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Subject: **Response to Portion of NRC Request for Additional Information
Letter No. 96 – Fire Protection System– RAI Numbers 9.5-49, 9.5-54,
9.5-55, and 9.5-56**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

James C. Kinsey
Project Manager, ESBWR Licensing

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NRD

Reference:

1. MFN 07-231, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 96 Related to the ESBWR Design Certification Application*, April 12, 2007.

Enclosure:

1. MFN 07-235 – Response to Portion of NRC Request for Additional Information Letter No. 96 – RAI Numbers 9.5-49, 9.5-54, 9.5-55, and 9.5-56.

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Enclosure 1

MFN 07-235

**Response to Portion of NRC Request for
Additional Information Letter No. 96
Related to ESBWR Design Certification Application**

Fire Protection System

RAI Numbers 9.5-49, 9.5-54, 9.5-55, and 9.5-56

NRC RAI 9.5-49

Include a COL Action Item for the implementation schedule for the FPP. The following item should be included in the COL Action Items for the ESBWR fire protection program. A detailed description of this aspect of the ESBWR fire protection program is required to adequately determine that the design meets regulatory requirements. However, the final design for this aspect of the program has not been developed sufficiently at the DCD stage to be described in adequate detail to conclude that the design is acceptable. Implementation schedule for the Fire Protection Program (FPP) - The implementation milestones for programmatic aspects of the FPP should be included in the COL within the license condition on operational program implementation.

GE Response

Based on the provisions in Section 9.5.1 of Regulatory Guide 1.206, GE concurs that the COL Applicant should provide implementation milestones for programmatic aspects of the Fire Protection Program (FPP). However, the COL Applicant, in accordance with C.I.13.4 of Regulatory Guide 1.206, is to provide the implementation schedule for the FPP as part of FSAR Table 13.4. Therefore, GE does not believe a COL Action Item is necessary.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 9.5-54

Update DCD Tier 2, Section 9.5.1.15.4 to include instruction on the identification and protection of SSCs important to safety and on the use of the FPS for emergency backup for shutdown cooling. In addition to training in fire protection systems and hazards, the fire brigade, fire protection staff, and possibly the offsite fire department should receive training in the identification and protection of SSCs important to safety. The fire protection staff should also be trained in the alternative use of the fire protection system for emergency makeup for reactor shutdown cooling. Please update DCD Tier 2, Section 9.5.1.15.4 to include these training components.

GE Response

GE believes the training requirements delineated in DCD Tier 2, Revision 3, Subsection 9.5.1.15.4 are consistent with the regulatory guidance provided in SRP 9.5.1, Branch Technical Position CMEB 9.5-1, and Regulatory Guide 1.189 (April 2001), Section C.1.1.6.4.2. As stated in DCD Subsection 9.5.1.15.4.5; "Fire brigade drills are conducted in various plant areas, especially in those areas identified by the fire hazards analysis to be critical to plant operation and to contain significant fire hazards" and "Critiques are conducted upon completion of each

drill to evaluate the effectiveness of brigade performance and incorporate lessons learned into future drill evolutions.” These drills and critiques should identify any weaknesses in “protection of SSCs important to safety.” Corrective actions would be generated to mitigate any weakness.

The emergency makeup function for reactor shutdown cooling does not apply until 72 hours after a postulated accident. Plant operators versus the Fire Brigade typically perform the emergency makeup in accordance with procedures to which plant operators are trained.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 9.5-55

Move paragraphs to appropriate section (DCD Section 9.5.1.15.4.6). Editorial Comment: The text following the first paragraph in DCD Tier 2, Revision 3, Section 9.5.1.15.4.6 is unrelated to the title of the section. This text should be moved to the appropriate section or a new section heading added.

GE Response

The text following the first paragraph of DCD Tier 2 Revision 3, Subsection 9.5.1.15.4.6, is being relocated to more appropriate subsections based on topic content. The second paragraph of Subsection 9.5.1.15.4.6, which discusses Fire Brigade equipment, is to be relocated to new Subsection 9.5.1.15.4.7, "Fire Brigade Equipment." The third paragraph of Subsection 9.5.1.15.4.6, which discusses the responsibility of the On Duty Shift Supervisor, is to be relocated to existing Subsection 9.5.1.15.2, "Organization and Responsibilities." The fourth paragraph of Subsection 9.5.1.15.4.6, which addresses Fire Brigade member qualifications, is to be relocated to existing Subsection 9.5.1.15.4.2, "Fire Brigade Training."

DCD Impact

DCD Tier 2, Subsections 9.5.1.15.2, 9.5.1.15.4.2, 9.5.1.15.4.6 and 9.5.1.15.4.7 are to be revised in Revision 4 as noted in the attached markup pages.

NRC RAI 9.5-56

Update FPP tests and inspections to include those for fire detection systems, auto suppression systems, manual suppression equipment, emergency lighting, etc. DCD Tier 2, Revision 3, Section 9.5.1.15.8 on testing and inspection does not mention tests and inspections for fire detection systems, auto suppression systems, manual suppression equipment, emergency lighting, etc. The tests and inspections for these features of the FPP following the initial tests should be mentioned in this section.

GE Response

The tests and inspections for Fire Protection equipment and features, as described in DCD Tier 2 Subsection 9.5.1.15.8, are intended to comply with the guidance provided in Regulatory Guide 1.189 (April 2001), Regulatory Positions C.1.1.7.4 and C.1.1.7.5. Therefore, the following text is to be added to DCD Tier 2, Subsection 9.5.1.15.8 to provide additional guidance on inspections and testing.

“The Fire Protection System, including fire detection system, auto suppression system, and manual suppression equipment, is periodically inspected. In addition, systems, which support fire fighting; such as emergency breathing and auxiliary equipment, emergency lighting, and communication equipment are periodically inspected.”

“Fire protection equipment, emergency lighting, and communication equipment are tested periodically to ensure that the equipment will function properly and continue to meet the design criteria.”

DCD Impact

DCD Tier 2, Subsection 9.5.1.15.8 is to be revised in Revision 4 as noted in the attached markup.

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The COL applicant shall provide a complete description of the applicant's fire protection program.

9.5.1.15.1 Fire Protection Program Criteria

The ESBWR Plant Fire Protection Program is based on the criteria of several industry and regulatory documents that are referenced in Table 9.5-1.

9.5.1.15.2 Organization and Responsibilities

The organizational staffing structure of the Fire Protection Program is discussed in Chapter 13.1.

The on-duty Shift Supervisor has responsibility for taking certain actions based on an assessment of the magnitude of the fire emergency. These actions include safely shutting down the plant, making recommendations for implementing the Emergency Plan, notification of emergency personnel and requesting assistance from off-duty personnel, if necessary. Emergency Plan consideration of fire emergencies includes the guidance of Regulatory Guide 1.101.

The site engineer in charge of the Fire Protection Program is responsible for the following:

- Ensuring that programs and periodic inspections are implemented to;
 - Minimize the amount of combustibles in safety-related areas; and
 - Determine the effectiveness of housekeeping practices.
- Assure the availability and acceptability of the following;
 - Fire Protection System and components;
 - Manual fire fighting equipment;
 - Emergency breathing apparatus;
 - Emergency lighting;
 - Communication equipment;
 - Fire barriers including fire rated walls, floors and ceilings, fire rated doors, dampers, etc., fire stops and wraps, and fire retardant coatings. Procedures specifically address the administrative controls to be put in place, including fire watches, when a fire barrier is breached for maintenance; and
 - Assure prompt and effective corrective actions are taken to correct conditions adverse to fire protection and preclude their recurrence.
- Ensuring that periodic maintenance and testing of fire protection systems, components, and manual fire fighting equipment is conducted, test results are evaluated, and the acceptability of systems under test is determined in accordance with established plant procedures;
- Designing and selecting equipment related to Fire Protection;
- Reviewing and evaluating proposed work activities to identify potential transient fire loads;
- Managing the Plant Fire Brigade, including;

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- The direction and coordination of firefighting activities (fire brigade leaders only); and
- Detailed review of firefighting strategies and procedures.

Field exercises are conducted to reinforce the classroom training and provide an opportunity to practice the skills learned. These exercises include:

- Fighting small fires with portable fire extinguishers;
- Fighting interior fires using breathing apparatus;
- Controlling incidents involving flammable gases or pressurized liquid fuels;
- Fighting large flammable liquid fires using hose lines and/or foam; and
- Fighting flammable liquid fires inside building.

The classroom instruction and field exercises are provided by qualified individuals who are knowledgeable, experienced, and suitably trained in fighting the types of fires that could occur and in using the types of equipment available at the power station.

To qualify as a member of the Fire Brigade, an individual must meet the following criteria:

- Is available to answer fire alarms;
- Has attended the required training sessions for the position he occupies on the Fire Brigade; and
- Has passed an annual physical exam.

9.5.1.15.4.3 Fire Protection Staff Training

The Fire Protection Engineer responsible for the formulation and implementation of the Fire Protection Program meets the qualification requirements listed in Table 13.1-1.

The station fire protection staff receives training in:

- Design and maintenance of fire detection, suppression, and extinguishing systems;
- Fire prevention techniques and procedures;
- Firefighting techniques and procedures for plant personnel and the fire brigades; and
- Hazardous material identification and handling. Specific courses to achieve the above training objectives are provided for the System Engineers assigned to the fire protection staff if they are not fully trained when hired. Other training organizations may be used to provide this training on a case-by-case basis.

9.5.1.15.4.4 Offsite Fire Department Training

Training for offsite fire departments that have agreed to assist during a major fire onsite is provided to make members aware of the need for radiological protection of personnel, the special hazards and operational precautions associated with fire fighting at a nuclear power plant. The course is provided annually and includes instruction in the following:

- Basic radiation protection, including the use of personal dosimetry devices;

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- Plant familiarization, including hazards, available fire fighting equipment, and fire protection systems;
- Firefighting procedures; and
- Security procedures, including entry to and exit from the plant.

9.5.1.15.4.5 Fire Brigade Retraining**Classroom**

Regular planned meetings are held at least once each calendar quarter for brigade members to review changes in the fire protection program and other subjects as necessary. Periodic refresher training sessions are held to repeat the classroom instruction program for brigade members over any 2-year period. These sessions may be concurrent with the regular planned meetings.

Practice

Practice sessions are held for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant. These sessions provide brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in firefighting. These practice sessions are provided at least once per year for each fire brigade member.

Drills

Fire brigade drills are conducted in various plant areas, especially in those areas identified by the fire hazards analysis to be critical to plant operation and to contain significant fire hazards. Fire brigade drills are performed in the plant so that the fire brigade can practice as a team. Unannounced drills are in full dress. Regularly scheduled drills are also in full dress. Full dress includes helmet, coat, boots, gloves, and emergency breathing apparatus. Donning of face mask and use of emergency air is not mandatory during drills.

Drills are performed at least once each calendar quarter for each shift fire brigade. The offsite local fire department is invited to participate in at least one drill per year. Each fire brigade participates in at least two drills per year. Critiques are conducted upon completion of each drill to evaluate the effectiveness of brigade performance and incorporate lessons learned into future drill evolutions. Drills include reviews of the latest plant modifications and corresponding changes in firefighting plans.

9.5.1.15.4.6 Fire Brigade Records

Individual records of training provided to each fire brigade member, including drill critiques, are maintained as part of the permanent plant files for at least 3 years to ensure that each member receives training in all parts of the training program. Retraining or broadened training for firefighting within buildings is scheduled for all those brigade members whose performance records show deficiencies. A system to document drills including critiques and corrective actions has been developed. Fire brigade training review and individual performance programs also have been developed.

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9.5.1.15.4.7 Fire Brigade Equipment

The minimum equipment provided for the ESBWR Plant Fire Brigade consists of personal protective equipment such as turnout coats, boots, gloves, hard hats, emergency communications equipment, portable lights, portable ventilation equipment and portable extinguishers. Self-contained breathing apparatus (SCBA) approved by NIOSH, using full face positive pressure masks, are provided for selected fire brigade, emergency repair and control room personnel. At least ten masks are provided for fire brigade personnel. At least two extra air bottles are located on-site for each SCBA. An additional on-site 6-hour supply of reserve air is provided to permit quick and complete replenishment of exhausted supply air bottles. Additional SCBAs are provided near the personnel containment entrance for the exclusive use of the Fire Brigade. The Fire Brigade Leader has ready access to keys for any locked fire doors.

9.5.1.15.5 Administrative Controls

Administrative controls for the Fire Protection Program are implemented through plant administrative procedures. These procedures are available for review and inspection prior to implementation of the program.

These controls establish procedures to:

- Control actions to be taken by an individual discovering a fire, such as notification to the Control Room, attempting to extinguish the fire, and actuation of local fire suppression systems;
- Control actions to be taken by the Control Room operator, such as sounding fire alarms, and notifying the Shift Supervisor of the type, size and location of the fire;
- Control actions to be taken by the Fire Brigade after notification of a fire, including location to assemble, directions given by the fire brigade leader, the responsibilities of brigade members such as selection of fire fighting and protective equipment and use of preplanned strategies for fighting fires in specific areas;
- Control actions to be taken by the Security force upon notification of a fire; and
- Define the strategies established for fighting fires in safety-related areas and areas presenting a hazard to safety-related equipment, including the designation of the;
 - Fire hazards in each plant zone covered by a fire fighting procedure;
 - Fire extinguishers best suited for controlling fires with the combustible loadings of the zone and the nearest location of these extinguishers;
 - Most favorable direction from which to attack a fire in each area in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be free of fire, and the best station of elevation for fighting the fire. All access and egress routes that involve locked doors are specifically identified in the procedure with the appropriate precautions and methods for access specified;
 - Plant systems that should be managed to reduce the damage potential during a local fire and the location of local and remote controls for such management (e.g., any hydraulic or electrical system in the zone covered by the specific fire fighting

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- Control the use of specific combustibles in the powerblock. All wood used in the power block during maintenance, modification, or refueling operation (such as lay-down blocks or scaffolding) is treated with a flame retardant. Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers may be unpacked in the power block if required for valid operating reasons. However, all combustible materials are removed from the area immediately following unpacking. Such transient combustible material, unless stored in approved containers, is not left unattended in the powerblock during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior, or polyethylene sheeting is placed in metal containers with tight-fitting self-closing metal covers. Only noncombustible panels or flame-retardant tarpaulins or approved materials of equivalent fire-retardant characteristics are used in the powerblock. Any other fabrics or plastic films used in the powerblock are certified to conform to the large-scale fire test described in NFPA 701.
- Govern the control of electrical appliances in areas that contain or expose safety-related equipment.

9.5.1.15.7 Control of Radioactive Materials

As stated in the Fire Hazards Analysis, (FHA), the primary objectives of a fire protection program are to minimize both the probability of occurrence and the consequences of a fire. To meet these objectives, the fire protection program provides reasonable assurance, through defense in depth, which a fire will not prevent the performance of necessary safe shutdown functions and that radioactive releases to the environment in the event of a fire will be minimized. Table 9A.5-1 specifically addresses the radiological release potential for each defined fire area.

9.5.1.15.8 Testing and Inspection

The Fire Protection System is initially tested in accordance with Chapter 14.

Testing and inspection requirements is implemented through administrative procedures. Post maintenance or modifications testing to the Fire Protection System is subject to review to ensure conformance to design requirements. Installation of portions of the system where performance cannot be verified through post modification tests, such as penetration seals, fire retardant coatings, cable routing, and fire barriers is inspected. Inspections are performed by individuals knowledgeable of fire protection design and installation requirements. Open flame or combustion generated smoke are not be used for leak testing or similar procedures such as air flow determination. Inspection and testing procedures address the identification of items to be tested or inspected, responsible organizations for the activity, acceptance criteria, documentation requirements and signoff requirements.

The Fire Protection System, including fire detection system, auto suppression system, and manual suppression equipment, is periodically inspected. In addition, systems, which support fire fighting; such as, emergency breathing and auxiliary equipment, emergency lighting, and communication equipment are periodically inspected.

Fire Protection materials subject to degradation (such as fire stops, seals and fire retardant coatings) are visually inspected periodically to assure they are not degraded or damaged. Fire

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hoses are hydrostatically tested in accordance with NFPA-1962. Hoses stored in outside hose stations are tested annually and interior standpipe hoses are tested every 3 years.

The Fire Protection System is periodically tested in accordance with plant procedures. Fire protection equipment, emergency lighting, and communication equipment are tested periodically to ensure that the equipment will function properly and continue to meet the design criteria. Testing includes periodic operational tests and visual verification of damper and valve positions. Fire doors and their closing and latching mechanisms are also included in these procedures. Fire doors separating safety-related areas are self-closing or provided with closing mechanisms and are inspected semiannually to verify that the automatic hold open, release and closing mechanisms and latches are operable. Watertight and missile resistant doors are not provided with closing mechanisms. Fire doors with automatic hold open and release mechanisms are inspected daily to verify that the doorways are free of obstructions.

Fire doors separating fire areas are normally closed and latched. Fire doors that are locked closed are inspected weekly to verify position. Fire doors that are closed and latched are inspected daily to assure that they are in the closed position. However, fire doors that are closed and electrically supervised at a continuously manned location are not inspected.

9.5.1.15.9 Quality Assurance

Quality assurance controls are applied to the activities involved in the design, procurement, installation, testing, and maintenance of fire protection systems for safety-related areas, in accordance with the programs outlined in Chapter 17. The COL applicant shall provide details of the QA program for the fire protection program.

9.5.1.15.10 Emergency Planning

Emergency planning is described in DCD Section 13.3.

9.5.1.16 COL Information

The following site specific items shall be determined by the COL applicant:

- Details of the QA program for the fire protection program;
- Details of manual fire-fighting capability, including smoke control during a fire;
- Complete description of the applicant's fire protection program;
- Proposed fire protection license condition for making changes to the fire protection system without prior review and approval of the NRC;
- Fire protection system piping and instrumentation diagram showing complete site-specific system;
- Compliance review of the as-built design against the assumptions and requirements stated in the FHA;
- Provisions for manual smoke control by manual actions of the fire brigade for all plant areas;
- Final quantity and capacity of secondary firewater storage;