REQUEST FOR ADDITIONAL INFORMATION NO. 158-1814 REVISION 0

1/21/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 16 - Technical Specifications
Application Section: 16

QUESTIONS for Technical Specification Branch (CTSB)

16-100

Justify the setting of 2735 psig as the maximum RCS pressure allowed.

Ch. 5 of the FSAR contains Table 5.2.2-1 which states the design pressure of the RCS system is 2485 psig. The setting of 2485 psig yields a 110% value (maximum allowed for RCS pressure vessel by ASME Code, Section III) of 2733.5 psig. Therefore a less than or equal to 2735 psig would exceed 110% design value if that setting were reached.

This justification is needed to preclude the plant from exceeding ASME Code.

16-101

Justify the peak fuel centerline temperature of 5072 degrees F in Safety Limit (SL) 2.1.1.2. As stated in paragraph 4.2.1.2.1 of the US-APWR FSAR, the melting temperature for fuel not containing gadolinia is 5072 F and 4892 F for fuel which does contain gadolinia.

Per Table 4.2-1 of the FSAR, the US-APWR core can contain as much as 10% gadolinia in the fuel. In order to address both types of fuel, both melting temperatures should be evaluated to incorporate the most limiting.

The reduction in melting temperature based on burnup (58 degrees F per 10,000 MWD/MTU) was consistent with both the FSAR and STS used (NUREG 1431 Rev. 3.1) and is acceptable.

16-102

Clarify and revise the correlation used in defining Safety Limit (SL) 2.1.1.1. SL 2.1.1.1 only lists the WRB-2 DNB correlation, while the FSAR Ch. 4 also discusses the use of W-3 DNB correlation.

The pressure range for the WRB-2 DNB correlation is 1440-2490 psia per Ch. 4 of the FSAR. Therefore, the data obtained via this correlation is only valid during accident analysis during which the system pressure remains in this range. However, Ch. 4 further discusses that accident analysis during which pressure falls below this applicable range

would rely on W-3 DNB correlation, even stating the limits for certain pressure ranges (i.e. 1.45 for 500-1000 psia and 1.30 for 1000-1440 psia)

16-103

Justify the rod drop time of less than or equal to 3.15 seconds as stated in Surveillance Requirement (SR) 3.1.4.3. The SR states that the prescribed time is from the beginning of decay of stationary gripper coil voltage to dashpot entry.

Ch. 4 of the FSAR, paragraph 4.2.4.3 states that the rod drop test is periodically performed but contains no reference to a satisfactory drop time. In the accident analysis, section 15.0.0.2.5 states that a time of 3 seconds is used for insertion time to dashpot entry.

The correct rod drop time is needed to adequately support its use in the accident analysis, the conflict being the time contained in the SR is longer than that stated in the accident analysis.

16-104

Justify deviation from American National Standard ANSI/ANS-19.6.1-2005 in regard to test required under the Physics Test program.

Mitsubishi Heavy Industries (MHI) supplied a document listing the justification for deviations between the US-APWR FSAR and the Standard Technical Specifications (STS) used, which in most cases was NUREG 1431 Rev. 3.1. In this document, it was stated that the NUREG 1431 Rev. 1 was used for Physics Test - Mode 1. The NUREG 1431 Rev. 3.1 does not contain a section for Mode 1 Physics Tests, only Mode 2.

NUREG 1431 Rev. 1 states the required tests to be performed on page B3.1-53. The first test listed is the Neutron Flux Symmetry test. The NUREG states that this test can be done in Mode 1 or 2, because the power limit for the test (less than or equal to 30% RTP) can be achieved in either Mode.

ANSI/ANS-19.6.1-2005, referenced in US-APWR section B3.1.8, contains Table 1 on page 3 which states the Flux symmetry test as one of the required tests to be performed during Physics Testing, and describes the test in detail on page 7, including the power level limit of less than or equal to 30% RTP.

The US-APWR FSAR does not contain the Flux Symmetry test in either the Physics Test - Mode 1 (B3.1.8), page B3.1.8-2 of DCD, or Physics Test - Mode 2 (B3.1.9), page B3.1.9-2 of FSAR. The omission of this test from the Physics Test program would not allow the program to be carried out in accordance with the American National Standard.

This justification is required to ensure that the Physics Testing is carried out in accordance with the American National Standard.

16-105

Justify deviating from American National Standard ANSI-ANS-19.6.1-2005 regarding a physics test to be performed in Mode 1.

The US-APWR FSAR on page B3.1.8-2 states that the "Critical Boron Concentration-Full Power" is to be performed.

The Standard ANSI-ANS-19.6.1-2005 lists all tests to be performed in Table 1 on page 3. The final test is listed as "HZP to HFP reactivity difference", and is discussed in detail on page 7. Previous revisions of ANSI-ANS-19.6.1 regard the test as "Critical Boron Concentration-Full Power".

The 2005 Standard is the reference cited in the US-APWR FSAR, and this revision of the Standard incorporates the new name for the test.

This information is needed to ensure testing is completed in accordance with the most recent applicable American National Standard.

16-106

Justify deviation from American National Standard ANSI-ANS-19.6.1-2005 regarding the conduct of the Power Distribution - Intermediate Power Test.

The US-APWR FSAR on page B3.1.8-2 states that the test will be conducted "at least one time by 30% RTP."

ANSI-ANS-19.6.1-2005, which is referenced in the US-APWR FSAR, states in paragraph 6.6.3 on page 7 that for this test: "reactor power shall be at a stable power level between 40 and 80% of full power."

This information is required to ensure that the Physics Testing will be conducted in accordance with the American National Standard.

16-107

Justify and/or clarify the reduction of the required channels for LCO 3.3.1, "RTS Instrumentation" Function 6, to 3 required channels in LCO 3.1.9.

The STS (NUREG 1431 Rev. 3.1) contains Table 3.3.1-1 which states that in Modes 1 and 2, there are 4 required channels for Function 6 (Overtemperature Delta-T). The same table contained in the FSAR for US-APWR only requires 3 channels for the Function 6. If there are only 3 channels required, then there would be no need to have a special provision in the Physics Test to reduce the required number to 3.

This information is needed to provide clarification for the required number of channels for Function 6, both during normal operation in Modes 1 and 2 and during the Physics Test.

16-108

Justify deviation from American National Standard ANSI-ANS-19.6.1-2005 regarding the physics tests performed. The US-APWR FSAR states on page B3.1.9-2 that one of the Mode 2 tests to be performed is the Critical Boron Concentration - Control Rods Inserted.

The Standard ANSI-ANS-19.6.1-2005 contains Table 1 on page 3 that lists the required physics tests. The Critical Boron Concentration with Control Rods Inserted is not listed on that table.

Previous revisions of the ANSI-ANS-19.6.1 have two Critical Boron Concentration tests, one with control rods withdrawn and one with control rods inserted. The 2005 ANSI document only lists one test of this nature entitled "Critical Boron Concentration". Paragraph 6.2.1 on page 5 of ANSI-ANS-19.6.1-2005 describes the test as being performed with all control rods withdrawn.

This information is required to ensure that the Physics Tests are being performed in accordance with the American National Standard.

16-109

The following comments are of the editorial nature:

1. Correct the typographical error discussed below.

On page B2.1.1-2 of the FSAR, the second full paragraph states "...by the limit DNBR values stated in SL2.1.1.1, which are...". There is no space between the 'L' and the '2'.

2. Correct the typographical error discussed below.

On page B 3.1.6-1 of the US-APWR bases, a line in the third paragraph ends with the word 'group' broken up on two lines. The letters 'gr' are ending a line and the letters 'oup' begin the next.

16-110

Clarify the explanation of the transient discussed for maximum RCS pressure setting.

STS (NUREG 1431 Rev 3.1) states in B 2.1.2 on page B 2.1.2-2 that during the transient, no control actions are assumed, except the secondary safety valves are assumed to open and nominal feedwater supply is maintained. The same bases for US-APWR omits the final statement about nominal feedwater supply being maintained, which could have significant impact on the transient and/or system response.

16-111

Clarify the explanation of the Safety Limit (SL) reference in the bases for SL 2.1.2.

The STS (NUREG 1431 Rev 3.1) states the bases of the RCS pressure limit is 110% of design pressure due to that number being the most restrictive between the 110% figure (ASME Code for RCS Vessel) and 120% figure (USAS Section B31.1 for RCS piping, valves, and fittings).

The SL is the for the entire RCS system, therefore the deviation from the STS (NUREG 1431) as presented in the US-APWR bases on page B 2.1.2-2 does not fully justify the pressure limit because only the 110% of RCS pressure vessel, and not the 120% for RCS piping, valves, and fittings, is discussed in the US-APWR bases.

16-112

Clarify the explanation of plant conditions discussed in bases for 3.1.2.

The third paragraph of the STS (NUREG 1431 Rev 3.1) on page B3.1.2-1 contains the following:" When the reactor is critical at RTP and moderator temperature, the excess positive reactivity is compensated by...".

The same line in the US-APWR bases omits the plant condition description of being at RTP and moderator temperature. The omission of these plant conditions impacts the intent of the paragraph by altering the amount of negative reactivity in the core and corresponding compensation.

16-113

Justify the omission of the maximum upper limit placed on LCO 3.1.3 as prescribed in STS (NUREG 1431 Rev. 3.1). NUREG 1431 also contains Figure 3.1.3-1 showing MTC vs. % RTP and this Figure was also omitted.

The basis in NUREG 1431 on page B 3.1.3-4 states that the LCO establishes a maximum positive value which cannot be exceeded, and that BOC and EOC limits are established in the COLR to allow specifying limits for each particular cycle. These statements were also omitted from the bases for US-APWR.

While bounding values were used in the accident analysis contained in Ch. 15 of the FSAR, the incompleteness of the specification does not support normal operation, particularly when transitioning from one fuel cycle to the next.

16-114

Revise all references of ***10 CFR 50.36(d)(2)(ii)*** to read ***10 CFR 50.36(c)(2)(ii)***

This correction is required following the NRC final ruling in August 2008 to restore original paragraph designation as existed before the 2007 Part 52 rulemaking.