Enclosure 1

MFN 15-024

GEH Response to RAI 06.03-1

NRC Request for Additional Information 06.03-1:

10 CFR 52.59(a) (2014) requires, in pertinent part, a finding of compliance with the regulations in effect at the time of original certification in order to issue a renewed design certification.

10 CFR 50.46 (1997) requires that the emergency core cooling system (ECCS) be designed to meet five criteria, one of which is to provide long-term cooling capability of sufficient duration following a successful system initiation so that the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core (10 CFR 50.46(b)(5)). The ECCS should be designed to meet this criterion, assuming the worst single failure. Experience gained from operating events, experiments, and detailed analysis demonstrate that excessive buildup of debris from thermal insulation, chemical precipitates, corrosion products, and other particulates on ECCS pump strainers is highly likely to occur, creating the potential for a common-cause failure of the ECCS, which could prevent the ECCS from providing long-term cooling following a loss-of-coolant accident.

During operation of the ECCS following a loss-of-coolant accident, debris with sizes smaller than the hole size of ECCS pump suction strainers could pass through the strainers and reach downstream components (such as pumps, valves, orifices, and heat exchangers) and the reactor core. The potential downstream effects include wear and clogging of components, blockage of coolant flow through the core, and deposition of debris on fuel rods, all of which could impact the plant's core cooling capability. Testing performed since the ABWR design was certified has demonstrated that small amounts of fibrous debris combined with particulate debris can effectively clog ECCS suction strainers. This testing indicates that debris quantities similar to those listed in the certified design can challenge ECCS functioning.

The ABWR DCD does not restrict the types of insulation used in the containment. As such, the ABWR design has no limitations on using insulations which are prone to cause significant head loss on strainers (e.g., calcium silicate). Further, experience gained from reactor design reviews since the ABWR design was certified, including testing and detailed analyses of in-vessel effects, demonstrates that buildup of debris within the core may impede reactor coolant flow into the fuel assemblies, which in turn could adversely impact long term core cooling. Therefore, the NRC staff is concerned that the GE-Hitachi ABWR DC renewal application does not demonstrate that the ECCS provides long term cooling of the reactor core, as required by 10 CFR 50.46(b)(5), which was applicable and in effect at the time the design certification was issued.

In accordance with 10 CFR 52.59(a) (2014), provide information showing that the ECCS suction strainer design complies with 10 CFR 50.46(b)(5) (1997).

Regulatory Guide 1.82, Revision 4, “Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," provides an acceptable method of ensuring compliance with 10 CFR 50.46(b)(5).

GEH Response to RAI 06.03-1:

Since the original ABWR certification, there have been advances in the industry's understanding of debris loading on ECCS suction strainers during a LOCA. Appendix 6C of the ABWR DCD describes the design features that help mitigate the effects of suppression pool debris accumulation during normal operation and during a LOCA. The ABWR DCD will be updated to make necessary clarifications to reflect updates in the design, and debris loading methodology, as shown on the attached markups. The DCD also will be updated to comply with the guidance of Regulatory Guide 1.82 Revision 3, and to reference the guidance of Utility Resolution Guidance for ECCS Suction Strainer Blockage (NEDO-32686-A).

In regards to concerns related to chemical effects (precipitates, corrosion products, etc.) and downstream effects (debris obstructing piping, equipment, and core flow), additional research and testing is recommended to ensure these phenomena are properly understood. A test program is currently being performed by the BWR Owner's Group in collaboration with the NRC. The results of this testing will be an important factor in determining the bounding worst-case conditions the ECCS suction strainers must be designed to accommodate.

Therefore, to ensure these test results can be included in the strainer design, a COL Information Item will be added to the DCD for the COL Applicant to complete an evaluation of the ECCS strainer for chemical and downstream effects to successfully demonstrate their ability to provide long term cooling in accordance with 10 CFR 50.46(b)(5).

Impact on DCD for GEH Response to RAI 06.03-1:

The following GEH ABWR DCD, Tier 2, sections will be revised as shown on the attached markup (Enclosure 2):

- Table 1.6-1: Add reference to report NEDO-32686-A,
- Table 1.8-20: Update line for Regulatory Guide 1.82 to reflect Revision 3,
- Table 1.8-22: Added references to GL 97-04 and 98-04,
- Table 1.9-1: Added COL Information Item, and
- Section 6C: Content added/revised to reflect updates in strainer design, and a new COL Information Item to evaluate chemical and downstream effects.