

REQUEST FOR ADDITIONAL INFORMATION 830-6056 REVISION 3

9/22/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 07-08 Branch Technical Position - Guidance for Application of Regulatory Guide 1.22
Application Section: Section 7.8

QUESTIONS for Operating Licensing and Human Performance Branch (AP1000/EPR Projects) (COLP)

07-08 Branch Technical Position-1

Regulatory guidance:

NUREG-0800, Appendix 18-A, Section C states, "A diversity and defense-in-depth (D3) analysis should include the justification of any operator actions that are credited for response to an AOO/PA concurrent with software CCF as described in BTP 7-19.

Evaluation:

MUAP-07006, Section 3.1.3 states: Operator actions may be required within 30 minutes for some events such as feedwater line break and small break loss-of-coolant accidents.

MUAP-07014 contains no mention of operator actions for a feedwater line break.

Question:

1. Are there manual actions associated with feedwater line breaks?

07-08 Branch Technical Position-2

Regulatory guidance:

NUREG-0800, Appendix 18A, Section C states, "A diversity and defense-in-depth (D3) analysis should include the justification of any operator actions that are credited for response to an AOO/PA concurrent with software CCF as described in BTP 7-19.

Evaluation:

Technical Report *Defense-In-Depth and Diversity Coping Analysis* (MUAP-07014), Rev 4., Section 3.3 states: "The Diverse HSI Panel (DHP), which is located in the main control room (MCR), contains conventional switches for manual actuation of the systems and the components which are required to cope with a CCF." (Emphasis added)

The list from the MUAP is reproduced below along with the staff's understanding of how the action is used. Some of these actions do not appear to be credited in the Best Estimate analyses summarized in section 5 of MUAP-07014.

· Manual reactor trip / Turbine trip / Main feedwater isolation

Staff understanding: Credited as the diverse reactor trip function and in the SGTR response; otherwise, redundant to automatic signal

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- Manual emergency feedwater actuation

Staff understanding: Not credited - Redundant to automatic signal

- Manual emergency core cooling system (ECCS) actuation

Staff understanding: Not credited - Redundant to automatic signal

- Manual containment isolation

Staff understanding: Not addressed in section 5 but appears to be a manual action operators would have to perform.

- Manual operation of emergency feedwater control valves

Staff understanding: Credited in SGTR for isolation of affected S/G

- Manual operation of main steam depressurization valves

Staff understanding: Credited in SGTR for depressurization and equalization of pressure between RCS and SG

- Manual operation of safety depressurization valve

Staff understanding: Credited in SGTR for depressurization and equalization of pressure between RCS and SG

- Manual operation of main steam isolation valves: 4 switches

Staff understanding: Credited in SGTR for isolation of affected S/G

Question:

1. Correct any errors or omissions in this list.
2. If containment isolation is credited please include these manual actions in the analysis descriptions in section 5.

07-08 Branch Technical Position-3

Regulatory guidance:

NUREG-0800, Appendix 18A, Analysis criterion 4: The sequence of actions uses only alarms, controls, and displays that would be available in the MCR and operable during the assumed CCF scenario(s), as documented in the Failure Modes and Effects Analysis.

Evaluation:

MUAP-07006, Rev. 2 (accepted), Section 3.1.3 states, "Any operator actions credited prior to 30 minutes are justified based on human factors engineering (HFE) evaluation."

MUAP-07014, Rev. 4, Section 3.4 (bottom of page 3-6) states, "As described in MUAP-07006, any operator actions credited in the D3 coping analysis are justified based on a Human Factor Engineering (HFE) evaluation."

Several paragraphs later in MUAP-07014, Section 3.4 states, "Tasks for all credited time critical manual operator actions will be analyzed according to the Special Event procedures to confirm adequate time margin between time available and time required."

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Since MUAP-07006 doesn't actually say what MUAP-07014 says and MUAP-07014 has statements that could be interpreted inconsistently, the staff is asking for MHI to confirm that all manual actions credited in the coping analysis are justified with an HFE evaluation. Many of the manual actions that occur greater than 30 minutes are local actions and thus are inconsistent with regulatory guidance which suggests that any DAS credited actions should be implemented from the control room. The staff is reviewing the use of local manual action as an alternate method and has used the HFE evaluation (and subsequent V&V) as the basis for accepting local manual actions.

Questions:

1. Confirm MUAP-07014 statement that, "any operator actions credited in the D3 coping analysis are justified based on a Human Factor Engineering (HFE) evaluation."
2. Is reference to MUAP-07006 appropriate?

07-08 Branch Technical Position-4

Regulatory Guidance:

NUREG-0800, Appendix 18A, Analysis criterion 1: The analysis establishes the time available using an analysis method and acceptance criteria consistent with the guidance of BTP 7-19. The basis for the time available is documented.

Evaluation:

MHI's Responses to NRC's RAIs on Topical Report MUAP-07006-P(R1) Defense-in-Depth and Diversity (UAP-HF-08070-P, Revision 0), Response To The Second RAI (APRIL 2, 2008) pgs29-30, RAI #1-analyzed events states:

"SBLOCA violates the integrity of RCPB as an initiator. Therefore, the containment vessel (CV) integrity should be maintained. The US-APWR Probabilistic Risk Assessment, MUAP-07030 shows that for SBLOCA the operator has 4.91 hrs for manual actuation of CV spray to prevent the violation of CV integrity. DAS provides the low pressurizer pressure reactor trip actuation prompting alarm and the CV pressure indicator alerts the operator to the potential need for manual actions to maintain CV integrity. The design attributes for local controls credited in the D3 Coping Analysis, including immunity from the CCF and state based priority, will be added to the next revision of MUAP-07006."

MUAP-07014 states that the operator has 24 hours to start containment spray

Question:

Why is there a difference in the time required for operator action between these two documents?

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07-08 Branch Technical Position-5

Regulatory Guidance:

The analysis establishes the time available using an analysis method and acceptance criteria consistent with the guidance of BTP 7-19. The basis for the time available is documented.

Evaluation:

The time available, time required, available margin and the basis for these numbers is not clear for the SGTR event. The following compiles the data the staff has extracted from the DCD chapter 15 design basis analysis and the MUAP-07014 Best estimate analysis.

SGTR occurs	T=0		
Receive MS line radiation alarm	Ch. 15 – alarm occurs within 2 min. of event		
Operator moves to DHP	T=.5 min total=2.5 min		
Select special event EOP	T=.5 min total=3.0 min		
Operator energizes DHP manual controls	T=.5 min total=3.5 min		
Follow steps in procedure		07014 – total time through this step is 15 min	
· Operators manually trip reactor	T=1.5min total=15 min	Ch 15 – operators assumed to trip Rx 15 minutes after SGTR	
· Operators manually isolate the ruptured SG	T=5 min total=20 min Ch. 15 – assumes 10 minutes from alarm initiation for operator to identify ruptured SG	Duration of activity is from Ch 15. 07014 indicates time available is 30 min	Margin = 10 min
· Operators start RCS cooldown by manually opening MSDVs	T=5 min total= 25 min	Duration of activity is from Ch 15 Time available?	Margin?
· press equalization, Operator reduces RCS pressure using SDV	?	Time available?	Margin?
· Operator secures ECCS	?	Time available?	Margin?

Question:

1. Correct errors or omissions on this table.
2. Ensure Time available, Time required and margin are explicitly addressed in Chapter 5 of MUAP-07014.