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Subject: Response to Portion of NRC Request for Additional Information Letter No. 79 - Containment Isolation Design - RAI Numbers 6.2-119 S01 and 6.2-121 S01

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAIs originally transmitted via the Reference 1 letter and supplemented by NRC requests for clarification in Reference 2.

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

Sincerely,

Kathy Sedney for

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NRO

References:

1. MFN 06-393, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application*, October 11, 2006
2. E-Mail from Shawn Williams, U.S. Nuclear Regulatory Commission, to George Wadkins, GE Hitachi Nuclear Energy, dated May 30, 2007 (ADAMS Accession Number ML071500023)

Enclosure:

1. MFN 06-474 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 79 - Related to ESBWR Design Certification Application - Containment Isolation Design - RAI Numbers 6.2-119 S01 and 6.2-121 S01

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Enclosure 1

MFN 06-474 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 79

Related to ESBWR Design Certification Application

Containment Isolation Design

RAI Numbers 6.2-119 S01 and 6.2-121 S01

NRC RAI 6.2-119 S01:

The containment isolation provisions of the isolation condenser condensate, venting, and purge lines consist of one barrier (a closed system) outside containment and two CIVs inside containment. RAI 6.2-119 stated that this design did not comply with the explicit requirements of GDC 55 or GDC 56, and was inconsistent with the guidelines of the appropriate guidance documents (SRP 6.2.4, Rev. 2; RG 1.141; and national standard ANS-56.2/ANSI N271-1976) for alternate means for complying with GDC 55 or GDC 56. These GDC allow alternate isolation provisions, other than their explicit requirements, if "it can be demonstrated that the containment isolation provisions for a specific class of lines, such as instrument lines, are acceptable on some other defined basis." The guidance documents define other acceptable bases.

The applicant's response stated that, effectively, the isolation condenser system (ICS) has three barriers (one outside and two inside containment) and goes "beyond the requirements" in GDC 55 and 56.

Supplemental Request:

The explicit requirements of GDC 55 and 56 are to have one CIV inside and one CIV outside containment. If a containment penetration had, for example, two CIVs inside and one CIV outside containment, or one CIV inside containment, one CIV outside containment, and a closed system outside containment, then it would clearly and simply go beyond the requirements of the GDC. However, one cannot simply add up the number of containment isolation barriers and conclude that three must be better than two. It depends on the configuration. For example, three CIVs inside containment, and none outside, does not satisfy the explicit requirements of the GDC because there is no valve outside containment. It would also not be in accordance with the guidance documents.

Containment isolation design philosophy, as set forth in the regulations and the guidance documents, requires redundant isolation barriers such that no single failure of a pipe or valve can disable the isolation function. Even passive failures are implicitly considered in the design provisions. For example, one locked-closed manual isolation valve on a penetration is not enough, even though no active failure could cause it to fail; a second, redundant barrier is required. Likewise, a closed piping system, inside or outside containment, is not by itself sufficient; a second barrier, typically a valve, is required, and the requirements and guidelines state that it must be outside of containment, presumably to be accessible for manual operator action if it fails to close. Furthermore, when there is a closed system and one CIV outside containment, there must be a special provision to protect against a failure of the pipe segment between the containment wall and the CIV, either by enclosing the pipe segment and valve in a leak-tight or controlled leakage enclosure or by designing them to particular conservative design requirements which are assumed to preclude a breach. This is done because a pipe breach in this location would be unisolable.

It is true that standard technical specifications allow, in many circumstances, continued plant operation with only a single isolation barrier in place, but this is with a recognition that the containment isolation system is degraded by this condition and must eventually be restored to the full design capability.

In addition to the explicit GDC 55 and 56 configuration of one CIV inside and one outside containment, the guidance documents allow two other configurations: 1) one CIV and a closed system, both outside containment, or 2) two CIVs outside containment. The ICS design does not conform to either of these.

The NRC has the authority to approve additional isolation configurations under the "other defined basis" provision of the GDC, but the applicant must adequately justify their proposed alternative to assure sufficient safety, consistent with the overall containment isolation design philosophy expressed in the GDC and guidance documents. For example, SRP 6.2.4 states, "If it is not practical to locate a valve inside containment (for example, the valve may be under water as a result of an accident), both valves may be located outside containment." In the ICS case, locating a CIV outside containment would place it under water all of the time. This is good justification for moving it inside containment, if it can also be shown that a single failure would not disable the containment isolation function.

Provide additional justification for the proposed design, as discussed above, in DCD, Tier 2, Section 6.2.4.3.1.1, or revise the design to conform to the GDC requirements and guidance documents provisions.

GEH Response:

Due to the physical arrangement of the Isolation Condenser System (ICS) condensate, venting, and purge line piping, it is impractical to locate an isolation valve outside the containment boundary. As stated in the RAI, such a valve would be under water and therefore inaccessible and less reliable than a valve located inside the containment boundary.

An alternative arrangement has been provided for this system in which two isolation valves in series are located inside containment. The innermost isolation valves for each containment penetration (i.e., those located next to the containment boundary) are located as close as possible to the containment boundary. Therefore, a break either inside or outside containment could be isolated by either of two redundant isolation valves. The piping in the areas between the outermost isolation valves and the innermost isolation valves, as well as between the innermost isolation valves and the containment boundaries, are designed using conservative requirements, precluding breaks occurring in these areas. Furthermore, if a break were to occur in these segments of piping, the ICS piping and components outside containment form a closed system designed to withstand the full reactor design pressure.

Given the above rationale, the containment isolation design for the ICS is considered an adequate alternative to the requirements of GDC 55. DCD Tier 2, Subsection 6.2.4, will be revised to include a more detailed description of the ICS condensate, venting, and purge line containment isolation design.

DCD Impact:

DCD Tier 2, Subsections 6.2.4.1, 6.2.4.3.1.1, 6.2.4.3.1.2, and 6.2.4.3.1.3 will be revised as shown in the attached markup.

6.2.4.1 Design Bases

Safety Design Bases

- Containment isolation valves provide the necessary isolation of the containment in the event of accidents or other conditions and prevent the unfiltered release of containment contents that cannot be permitted by 10 CFR 50.34(a)(1) limits. Leak-tightness of the valves shall be verified by Type C test.
- Capability for rapid closure or isolation of pipes or ducts that penetrate the containment is performed by means or devices that provide a containment barrier to limit leakage within permissible limits;
- The design of isolation valves for lines penetrating the containment follows the requirements of General Design Criteria 54 through 57 to the greatest extent practicable consistent with safety and reliability. Exemptions from GDCs are listed in Table 1.9-6.
- Isolation valves for instrument lines that penetrate the DW/containment conform to the requirements of Regulatory Guide 1.11;
- Isolation valves, actuators and controls are protected against loss of their safety-related function from missiles and postulated effects of high and moderate energy line ruptures;
- Design of the containment isolation valves and associated piping and penetrations meets the requirements for Seismic Category I components;
- Containment isolation valves and associated piping and penetrations meet the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Class 1, 2, or MC, in accordance with their quality group classification;
- The design of the control functions for automatic containment isolation valves ensures that resetting the isolation signal shall not result in the automatic reopening of containment isolation valves, and,
- Penetrations with trapped liquid volume between the isolation valves have adequate relief for thermally-induced pressurization.

Design Requirements

The containment isolation function automatically closes fluid penetrations of fluid systems not required for emergency operation. Fluid penetrations supporting ESF systems have remote manual isolation valves that can be closed from the control room, if required.

The isolation criteria for the determination of the quantity and respective locations of isolation valves for a particular system conform to General Design Criteria 54, 55, 56, 57, and Regulatory Guide 1.11. Redundancy and physical separation are required in the electrical and mechanical design to ensure that no single failure in the containment isolation function prevents the system from performing its intended functions.

Protection of Containment Isolation Function components from missiles is considered in the design, as well as the integrity of the components to withstand seismic occurrences without loss of operability. For power-operated valves used in series, no single event can interrupt motive power to both closure devices. Pneumatic powered or equivalent containment isolation POVs are designed to fail to the closed position for containment isolation upon loss of the operator gas supply or electrical power with the exception of the following lines that are fail as-is:

- Isolation Condenser System steam supply
- Isolation Condesner System condensate return
- Fuel and Auxiliary Pools Cooling System suppression pool suction
- Fuel and Auxiliary Pools Cooling System suppression pool return

The containment isolation function is designed to Seismic Category I. Safety and quality group classifications of equipment and systems are found in Table 3.2-1. Containment isolation valve functions are identified in Tables 6.2-16 through 6.2-42.

Penetration piping is evaluated for entrapped liquid subject to thermally-induced pressurization following isolation. The preferred pressure relief method is through a self-relieving penetration by selection and orientation of an inboard isolation valve that permits excess fluid to be released inward to the containment. Use of a separate relief valve to provide penetration piping overpressure protection is permissible on a case-by-case basis when no other isolation valve selection option is available.

The criteria for the design of the LD&IS, which provides containment and reactor vessel isolation control, are listed in Subsection 7.1.2. The bases for assigning certain signals for containment isolation are listed and explained in Subsection 7.3.3.

6.2.4.2 System Design

The containment isolation function is accomplished by valves and control signals, required for the isolation of lines penetrating the containment. The RCPB influent lines are identified in Table 6.2-13, and the RCPB effluent lines are identified in Table 6.2-14. Table 6.2-15 through 6.2-42 show the pertinent data for the containment isolation valves. (Refer to COL item in section 6.2.8). A detailed discussion of the LD&IS controls associated with the containment isolation function is included in Subsection 7.3.3.

Power-operated containment isolation valves have position indicating switches in the control room to show whether the valve is open or closed. Power for valves used in series originates from physically independent sources without cross ties to assure that no single event can interrupt motive power to both closure devices.

All POVs with geared or bi-directional actuators (motorized or fluid-powered) remain in their last position upon failure of valve power. All POVs with fluid-operated/spring-return actuators (not applicable to air-testable check valves) close on loss of fluid pressure or power supply. To support the inerted containment design, pneumatic actuators for valves located inside containment are supplied with pressurized nitrogen gas, whereas pneumatic actuators for valves located outside of containment are generally supplied compressed air.

The design of the containment isolation function includes consideration for possible adverse effects of sudden isolation valve closure when the plant systems are functioning under normal operation.

General compliance or alternate approach assessment for Regulatory Guide 1.26 may be found in Subsection 3.2.2. General compliance or alternate approach assessment for Regulatory Guide 1.29 may be found in Subsection 3.2.1.

Containment isolation valves are generally automatically actuated by the various signals in primary actuation mode or are remote-manually operated in secondary actuation mode. Other appropriate actuation modes, such as process-actuated check valves, are identified in the containment isolation valve information Tables 6.2-13 through 6.2-42.

Systems containing penetrations that support or provide a flow path for emergency operation of ESF systems are not automatically isolated. The penetrations supporting ESF systems include some of the Fuel and Auxiliary Pool Cooling system (FAPCS) penetrations. Those FAPCS penetrations required for emergency operation include remote manual isolation valves or check valves. In addition, the Standby Liquid control Sysstem (SLC) and Isolation condenser System (ICS) are ESF systems that have fluid paths through containment penetrations. The SLC penetrations are not automatically isolated and do not contain remote manual isolation valves. Instead, the SLC penetrations are isolated if necessary by process-actuated check valves, but only after the SLC flow into the reactor pressure vessel/containment has ceased following an accident. The ICS penetrations listed in Tables 6.2-23 through 6.2-30 consist of various system process lines, all of which may be open or required to be opened following an accient in order to perform the required ESF function. The ICS penetration flow paths contain remote manual isolation valves, process-actuated flow control valves, or automatic isolation valves that only close for the applicable ICS train if leakage outside of containment is detected through IC/Passive Containment Cooling (PCC) pool high radiation or IC lines high flow.

6.2.4.2.1 Containment Isolation Valve Closure Times

Containment isolation valve closure times are established by determining the isolation requirements necessary to keep radiological effects from exceeding guidelines in 10 CFR50.67. For system lines, which can provide an open path from the containment to the environment, a discussion of valve closure time bases is provided in Chapter 15. However the design values of closure times for power-operated valves is more conservative than the above requirement. For valves above 80 mm (3 inches) up to and including 300 mm (12 inches) in diameter, the closure time is at least within a time determined by dividing the nominal valve diameter by 300 mm (12 inches) per minute. Valves 80 mm (3 inches) and less generally close within 15 seconds. All valves larger than 300 mm (12 inches) in diameter close within 60 seconds unless an accident radiation dose calculation is performed to show that the longer closure time does not result in a significant increase in off-site dose.

6.2.4.2.2 Instrument Lines Penetrating Containment

Sensing instrument lines penetrating the containment follow all the recommendations of Regulatory Guide 1.11. Each line has a 6-mm (1/4-inch) orifice inside the DW, as close to the beginning of the instrument line as possible, a manually-operated isolation valve just outside the containment followed by an excess flow check valve. The instrument line is designed such that the instrument response time is acceptable with the presence of the orifice, and that the flow restriction is not plugged.

6.2.4.2.3 Compliance with General Design Criteria and Regulatory Guides

In general, all requirements of General Design Criteria 54, 55, 56, 57 and Regulatory Guides 1.11 and 1.141 are met in the design of the containment isolation function. A case-by-case analysis of all such penetrations is given in Subsection 6.2.4.3.

6.2.4.2.4 Operability Assurance, Codes and Standards, and Valve Qualification and Testing

Protection is provided for isolation valves, actuators and controls against damage from missiles. All potential sources of missiles are evaluated. Where possible hazards exist, protection is afforded by separation, missile shields or by location outside the containment. Tornado missile protection is afforded by the fact that all containment isolation valves are inside the missile-proof RB. Internally-generated missiles are discussed in Subsection 3.5.1, and the conclusion is reached that there are no potentially damaging missiles generated. Dynamic effects from pipe break (jet impingement and pipe whip) are discussed in Section 3.6. The arrangement of containment isolation valves inside and outside the containment affords sufficient physical separation such that a high energy pipe break would not preclude containment isolation. The containment isolation function piping and valves are designed in accordance with Seismic Category I.

Section 3.11 presents a discussion of the environmental conditions, both normal and accidental, for which the containment isolation valves and pipe are designed. Containment isolation valves and associated pipes are designed to withstand the peak calculated temperatures and pressures during postulated design basis accidents to which they would be exposed. The section discusses the qualification tests required to ensure the performance of the isolation valves under particular environmental conditions.

Containment isolation valves are designed in accordance with the requirements of ASME Code, Section III and meet at least Group B quality standards, as defined in RG 1.26. Where necessary, a dynamic system analysis which covers the impact effect of rapid valve closures under operating conditions is included in the design specifications of piping systems involving containment isolation valves. Valve operability assurance testing is discussed in Subsection 3.9.3.2. The power-operated and automatic isolation valves will be cycled during normal operation to assure their operability.

Subsection 6.2.6 describes leakage rate testing of containment isolation barriers.

6.2.4.2.5 Redundancy and Modes of Valve Actuations

The main objective of the Containment Isolation Function is to provide environmental protection by preventing releases of radioactive materials. This is accomplished by complete isolation of system lines penetrating the containment. Redundancy is provided in all design aspects to satisfy the requirement that no single active failure of any kind should prevent containment isolation.

Mechanical components are redundant, in that isolation valve arrangements provide backup in the event of accident conditions. Isolation valve arrangements satisfy all requirements specified in General Design Criteria 54, 55, 56 and 57, and Regulatory Guides 1.11 and 1.141.

Isolation valve arrangements with appropriate instrumentation are shown in the P&IDs. The isolation valves generally have redundancy in the mode of actuation, with the primary mode being automatic and the secondary mode being remote manual.

A program of testing (Subsection 6.2.4.4) is maintained to ensure valve operability and leak-tightness. The design specifications require each isolation valve to be operable under the most severe operating conditions that it may experience. Each isolation valve is afforded protection by separation and/or adequate barriers from the consequences of potential missiles.

Electrical redundancy is provided for each set of isolation valves, eliminating dependency on one power source to attain isolation. Electrical cables for isolation valves in the same line are routed separately. Cables are selected and based on the specific environment to which they may be subjected (for example, magnetic fields, high radiation, high temperature and high humidity).

Administrative controls will be applied by the plant operators by using established procedures and checklist for all non-powered containment isolation valves to ensure that their position is maintained and known. The position of all power-operated isolation valves is indicated in the control room. Discussion of instrumentation and controls for the isolation valves is included in Subsection 7.3.3.

6.2.4.3 Design Evaluation

A discussion of the main objectives of the containment, the arrangements, the redundancies and the position control of all non-powered isolation valves and all power operated isolation valves is included in Subsection 6.2.4.2.5.

6.2.4.3.1 Evaluation Against General Design Criterion 55

The RCPB, as defined in 10 CFR 50, Section 50.2, consists of the RPV, pressure-retaining appurtenances attached to the vessel, valves and pipes which extend from the RPV up to and including the outermost isolation valves. The lines of the RCPB, which penetrate the containment, include functions for isolation of the containment, thereby precluding any significant release of radioactivity. Similarly, for lines which do not penetrate the containment but which form a portion of the RCPB, the design ensures that isolation of the RCPB can be achieved.

The following paragraphs summarize the basis for ESBWR compliance with the requirements imposed by General Design Criterion 55.

6.2.4.3.1.1 Influent Lines

GDC 55 states that each influent line, which penetrate the containment directly to the RCPB, be equipped with at least two isolation valves, one inside the containment and the other as close to the external side of the containment as practical. Table 6.2-13 lists the influent pipes that comprise the RCPB and penetrate the containment. The table summarizes the design of each line as it satisfies the requirements imposed by General Design Criterion 55.

Feedwater Line

The feedwater line is part of the reactor coolant pressure boundary as it penetrates the containment to connect with the RPV. It has two containment isolation valves with process-actuated closure to isolate the line in the event of an outboard feedwater pipe rupture (feedwater HELB). Additionally, two valves with automatic power-actuated closure, including the outboard containment isolation valve, isolate the line in the event of an inboard feedwater pipe rupture (feedwater LOCA). The isolation valve inside the containment is a check valve, located as close as practicable to the containment wall. Outside the containment is a non-simple check valve located as close as practicable to the containment wall. The non-simple check valve outside containment is provided with powered actuation that, upon an automatic or remote manual signal from the main control room, provides closure force to the valve disk for isolation. An additional POV with automatic closure is provided upstream of the outboard containment isolation valve as a redundant backup valve for feedwater isolation for the LOCA event.

Isolation Condenser Condensate and Venting Lines

The containment isolation provisions for the Isolation Condenser System (ICS) condensate, vent, and purge lines constitute an alternative design basis beyond what is described by GDC 55. Instead of one isolation valve outside the containment and once isolation valve inside the containment, the ICS influent lines rely upon two valves inside containment as well as a closed system outside the containment. The following rationale support this alternative design:

The isolation condenser condensate lines penetrate the containment and connect directly to the RPV. The isolation condenser venting lines extend from the isolation condenser through the containment and connect together downstream of two tandem installed normally-closed stop valves. The venting line terminates below the minimum drawdown level in the suppression pool. An isolation condenser purge line also penetrates the containment and it contains an excess flow check valve and a normally open shutoff valve. Each IC condensate line has two open condensate return line isolating shutoff valves (F003 and F004) located in the containment where they are protected from outside environmental conditions, which may be caused by a failure outside the containment. The condensate lines are automatically isolated when leakage is detected.

The IC condensate line isolation valves and the pipes penetrating the containment are designed in accordance to ASME Code Section III, Class 1 Quality Group A, Seismic Category I. Penetration sleeves used at the locations where the condensate return pipes exit the pool at the containment pressure boundary are designed and constructed in accordance with the requirements specified within Subsection 3.6.2.1. In addition, the IC System outside the containment consists of a closed loop designed to ASME Code Section III, Class 2, Quality Group B, Seismic Category I, which is a "passive" substitute for an open "active" valve outside the containment. The containment isolation for the vent lines is very similar in design to the condensate lines. Instead of automatic isolation valves inside containment, the vent lines utilize two normally closed fail closed valves in series. The vent lines are 20-mm in diameter, and their inboard isolation valves are designed to ASME Code Section III, Class 2, Quality Group B, Seismic Category I. The IC purge line isolation valves and the pipes penetrating the containment are designed in accordance to ASME Code Section III, Class 1 Quality Group A, Seismic Category I. The purge line is a 20-mm line that utilizes a closed system outside containment, and a fail closed isolation valve in series with an excess flow check valve inside containment. The combination of an already closed loop outside the containment plus the two series automatic isolation valves inside the containment ~~comply with~~provide a sufficient alternative to the requirements of isolation functions of US NRC Code of Federal Regulations 10 CFR 50,

Appendix A, Criteria 55 ~~and 56~~. It is more practical to locate both valves inside containment because a valve outside containment would be submerged in the IC/PCC pool. The isolation valves shall be located as close to the containment boundary as possible, and the pipe between the outermost isolation valve and the containment shall be designed to the requirements of SRP 3.6.2 to minimize the chances of a break in this area. A break on any of these influent lines could be contained by either of the redundant isolation valves. Furthermore, a break between the isolation valves and the containment would still be contained by the closed system outside containment, and would require an additional break before a radioactive release could occur. Therefore, this design can accommodate a single failure.

Standby Liquid Control System Line

The SLC system line penetrates the containment to inject directly into the RPV. In addition to a simple check valve inside the containment, a check valve, together with two parallel squib-activated valves are located outside the DW. Because the SLC line is normally closed, rupture of this non-flowing line is extremely improbable. However, should a break occur subsequent to the opening of the squib-activated valves, the check valves ensure isolation. All mechanical components required for boron injection are at least Quality Group B. Those portions which are part of the reactor coolant pressure boundary are classified Quality Group A.

6.2.4.3.1.2 Effluent Lines

GDC 55 states that each effluent line, which form part of the reactor coolant pressure boundary and penetrate the containment, be equipped with two isolation valves; one inside the containment and one outside, located as close to the containment wall as practicable.

Table 6.2-14 lists those effluent lines that comprise the reactor coolant pressure boundary and which penetrate the containment.

Main Steam and Drain Lines

The main steam lines, which extend from the RPV to the main turbine and condenser system, penetrate the containment. The main steam drain lines connect the low points of the steam lines, penetrate the containment and are routed to the condenser hotwell. For these lines, isolation is provided by automatically actuated shutoff valves, one inside and one just outside the containment. The main steam line isolation valves (MSIVs) are described in Subsection 5.4.5.

Isolation Condenser Steam Supply Lines

The containment isolation provisions for the Isolation Condenser System (ICS) steam supply lines constitute an alternative design basis beyond what is described by GDC 55. Instead of one isolation valve outside the containment and one isolation valve inside the containment, the ICS effluent lines rely upon two valves inside containment as well as a closed system outside the containment. The following rationale support this alternative design:

The isolation condenser steam supply lines penetrate the containment and connect directly to the RPV. Two isolation shutoff valves are located in the containment where they are protected from outside environmental conditions, which may be caused by a failure outside the containment. The isolation valves in each IC loop are signaled to close automatically on excessive flow. The flow is sensed by four differential flow transmitters in either the steam supply line or the condensate drain line. The isolation valves are also automatically closed on high radiation in the steam leaving an IC-pool compartment. The isolation functions are based on any 2-out-of-4 channel trips.

The IC isolation valves and the pipe penetrating the containment are designed in accordance to ASME Code Section III, Class 1 Quality Group A, Seismic Category I. Penetration sleeves used at the locations where the IC steam supply lines enter the pool at the containment pressure boundary are designed and constructed in accordance with the requirements specified within Subsection 3.6.2.1. In addition to the IC isolation valves, the IC system outside the containment consists of a closed loop designed to ASME Code Section III, Class 2, Quality Group B, Seismic Category I, which is a "passive" substitute for an open "active" valve outside the containment. This closed-loop substitute for an open isolation valve outside the containment implicitly provides greater safety.

The combination of an already isolated loop outside the containment plus the series automatic isolation valves inside the containment ~~comply with~~provide a sufficient alternative to ~~the intent of~~ isolation functions of US NRC Code of Federal Regulations 10 CFR 50, Appendix A, Criteria 55~~ and 56~~. It is more practical to locate both valves inside containment because a valve outside containment would be submerged in the IC/PCC pool. The isolation valves shall be located as close to the containment boundary as possible, and the pipe between the outermost isolation valve and the containment shall be designed to the requirements of SRP 3.6.2 to minimize the chances of a break in this area. A break on the steam supply lines could be contained by either of the redundant isolation valves. Furthermore, a break between the isolation valves and the containment would still be contained by the closed system outside containment, and would require an additional break before a radioactive release could occur.

Reactor Water Cleanup System /Shutdown Cooling System

The Reactor Water Cleanup/Shutdown Cooling (RWCU/SDC) System consists of two independent trains. Each train takes its suction from the RPV mid-vessel region as well as from the RPV bottom region. The suction lines of each train are isolated by one automatic pneumatic-operated valve inside and one automatic pneumatic-operated valve outside the containment. The reactor bottom suction line has a sampling line isolated by one automatic solenoid-operated valve inside and one automatic solenoid-operated valve outside the containment. The details regarding these valves are shown in Table 6.2-31. RWCU/SDC pumps, heat exchangers and demineralizers are located outside the containment.

6.2.4.3.1.3 Conclusion on Criterion 55

In order to ensure protection against the consequences of accidents involving the release of radioactive material, pipes which form the reactor coolant pressure boundary are shown to provide adequate isolation capabilities on a case-by-case basis. A special isolation arrangement is required for the Isolation Condenser System, and it has been shown to be an adequate alternative to the explicit requirements of GDC 55. In all other cases, two isolation barriers were shown to protect against the release of radioactive materials in accordance with GDC 55.

In addition to meeting the isolation requirements stated in Criterion 55, the pressure-retaining components which comprise the reactor coolant pressure boundary are designed to meet other

NRC RAI 6.2-121 S01:

The resolution of this RAI is a subsidiary of RAI 6.2-119. Depending on the resolution of supplemental RAI 6.2-119, the response to RAI 6.2-121 may need to be revised.

GEH Response:

The response to RAI 6.2-121 is superseded by the response to RAI 6.2-119 S01, which contains farther justification for the alternative containment isolation design for the Isolation Condenser System (ICS).

DCD Impact:

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