HITACHI

**GE Hitachi Nuclear Energy**

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

MFN 08-197

Docket No. 52-010

March 6, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 140 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.5-69**

Enclosure 1 contains GEH's response to the subject RAI transmitted via Reference 1.

Should you have any questions about the information provided here, please contact me.

Sincerely,

R. E. Brown for/

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 08-031, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 140 Related to the ESBWR Design Certification Application,* January 11, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 140 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.5-69.

cc:

| | |
|---|---|
| AE Cubbage | USNRC (with enclosure) |
| RE Brown | GEH/Wilmington (with enclosure) |
| DH Hinds | GEH/Wilmington (with enclosure) |
| GB Stramback | GEH/San Jose (with enclosure) |
| eDRF | 0000-0080-5632, Revision 1 |

# Enclosure 1

# MFN 08-197

# Response to Portion of NRC Request for

# Additional Information Letter No. 140

# Related to ESBWR Design Certification Application

# Auxiliary Systems

# RAI Number 9.5-69

**NRC RAI 9.5-69**

*The diesel fuel oil system is not safety-related and has no safety-related design basis. However, it is identified as a system subject to regulatory treatment (regulatory treatment of non-safety systems, or RTNSS) with associated availability control requirements. Therefore, the staff requests the following additional information to complete its review.*

*A. Section 9.5.4.2 of the DCD states the fuel oil meets the requirements of ASTM D975 ("Standard Specification for Diesel Fuel Oils"). Since this standard is revised periodically and covers several grades of fuel, please identify the version of the standard and grade(s) of fuel in the DCD. If the intent is to use the most recent revision of the standard and only certain grades of fuel (e.g., those recommended by the manufacturer), please clarify this in the DCD.*

*B. Section 9.5.4.4 of the DCD states that periodic testing and inspection are performed at "regular intervals." Describe the tests performed, including test method, frequency, acceptance criteria, and corrective actions. Discuss your plans to include this information in the DCD.*

*C. For testing of both new fuel and stored fuel, explain the basis for any differences between the proposed testing program and the positions in Regulatory Guide 1.137.*

*D. COL item 9.5. 4-2-A addresses the material and corrosion protection for underground piping portion of the diesel fuel oil transfer system. Since the DCD does not state whether the fuel storage tanks can be located underground, discuss why corrosion protection for storage tanks was not included in this COL item. If any portion of the tanks can be located underground, please revise the COL Item 9.5.4-2-A to include the fuel storage tanks.*

**GEH Response**

A. As stated in DCD Tier 2, section 9.5.4.2, the fuel oil is required to meet the requirements of ASTM D975. The ESBWR is committed to ASTM D975, Rev C-04, 2004, Standard Specification for Diesel Fuel Oils. The revision was not specified because no revisions to ASTMs, RGs, etc. are specified in the body of the DCD. Revisions are specified in Tables in DCD Tier 2, Chapter 1. Revisions for ASTMs are specified in Table 1.9-22. These are commercial diesel generators and the manufacturer specifies different grades of fuel. Section 9.5.4.4 already states "The ASTM standard fuel sample tests are conducted at regular intervals to ensure compliance with fuel composition limits recommended by the diesel engine manufacturer." Different grades of fuel have different fuel composition limits and GEH does not believe additional clarification in the DCD is warranted.

B. These are commercial diesel generators and the manufacturer specifies periodic testing and inspection with recommended intervals. The development of

Operating and Maintenance Procedures on the basis of these recommendations is the responsibility of the COL Applicant (COL 13.5-2-A). Development of Operating and Maintenance Procedures for RTNSS systems, as described in Subsection 19A, are included within the scope of ESBWR HFE Procedure Development and Implementation Plan, NEDO-33274 (Reference 13.5-8). GEH is adding clarification to DCD Subsection 13.5.2 per response to RAI 9.2-11 S03 (MFN 08-187, February 29, 2008) that procedures for RTNSS systems are included within the scope of Regulatory Guide 1.33. ESBWR HFE Procedures Development and Implementation Plan (NEDO-33274) describes ESBWR compliance with RG 1.33 Rev. 2. No frequency, acceptance criteria, and corrective actions are provided for any other RTNSSs and there are no plans to include any specific testing or inspection requirements in Subsection 9.5.4 of the DCD at this time.

C. ESBWR is not committed to RG 1.137 (DCD Tier 2, Table 1.9-21) nor to SRP 9.5.4 (DCD Tier 2 Table 1.9-20) as the ESBWR is designed to shut down safely without reliance on offsite or diesel generator derived AC power. Vendor's recommendations and industry experience is used in developing applicable testing method, frequency, acceptance criteria and any necessary corrective actions. There is no plan to include this information in the DCD at this time.

D. The corrosion protection for storage tanks was not addressed in COL item 9.5.4-2 because the utility, when building the tanks, has to comply with the local, state and federal fuel oil storage tank requirements. These requirements ensure that corrosion protection of the tanks themselves is addressed. However, the DCD will be revised to document that corrosion protection for all of the underground portions of the fuel oil transfer system is provided.

**DCD Impact**

DCD Tier 2, Subsection 9.5.4 will be revised in Revision 5 as noted in the attached markups.

- Provide protection against contamination of the ground or ground water through failure of tanks or buried piping;
- The diesel engine is designed to be compatible with the use of low and ultra-low sulfur diesel fuel;
- Diesel Fuel tanks will be designed in accordance with State and Federal regulations for required berm holding requirements; and
- The Diesel Fuel tanks will provide fuel to the Auxiliary Boiler system and the diesel-engine driven Fire Protection System pump.

### *9.5.4.2 System Description*

**Summary Description**

A simplified diagram of a typical DG fuel oil system is provided as Figure 9.5-9. The diesel generator manufacturer supplies the design of the system from the fuel oil day tank to the engine.

The DG fuel oil system for each of the two engines consists of separate Fuel oil storage tanks, fuel oil day tanks, fuel oil transfer pumps, strainers/filters, oil purifier or tank connections for tying in a purification system, instrumentation and controls, and the necessary interconnecting piping and valves. The Diesel Generator Fuel Oil Storage and Transfer System design includes redundant fuel oil transfer pump trains and a duplex filter skid (two filter elements). The redundant fuel oil transfer pumps are supplied from separate electrical power supplies and physically separated to prevent loss of function.

The DG fuel oil system has piping connections to supply fuel to the Auxiliary Boiler system and diesel-engine driven Fire Protection System pumps.

**Detailed System Description**

There are two diesel generators, DG-A and DG-B, each housed in a separate enclosure in the Electrical Building adjacent to the Turbine Building. The units are identical and are held in reserve to furnish standby AC power in the event of Loss of Preferred Power (LOPP). Each DG has its own day tank, which holds sufficient fuel oil to operate its corresponding DG set for a minimum of 8 hours at full load. Each DG has its own storage tank, which holds sufficient fuel oil to operate its corresponding DG a minimum of 7 days without refueling. COL applicant will establish procedural controls to ensure a minimum fuel oil capacity is maintained onsite (9.5.4-1-A). Transfer pumps supply fuel oil to each day tank from the fuel oil storage tank. A bleed line returns excess fuel oil from the day tank for recirculation to the fuel oil storage tank.

An engine-driven fuel oil booster pump supplies fuel from the day tank to the diesel engine fuel manifold then to the engine fuel injector pumps and injectors. Day tank elevation is such that the engine fuel oil pump operates with flooded suction. There are no intermediate powered components to fail. A suction strainer limits foreign matter from entering the pump and causing malfunction.

Corrosion protection for underground ~~piping for~~portions of the fuel oil system is determined based on the ~~piping~~ material of the underground portion. If piping subject to corrosion, such as carbon steel piping, is utilized, corrosion protection for underground portions is provided. The

COL applicant shall describe the material and corrosion protection for the underground ~~piping~~ portion of the fuel oil transfer system (9.5.4-2-A).

A single DG can meet full site standby power demands. Fuel oil transfer system piping and components up to the engine skid connection are designed and constructed in accordance with industry standards and ASME B31.1, as applicable, for above ground piping runs. The underground piping portions is designed and constructed in accordance with the latest industry standards for buried pipe including provisions for corrosion protection . The diesel fuel oil storage and transfer systems are capable of supporting the start requirements of the diesel-generators (refer to Subsection 8.3.1). The stored fuel oil meets the requirements of the ASTM D975 "Standard Specification for Diesel Fuel Oils" and the requirements of the diesel engine manufacturer (see Subsection 9.5.4.6). The quality of the fuel oil used for the diesel engine is assured by routine testing. Similarly, the piping supplying the Auxiliary Boiler and Fire Protection systems meets the above requirements.

The DG fuel oil system has piping connections to supply fuel to the Auxiliary Boiler system. The piping connections for the auxiliary boiler tie into the diesel oil storage tank at an elevated nozzle connection. This location ensures that fuel stored below this level is not be affected by Auxiliary Boiler or Fire Protection system usage. This ensures the 7 days Diesel Fuel Oil storage requirements cannot be used for any other purposes.

**System Operation**

Transfer pumps supplying fuel oil to the day tanks from the yard tanks can be operated manually; however, level sensors on the day tanks normally operate them automatically. A "low" level signal starts the first transfer pump, a "low-low" level signal starts the standby transfer pump and a "high" level signal stops both pumps. The engine-driven fuel oil pump supplies fuel to the diesel engine fuel manifold from the day tank. Administrative controls ensure a minimum of fuel oil capacity is maintained onsite at all times.

### *9.5.4.3 Safety Evaluation*

The DG and its auxiliary systems are not safety-related, and are not credited in any safety analysis. The storage tanks are located at a sufficient distance away from other plant buildings or buildings are protected with 3-hr rating barriers. The fuel oil day tank is located in a separate room with 3-hr fire rated concrete walls. Corrosion protection is provided for underground fuel oil piping. To prevent any fuel oil contamination during storage, biocides and other fuel additives are added, as required, to the stored fuel oil to prevent deterioration, accumulation of sludge in the tank, and the growth of algae and fungi. The design incorporates either a fuel oil purification system or tank connections for periodic hookup to a fuel oil purification system. This prevents tank contamination and thus ensure the diesel oil storage tank maintains the fuel at the desired quality.

### *9.5.4.4 Tests and Inspections*

The DG fuel oil storage and transfer system permits periodic testing and inspection.

DG fuel oil storage and transfer system functionality is demonstrated during the regularly scheduled operational tests of the DG. Periodic testing of instruments, controls, sensors and alarms assures reliable operation.

The ASTM standard fuel sample tests are conducted at regular intervals to ensure compliance with fuel composition limits recommended by the diesel engine manufacturer. The design incorporates the use of either a fuel oil purification system or tank connections to tie in a site portable purification system. This is to ensure the diesel oil storage tank maintains the fuel at the desired quality.

Each fuel oil storage tank is emptied and accumulated sediments are removed every 10 years to conform to Federal and State examination requirements.

New fuel oil is tested for specific gravity, cloud point and viscosity and visually inspected for appearance prior to addition to ensure that the limits of ASTM D975 are not exceeded. Analysis of other properties of the fuel oil is completed within thirty days of the receipt of the new fuel.

#### *9.5.4.5 Instrumentation Requirements*

Fuel supply levels in the storage and day tanks are indicated locally and in the Main Control Room (MCR). Also, alarms on the local DG panel annunciate low level and high level in the day tanks. The setting of the low level alarm provides fuel for at least 60 minutes of DG operation at 100% load with 10% margin between the alarm and when the suction line inlet level sensors in the day tank signal automatic start of the first fuel oil transfer pump.

#### *9.5.4.6 COL Information*

#### *9.5.4-1-A Fuel Oil Capacity*

COL applicant will establish procedural controls to ensure a minimum fuel oil capacity is maintained onsite.

#### *9.5.4-2-A Protection of Underground Piping*

The COL applicant shall describe the material and corrosion protection for the underground ~~piping~~ portion of the fuel oil transfer system.

#### *9.5.4.7 References*

9.5.4-1 ASME B31.1, "Power Piping"

9.5.4-2 ASTM D975, "Standard Specification for Diesel Fuel Oils"

### 9.5.5 Diesel Generator Jacket Cooling Water System

#### *9.5.5.1 Design Bases*

**Safety (10 CFR 50.2) Design Bases**

The DG jacket cooling water system is not safety-related and has no safety design basis.

The diesel generator jacket cooling water system has Regulatory Treatment of Non-Safety Systems (RTNSS) functions as a supporting system to provide power. Performance of RTNSS functions is assured by applying requirements for Category B2 RTNSS as described in Section 19A.8.3.

**Power Generation Design Bases**

A separate jacket cooling water system supplies each DG.