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Proprietary Notice
This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 1, the balance of this letter may be considered non-proprietary.

MFN 08-414, Supplement 3

Docket No. 52-010

May 6, 2009

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

Subject: **Response to NRC Request for Additional Information Letter No. 327 Related to the ESBWR Design Certification Application - Reactor Water Clean-Up/Shutdown Cooling System - RAI Number 5.4-59 S03**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter No. 327, Reference 1.

The GEH response to RAI Number 5.4-59 S03 is addressed in Enclosures 1 and 2. Enclosure 1 contains GEH proprietary information as defined by 10 CFR 2.390. GEH customarily maintains this information in confidence and withholds it from public disclosure. Enclosure 2 is a non-proprietary version that is suitable for public disclosure.

Enclosure 3 contains DCD non-proprietary markups.

The affidavit contained in Enclosure 4 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GEH. GEH hereby requests that the information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 09-262, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application*, dated April 13, 2009

Enclosures:

1. Response to NRC Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application – Reactor Water Clean-Up/Shutdown Cooling System - RAI Number 5.4-59 S03 – GEH Proprietary Information

2. Response to NRC Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application – Reactor Water Clean-Up/Shutdown Cooling System - RAI Number 5.4-59 S03 – Public Version

3. Response to NRC Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application – Reactor Water Clean-Up/Shutdown Cooling System - RAI Number 5.4-59 S03 – DCD Markups

4. Response to NRC Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application – Reactor Water Clean-Up/Shutdown Cooling System - RAI Number 5.4-59 S03 – Affidavit

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF Section	0000-0101-3380

Enclosure 2

MFN 08-414, Supplement 3

Response to NRC Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application Reactor Water Clean-Up/Shutdown Cooling System

RAI Number 5.4-59 S03

Public Version

NRC RAI 5.4-59 S03:

The staff reviewed GEH's response to 5.4-59S02 and GEH's proposed changes to Section 5.4 of the DCD. These DCD changes clearly outline the analytical lower limit of the shutdown cooling core circulation path and the need to prevent thermal stratification by maintaining proper water level. However, a discussion of the performance of the RWCU/SDCS including the potential for core bypass and inadequate mixing has not been addressed in the DCD. Instead, the DCD only mentions that spilled water from the separators mixes with the incoming colder shutdown water (through the feedwater nozzle) in the upper downcomer and the mixture flows down. GEH is requested to provide a discussion in the DCD outlining why core bypass and inadequate mixing are not potential concerns given specific design details (including the feedwater sparger and locations and orientations of the nozzles).

GEH is also requested to evaluate and clarify the description of the RWCU/SDCS performance as stated in NEDO-33201 Revision 3 Section 16.3.1.1 and in Chapter 5.4 of the DCD, since the ability for one train of RWCU/SDCS to keep the core from boiling is a key RTNSS assumption.

GEH Response:

The thermal-hydraulic uncertainty of mixing completeness for the naturally circulating vessel flow and the RWCU/SDC cooled return flow was discussed in response to question (E) of RAI 5.4-59 (MFN 08-414). Additional discussion on flow mixing was provided in response to question (b) of RAI 5.4-59 Supplement 01 (MFN 08-414, Supplement 1). In addition, in response to question (C) of RAI 5.4-59 Supplement 02, GEH has provided detailed vessel modeling information for the NRC staff's use (MFN 08-414, Supplement 2).

Additional study of the relationship between the mixing factor (previously discussed in the response provided by MFN 08-414, Supplement 1) and the RWCU/SDC system flow rate has been performed to address the sensitivity of the SDC function to flow mixing. The preliminary study results show the following:

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The design bases for the RWCU/SDC system stated in DCD T2 Subsection 5.4.8.2.1, include that the RWCU/SDC system, along with use of ICS, shall be capable of achieving reactor cold shutdown condition in 36 hours assuming the most restrictive single active failure. As the tabulated results above show, increasing the SDC flow rate increases the tolerance for incomplete mixing due to the partial short-cycling of SDC return flow back to SDC supply flow. Additional cool down time also increases the tolerance for incomplete mixing due to short-cycling of SDC return flow. Based on the current Revision 5 DCD description, and the DCD changes made as part of the prior RAI responses, GEH's position is that while the cooling and vessel circulation flows mixing may be incomplete at the point the supply flow for RWCU/SDC is drawn, the design bases of RWCU/SDC and the interfacing systems require and assure that the mixing is always adequate.

GEH will provide additional discussion in Revision 6 to the DCD on the shutdown cooling function of the RWCU/SDC system to address the issue of flow mixing more completely, taking into consideration all of the questions posed.

The description of RWCU/SDC performance is being clarified in NEDO-33201, Revision 4, Subsection 16.3.1.1.

<u>DCD/NEDO-33201 Impact</u>:

DCD Tier 2, Rev. 5, Subsection 5.4.8 will be revised as noted in the attached markup.

Changes to NEDO-33201, Subsection 16.3.1.1, will be provided in NEDO-33201, Rev. 4.

Enclosure 3

MFN 08-414, Supplement 3

Response to NRC Request for Additional Information Letter No. 327 Related to ESBWR Design Certification Application Reactor Water Clean-Up/Shutdown Cooling System

RAI Number 5.4-59 S03

DCD Markups

Resin breakthrough to the reactor is prevented by a strainer in the demineralizer outlet line to catch the resin beads. Non-regeneration type resin beads are used, minimizing the potential for damaged beads passing through the strainer to the reactor. The demineralizer is protected from high pressure differential by a bypass valve. The demineralizer is protected from excessive temperature by automatic controls that first open the demineralizer bypass valve and then close the demineralizer inlet valve.

Resin bed performance is monitored as described in Subsection 9.3.2. When it is desired to replace the resin, the resin vessel is isolated from the rest of the system before resin addition.

The resin transfer system is designed to prevent resin traps in sluice lines. Consideration is given in the design to avoid resins collecting in valves, low points or stagnant areas.

Interlocks are provided to prevent inadvertent opening of the demineralizer resin addition and backflushing valves during normal operation.

Pumps — The RWCU/SDC low and high-capacity pumps overcome piping and equipment head losses and feedwater line backpressure and return the treated water to the reactor through the feedwater lines.

The continuous minimum flow rate recommended by the vendor is less than the minimum flow through the pumps during any of their respective operating modes.

The pumps meet the minimum net positive suction head requirement for all operating modes.

Pumps are protected from damage by foreign objects during initial startup by temporary startup suction strainers.

Adjustable Speed Drive — The RWCU/SDC pumps are each powered from an ASD. The ASDs receive ~~480V~~ electrical power at constant AC voltage and frequency. The ASDs convert this to a variable frequency and voltage in accordance with a demand signal. The variable frequency and voltage is supplied to vary the speed of the pump motor. The ASD ~~allows effective~~assists the control of cooldown rate, and reactor temperature after cooldown.

Regenerative Heat Exchanger—Each RHX is used to recover sensible heat in the reactor water to reduce and recycle the heat loss and avoid excessive thermal stresses and thermal cycles of the feedwater piping. Thermal relief valves are provided on both the shell and tube sides of the RHX.

Non-Regenerative Heat Exchanger—Each NRHX cools the reactor water by transferring heat to the Reactor Component Cooling Water System (RCCWS).

The maximum allowed cooling water outlet temperature from the NRHX is 60°C (140°F). Thermal relief valves are provided on the tube side of the NRHX. Shell side relief valves are also provided and sized on the basis of a tube leakage equivalent to 10% of the tube side flow. These valves can relieve shell side pressure in the event that shell side valves are closed and the tube side flow continues.

Isolation Valves — Only the containment isolation valves and piping perform a safety-related function. Refer to Subsection 6.2.4 for isolation valve descriptions.

Both the mid-vessel and bottom head suction lines contain valves which provide diversity of isolation in the unlikely event of a break outside containment. These valves receive automatic

5.4.8.2.1 Design Bases

Safety Design Bases

Refer to Subsection 5.4.8.1.1 for the safety design bases.

Power Generation Bases

The shutdown cooling mode of the RWCU/SDC system is designed to:

- Remove decay heat during normal plant shutdowns;
- Remove the core decay heat, plus overboard the CRD cooling flow after approximately one-half hour following control rod insertion and assuming either the main condenser or ICS is available for initial cooldown; and
- With loss of preferred off-site AC power, bring the plant to cold shutdown in 36 hours in conjunction with the ICS, assuming the most restrictive single active failure.

The RWCU/SDC shutdown cooling function modes are interlocked with reactor power operation to prevent increase in core reactivity (Subsection 5.4.8.1.1).

Post-LOCA Bases

In the unlikely event that fuel damage has occurred, the post-LOCA shutdown cooling mode of the RWCU/SDC system is designed to:

- Bring the plant to cold shutdown, and maintain cold shutdown conditions, through realignment of the intersystem cross connection and the applicable intrasystem cross-connections to the FAPCS;
- Achieve and maintain plant cold shutdown conditions through the suppression pool cooling (with support of portions of the FAPCS), and the mid-vessel injection modes of operation; and
- With the support of portions of the FAPCS, deliver cooled water for drywell spray, GDCS pools makeup, or suppression pool makeup.

The RWCU/SDC system is not intended to satisfy GDC 38 requirements. The GDC 38 functional requirements are met by the containment PCCS heat exchangers for the first 72 hours. After the first 72 hours, refilling of the PCCS pools and the PCCS Vent Fans maintain stable shutdown conditions, indefinitely.

5.4.8.2.2 System Description

In conjunction with the heat removal capacity of either the main condenser and/or the isolation condensers, the RWCU/SDC system can reduce the RPV pressure and temperature during cooldown operation from the rated design pressure and temperature to below boiling at atmospheric pressure in less than one day (see Table 5.4-3). The system is also designed to control the reactor temperature reduction rate.

The system can be connected to nonsafety-related standby AC power (diesel-generators), allowing it to fulfill its reactor cooling functions during conditions when the preferred power is not available.

The shutdown cooling function of the RWCU/SDC system provides decay heat removal capability at normal reactor operating pressure as well as at lower reactor pressures.

The redundant trains of RWCU/SDC permit shutdown cooling even if one train is out of service; however, cooldown time is extended when using only one train.

In the event of loss of preferred power, the RWCU/SDC system, in conjunction with the isolation condensers, is capable of bringing the RPV to the cold shutdown condition in a day and a half, assuming the most limiting single active failure, and with the isolation condensers remove the initial heat load. Refer to Subsection 5.4.8.1.2 for a description of the RWCU/SDC pump motor ASD and its operation for shutdown cooling.

In the event of a severe accident resulting in fuel failure, train A of the RWCU/SDC system can be cross-connected to the FAPCS suppression pool suction and the FAPCS containment cooling line to provide containment cooling capabilities. This will allow containment cooling while maintaining the contaminated water inside the reactor building. In this condition the RWCU/SDC system has the capability to return cooled suppression pool water to the reactor vessel through the RWCU mid-vessel suction to preclude using the feedwater injection flowpath, which exits the reactor building.

System Operation

The modes of operation of the shutdown cooling function are described below:

Normal Plant Shutdown — The operation of the RWCU/SDC system at high reactor pressure reduces the plant reliance on the main condenser or ICS. The entire cooldown is controlled automatically. During the initial phase of reactor shutdown, the RWCU/SDC pumps operate at reduced speed with the pumps and system configuration aligned to provide a moderate system flow rate and control the cooldown rate to less than the maximum RPV cooling rate allowed. One or both trains of RWCU/SDC may be operated during the early phase of reactor shutdown and cooldown. As cooldown proceeds and RWCU/SDC removes a larger portion of the reactor decay heat, ~~temperatures are reduced~~, ~~pump speeds are increased and various bypass valves are opened, as described below. During the early phase of shutdown, the RWCU/SDC pumps operate at reduced speed to control the cooldown rate to less than the maximum allowed RPV cooling rate~~total RWCU/SDC system flow is increased.

~~In order to maintain less than the maximum allowed RPV cooling rate, both RWCU/SDC trains are placed into operation early during the cooldown, but with the pumps and system configuration aligned to provide a moderate system flow rate. The flow rate for each train is gradually increased as RPV temperature drops. To accomplish this,~~ I~~i~~n each RWCU/SDC train, the bypass line around the RHX, and the bypass line around the demineralizer are opened to permit increased pump speed and obtain the quantity of system flow required ~~for the ending~~ to achieve the process state needed during ~~condition of~~ the shutdown cooling mode. Flow continues through ~~the~~ each in-service RWCU/SDC NRHX, ~~of both RWCU/SDC trains~~ with the capability of controlling the RCCWS inlet valve to increase, or decrease cooling water flow as necessary.

The RWCU/SDC design assumes that during normal shutdown operation, the RPV water level is raised and maintained sufficiently above the first stage water spillover of the steam separators. The design assumes that water rising from the core is returned to the vessel annulus through passages provided in the steam separator assembly, and this minimum level assumption is to ensure vessel natural circulation through the reactor core. A loss of coolant level just below the first stage spillover level will not cause the RWCU/SDC system to trip, but results in shutdown cooling circulation flow only from and return flow back to the vessel downcomer region until vessel level is restored. Instrumentation (below, subsection 5.4.8.2.5) and pump controls (above, subsection 5.4.8.1.2) provide protection for the RWCU/SDC system components in the event of a significant loss of RPV coolant level. To avoid entering a thermal stratification condition, it is expected based on existing BWR operating experience (refer to Section 18.3) that the plant is operated (see also Sections 13.5 and 18.9) with reactor vessel water level sufficiently above the minimum level assumption during use of RWCU/SDC system in the shutdown cooling mode.

The spillover water from the separators begins to mix with the incoming cooler shutdown water (entering through the feedwater nozzle) in the upper downcomer region around the separator standpipes, and the mixing flows descend down the vessel annulus and into the vessel lower head region. Inside the core shroud, thermal convection currents driven by decay heat from the fuel elements rise vertically through the fuel assembly channels, the chimney partitions and the separator standpipes with minimal cross-flow currents due to the structure of the vessel internals (see Figure 5.1-1). Total vessel circulation is dependent on the core decay power and the relative density increase of the condensate in the upper and annular downcomer regions effected by the mixing with the cooler return flow provided by RWCU/SDC. Shutdown cooling supply water flows from the reactor vessel through one or both of the mid-vessel RWCU/SDC nozzles and to the in-service RWCU/SDC train NRHX, where decay heat is removed, and pumped back through one or both feedwater lines (refer to Figure 5.3-3).

Temperature is sensed from the RWCU/SDC supply and return flows (equivalently, the NRHX primary inlet and outlet flow temperatures), and from below the lower core plate, permitting determination of the vessel recirculation state and the rate of decay heat removal. Based on knowing core decay power and the heat transfer characteristics of the core, the temperature rise across the core for natural convection currents can be analytically estimated. The RWCU/SDC supply and return temperatures along with the RWCU/SDC flow provide a direct means to calculate decay heat removed, and comparison to the known state of core decay power. RWCU/SDC supply flow temperature may be compared to the core inlet temperature, as measured by the below lower core plate temperature sensors, to evaluate the relative degree of mixing of the separator spillover flow and RWCU/SDC return flow.

Complete mixing is assumed in the design evaluation of NRHX sizing. Operation of RWCU/SDC for decay heat removal is not dependent upon complete mixing of the spillover and SDC return flows in the upper downcomer region. Flow mixing may be incomplete when the circulating vessel mass reaches the mid-vessel nozzle(s), but the design assures that mixing is never less than adequate to achieve the design decay heat removal and core cooldown requirements.

In addition, the RWCU/SDC pump flow and NRHX cooling capacity, and their associated controls, are designed to limit the temperature difference between the supply and return flows to minimize the potential for thermal cycling stress load on any component or weld of the vessel due to less than complete mixing in the upper downcomer region. This assures that cyclic loading experienced during normal RWCU/SDC operation, regardless of incomplete mixing, does not adversely impact vessel design loading limits.

The automatic reactor temperature control function ~~controls the~~ regulates each ASD, controlling the cooldown by gradually increasing the speed of the system pumps up to the maximum pump flow. Water purification operation is continued without interruption.

~~Over~~ In the final ~~part~~ phase of the cooldown, maximum flow is developed through the RWCU/SDC ~~pumps~~trains. After about two weeks, flow rate reduction becomes possible while maintaining reactor coolant temperatures within target temperature ranges.

CRD System flow is maintained to provide makeup water for the reactor coolant volume contraction that occurs as the reactor is cooled down. The CRD system also provides a purge flow during normal plant power operation and during shutdown cooling operation to each RWCU/SDC pump for cooling and preventing contaminant instrusion.~~The RPV water level during normal shutdown operation is maintained above the first stage water spill of the steam separators. This is to ensure natural circulation through the reactor core. The spilled water from the separators mixes with the incoming colder shutdown water (through the Feedwater nozzle) in the upper downcomer, and the mixture flows down. Hotter shutdown water (through the RWCU/SDC nozzle) returns to the NRHX in order to remove the decay heat.~~

The RWCU/SDC system overboarding line is used for fine level control of the RPV water level as needed.

Hot Standby — During hot standby the RWCU/SDC system may be used as required in conjunction with the main or isolation condenser to maintain a nearly constant reactor temperature by processing reactor coolant from the reactor bottom head and the mid-vessel region of the reactor vessel and transferring the decay heat to the RCCWS by operating both RWCU/SDC trains and returning the purified water to the reactor via the feedwater lines.

The pumps and the instrumentation necessary to maintain hot standby conditions are connectable to the Standby AC Power supply during any loss of preferred power.

Refueling — The RWCU/SDC system can be used to provide additional cooling of the reactor well water when the RPV head is off in preparation for removing spent fuel from the core.

Operation Following Transients— In conjunction with the isolation condensers, one-half hour after control rod insertion, the RWCU/SDC system has the capability of removing core decay heat and overboarding excess makeup due to the CRD purge flow.

If the reactor is in the "run" mode of operation, a shutdown caused by an isolation event causes the ICS to activate. Assuming the most restrictive single active failure, any number of the Isolation Condensers can be valved-out by the operator in order to provide easier pressure and water regulation of the RWCU/SDC system.

Post-LOCA Shutdown (With Fuel Failure) — The preferred method of reaching and maintaining cold shutdown after a LOCA is the FAPCS. In the unlikely event there has been a fuel failure, the RWCU/SDC system will be utilized. For this mode of operation, the RWCU/SDC system requires manual realignment of cross-connections with the FAPCS. Each cross-connection contains spectacle flanges and closed manual isolation valves. These provisions preclude the possibility of intersystem LOCA during normal modes of operation. There is also an intersystem cross-connection, which must be realigned for mid-vessel injection.

The NRHX provides the heat removal capacity to sufficiently cool the plant from stable shutdown conditions to cold shutdown conditions (Table 5.4-3).

5.4.8.2.3 Safety Evaluation

The RWCU/SDC system does not perform or ensure any system level safety-related function, and thus, is classified as nonsafety-related.

Refer to Subsection 5.4.8.1.3 for an evaluation of the safety-related containment isolation, and instrumentation for pipe break detection outside the containment functions of the RWCU/SDC system.

Loss of RWCU/SDC function due to vessel level decrease below the first stage spilloever level would result in heatup and expansion of the vessel coolant inventory inside the shroud. A minor decrease in level due to thermal contraction from cooldown is, therefore, self correcting. Loss of decay heat removal due to a more significant decrease in vessel level is bounded by the evaluation of a total loss of RWCU/SDC function provided in Subsection 15.2.2.9, and by the evaluation of the spectrum of postulated LOCA events described in Section 6.3.

5.4.8.2.4 Testing and Inspection Requirements

Refer to Subsection 5.4.8.1.4 for the testing and inspection requirements for the RWCU/SDC system.

5.4.8.2.5 Instrumentation

Each pump is protected from potential cavitation during the shutdown cooling mode by a speed runback set to actuate if the RPV water level falls to Level 3. RWCU/SDC system instrumentation is described in Subsection 7.4.3. The shutdown cooling mode of the RWCU/SDC has an automatic temperature control function that controls the speed of the ASDs to control the coolant temperature as measured by the core inlet thermocouples during the shutdown operation.

Instruments monitoring the temperature of the RCCWS water leaving the NRHX also automatically control the RWCU/SDC system flow by adjusting the pump speed in the event the RCCWS outlet temperature from the NRHX rises above limit.

5.4.9 Main Steamlines and Feedwater Piping

5.4.9.1 Design Bases

Safety Design Bases

The main steam and feedwater lines are designed to:

- Withstand the stresses from internal pressures, safe shutdown earthquake (SSE) loads, DBA loads, hydrodynamic loadings, reactions from discharging SRVs and SVs (for the main steamlines), loads from fast closure of the turbine stop and/or control valves (for the main steamlines), and waterhammer loads (for the feedwater lines); and
- Provide for long-term leak-tight isolation of the RPV and the containment.

Table 5.4-3

Reactor Water Cleanup/Shutdown Cooling System Data

Number of trains:	Two
Demineralizer type:	Mixed bed
Demineralizer Capacity (minimum % of rated feedwater system flow per train):	1
Flow rate per train in Cleanup Mode (one train operation):	116 m^3/hr (510.7 gpm)
RWCU/SDC shell side RHX exit temperature in Cleanup Mode:	Approximately 226.7°C (440°F)
Maximum allowed cooling water outlet temperature from the NRHX when operated in the shutdown, startup, hot standby, isolation event or overboarding (i.e., dumping water to the main condenser or to the radwaste system) modes:	60°C (140°F)
Flow, through the bottom head connections during heatup and startup operations to prevent thermal stratification (two train operation):	181.6 m^3/hr (800 gpm)
RWCU/SDC flow rate (after heatup) (two train operation):	181.6 m^3/hr (800 gpm)
Approximate flow, during the initial heatup, overboarded to the main condenser (two train operation):	363.2 m^3/hr (1600 gpm) maximum 181.6 m^3/hr (800 gpm) minimum
Approximate maximum flow, during startup overboarded to the main condenser:	112.2 m^3/hr (494.2 gpm)

Table 5.4-3

Reactor Water Cleanup/Shutdown Cooling System Data

The combined minimum system process flow range from the bottom drain line and the RPV mid-region nozzle suction line (per train):	90.8 m^3/hr (400 gpm) to 682.6 m^3/hr (3005.5 gpm)
RWCU/SDC shutdown cooling design ~~maximum~~ mininum full flow rate (two train operation):	1365.2 m^3/hr (6011 gpm)
RWCU/SDC system shutdown cooling function heat removal capacity ~~(two train operation)~~:	55.4 MWt (189.2 MBtu/hr)
From the rated design pressure and temperature, in conjunction with the heat removal capacity of either the main condenser and/or the isolation condensers, the time to cool down the reactor coolant temperature to: - 60°C (140°F) - 54°C (130°F) - 49°C (120°F)	 24 hours 40 hours 96 hours
Non-regenerative Heat Exchanger Capacity (K value) required for long term Post-LOCA containment cooling:	4.6E+05 J/sec °C (8.7E+05 Btu/hr °F)

Enclosure 4

MFN 08-414, Supplement 3

Response to NRC Request for
Additional Information Letter No. 327
Related to ESBWR Design Certification Application
Reactor Water Clean-Up/Shutdown Cooling System

RAI Number 5.4-59 S03

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, David H. Hinds, state as follows:

(1) I am Manager, New Units Engineering, GE Hitachi Nuclear Energy ("GEH"), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in enclosure 1 of GEH's letter, MFN 08-414, Supplement 3, Mr. Richard E. Kingston to U.S. Nuclear Energy Commission, entitled "*Response to NRC Request for Additional Information Letter No. 327 – Related to ESBWR Design Certification Application – Reactor Water Clean-up/Shutdown Cooling System - RAI Number 5.4-59 S03,*" dated May 6, 2009. The proprietary information in enclosure 1, which is entitled "*Response to NRC Request for Additional Information Letter No. 327 – Related to ESBWR Design Certification Application – Reactor Water Clean-up/Shutdown Cooling System - RAI Number 5.4-59 S03 – GEH Proprietary Information,*" is delineated by a [[dotted underline inside double square brackets{3}]]. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GEH's design and licensing methodology. The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost to GEH.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's

comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 6th day of May 2009.

David H. Hinds
GE-Hitachi Nuclear Energy Americas LLC