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TOKYO, JAPAN

February 16, 2010

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-10045

Subject: MHI's Responses to US-APWR DCD RAI No.516-4027

Reference: 1) "Request for Additional Information 516-4027 Revision 0, SRP Section: 07.01-C Appendix – Guidance for Evaluation of Conformance to IEEE Std. 603 Application Section: 7.2 Reactor Trip System, 7.3 Engineered Safety Feature Systems," dated 1/11/2010

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 516-4027, Revision 0."

Enclosed is the response to 1 RAI contained within Reference 1. This transmittal completes the response to this RAI.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. 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. 516-4027, Revision 0

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

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Enclosure 1

UAP-HF-10045
Docket No. 52-021

Response to Request for Additional Information No. 516-4027,
Revision 0

February 2010

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/15/2010

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 516-4027 REVISION 0**
SRP SECTION:	**07.01-C – GUIDANCE FOR EVALUATION OF CONFORMANCE TO IEEE STD.603**
APPLICATION SECTION:	**07.02, 07.03**
DATE OF RAI ISSUE:	**1/11/2010**

QUESTION No.: 07.01-C Appendix-1

Provide the predefined, preferred failure state of the control outputs of the safety systems.

10 CFR 50.55a(h) incorporates by reference IEEE Std. 603-1991. Criterion 5.5 of IEEE Std. 603-1991 requires, in part, that the safety systems be designed to accomplish their safety functions under the full range of applicable conditions enumerated in the design basis. Appendix 7.1-C of the SRP, states "The review of system integrity should confirm that the design provides for safety systems to fail in a safe state, or into a state that has been demonstrated to be acceptable on some other defined basis, if conditions such as disconnection of the system, loss of energy, or adverse environments, are experienced." Additionally, the guidance goes on to state, "During either partial or full system initialization or shutdown after a loss of power, control output to the safety system actuators should fail to a predefined, preferred failure state." At the October 7 - 8, 2009 meeting with the staff, MHI agreed to provide the predefined, preferred failure state for the control outputs of the safety system. The staff needs to understand the predefined, preferred failure state of safety systems, including information that will determine which state receives priority from the Power Interface Modules. MHI is requested to provide this information as a table in the US-APWR Design Certification Final Safety Analysis Report.

ANSWER:

Reactor Trip System Outputs

The following will be added to the end of Section 4.4.1 of MUAP-07004, "Safety I&C System Description and Design Process" at the next revision:

The configuration of the Reactor Trip System (RTS) output interface for each reactor trip breaker is shown in Figure 4.4-1. The output interface on the left of this figure controls the undervoltage and shunt trip mechanisms of the reactor trip breaker. This output will trip its breaker under conditions of loss of power or disconnection, except failures or disconnections prior to the two-out-of-four voting logic. These failures will result in actuation of only one trip leg. This condition is alarmed.
The outputs in the center and on the right of this figure are used to individually test the undervoltage or shut trip mechanisms of the breaker. These outputs are normally de-energized, but normally maintain circuit continuity (ie. normally closed output contacts). Therefore, if these outputs fail, there is no effect on the operation of the breaker or the ability to trip the breaker. However, if the output on the right is disconnected, the breaker's shunt trip mechanism will not

function. If the center output is disconnected, the breaker will trip via the shunt trip mechanism.

ESF System Outputs
All of safety related plant components controlled by the SLS as well as ESF system components share the common design policy for the fail mode. The following will be added after the 5th paragraph of Section 4.2.3 of MUAP-07004 at the next revision:

All PIF modules use outputs that must be energized to actuate their respective plant component. When the output is energized, circuit continuity is established (ie. normally open output contacts). For switchgear and motor operated valves, loss of power or disconnections will have no effect on the plant component; the component will maintain its current position. If a motor operated valve is in mid-travel, it will fail in the mid-travel position. For motor contactors and solenoids, loss of power or disconnections will result in de-energizing the plant component. Energized valves will transition to their mechanically designed failure position (eg. fail-open or fail-closed).

Conformance to IEEE 603-1991
Summary of this response to RAI will be added to Appendix A.5.5 of MUAP-07004 at the next revision to complement the description of the conformance to IEEE 603-1991 Criterion 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.