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TOKYO, JAPAN

September 22, 2008

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

Attention: Mr. Jeffrey A. Ciocco,

Docket No. 52-021
MHI Ref: UAP-HF-08204

Subject: MHI's Responses to US-APWR DCD RAI No.57-852 Revision 0

Reference: 1) "Request for Additional Information No. 57-852 Revision 0, SRP Section: 06.02.04, Application Section: 6.2.4" dated August 25, 2008.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No.57-852 Revision 0."

Enclosed are the responses to 36 RAIs contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Responses to Request for Additional Information No.57-852 Revision 0

CC: J. A. Ciocco
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D081
NRO

Enclosure 1

UAP-HF-08204
Docket Number 52-021

Responses to Request for Additional Information No.57-852 Revision 0

September, 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

9/22/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 57 REVISION 0**
SRP SECTION:	**06.02.04 - CONTAINMENT ISOLATION SYSTEM**
APPLICATION SECTION:	**06.02.04 CONTAINMENT ISOLATION SYSTEM**
DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-1

Provide justification for Systems with single valve isolation- Hot Leg CS/RHR line.
In section 6.2.4.3.2 in the DCD application, you have stated that table 6.2.4-2 lists GDC 55 and 56 systems with single valve isolation and provides justification for use of single valve protection. Additional justification is needed in order to demonstrate that the configurations meet the requirements of the ANSI N271-1976 "other defined basis" of GDC 55:
For the Hot leg CS/RHR Pump Suction Line valves (Figure 6.2.4-1 sheet 12), provide: a discussion that the RHRS is shown to be more reliable with this configuration, a discussion that a single active failure can be accommodated with only one valve in the line, a discussion on how leak testing that portion of the RHRS outside of containment is performed, or how it can be shown that system integrity can be maintained during normal plant operations.

ANSWER:

As US-APWR Hot leg CS/RHR line is similar to conventional plant, justification is similar to conventional plant. Justification for this configuration is shown as follows, which is based on ANSI N271-1976.

The lines from the RCS hot leg to the CS/RHR pump suctions each contain two remote manual (motor operated) valves, which are closed during normal plant power operation. The valves are interlocked such that they cannot be opened when the RCS pressure is greater than the design pressure of the RHR system. The valve which is located closer to the RCS inside the missile barrier is not considered a containment isolation valve. The second valve defines the limit of the reactor coolant pressure boundary. This valve also provides the containment isolation barrier inside containment and is considered to be sealed closed.

Since these lines connect to the Containment Spray recirculation loops which are filled with sump water and at least two of which is in operation post accident, there is no need for any containment isolation valves in these lines outside containment. If a leak occurs in the line upstream (toward the RCS) of the valve inside containment, the closed valve isolates the line. If a leak occurs in the recirculation system outside containment, the sump valve is closed to prevent loss of sump water and the closed valve in the RHR suction line prevents any containment atmosphere from entering the system outside containment. If a leak should occur in the short length of pipe between the valve inside containment and the containment, any containment atmosphere will get only as far as the fluid-filled system. Since this system is filled with sump water and is most likely in operation, no gas could escape to the outside. The fluid in the RHR suction line would drop to approximately the level of fluid in the sump and any containment atmosphere which did leak into the line would be contained in this length of closed piping.

Another closed valve in the line would do nothing except somewhat decrease the length of pipe outside containment which could possibly be exposed to containment atmosphere following a leak. It is possible that a valve in this section of pipe would increase the probability of leakage of gas through the stem packing and could not be considered as tight as a clean length of pipe. No single failure of any active or passive component anywhere in the present system can cause any release of containment atmosphere to the outside. Any additional valves would complete normal residual heat removal operation and are unnecessary for containment isolation.

This arrangement is intended to provide guidance in satisfying Criterion 55 on the other defined basis in that system reliability is enhanced by a single valve and there is at least a single mechanical barrier after a single failure.

Inservice testing and inspection of these isolation valves and the associated piping system outside the containment is performed periodically under the inservice inspection requirements of ASME XI as described in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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SRP SECTION:	**06.02.04 - CONTAINMENT ISOLATION SYSTEM**
APPLICATION SECTION:	**06.02.04 CONTAINMENT ISOLATION SYSTEM**
DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-2

Provide justification for Systems with single valve isolation-SI pump suction line; provide discussion on leak housing.
In section 6.2.4.3.2 in the DCD application, you have stated that table 6.2.4-2 lists GDC 55 and 56 systems with single valve isolation and provides justification for use of single valve protection. Additional justification is needed in order to demonstrate that the configurations meet the requirements of the ANSI N271-1976 "other defined basis" of GDC 56:
For the SI pump suction line valves (Figure 6.2.4-1 sheet 11) provide:
a discussion that the SIS is shown to be more reliable with this single valve configuration, a discussion that a single active failure can be accommodated with only one valve in the line, a discussion how leak testing that portion of the SIS outside of containment is performed, or how it can be shown that system integrity can be maintained during normal plant operations.
ANSI N271-1976, Section 3.6.4 defines the basis for lines consisting of a single valve and a closed system which are both located outside containment. Pursuant to this section, provide a discussion of the design of any protective or leak tight or controlled leakage housing that encloses the single valve and the piping between the containment and the valve.

ANSWER:

As US-APWR SI suction line is similar to conventional plant, justification is similar to conventional plant. Justification for this configuration is shown as follows, which is based on ANSI N271-1976.

The lines from refueling water storage pit (RWSP) to the suctions of the safety injection (SI) pumps and containment spray / residual heat removal (CS/RHR) pumps are each provided with a single remote manual gate valve. The valve does not provide a barrier outside containment to prevent loss of sump water should a leak develop in a recirculation loop. (The valve is to be closed remotely from the control room to accomplish this. Leak detection is provided for each line, so that the operator can determine which valve is to be closed.) These lines and valves are designed to preclude a breach of piping integrity. Therefore, guard pipe are not provided in these lines. (Reference: SRP 6.2.4 Rev.3 SRP Acceptance Criteria 5) This arrangement is intended to provide guidance in satisfying Criterion 56 on the other defined basis in that system reliability is enhanced by a single valve and a single barrier is still maintained after accommodating a single active failure.

Inservice testing and inspection of these isolation valves and the associated piping system outside the containment is performed periodically under the inservice inspection requirements of ASME XI as described in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-3

Provide justification for systems with single valve isolation-CS/RHR pump suction line; provide discussion on leak housing.

In section 6.2.4.3.2 in the DCD application, you have stated that table 6.2.4-2 lists GDC 55 and 56 systems with single valve isolation and provides justification for use of single valve protection. Additional information is needed in order to demonstrate that the configurations meet the requirements of the ANSI N271-1976 other defined basis of meeting the requirements of GDC 56: For the CS/RHR pump suction line valves (Figure 6.2.4-1 sheet 18) provide:

a discussion that the CS/RHR system is shown to be more reliable with this single valve configuration, a discussion that a single active failure can be accommodated with only one valve in the line, a discussion how leak testing that portion of the RHRS outside of containment is performed, or how it can be shown that system integrity can be maintained during normal plant operations.

ANSI N271-1976, Section 3.6.4 defines the basis for lines consisting of a single valve and closed systems which are both located outside containment. Pursuant to this section, provide a discussion of the design of any protective or leak tight or controlled leakage housing that encloses the single valve and the piping between the containment and the valve.

ANSWER:

As US-APWR CS/RHR pump suction line is similar to conventional plant, justification is similar to conventional plant. Justification for this configuration is shown as follows, which is based on ANSI N271-1976.

The lines from refueling water storage pit (RWSP) to the suctions of the safety injection (SI) pumps and containment spray / residual heat removal (CS/RHR) pumps are each provided with a single remote manual gate valve. The valve does not provide a barrier outside containment to prevent loss of sump water should a leak develop in a recirculation loop. (The valve is to be closed remotely from the control room to accomplish this. Leak detection is provided for each line, so that the operator can determine which valve is to be closed.) These lines and valves are designed to preclude a breach of piping integrity. Therefore, guard pipe are not provided in these lines. (Reference: SRP 6.2.4 Rev.3 SRP Acceptance Criteria 5) This arrangement is intended to provide guidance in satisfying Criterion 56 on the other defined basis in that system reliability is enhanced by a single valve and a single barrier is still maintained after accommodating a single active failure.

Inservice testing and inspection of these isolation valves and the associated piping system outside the containment is performed periodically under the inservice inspection requirements of ASME XI as described in subsection 3.9.6 and section 6.6. During normal operation, the systems are water filled, and degradation of valves or piping is readily detected.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-4

Clarify design requirements that prevent debris from interfering with valve closure.
Pursuant to RG 1.206 section C.I.6.2.4.2 guidance, provide a discussion on the design requirements of the containment isolation barriers as they pertain to provision taken to ensure that closure of any containment isolation valves is not prevented by debris that could become entrained in escaping fluid.
Specifically discuss the following penetrations:
Penetration#152,153,156,157 (Safety injection Pump Suction line)
Penetration #151,154,155,158 (Containment Spray/Residual Heat Removal (CS/RHR)) PUMP SUCTION LINE.

ANSWER:

Provisions are made to ensure that closure of the containment isolation valves is not inhibited by entrapped debris that could become entrained in escaping fluid. Four independent sets of strainers are provided inside the RWSP to prevent debris from entering the Safety Injection System and the Containment Spray System. The open end of each suction pipe is equipped with a debris strainer (emergency core cooling/containment spray (ECC/CS) strainer) that satisfies NEI 04-07, "PWR Sump Performance Evaluation Methodology" and conforms to the guidance in RG 1.82. See Subsection 6.2.2.2.5 for details.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-5

Clarify placement of outermost CIV as close as possible to containment for GDC 55 and 56 systems

In Section 6.2.4.3.3, you state that valves outside containment in systems designed in conformance with GDC 57 will be located as close to containment as practical. State in the DCD that the outside containment isolation valve shall be located as close to containment as practical for those systems designed in conformance with GDC 55 and 56 or designed in conformance with some other defined basis set forth in RG 1.141.

ANSWER:

MHI will revise the DCD Revision 2.

Impact on DCD

The DCD will be changed to incorporate the followings:

DCD Subsection 6.2.4.3.1, first paragraph is revised to read:

"Each line that is part of the RCPB and penetrates containment is provided with containment isolation valves, unless 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. **Isolation valves outside containment are located as close to containment as practical for those systems designed in conformance with GDC 55 or some other defined basis set forth in RG 1.141.** The following systems penetrating containment meet GDC 55 criteria:"

DCD Subsection 6.2.4.3.2, first paragraph is revised to read:

"Each line that connects directly to the containment atmosphere and penetrates the primary reactor containment is provided with containment isolation valves as follows, unless 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. **Isolation valves outside containment are located as close to containment as practical for those systems designed in conformance with GDC 56 or some other defined basis set forth in RG 1.141.** The following systems penetrating the containment meet GDC 56 criteria:"

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-6

Describe ITAAC for verification of containment isolation valve placement.
How will completion of COL item 6.2(6), as written, ensure that the supplied as-built piping distances from the outer containment isolation valve to the containment will be such that the valves are located as close to containment as practical? (i.e. describe any inspections tests or acceptance criteria which will confirm that the as built piping distances will not exceed those listed in table 6.2.4-3)

ANSWER:

A list of as-built pipe run distances from the outer containment isolation valves to the containment penetrations will be prepared prior to initial fuel load to confirm that as-built pipe run distance will not exceed those listed in table 6.2.4-3.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-7

Provide Conditions requiring containment isolation

Pursuant to 10 CFR 50.34(f)(2)(xiv), state the listing of all systems identified as essential and non essential, along with the basis for selection of each essential system, or confirm that essential systems are those listed as "yes" under the "ESF or Support System" column in DCD table 6.2.4-3.

For each nonessential system, include a description in the DCD that confirms that all designated nonessential systems are isolated automatically by the containment isolation signal.

Regulatory Guide 1.206, Section C.I.6.2.4.1 states that the applicant should discuss the design bases for the containment isolation system, including the design requirements for the governing conditions under which containment isolation becomes mandatory. The staff did not find in US-APWR DCD Tier 2 (Rev. 0) Section 6.2.4.1 sufficient detail to evaluate this design bases. Provide more information on the conditions under which containment isolation becomes mandatory.

ANSWER:

Essential systems are listed as "Yes" in Table 6.2.4-3 under "ESF or Support System". Non-essential systems are listed as "No" in Table 6.2.4-3 under "ESF or Support System".

Non-essential systems are isolated automatically by the containment isolation signal. This is included the statement "The containment isolation system is designed in accordance with the Three Mile Island (TMI)-related requirements of 10CFR50.34(f)(2)(xiv)(A) through (E)." in Subsection 6.2.4.1.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-8

Clarify design requirements for relief valves used as containment isolation barriers.
Per, ANSI N271-1976, section 4.74, when relief valves that discharge into containment are also used for containment isolation barriers, the discharge side of the valve shall be designed to withstand and be tested at the containment design pressure.
The four Containment Spray/Residual Heat Removal System (CS/RHR) Pump suction lines (6.2.4-1 Sheet 12) rely on relief valves for such purpose.
Pursuant to the guidance in Sections 3.6.6 and 4.74 of ANSI N271-1976, state in the DCD that the discharge side of the relief valves in the CS/RHR pump suction lines are designed to withstand and be tested at the containment design pressure.

ANSWER:

The relief valve in each CS/RHR pump suction line protects the CS/RHR from over-pressurization and also serves as containment isolation valves. The relief valve flow is discharged to the Refueling Water Storage Pit which is designed to handle large flows of hot water and/or steam. The discharge side of the relief valves in the CS/RHR pump suction lines is designed to higher design pressure than containment design pressure and will be tested at the design pressure, since this discharge side piping serves as the emergency letdown line which is more severe design condition. This arrangement satisfies the requirements of ANSI N271-1976 Sections 3.6.6 and 4.7.4.

Impact on DCD

The DCD will be changed to incorporate the following:

Added the following sentence after first paragraph in Subsection 6.2.4.1

The discharge side of the relief valves in the CS/RHR pump suction lines is designed to withstand and be tested at the containment design pressure.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-9

Clarify if all power operated CIVs have position indication in the MCR, SBO considerations for indication and closure.
Pursuant to the guidance in section 4.2.3, provide a description in the DCD that states that all power operated isolation valves have position indication in the main control room.
In addition, pursuant to RG 1.155 section C.3.2.7, indicate if provisions are provided, independent of the preferred and blacked out unit's onsite emergency ac power supplies, for valve position indication and closure for containment isolation valves that may be in the open position at the onset of a station blackout.
Address these valves in particular:
RWS-MOV-002 (Figure 6.2.4-1 Sheet 32) refueling water recirculation pump suction line
RWS-MOV-004 (Figure 6.2.4-1 Sheet 32) refueling water recirculation pump suction line.

ANSWER:

All power operated containment isolation valves have position indication in the main control room. Since position indicating systems are energized by I&C power source which is backed up with battery, valve positions can be indicated in the control room when station blackout occurs. In addition, since alternate alternating current (AAC) power sources which are independent of the preferred and emergency ac power source are provided in the US-APWR, containment isolation valves are able to be close when station blackout occurs.

RWS-MOV-002 and 004 also have position indication, and they can indicate valve position and be closed when station blackout occurs.

Impact on DCD

The DCD will be changed to incorporate the following:

Added the following sentence after the third paragraph in Subsection 6.2.4.2
All power operated isolation valves have position indication in the main control room.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-10

Justify Failed-Open position of penetration #283 valves upon loss of power.
As described in Table 6.2.4.2-3 The two motor operated valves associated with penetration #283 (CVCS seal water return line) fail as-is upon loss of power, however, their post accident position is closed. Pursuant to the requirement of GDC 55 as it relates to the criteria that, upon the loss of actuating power, the position of automatic isolation valves should take the position of greatest safety, explain how a failed- open position of the two MOVs in series, as shown in figure 6.2.4-1 sheet 8, is the position of greatest safety upon loss of power.

ANSWER:

The two motor operated valves in series are designed that inside and outside valves are powered from different Class-1E power source trains. This means that both valve actuating powers are not lost simultaneously under a single failure condition. Therefore, if one motor operated valve cannot be closed due to loss of actuating power, the other motor operated valve can be closed.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-11

Justify the failed open position of penetration #267L valves upon loss of power.
As described in Table 6.2.4.2-3, the two motor operated valves associated with penetration **#267L** fail as-is upon loss of power, however, their post accident position is closed. Pursuant to the requirement of GDC 55 as it relates to the criteria that, upon the loss of actuating power, the position of automatic isolation valves should take the position of greatest safety, explain how a failed- open position of the two MOVs in series, as shown in figure **6.2.4-1 sheet 27**, is the position of greatest safety upon loss of power.

ANSWER:

The two motor operated valves in series are designed that inside and outside valves are powered from different Class-1E power source trains. This means that both valve actuating powers are not lost simultaneously under a single failure condition. Therefore, if one motor operated valve cannot be closed due to loss of actuating power, the other motor operated valve can be closed.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-12

Justify the failed open position of penetration #269R valves upon loss of power.
As described in Table 6.2.4.2-3, the two motor operated valves associated with penetration **#269R** fail as-is upon loss of power, however, their post accident position is closed. Pursuant to the requirement of GDC 55 as it relates to the criteria that, upon the loss of actuating power, the position of automatic isolation valves should takes the position of greatest safety, explain how a failed- open position of the two MOVs in series, as shown in figure **6.2.4-1 sheet 28**, is the position of greatest safety upon loss of power.

ANSWER:

The two motor operated valves in series are designed that inside and outside valves are powered from different Class-1E power source trains. This means that both valve actuating powers are not lost simultaneously under a single failure condition. Therefore, if one motor operated valve cannot be closed due to loss of actuating power, the other motor operated valve can be closed.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-13

Justify failed open position of penetration #161 valves upon loss of power.
As described in Table 6.2.4.2-3, the two motor operated valves associated with penetration **#161** fail as-is upon loss of power, however, their post accident position is closed. Pursuant to the requirement of GDC 56 as it relates to the criteria that, upon the loss of actuating power, the position of automatic isolation valves should takes the position of greatest safety, explain how a failed- open position of the two MOVs in series, as shown in figure **6.2.4-1 sheet 32**, is the position of greatest safety upon loss of power.

ANSWER:

The two motor operated valves in series are designed that inside and outside valves are powered from different Class-1E power source trains. This means that both valve actuating powers are not lost simultaneously under a single failure condition. Therefore, if one motor operated valve cannot be closed due to loss of actuating power, the other motor operated valve can be closed.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-14

Justify failed open position of penetration #266 valves upon loss of power.
As described in Table 6.2.4.2-3, the two motor operated valves associated with penetration **#266** fail as-is upon loss of power, however their post accident position is closed. Pursuant to the requirement of GDC 56 as it relates to the criteria that, upon the loss of actuating power, the position of automatic isolation valves should takes the position of greatest safety, explain how a failed- open position of the two MOVs in series, as shown in figure **6.2.4-1 sheet 44**, is the position of greatest safety upon loss of power.

ANSWER:

The two motor operated valves in series are designed that inside and outside valves are powered from different Class-1E power source trains. This means that both valve actuating powers are not lost simultaneously under a single failure condition. Therefore, if one motor operated valve cannot be closed due to loss of actuating power, the other motor operated valve can be closed.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

9/22/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 57 REVISION 0**
SRP SECTION:	**06.02.04 - CONTAINMENT ISOLATION SYSTEM**
APPLICATION SECTION:	**06.02.04 CONTAINMENT ISOLATION SYSTEM**
DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-15

Provide justification of containment setpoint pressure for phase A containment isolation.
10 CFR 50.34(f)(2)(xiv) requires reduction of the containment setpoint pressure that initiates containment isolation for nonessential penetrations to the minimum value compatible with normal operating conditions. Clarification on this requirement is provided in NUREG-0737 "Clarification of TMI Action Items", which states: "The pressure setpoint selected should be far enough above the maximum observed (or expected) pressure inside containment during normal operation so that inadvertent containment isolation does not occur during normal operation from instrument drift or fluctuations due to the accuracy of the pressure sensor. A margin of 1 psi above the maximum expected containment pressure should be adequate to account for instrument error. Any proposed values greater than 1 psi will require detailed justification.
Applicants for an operating license and operating plant licensees that have operated less than one year should use pressure history data from similar plants that have operated more than one year, if possible, to arrive at a minimum containment setpoint pressure."
Pursuant to the requirement of 10 CFR 50.34(f)(2)(xiv) explain (or indicate where in the DCD application it is explained) why the chosen setpoint of 21.5 psia for the High Containment Pressure actuation of Containment isolation phase A function is determined to be the minimum value compatible with normal operating conditions.
Provide justification for this set point as described in NUREG-0737 "Clarification of TMI Action plan Requirements

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ANSWER:

Automatic containment isolation phase-A is activated by the signal generation of ECCS activation, which includes containment High-1 at 6.8 psig of the containment pressure. This setpoint is selected as 10% of the containment design pressure (68 psig). On the other hand the maximum expected pressure inside containment during normal operation is 2.0 psig, and accuracy of the pressure instrument channel is 2.5 psi, which was estimated by combining instrumentation factors that affect the accuracy of each component in the channel (DCD 7.2.2.7.1). In order to prevent an inadvertent actuation of containment isolation, a certain margin was considered. This margin for the setpoint is 2.3 psi, which is adequate and small enough. Therefore this pressure setpoint for containment isolation is consistent with the requirement of 10 CFR 50.34(f)(2)(xiv).

Dose evaluation was performed with this setpoint including a margin. This assumption generates the conservative results by estimating longer duration of containment purge flow than actual. It was confirmed that this conservative results satisfied the criterion for dose evaluation (DCD 15.6.5.5).

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-16

Clarify basis of containment valve closure times.
In meeting GDC 54 requirements the performance capability of the isolation function should reflect the safety importance of isolation system lines. In section 6.2.4.2 of the DCD you specify the basis of containment valve closure times for valves 3.5 inches and larger.
As stated in paragraph 4.4.4 of ANSI N271-1976, closure times for valves 3.5 inches or smaller is generally less than 15 seconds.
Specify in section 6.2.4.2 of the DCD that containment isolation valves 3 inches and smaller will close within 15 seconds, or provide the basis for other closure times for these valves. Explain how the potential effects of water hammer and erosion were considered in the establishment of CIV closure times.

ANSWER:

MHI will add the closure time of containment isolation valves 3 inches and smaller.

The fast closing containment isolation valves may cause water hammer in the piping systems. Water hammer and erosion due to containment isolation valve closure time have not occurred in our experience. Therefore MHI believes this requirement of valve closure time is appropriate.

Impact on DCD

The DCD will be changed to incorporate the followings:

Add the following to Subsection 6.2.4.2, third paragraph:

"Containment isolation valves 3 in. and smaller close within 15 seconds."

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-17

Clarify calculation of low volume purge CIV closure time and BTP 6-4 compliance.
Pursuant to BTP 6-4, describe (or indicate where in the DCD it is described) any analyses of radiological consequences that were used to establish the 8-inch low volume purge and vent system penetration line sizing and 5 second isolation valve closure time.
Indicate how the proposed low volume purge system penetration line sizing and isolation valve closure time will be confirmed by site specific accident dose analyses in order to ensure that the radiological consequences of a LOCA, assuming the purge valves are open and subsequently close, will not exceed 10 CFR 100 guideline values.
In addition, indicate where the analysis to support compliance with BTP 6-4 acceptance criterion #5 A through D is located in the DCD.

ANSWER:

In evaluating radiological consequences of DCD Chapter 15, a large break LOCA is assumed, wherein the total amount of RCS will be instantaneously discharged into the containment at the same time that the piping ruptures, and it is also assumed that purge flow corresponding to the design pressure will continue for 15 seconds until the containment is isolated. On the other hand, in cases in which there is a small break LOCA, discharge from RCS to the containment takes time, resulting in a delayed increase in internal pressure and requiring a longer time for the containment to be isolated, while decreasing the amount of purge flow. The results are shown in table below. It can thus be said that the assumption in DCD Chapter 15 is conservative, as it estimates a larger amount of radioactivity to be released compared to a small break LOCA.

Break size	Time up to isolation	The values corresponding to released radioactivites*
3/8 inch	1800 sec	2.6E+09 ft^3-lb
1 inch	571 sec	2.7E+09 ft^3-lb
4 inch	41.6 sec	2.3E+08 ft^3-lb
10 inch	22.7 sec	5.0E+08 ft^3-lb
Large break	15 sec	3.9E+09 ft^3-lb

*Note: These are the integrated values of the product of the purge flow and primary coolant released to the containment. The released radioactivities are determined by the following.

(Released radioactivities) = (Primary coolant concentration of radioactivities) / (Containment volume) * $\int$ ((Purge flow) * (Primary coolant released to the containment)) dt

Therefore, the released radioactivities to the environment are proportionate to these integrated values above.

The evaluation of radiological consequences in DCD Chapter 15 employs, according to RG1.183, 1 μCi/g as the equilibrium iodine concentration. However, even when considering a higher concentration of 60 μCi/g, the contribution of radioactivity in RCS is relatively insignificant, and is below the acceptance criteria. Thus, the low volume purge system's piping size and the isolation time have been verified.

The design of the low volume purge system's penetration piping size and of the isolation time is not site specific. However, by verifying that the site specific χ/Q values do not exceed those of DCD or that the acceptance criteria for radiological consequences in an accident are not exceeded even when the site specific χ/Q values are above those of DCD, validity of the current design can be ascertained.

The compliance with BTP 6-4 acceptance criterion #5 A through D is as following:

A: See above-mentioned response.

B: The containment low volume purge system has no safety related fans, filters, or ductwork located beyond the containment isolation valves. See DCD Section 9.4.6.3.4 and Table 9.4.6-1.

C: Conservatism of the minimum containment pressure analysis for ECCS capability study is described considering for purged containment volume before containment isolation as follows. Containment pressure rises by blowdown of the postulated large break LOCA regarding ECCS capability study and reaches at the setpoint of the containment pressure High-l, 9.3 psig (including 2.5psi of the instrument error). It induces both signal generations of the safety injection and the containment isolation Phase A at 1.6 sec for nominal case of the large break LOCA. The normal containment purge line is assumed to be completely closed after 13 sec of the signal generation. Until the achievement of the containment isolation Phase A at 14.6 sec, no more than 7000 ft3 of the volume is estimated to be purged to outside of the containment. The estimated volume is 12% of the margin with the overestimated containment free volume used for the analysis. Furthermore, since the purged volume of integration is approximately 0.25 % to the initial containment free volume, 2861000 ft3, the influence on the transient is ignorable.

D: Each design leak rate of the containment high volume purge isolation valve is assumed as 360 scc/min. However, the maximum allowable leak rate of the purge isolation valves are not considered as significant parameter, since the bypass leakage fraction is credited as 50% in dose evaluation though total potential containment bypass leakage is considered to be much less than 10%. The specific allowable leak rate will be decided as acceptance criteria for each containment isolation valve Type C test of containment leakage rate testing.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-18

Clarify administrative controls and leak testing provisions for flanged closures
Pursuant to GDC 54 as it relates to requirements that the design of piping systems penetrating containment with a capability to periodically test the operability of the isolation valves and associated apparatus, state in the DCD that the containment penetration barriers that consist of flanged closures are under administrative controls similar to manual valves and have provisions for containment leak testing in accordance with ANSI N271-1976, paragraph 5.3. Include a discussion of the Containment Leak Rate Testing System (LTS) penetration (Figure 6.2.4-1 sheet 47) and the oil supply and drain line for the RCP motor penetrations penetration (Figure 6.2.4-1 sheet 48) in your response.

ANSWER:

Descriptions of the accommodations for leakage testing that are provided for containment penetration barriers that consist of flanged closures and are under administrative controls have provisions for containment leak testing in accordance with ASNI N271-1976, paragraph 5.3, has been provided in DCD Subsection 6.2.6.2. Figure 6.2.4-1, Sheets 46 and 47, presents the permanently installed penetrations for the containment integrated leakage rate testing. These penetrations are flanged closures during normal reactor operation, with compressed air equipment suitable to perform the test temporarily connected.

Figure 6.2.4-1, Sheets 46 and 47 (LTS penetrations) will be revised to show the required test connections for the subject penetrations which are subject to Type B leakage rate testing.

Figure 6.2.4-1, Sheet 48 (Oil supply and drain line for the RCP motor) will be revised to show the required test connections for the subject penetration which is subject to the Type B test in accordance with 10CFR50, Appendix J.

Impact on DCD

DCD will be changed to incorporate the following:

6.2.4 System Design
(After third paragraph)
The containment penetration barriers that consist of flange closure, personnel airlock and equipment hatch are under administrative control.

MHI will revise Figure 6.2.4-1 will be updated to show the required test connections for the subject penetrations which are subject to Type B leakage rate testing.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-19

Clarify administrative controls and leak testing provisions for personnel airlock.
Pursuant to RG 1.141 guidance (ANSI N271-1976, paragraph 4.10) state in the DCD that the personnel airlock will be under administrative controls similar to manual valves and have provisions for containment leak testing in accordance with ANSI N271-1976, paragraph 5.3. Provide descriptions of the accommodations for leakage testing that are provided for in the airlock design.

ANSWER:

Descriptions of the accommodations for leakage testing that are provided for in the airlock are provided in DCD Subsection 6.2.6.2. The personnel airlock will be under administrative controls. Figure 6.2.4-1, Sheet 49 will be revised to illustrate the personnel airlocks that are subject to the Type B test in accordance with 10CFR50, Appendix J. Door seals for the personnel airlocks are the Type B leakage rate tested by pressurizing the airlock, and utilizing permanent test fixtures and gauges.

Impact on DCD

DCD will be changed to incorporate the following:

6.2.4 System Design
(After third paragraph)
The containment penetration barriers that consist of flange closure, personnel airlock and equipment hatch are under administrative control.

MHI will revise Figure 6.2.4-1 Sheet 49 to show the airlock leak test connections.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-20

Clarify administrative controls and leak testing provisions for equipment hatch
Pursuant to RG 1.141 guidance (ANSI N271-1976, paragraph 4.10), state in the DCD that the equipment hatch will be under administrative controls similar to manual valves and have provisions for containment leak testing in accordance with ANSI N271-1976, paragraph 5.3. Provide descriptions of the accommodations for leakage testing that are provided for in the hatch design.

ANSWER:

Descriptions of the accommodations for leakage testing that are provided for in the equipment hatch seals are provided in DCD Subsection 6.2.6.2. The equipment hatch seals will be under administrative controls. Figure 6.2.4-1, Sheet 50 will be revised to illustrate the equipment hatch which is subject to the Type B test in accordance with 10CFR50, Appendix J. Equipment hatch seals are the Type B leakage rate tested by pressurizing the equipment hatch, and utilizing suitable permanent test fixtures and gauges.

Impact on DCD

DCD will be changed to incorporate the following:

6.2.4 System Design
(After third paragraph)
The containment penetration barriers that consist of flange closure, personnel airlock and equipment hatch are under administrative control.

MHI will revise Figure 6.2.4-1 Sheet 50 to show the hatch seals leak test connections.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-21

Clarify administrative controls and leak testing provisions for fuel transfer tube.
Pursuant to RG 1.141 guidance (ANSI N271-1976, paragraph 4.10), state in the DCD that the fuel transfer tube will be under administrative controls similar to manual valves and have provisions for containment leak testing in accordance with ANSI N271-1976, paragraph 5.3. Provide descriptions of the accommodations for leakage testing that are provided for in the fuel transfer tube design.

ANSWER:

A brief description of the accommodations for leakage testing that are provided for the fuel transfer tube is provided in DCD Section 6.2.6.2. The fuel transfer tube will be under administrative controls. Figure 6.2.4-1, Sheet 39 will be revised to illustrate the fuel transfer tube which is subject to the Type B test in accordance with 10CFR50, Appendix J.

As stated in DCD Section 6.2.6.2, the seals on the fuel transfer tube (containment end) blind flange are Type B tested.

Impact on DCD

DCD will be changed to incorporate the following:

6.2.4 System Design
(After third paragraph)
The containment penetration barriers that consist of flange closure, personnel airlock and equipment hatch are under administrative control.

MHI will revise Figure 6.2.4-1 Sheet 39 to show the leak test connections.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-22

Clarify administrative controls and leak testing provisions for the 14 spare penetrations.
Pursuant to RG 1.141 guidance (ANSI N271-1976, paragraph 4.10), state in the DCD that the fourteen spare penetrations listed in DCD Table 6.2.4-3 will be under administrative controls similar to manual valves. This table notes that they will be Appendix J Type B leak tested. Describe the accommodations for leakage testing that are provided for in the spare penetrations design in accordance with ANSI N271-1976, paragraph 5.3.

ANSWER:

Descriptions of the accommodations for leakage testing that are provided for the fourteen (14) spare penetrations will be provided in DCD Subsection 6.2.6.2. The subject spare penetrations listed in Table 6.2.4-3 will be under administrative controls. Figure 6.2.4-1 will be revised to include a typical illustration of spare penetrations, which are subject to the Type B test in accordance with 10CFR50, Appendix J and ANSI N271-1976, Paragraph 5.3.The subject spare penetrations that consist of flanged closures are P269L, P301, P419, P420. The other spare penetrations that consist of the sleeve and sleeve end cap welded together are subject to the Type A test.

Impact on DCD

DCD will be changed to incorporate the following:

6.2.4 System Design
(After third paragraph)
The containment penetration barriers that consist of flange closure, personnel airlock and equipment hatch are under administrative control.

MHI will revise to provide descriptions of the accommodations for leakage testing for the spare penetrations in DCD Subsection 6.2.6.2.

MHI will revise Table 6.2.4-3 to add available data for the spare penetrations
MHI will revise Figure 6.2.4-1 will be updated to show the required test connections for the subject penetrations which are subject to Type B leakage rate testing.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-23

Clarify if CCWS lines to/from the letdown HTEX meet GDC 57 criteria.
Section 6.2.4.3.3 of the DCD application lists those systems (or portions of systems) that meet the criteria of GDC 57. Explain why the Component Cooling Water (CCWS) inlet and outlet for the letdown heat exchanger is not included with those lines listed in paragraph 6.2.4.3.3.

ANSWER:

Component Cooling Water (CCWS) inlet and outlet for the letdown heat exchanger should be included with those lines listed in paragraph 6.2.4.3.3.

Impact on DCD

The DCD will be changed to incorporate the followings:

6.2.4.3.3 Evaluation of Conformance to General Design Criterion 57 of 10CFR50, Appendix A

- CCWS inlet and outlet for **letdown and** excess letdown heat exchanger, using one outboard containment isolation valve each to and from the containment capable of automatic operation.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-24

Clarify nomenclature for the Main steam depressurization valves.
Clarify the proper valve designation of the main steam depressurization valves. Figure 6.2.4-1 lists these valves as NMS-MOV-507A,B,C,D, however Table3.2-2 lists thee valves as NMS-MOV-508A,B,C,D.

ANSWER:

The valve numbers of main steam depressurization valves (MSDV) are NMS-MOV-508A, B, C and D. Figure 6.2.4-1 shows main steam relief valve block valves (MSRVBVs) as NMS-MOV-507A, B, C and D. As containment isolation barrier is up to MSRVBVs and MSDVs are not included containment isolation barrier, the numbers of MSDV are not listed in Figure 6.2.4-1.

Table 3.2-2 shows the classification of mechanical and fluid systems, components, and equipment. MSDVs are not included containment isolation barrier, but these valves have another safety function such as decay heat removal. Therefore MSDVs are also classified in Equipment Class 2. As described the above, Table 3.2-2 is also appropriate.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-25

Clarify if portions of the MSS system meet GDC 4 criteria, inclusion of MSS valves as barriers.
The following is in reference to item #8 Main Steam System (MSS) in Table 3.2.2. Pursuant to GDC 4 with regard to the designation of structures systems and components important to safety which are designed to withstand the effects of and withstand the environmental conditions associated with postulated accidents, confirm if the main steam piping including the branch pipe from the steam generators up to and including the following valves: Main Steam Relief Valves NMS-PCV-466,476,486,496,467,477,487,497,468,478,488,498, have similar classification designations as those for the main steam piping including the branch pipe from the steam generators up to and including the following valves: Main Steam Relief Valves NMS-PCV-465,475,485,495.
In addition the staff noted that none of the main steam relief valves are listed as containment isolation barriers associated with valve arrangement sheet 15 items in Table 6.2.4-3. Indicate if these valves should be added to Table 6.2.4.3 as containment isolation barriers.

ANSWER:

It is stated "Main Steam Relief Valves NMS-PCV-466, 476, 486, 496, 467, 477, 487, 497, 468, 478, 488, 498" in this RAI, but these valves are not existing. MHI believes these valve numbers are from Figure 6.2.4-1 sheet 15. The numbers 465, 475, 485, 495, 466, 476, 486, 496, 467, 477, 487, 497, 468, 478, 488, 498 in this figure mean transmitter numbers for main steam line pressure. Components up to these transmitters are containment isolation barriers, so they are designed to withstand the effects of and withstand the environmental conditions.

Main steam relief valves are not listed as containment isolation barriers because up to main steam relief valve block valves (NMS-MOV-507A, B, C, D) are designed as containment isolation barriers. This configuration is based on GDC 57. Therefore, the main steam relief valves should not be added to Table 6.2.4-3.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-26

Clarify if portions of the Emergency Feedwater system meet GDC 4 criteria.
Pursuant to GDC 4 with regard to the designation of structures systems and components important to safety which are designed to withstand the effects of and withstand the environmental conditions associated with postulated accidents, confirm if the Emergency Feedwater discharge piping to the steam generators from and excluding the emergency feedwater system containment isolation valves EFS-MOV-019A,B,C,D ,has similar classification designations as those listed in table 3.3-2 for the Main feedwater piping and valves to the steam generators from and including the main feedwater isolation valves NFS-VLV-512A,B,C,D.

ANSWER:

A review of DCD Table 3.2-2, Revision 1 with regard to the classification of the Emergency Feedwater discharge piping from and excluding the emergency feedwater system containment isolation valves EFS-MOV-019A,B,C,D and Main Feedwater piping and valves to the steam generators from and including the main feedwater isolation valves NFS-VLV-512A,B,C,D shows that the subject EFWS and NFS piping and components have similar classification designations, as shown below:

	EFWS discharge piping from and excluding the EFWS containment isolation valves EFS-MOV-019A,B,C,D)	Main Feedwater (NFS) piping and valves to the SGs from and including the main feedwater isolation valves NFS-VLV-512A,B,C,D	Notes/Remarks
Equipment Class	2 (See Note 1)	2 (See Note 2)	Note 1: EC 2 (Ref.: DCD, Figure 10.4.9-1) Note 2: EC 2 (Ref.: DCD, Figure 10.4.7-1)
Location	R/B	R/B PCCV	
Quality Group	B	B	
10CFR 50 Appendix B	YES	YES	
Code and Standards	ASME Code, Section III, Class 2	ASME Code, Section III, Class 2	
Seismic Category	I	I	

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-27

Clarify if portions of the VWS system meet GDC 4 criteria.
Pursuant to GDC 4 with regard to the designation of structures systems and components important to safety which are designed to withstand the effects of and withstand the environmental conditions associated with postulated accidents, and pursuant to SRP 6.2.4 subsection II Acceptance Criterion #15, confirm that the Chilled Water System (VWS) piping and valves from the VWS containment isolation valve VWS-MOV-403, through the CRDM Cooling Units in containment, up to and including VWS containment isolation Valve VWS-MOV-40, is designed to the following criteria:
The system is protected against missiles and pipe whip.
The system is designated seismic Category I.
The system is classified Quality Group B.
The system is designed to withstand temperatures equal to at least that of the containment design.
The system is designed to withstand the external pressure from the containment structure acceptance test.
The system is designed to withstand the LOCA transient and environment.

ANSWER:

The chilled water system (VWS) piping and valves from VWS containment isolation valve VWS-MOV-403, through the CRDM cooling units in containment, up to and including VWS containment isolation valve VWS-MOV-407, are designed to closed system in accordance with SRP 6.2.4 subsection II Acceptance Criterion #15.

The description for VWS in Table 3.2-2 of DCD Revision 1 was revised to be consistent with the closed system design in accordance with SRP 6.2.4 subsection II Acceptance Criterion #15.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-28

Illustrate missile barrier in figure 6.2.4.1
Pursuant to the evaluation of GDC-4, in accordance with ANSI N271-976 appendix B guidance, show the relationship between the missile barrier and the containment isolation barrier for each containment isolation configuration shown in figure 6.2.4.1

ANSWER:

The statement that containment isolation barrier is required to be protected from missiles is clearly provided in DCD subsection 6.2.4.1 Design Bases. So, all containment isolation barriers are located outside the missile barrier. Therefore, MHI believes that there is no need to show the missile barrier in Figure 6.2.4-1.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

9/22/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 57 REVISION 0**
SRP SECTION:	**06.02.04 - CONTAINMENT ISOLATION SYSTEM**
APPLICATION SECTION:	**06.02.04 CONTAINMENT ISOLATION SYSTEM**
DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-29

Provide information on leak detection capability in remote manual systems.
As discussed in section 6.2.4.2, you state that the US-APWR design provides means of detection of possible leakage from lines where remote manual valves are acceptable and employed. Additional details on these provisions are required in order to demonstrate the acceptability of meeting the requirements of GDC 54 as it relates to the ability to detect leakage from, identify and isolate these lines. Provide details of leakage detection capability for each system needed for safe shutdown of the plant listed in table 6.2.4-3 that utilizes remote manual valves for containment isolation. Details of such provisions can include (but are not limited to) a description of instrumentation for measuring system flow rates or pressure , temperature, radiation or water level in areas outside the containment like valve rooms or engineered safeguards areas.

ANSWER:

Systems that are including remote manual valve for containment isolation are followings:

- Safety injection system.
- Containment spray system
- Residual heat removal system
- Emergency feedwater system
- Main steam system
- Seal water injection
- Post-accident sampling return line
- Fire protection water supply system

The condition in which containment isolation is needed in safety injection system, containment spray system and residual heat removal system is when leak occurs in these systems. These systems are located in safeguard component area. Leak detection system is installed in each system. Level instruments are installed in each pump compartment sump. In addition, if leak is occurred, operators can notice by pump suction/discharge pressure and pump flow rate.

As for main steam system, NMS-MOV-507A, B, C, D, NMS-MOV-701A, B, C, D and EFS-MOV-101A, B, C, D are remote manual isolation valves. The condition in which containment isolation is needed is to prevent fission product from releasing such as in SGTR. In each main steam line, radiation monitors is installed. So operators can notice that these valves should be closed.

As for seal water injection line, CVS-MOV-178A, B, C, D are remote manual isolation valves. The condition in which containment isolation is needed is the case that seal injection flow is lost. In each injection line, flow rate instrument is installed. So operators can notice that these valves should be closed.

As for post-accident sampling return line and fire protection water supply system, PSS-MOV-071 and FSS-MOV-004 are remote manual isolation valves. The reason why these valves does not receive containment isolation signal is that these are closed under administrative control, such as locked closed. Therefore, these valves are not needed to be closed if leak occur.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-30

Provide information on provisions to alert the operator to isolate RM systems.
In order to evaluate if requirements of GDC 54 as they relate to reliable isolation capability systems utilizing remote manual containment isolation valves have been met for the US-APWR, more information is required. For each containment penetration listed in table 6.2.4-3 that is equipped with remote manual containment isolation valves, provide details as to what provisions are provided to alert the operator of the need to isolate fluid systems equipped with remote manual isolation valves. Such provisions may include instruments to measure flow rate, sump water level, temperature, pressure, and radiation level. For each penetration and provision (instrument(s)) listed, provide a description of how an operator in the main control room would use the provision or instrument to identify the line and to determine when to isolate the fluid system.

ANSWER:

Systems that are including remote manual valve for containment isolation are followings:

- Safety injection system.
- Containment spray system
- Residual heat removal system
- Emergency feedwater system
- Main steam system
- Seal water injection
- Post-accident sampling return line

- Fire protection water supply system

The condition in which containment isolation is needed in safety injection system, containment spray system and residual heat removal system is when leak occurs in these systems. These systems are located in safeguard component area. Leak detection system is installed in each system. Level instruments are installed in each pump compartment sump. In addition, if leak is occurred, operators can notice by pump suction/discharge pressure and pump flow rate.

As for main steam system, NMS-MOV-507A, B, C, D, NMS-MOV-701A, B, C, D and EFS-MOV-101A, B, C, D are remote manual isolation valves. The condition in which containment isolation is needed is to prevent fission product from releasing such as in SGTR. In each main steam line, radiation monitors is installed. So operators can notice that these valves should be closed.

As for seal water injection line, CVS-MOV-178A, B, C, D are remote manual isolation valves. The condition in which containment isolation is needed is the case that seal injection flow is lost. In each injection line, flow rate instrument is installed. So operators can notice that these valves should be closed.

As for post-accident sampling return line and fire protection water supply system, PSS-MOV-071 and FSS-MOV-004 are remote manual isolation valves. The reason why these valves does not receive containment isolation signal is that these are closed under administrative control, such as locked closed. Therefore, these valves are not needed to be closed if leak occur.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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QUESTION NO. : 06.02.04-31

Provide a table describing the provisions for individual leakage rate testing of the isolation barrier. In order to evaluate if requirements of GDC 54 as they relate to the ability to test the operability of isolation barriers are met and to determine if valve leakage is within acceptable limits, for each containment isolation barrier, provide a table describing the provisions (test connection etc) for individual leakage rate testing of the barrier.

ANSWER:

Figure 6.2.4-1 will be revised to show all test, vent and drain connections. P&IDs/Figure 6.2.4-1 will be revised in DCD revision 2, to show all test, vent and drain connections to ensure proper differential pressure of containment isolation valves requiring testing.

Impact on DCD

Figure 6.2.4-1 will be revised, in revision 2, to show all vent, drain and test connections to obtain proper differential test pressure for containment isolation.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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DATE OF RAI ISSUE:	**8/25/2008**

QUESTION NO. : 06.02.04-32

Clarify use of resilient seals on containment vent and purge valves and accommodations for seal replacement if supplied.
In order to evaluate if requirements of GDC 54 as they relate to the ability to test the operability of isolation barriers and to determine if valve leakage is within acceptable limits, specify (or state where in the DCD it is specified) if the containment purge and vent valves will be supplied with resilient seals. If supplied, specify what accommodations are provided for resilient seal replacement when required by leakage rate testing or manufacturer recommendation.

ANSWER:

Containment purge and vent valves (Containment Purge System) may be supplied with resilient seals and the subject containment penetrations and containment isolation valves will receive preoperational and periodic Type C leak rate testing in accordance with 10CFR50, Appendix J. The soft seated containment isolation butterfly valves in the containment purge system which may require resilient seal replacement following the leakage rate testing will be subject to seals replacement based on a valve manufacturer recommendation.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-33

Provide information on evaluation of isolation valve seal systems
Table 6.2.4.1, "Design Information Regarding Provisions for Isolating Containment Penetrations" refers to an isolation valve seal system. There is no reference to such a system elsewhere in the DCD. It is unclear if an isolation valve seal system will be provided as part of the design. Clarify if such system is provided. If it is, please submit an evaluation of the functional capabilities of the system.

ANSWER:

There are no applications of isolation valve seal systems or fluid-filled systems that serve as seal systems in the US-APWR as they relate to ANS-56.2/ANSI-N271-1976, Section 4.11. The description in Table 6.2.4-1 of the DCD will be revised in revision 2 as shown below.

Impact on DCD

DCD will be changed to revise Row 5 of Table 6.2.4-1.

~~The bypass leakage rates through the containment boundaries (isolation barriers) shall be limited to as low as reasonably achievable. (ANS-56.2/ANSI-N271-1976, Section 4.11)~~ **There are no applications of isolation valve seal systems or fluid-filled systems that serve as seal systems in the US-APWR as described in ANS-56.2/ANSI-N271-1976, Section 4.11.**

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-34

Clarify possible Typo.
GDC 55 as described in section 3.1.5.6 may have a typographical error. It appears that item #2 is the same as item #1 in the paragraph. Item #2 reads: One **locked closed** isolation valve inside and one locked closed isolation valve outside containment; or"
Confirm that #2 should read: "One **automatic** isolation valve inside and one locked closed isolation valve outside containment; or"

ANSWER:

Item #2 should be read as: "One **automatic** isolation valve inside and one locked closed isolation valve outside containment; or"

Impact on DCD

The DCD will be changed to incorporate the following:

Item #2 in subsection 3.1.5.6 will be revised "One **automatic** isolation valve inside and one locked closed isolation valve outside containment; or"

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-35

In table 6.2.4.1, "Design Information Regarding Provisions for Isolating Containment Penetrations" For Valve Operability and Qualification, References "N278.1-1995", NRC staff could not locate this reference. Please indicate if this is in fact ASME N278.1- 1975?

ANSWER:

This Reference should be read as: ANSI / ASME N278.1- 1975.

Impact on DCD

Table 6.2.4-1 will be revised to incorporate ANSI / ASME N278.1- 1975

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 06.02.04-36

In order to evaluate the Containment Isolation System design as it relates to meeting the requirements of 10 CFR 50 Appendix A(1), consideration of the need to design against single failures of passive components in fluid systems important to safety, more information is required. There is no failure modes and effects analysis of the CIV system provided. In accordance with RG 1.206 C.I.6.2.4.3 guidance, please provide a failure modes and effects analysis.

ANSWER:

Piping and valves of containment isolation barrier are designed to preclude a breach of piping integrity (Reference: SRP 6.2.4 Rev.3 SRP Acceptance Criteria 5). Therefore, MHI believes single failures of passive components in CIS do not need to be considered.

MHI will add a failure modes and effects analysis in DCD Revision 2.

Impact on DCD

The DCD will be changed to incorporate the following:

6.2.4.3 Design Evaluation

[After first paragraph]
The CIS is able to perform its safety function in the event of any single active failure. The CIS includes double isolation barriers at the containment penetrations. Redundant isolation valves are powered from separate electrical trains to provide containment isolation in the event of a single active failure in the electrical system. Therefore, CIS meets the single failure criterion.

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA