



GE Energy

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**Subject: Response to Portion of NRC Request for Additional Information
Letter No. 62 Related to ESBWR Design Certification Application –
Fire Protection - RAI Numbers 14.3-11, 14.3-14 and 14.3-15**

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,

A handwritten signature in cursive script that reads "James C. Kinsey for".

James C. Kinsey
Project Manager, ESBWR Licensing

Reference:

1. MFN 06-380, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 62 Related to ESBWR Design Certification Application*, September 29, 2006

Enclosure:

1. MFN 07-140 - Response to Portion of NRC Request for Additional Information Letter No. 62 Related to ESBWR Design Certification Application – Fire Protection - RAI Numbers 14.3-11, 14.3-14 and 14.3-15

cc: AE Cabbage USNRC (with enclosures)
DH Hinds GE (with enclosures)
RE Brown GE (w/o enclosures)
eDRF 0000-0062-8451

ENCLOSURE 1

MFN 07-140

Response to Portion of NRC Request for

Additional Information Letter No. 62

Related to ESBWR Design Certification Application

Fire Protection - RAI Numbers 14.3-11, 14.3-14 and 14.3-15

NRC RAI 14.3-11

Include verification of the implementation of the seismic design for the portion of the fire protection system that must remain functional following an SSE. (DCD Tier 1, Table 2.16.3-1)

The DCD Tier 1, DD states that one source of fire water supply, one of the fire water pumps and the fire main leading to and including standpipes and subsystems for areas containing safe shutdown equipment are analyzed to withstand the effect of a Safe Shutdown Earthquake (SSE) to remain functional during and after an SSE. The ESBWR ITAAC should include verification that this analysis has been performed and that the system and equipment have been installed accordingly. Update the ITAAC to include this information.

GE Response

Tier 1, Table 2.16.3-3, ITAAC was revised to include verification that fire protection equipment for areas containing safe shutdown equipment has been analyzed and equipment has been installed accordingly (reference attached mark-up of ITAAC for DCD Tier 1, Table 2.16.3-3).

DCD Impact

DCD Tier 1, Table 2.16.3-3, ITAAC was revised in Revision 3.

NRC RAI 14.3-14

Clarify Design Commitment No. 8 which states that automatic fire suppression is provided for all non- electrical areas. (DCD Tier 1, Table 2.16.3-1)

The Tier 2 description of areas protected by automatic suppression systems does not include automatic suppression systems in all non-electrical areas. The Design Commitment in DCD Tier 1, Table 2.16.3-1 should be more specific. In addition, the reference to the applicable NFPA codes should state, as the Design Commitment, that the automatic suppression systems meet or exceed the requirements of NFPA 13 and NFPA 15, as applicable.

GE Response

Tier 1, Table 2.16.3-3, ITAAC was already revised in Revision 2 to state more specifically where automatic fire suppression will be provided for non-electrical areas (reference RAI 14.3-13). Design Commitment Item No. 8 was revised as follows:

8. Automatic fire suppression complying with NFPA 13 & 15 is provided for all non-electrical areas exceeding the combustible load limit of 700 MJ/m².

DCD Impact

No additional DCD change is needed, in response to this RAI.

NRC RAI 14.3-15

ITAAC Items 7 and 8 for automatic suppression systems should include inspections and tests indicated for Item 9 and as required by the applicable NFPA standard. (DCD Tier1, Table 2.16.3-1)

DCD Tier 1, Table 2.16.3-1, ITAAC Items 7 and 8 for automatic suppression systems should include inspections and tests indicated for Item 9 - inspection of as-built systems and testing of automatic logic under simulated fire conditions. As noted above, tests and inspection should also include those required by the applicable NFPA standards. Update the ITAAC to include this information.

GE Response

Tier 1, Table 2.16.3-3, ITAAC Inspections, Tests, Analysis Items No. 7 and No. 8 was revised to include inspection of as-built systems and testing of automatic logic under simulated fire conditions (reference attached mark-up of ITAAC for DCD Tier 1, Table 2.16.3-3).

DCD Impact

DCD Tier 1, Table 2.16.3-3, ITAAC was revised in Revision 3.

**Table 2.16.3-3
ITAAC For The Fire Protection System**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>1.</p> <p>a. The basic configuration of the Fire Protection System is as described in Subsection 2.16.3 and Figure 2.16.3-1.</p> <p>b.1 Fire protection equipment will meet the quality and seismic requirements, as shown in Table 2.16.3-1.</p> <p>b.2 For areas containing safe shutdown equipment, Fire Protection Equipment (i.e.; one source of fire water supply, one of the fire water pumps, and fire main leading to and including standpipes and subsystems) is analyzed to withstand the effect of an SSE to remain functional during and after an SSE.</p> <p>c. Fire protection pumps will have the flow capabilities shown in Table 2.16.3-2.</p>	<p>1.</p> <p>a. Inspections of the as-built system will be conducted.</p> <p>b.1 Inspections of the as built equipment design documentation will be conducted.</p> <p>b.2 Inspection of the as-built equipment design documentation for fire protection equipment for areas containing safe shutdown equipment will be conducted.</p> <p>c. Test of the as-built pumps will confirm pump flow capabilities.</p>	<p>1.</p> <p>a. The as-built Fire Protection System conforms to the basic configuration contained in the Design Description of Subsection 2.16.3 and Figure 2.16.3-1.</p> <p>b.1 Fire protection equipment meets the quality and seismic requirements, as shown in Table 2.16.3-1.</p> <p>b.2 Fire protection equipment for areas containing safe shutdown equipment is designed and installed to withstand the effect of SSE to remain functional during and after an SSE.</p> <p>c. Fire protection pumps will have the flow capabilities shown in Table 2.16.3-2.</p>

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2. The motor driven pump described in the Design Description for the Fire Protection System is powered from the non-Class 1E bus.	2. A test of the power availability to the motor driven pump described in the Design Description in Subsection 2.16.3 will be conducted with power supplied from the permanently installed electric power busses.	2. The motor driven pump described in the Design Description for the Fire Protection System receives power from non-Class 1E busses only.
3. Two water supplies one with a minimum volume of 3900 m ³ (1,030,000 gal) and another with a minimum volume of 2000 m ³ (550,000 gal) each are provided.	3. Inspection of the as-built water supply sources and volumetric calculations using as-built dimensions will be performed.	3. As-built water supply sources meet the volumetric requirements specified in the Certified Design Commitment.
4.a. The fire water pumps independently will provide their required flow at a pressure of 689 kPa gauge (100 psig) at the most hydraulically remote 65 mm (~2.5 in) hose connections station in the Reactor Building and Control Building. 4.b. Fire water pumps independently will provide their required flow at 448 kPa gauge (65 psig) at the most hydraulically remote 40 mm (1.57 in) hose station in the Reactor Building and Control Building.	4.a. A test of the flow rate and pressure from each pump will be conducted. 4.b. A test of the flow rate and pressure from each pump will be conducted.	4.a. The fire water pumps independently provide their required flow at a pressure of 689 kPa gauge (100 psig) at the most hydraulically remote 65 mm (~2.5 in) hose connections station in the Reactor Building and Control Building. 4.b. The fire water pumps independently provide their required flow at 448 kPa gauge (65 psig) at the most hydraulically remote 40 mm (1.57 in) hose station in the Reactor Building and Control Building.
5. No location within a fire area is more than [30.5 m (100 ft)] from a hose station.	5. Inspection of the as-built hose rack locations will be performed.	5. Standpipe and hose rack stations are located such that no location within a fire area is more than [30.5 m (100 ft)] from a hose station.

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. No safe shutdown equipment is more than [30.5 m (100 ft)] from two hose stations on separate standpipes.	6. Inspection of the as-built hose rack and safe shutdown equipment locations will be performed.	6. Standpipe, hose rack stations and safe shutdown equipment are located as such that no safe shutdown equipment is more than [30.5 m (100 ft)] from two hose stations on separate standpipes.
7.a Automatic fire suppression complying with NFPA 13 & 15 is provided for all electrical areas exceeding the combustible load limit of 1400 MJ/m ² . 7.b- Automatic fire suppression for all electrical areas exceeding the combustible load limit of 1400 MJ/m ² should comply with inspection and test of automatic logic as required by applicable NFPA standard.	7.a Inspections to assure that of all electrical areas, exceeding the combustible load limit of 1400 MJ/m ² , have automatic fire suppression, per NFPA 13 & 15. 7.b Inspection of as-built systems and testing of automatic logic under simulated fire condition will be conducted.	7.a Confirm that of all electrical areas, exceeding the combustible load limit of 1400 MJ/m ² , have fire suppression, per NFPA 13 & 15. 7.b For all electrical areas exceeding the combustible load limit of 1400 MJ/m ² , the automatic fire suppression system initiation logic is actuated under simulated fire conditions, per NFPA standard.
8.a Automatic fire suppression complying with NFPA 13 & 15 is provided for all non-electrical areas exceeding the combustible load limit of 700 MJ/m ² . 8.b- Automatic fire suppression for all non-electrical areas exceeding the combustible load limit of 700 MJ/m ² should comply with inspection and test of automatic logic as required by applicable NFPA standard.	8.a Inspections to assure that all non-electrical areas, exceeding the combustible load limit of 700 MJ/m ² , have fire suppression, per NFPA 13 & 15. 8.b Inspection of as-built systems and testing of automatic logic under simulated fire condition will be conducted.	8.a Confirm that of all non-electrical areas, exceeding the combustible load limit of 700 MJ/m ² , have fire suppression, per NFPA 13 & 15. 8.b For all non-electrical areas exceeding the combustible load limit of 700 MJ/m ² , the Automatic fire suppression system initiation logic is actuated under simulated fire conditions, per NFPA standard.

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. Automatic foam-water extinguishing systems are provided for the diesel generator and day tank rooms, per codes NFPA 11& 16.	9. Inspection of as-built systems and testing of automatic logic under simulated fire conditions will be conducted.	9. The automatic foam-water suppression systems exist and initiation logic is actuated under simulated fire conditions.
10. The fuel oil tanks for the diesel-driven fire pumps have sufficient capacity to allow diesel engine operation for a minimum of 8 hours as described in this Subsection 2.16.3.	10. a. Testing will confirm fuel consumption rates of the as-built diesel engines. b. Analysis will confirm the as-built fuel oil tank volume(s). c. Analysis will confirm that there is sufficient fuel oil tank volume for the diesel engines to operation for 8 hours.	10. The fuel oil tanks for the diesel-driven fire pumps have sufficient capacity to allow diesel engine operation for a minimum of 8 hours before refilling based upon the as built fuel tanks and fuel consumption rates and margin criteria provided in NFPA 24.
11. Control room indications and controls for the Fire Protection System are as defined in Subsection 2.16.3.	11. Inspections will be performed on the control room indications/displays and controls for the Fire Protection System. Tests of the displays and controls will be performed to assure that the displays and controls function properly.	11. Indications/displays and controls exist or can be retrieved in the MCR as defined in Subsection 2.16.3, and that the displays and controls function properly.
12. The fire water supply system shall be capable of supplying a total makeup flow rate of $\geq 46 \text{ m}^3/\text{hr}$ (200 gpm) to the IC/PCC and spent fuel pools.	12. A test of the flow rate from each pump will be conducted.	12. The fire water supply system pumps independently provide the flow and pressure specified in the Certified Design Commitment.

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>13. Fire Detection</p> <p>a. Local fire alarm panels supervise fire and smoke detectors.</p> <p>b. The local fire alarm panels are connected to the alarm MFAP via a dedicated data link.</p> <p>c. Transmitted signals include detector status (normal, alarm, supervisory, trouble) and local fire alarm panel status.</p> <p>d. Instrumentation for fixed and automatic fire suppression systems provides local and remote monitoring capabilities for the suppression system status.</p> <p>e. All instrumentation for automatically actuated fire suppression systems is either FM approved or UL listed, where available.</p>	<p>13.</p> <p>a. Tests will confirm that local fire alarm panels supervise each fire and smoke detector.</p> <p>b. Inspections will confirm that local fire alarm panels are connected to the alarm MFAP via a dedicated data link.</p> <p>c. Inspections will confirm that transmitted signals include detector status (normal, alarm, supervisory, trouble) and local fire alarm panel status.</p> <p>d. Tests of the fixed and automatic fire suppression system instrumentation confirm local and remote monitoring capabilities.</p> <p>e. Inspections will confirm that all instrumentation for automatically actuated fire suppression systems is either FM approved or UL listed.</p>	<p>13.</p> <p>a. Each fire and smoke detector is supervised by a local fire alarm panel.</p> <p>b. A dedicated data link connects the local fire alarm panels to the MFAP.</p> <p>c. Transmitted signals include detector status (normal, alarm, supervisory, trouble) and local fire alarm panel status.</p> <p>d. Fixed and automatic fire suppression system instrumentation have local and remote monitoring capabilities.</p> <p>e. All instrumentation for automatically actuated fire suppression systems is either FM approved or UL listed.</p>

2.16.3.1 Fire Barriers

Design Description

Fire barriers of 3-hour fire resistance rating are provided separating:

- Safety-related systems from any potential fires in nonsafety-related areas that could affect the ability of safety-related systems to perform their safety function.
- Redundant divisions or trains of safety-related systems from each other to prevent damage from a single fire.
- Components within a single safety-related electrical division that present a fire hazard to components in another safety-related division.

Penetrations through fire barriers are sealed or closed to provide fire resistance ratings at least equal to that of the barriers. Only noncombustible materials qualified per ASTM E-119 are used for construction of fire barriers. Fire dampers protect ventilation duct openings in fire barriers as required by NFPA 90A

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.16.3.1-1 provides a definition of the inspections, test and/or analyses, together with associated acceptance criteria, which will be undertaken for the Fire Barriers.

**Table 2.16.3.1-1
ITAAC For Fire Barriers**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. 3-hour fire barriers shall be installed in all locations listed in Subsection 2.16.3.1.	1. Inspections will assure 3-hour fire barriers are installed.	1. All locations listed in Subsection 2.16.3.1 are protected by 3-hour fire barriers.
2. Penetrations through fire barriers are sealed or closed to provide fire resistance ratings at least equal to that of the barriers.	2. Inspections will confirm that penetrations through fire barriers are sealed or closed to provide fire resistance ratings at least equal to that of the barriers.	2. Penetrations through fire barriers provide fire resistance ratings at least equal to that of the barriers.
3. Only noncombustible materials qualified per ASTM E-119 are used for construction of fire barriers.	3. Inspections of material records will confirm that Only noncombustible materials qualified per ASTM E-119 are used for construction of fire barriers.	3. Only noncombustible materials qualified per ASTM E-119 are used for construction of fire barriers
4. Fire dampers protect ventilation duct openings in fire barriers as required by NFPA 90A.	4. Inspections confirm that fire dampers in ventilation duct openings meet NFPA 90A.	4. Fire dampers in ventilation duct openings meet NFPA 90A.