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ORIGINAL

August 6, 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-08142

Subject: MHI's Response to US-APWR DCD RAI No.29

References: 1) "Request for Additional Information No. 29 Revision 0, SRP Section: 11.01 – Source Terms, Application Section: SRP Sections 11.1, 2.4.13, 11.2 " dated July 7, 2008.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Request for Additional Information No. 29 Revision 0."

Enclosed is the response to an RAI 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 provided below.

Sincerely,

Y. Ogata

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

Enclosure:

1. Response to Request for Additional Information No.9 Revision 0

CC: J. A. Ciocco
C. K. Paulson

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Docket No. 52-021
MHI Ref: UAP-HF- 08142

Enclosure 1

UAP-HF-08142
Docket No. 52-021

Response to Request for Additional Information No.29 Revision 0

August, 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

8/6/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO.29 REVISION 0**
SRP SECTION:	**11.01 – Source terms**
APPLICATION SECTION:	**11.1, 2.4.13, 11.2**
DATE OF RAI ISSUE:	**7/7/2008**

QUESTION NO. : 11.01-2

Pursuant to SRP section 2.4.13, the dose consequence analysis for liquid radwaste system failures must consider the "most adverse" contamination in groundwater. Tc-99, which is produced in the reactor core in amounts several orders of magnitude greater than I-129, becomes an important contributor to dose from groundwater because of its long half life and low retardation in soil. Pursuant to SRP sections 11.2 (BTP-11-6) and 2.4.13, please identify the Tc-99 concentrations in the primary and secondary coolant under design basis and realistic conditions. Please include these concentrations and the associated technical basis in FSAR Section 11.1, or justify their exclusion

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ANSWER:

The dose consequence of Tc-99 is relatively small compared with that of Cs-137 written in DCD and therefore, it does not need to be considered. Its adequacy is as shown below.

1. Core inventories

The core inventories of Tc-99 and Cs-137 and I-129 as long half life nuclides are shown in Table-1. As shown in Table-1, the production of Tc-99 in the reactor core is larger than that of I-129 by several orders but at the same time, it is smaller than that of Cs-137 by several orders.

Table-1 Core Inventories

	Cs-137	Tc-99	I-129[*3]
Half Life[*1] (Sec)	9.467E+08 (3.0E+01 Yr)	6.722E+12 (2.1E+05 Yr)	4.954E+14 (1.7E+07 Yr)
Core Inventories(Ci)[*2]	1.9E+7	2.3E+03	5.6E+0

*1: Values written in ORNL/TM-6055

*2: Calculated by ORIGEN-2 (100% thermal power)

*3: For reference

2. Effluent concentration limit

The effluent concentration limits of Tc-99 and Cs-137 described in 10 CFR 20 Appendix B are shown in Table-2. The effluent concentration limit of Tc-99 is 60 times greater than Cs-137.

Table-2 Effluent Concentration limit

	Cs-137	Tc-99
Effluent Concentration limit (Water) (μCi/ml)[*1]	1E-6	6E-5

*1:10 CFR 20 Appendix B Table-2

3. Dose consequence evaluation of Tc-99

For evaluation in DCD Subsection 11.2.3.2, the retarding effect due to deposition of each nuclide to soil is ignored conservatively and the hydrological travel time is considered for one year for every nuclide. It can be said that this is a sufficiently short time compared with the half life not only of Tc-99 but of Cs-137. Thus, Cs-137 whose core inventories are larger than that of Tc-99 by several orders is the dominant nuclide.

And, as shown in section 2, the value for the concentration limit is tighter for Cs-137, and therefore, Cs-137 has a relatively larger contribution to the concentration limit written in 10CFR20 Appendix B. As an example, the dose consequence of Tc-99 is evaluated with the effluent concentration of Tc-99 being regarded the same as Cs-137. The evaluation result is shown in Table-3. From this, even when the concentration of Tc-99 is assumed to be similar to Cs-137, the concentration of Tc-99 is less than 1/500 of the concentration limit. As the core inventory is small, its contribution to the actual concentration limit can be predicted to be smaller, and therefore, the contribution of Tc-99 can be ignored.

Based on the above analysis, when a liquid radwaste system failure occurs, the concentration of Tc-99 shows a sufficiently low value compared with the concentration limit written in 10CFR20 Appendix B, and Tc-99 can be excluded from the subject nuclide for evaluation.

Table-3 Comparison with concentration limit value

	Holdup Tank	Waste Holdup Tank	Boric Acid Tank
Effluent Concentration of Tc-99 (μCi/ml)[*1][A]	8.8E-9	9.8E-10	1.2E-7
Effluent Concentration limit of Tc-99 (Water) (μCi/ml) [B]	6E-5		
Fraction of Concentration limit [A/B]	1.5E-4	1.6E-5	2.0E-3
Fraction of Concentration limit (total without Tc-99)[*2]	2.0E-2	2.1E-3	2.2E-1

*1:Same as the concentration of Cs-137(conservative assumption)

*2:DCD table11.2-17

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

This completes MHI's response to the NRC's question.