of the U.S. EPR Topical Report," AREVA NP Inc, June 2007.

42. NFPA 804, "Standard for Fire Protection for Advanced Light Water Reactor Electric-Generating Plants," National Fire Protection Association Standards, 2006.

43. NFPA 105, "Installation of Smoke Door Assemblies and Other Protective Openings," National Fire Protection Association Standards, 2007.

44. ASCE/SEI Std. 43-05, "Seismic Design Criteria for Structures, Systems and Components in Nuclear Facilities," American Society of Civil Engineers/Structural Engineering Institute, 2005.

45. ANSI/AWWA D100-2005, "Welded Steel Tanks for Water Storage," American National Standards Institute/American Water Works Association, 2005.

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.1	Fire Protection Program	Compliance	
C.1.1	Organization, Staffing, and Responsibilities	Compliance	
C.1.2	Fire Hazards Analysis	Compliance	See Fire Protection Analysis Appendix 9A.
C.1.3	Safe-Shutdown Analysis	Compliance	
C.1.4	Fire Test Reports and Fire Data	Compliance	
C.1.5	Compensatory Measures	Compliance	
C.1.6	Fire Protection Training and Qualifications	Compliance	
C.1.6.1	Fire Protection Staff Training and Qualifications	Compliance	
C.1.6.2	General Employee Training	Compliance	
C.1.6.3	Fire Watch Training	Compliance	
C.1.6.4	Fire Brigade Training and Qualifications	Compliance	
C.1.6.4.1	Qualifications	Compliance	
C.1.6.4.2	Instruction	Compliance	
C.1.6.4.3	Fire Brigade Practice	Compliance	
C.1.6.4.4	Fire Brigade Training Records	Compliance	
C.1.7	Quality Assurance	Compliance	
C.1.7.1	Design and Procurement Document Control	COL Applicant	Note 3
C.1.7.2	Instructions, Procedures and Drawings	COL Applicant	Note 3
C.1.7.3	Control of Purchased Material, Equipment, and Services	COL Applicant	Note 3
C.1.7.4	Inspection	Compliance	
C.1.7.5	Test and Test Control	Compliance	
C.1.7.6	Inspection, Test, and Operating Status	Compliance	
C.1.7.7	Non-conforming Items	Compliance	
C.1.7.8	Corrective Action	Compliance	
C.1.7.9	Records	Compliance	
C.1.7.10	Audits	Compliance	
C.1.7.10.1	Annual Fire Protection Audit	Compliance	

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R.G. Section	Regulatory Guide 1.189 “C. Regulatory Position”[1]	Compliance[2]	U.S. EPR Comment
C.1.7.10.2	24-Month Fire Protection Audit	Compliance	
C.1.7.10.3	Triennial Fire Protection Audit	Compliance	
C.1.8	Fire Protection Program Changes/Code Deviations	COL Applicant	Note 3
C.1.8.1	Change Evaluations	COL Applicant	Note 3
C.1.8.2	Exemptions to Appendix R to 10 CFR Part 50	N/A	For plants licensed before January 1, 1979.
C.1.8.3	Appendix R Equivalency Evaluations	N/A	For plants licensed before January 1, 1979.
C.1.8.4	License Amendments	N/A	For plants licensed before January 1, 1979.
C.1.8.5	10 CFR 50.72 Notification and 10 CFR 50.73 Reporting	COL Applicant	Note 3
C.1.8.6	NFPA Code and Standard Deviations Evaluations	Compliance	
C.1.8.7	Fire Modeling	COL Applicant	Note 3
C.2	Fire Prevention	Compliance	
C.2.1	Control of Combustibles	Compliance	
C.2.1.1	Transient Fire Hazards	Compliance	
C.2.1.2	Modifications	Compliance	
C.2.1.3	Flammable and Combustible Liquids and Gases	Compliance	
C.2.1.4	External/Exposure Fire Hazards	Compliance	
C.2.2	Control of Ignition Sources	Compliance	
C.2.2.1	Open Flame, Welding, Cutting, and Grinding (Hot Work)	Compliance	
C.2.2.2	Temporary Electrical Installations	Compliance	
C.2.2.3	Other Sources	Compliance	
C.2.3	Housekeeping	Compliance	
C.2.4	Fire Protection System Maintenance and Impairments	Compliance	

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.3	Fire Detection and Suppression		See Fire Protection Analysis – Appendix 9A for fire area by fire area description of system features.
C.3.1	Fire Detection		See below.
C.3.1.1	Fire Detection and Alarm Design Objectives and Performance Criteria	Compliance	
C.3.2	Fire Protection Water Supply Systems		See below.
C.3.2.1	Fire Protection Water Supply	Compliance	
C.3.2.2	Fire Pumps	Compliance	
C.3.2.3	Fire Mains	Compliance	
C.3.3	Automatic Suppression Systems	Compliance	
C.3.3.1	Water Based Systems	Compliance	
C.3.3.1.1	Sprinkler and Spray Systems	Compliance	
C.3.3.1.2	Water Mist Systems	N/A	Water mist suppression systems are not provided.
C.3.3.1.3	Foam-Water Sprinkler and Spray Systems	N/A	Foam sprinkler and spray systems are not provided.
C.3.3.2	Gaseous Fire Suppression	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.3.3.2.1	Carbon Dioxide (CO_2) Systems	N/A	Carbon dioxide extinguishing systems are not provided.
C.3.3.2.2	Halon	N/A	Halon fire extinguishing systems are not provided.
C.3.3.2.3	Clean Agents	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.3.4	Manual Suppression Systems and Equipment	Compliance	
C.3.4.1	Standpipes and Hose Stations	Compliance	

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.3.4.2	Hydrants and Hose Houses	Compliance	
C.3.4.3	Manual Foam	Compliance	
C.3.4.4	Fire Extinguishers	Compliance	
C.3.4.5	Fixed Manual Suppression Some fixed fire suppression systems may be manually actuated (e.g., fixed suppression systems provided in accordance with Section III.G.3 of Appendix R to 10 CFR Part 50). Manual actuation is generally limited to water spray systems and should not be used for gaseous suppression systems except when the system provides backup to an automatic water suppression system. Fixed manual suppression systems should be designed in accordance with applicable guidance of the appropriate NFPA standards. A change from an automatic system to a manually actuated system should be supported by an appropriate evaluation.	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification for the gaseous suppression system in the MCR subfloor.
C.3.5	Manual Firefighting Capabilities	Compliance	
C.3.5.1	Fire Brigade	Compliance	
C.3.5.1.1	Fire Brigade Staffing	Compliance	
C.3.5.1.2	Equipment	Compliance	
C.3.5.1.3	Procedures and Prefire Plans	Compliance	
C.3.5.1.4	Performance Assessment/Drill Criteria	Compliance	
C.3.5.2	Offsite Manual Firefighting Resources	Compliance	
C.3.5.2.1	Capabilities	Compliance	
C.3.5.2.2	Training	Compliance	
C.3.5.2.3	Agreement/Plant Exercise	Compliance	
C.4	Building Design/Passive Features	Compliance	
C.4.1	General Building and Building System Design	Compliance	
C.4.1.1	Combustibility of Building Components and Features	Compliance	
C.4.1.1.1	Interior Finish	Compliance	

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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.4.1.1.2	Testing and Qualification	Compliance	
C.4.1.2	Compartmentalization, Fire Areas, and Zones	Compliance	
C.4.1.2.1	Fire Areas	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.1.2.2	Fire Zones	Compliance	
C.4.1.2.3	Access and Egress Design	Compliance	
C.4.1.3	Electrical Cable System Fire Protection Design	Compliance	
C.4.1.3.1	Cable Design	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.1.3.2	Raceway/Cable Tray Construction	Compliance	
C.4.1.3.3	Electrical Cable System Fire Detection and Suppression	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.1.3.4	Electrical Cable Separation	Compliance	
C.4.1.3.5	Transformers	Compliance	
C.4.1.3.6	Electrical Cabinets	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.1.4	HVAC Design	Compliance	
C.4.1.4.1	Combustibility of Filter Media	Compliance	
C.4.1.4.2	Smoke Control/Removal	Compliance	
C.4.1.4.3	Habitability	Compliance	
C.4.1.4.4	Fire Dampers	Compliance	
C.4.1.5	Drainage	Compliance	
C.4.1.6	Emergency Lighting	Compliance	
C.4.1.6.1	Egress Safety	Compliance	
C.4.1.6.2	Post-Fire Safe-Shutdown	Compliance	
C.4.1.7	Communications	Compliance	
C.4.1.8	Explosion Prevention	Compliance	
C.4.2	Passive Fire-Resistive Features	Compliance	

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.4.2.1	Structural Fire Barriers	Compliance	
C.4.2.1.1	Wall, Floor, and Ceiling Assemblies	Compliance	
C.4.2.1.2	Fire Doors	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.2.1.3	Fire Dampers	Compliance	
C.4.2.1.4	Penetration Seals	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.2.1.5	Testing and Qualification	Compliance	
C.4.2.1.6	Evaluation of Penetration Seal Designs with Limited Testing	Compliance	
C.4.2.2	Structural Steel Protection	Compliance	
C.4.2.3	Fire-Resistive Protection for Electrical Circuits	Compliance	
C.4.2.3.1	Electrical Raceway Fire Barrier Systems	Compliance	
C.4.2.3.2	Fire Rated Cables	N/A	For plants licensed before January 1, 1979.
C.4.2.3.3	Fire Stops for Cable Routing	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.4.3	Testing and Qualification of Electrical Raceway Fire Barrier Systems	N/A	Electrical Raceway Fire Barrier Systems are not relied upon to protect post-fire shutdown-related systems and to meet the separation means discussed in Regulatory Position 5.3.
C.5	Safe-Shutdown Capability	Compliance	The U.S.EPR is a new reactor design Cold Shutdown Plant. See new reactor design requirements in this RG Position.

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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.5.1	Post-Fire Safe-Shutdown Performance Goals	Compliance	The U.S. EPR is a new reactor design Cold Shutdown Plant. See new reactor design requirements in this RG Position.
C.5.2	Cold Shutdown and Allowable Repairs	Compliance	The U.S. EPR is a new reactor design Cold Shutdown Plant. See new reactor design requirements in this RG Position.
C.5.3	Fire Protection of Safe-Shutdown Capability	Compliance	
C.5.3.1	Identification and Evaluation of Post-Fire Safe-Shutdown Circuits	Compliance	
C.5.3.2	High/Low-Pressure Interface	Compliance	
C.5.3.3	Operator Manual Actions	Compliance	
C 5.3.4	Spurious Actuations	Compliance	
C.5.4	Alternative and Dedicated Shutdown Capability		See below.
C.5.4.1	General Guidelines	Compliance	
C.5.4.2	Associated Circuits of Concern	Compliance	
C.5.4.3	Protection of Associated Circuits of Concern	Compliance	
C.5.4.3.1	Common Power Source	Compliance	
C.5.4.3.2	Spurious Actuation Circuits	Compliance	
C.5.4.3.3	Common Enclosures	Compliance	
C.5.4.4	Control Room Fires	Compliance	
C.5.5	Post-Fire Safe-Shutdown Procedures	COL Applicant	Note 3
C.5.5.1	Safe-Shutdown Procedures	COL Applicant	Note 3
C.5.5.2	Alternative/Dedicated Shutdown Procedures	COL Applicant	Note 3
C.5.5.3	Repair Procedures	COL Applicant	Note 3

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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.5.6	Shutdown/Low-Power Operations	Compliance	See Section 9.5.1.2.1 "Shutdown/Low Power Operations" for details of compliance.
C.6	Fire Protection for Areas Important to Safety		See below.
C.6.1	Areas Related to Power Operation		Compliance Position is as given for each sub-section below.
C.6.1.1	Containment	Compliance	
C.6.1.1.1	Containment Electrical Separation	Compliance	
C.6.1.1.2	Containment Fire Suppression	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.6.1.1.3	Containment Fire Detection	Compliance	
C.6.1.2	Control Room Complex	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.6.1.2.1	Control Room Fire Suppression	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.6.1.2.2	Control Room Fire Detection	Compliance	
C.6.1.2.3	Control Room Ventilation	Compliance	
C.6.1.3	Cable Spreading Room	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.6.1.4	Plant Computer Rooms	Compliance	
C.6.1.5	Switchgear Rooms	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.
C.6.1.6	Alternative/Dedicated Shutdown Panels	Compliance	
C.6.1.7	Station Battery Rooms	Compliance	
C.6.1.8	Diesel Generator Rooms	Compliance	
C.6.1.9	Pump Rooms	Compliance	
C.6.2	Other Areas		See below.
C.6.2.1	New Fuel Areas	Compliance	

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189 Sheet 9 of 10

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.6.2.2	Spent Fuel Areas	Compliance	
C.6.2.3	Radwaste Building/Storage Areas and Decontamination Areas	Compliance	
C.6.2.4	Independent Spent Fuel Storage Areas	COL Applicant	Note 3
C.6.2.5	Water Tanks	Compliance	
C.6.2.6	Cooling Towers	Compliance for the Essential Service Water System Cooling Tower Structure. COL Applicant for the Circulating Water System Cooling Tower Structure.	Note 3 for the Circulating Water System Cooling Tower Structure.
C.7	Protection of Special Fire Hazards Exposing Areas Important to Safety		See below.
C.7.1	Reactor Coolant Pump Oil Collection	Compliance	
C.7.2	Turbine/Generator Building	Compliance	
C.7.2.1	Oil Systems	Compliance	
C.7.2.2	Hydrogen System	Compliance	
C.7.2.3	Smoke Control	Compliance	
C.7.3	Station Transformers	Compliance	
C.7.4	Diesel Fuel Oil Storage Areas	Compliance	
C.7.5	Flammable Gas Storage and Distribution	Compliance	
C.7.6	Nearby Facilities	COL Applicant	Note 3
C.8	Fire Protection for New Reactors		See below.
C.8.1	General	Compliance	
C.8.2	Enhanced Fire Protection Criteria	Compliance	
C.8.3	Passive Plant Safe-Shutdown Condition	N/A	
C.8.4	Applicable Industry Codes and Standards	Compliance	
C.8.5	Other New Reactor Designs	N/A	
C.8.6	Fire Protection Program Implementation Schedule	Compliance	
C.8.7	Fire Protection for Non-power Operation	Compliance	

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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.9	Fire Protection for License Renewal	N/A	

Notes:

1. The scope of the Regulatory Position presented in this compliance comparison table is abbreviated, due to the depth of detail contained within the Regulatory Position Appendix C itself. The user should refer to RG 1.189 directly for the text portion of each section addressed by the table.

2. The U.S. EPR compliance to the regulatory positions delineated in RG 1.189 "Fire Protection for Nuclear Power Plants" is as indicated by the following definitions:

   – COL Applicant – The COL applicant will address the subject regulatory position.

   – Compliance – The U.S. EPR design supports compliance with the subject regulatory position.

   – N/A – (Not Applicable): The subject regulatory position is not applicable to the current design of the U.S. EPR.

   – Alternate Compliance – The U.S.EPR compliance to the subject regulatory position is provided by alternate means or methods.

   – Non-Compliance – The U.S. EPR does not comply with the subject regulatory position or intent of the subject regulatory position. The justification for the U.S. EPR position is provided in the "Comments" column.

3. A COL applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Position.

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