GPU NUCLEAR

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6710-96-2318
October 28, 1996

U. S. Nuclear Regulatory Commission
Att: Document Control Desk
Washington, DC 20555

Gentlemen:

Subject: Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Response to Request for Additional Information -
Core Reload Methodology

In response to NRC questions raised during discussions on July 19, 1996 and August 19, 1996, GPU Nuclear is providing the attached information.

This additional information is related to GPU Nuclear Topical Report TR-092P, Revision 0, "TMI-1 Reload Design and Setpoint Methodology," submitted on February 27, 1996 for NRC review and approval for in-house GPU Nuclear core reload design.

If any additional information is required, please contact Mr. David J. Distel, GPU Nuclear Regulatory Affairs at (201) 316-7955.

Sincerely,

J. Knubel
Vice President and Director, TMI

DJD/plp
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c: Administrator, Region I
NRC TMI Senior Resident Inspector
NRC Senior Project Manager, TMI

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NRC Question:

Figure A.9 page 149 indicates the maximum allowable peaking limits. The licensee's Maximum Allowable Peaking (MAP) limits for the axial peak values of 1.3 and less do not agree as well as those for axial peak values of 1.5 and greater. The licensee indicated that they did not base this analysis on Cycle 10 specific data but on composite bounding data from previous cycles.

It appears as though the licensee has not demonstrated their ability to repeat the vendor analysis.

GPU Nuclear Response:

As discussed with the NRC on August 19, 1996, GPU Nuclear has performed a confirmatory re-analysis of the entire RPS MAP limit analysis (axial peaks from 1.1 to 1.9) using recently available vendor-provided bounding thermal-hydraulic input data to provide a more direct comparison. The MAP limit analysis, as described in Section 3.6 of the subject topical report TR-092P, consists of two parts: (1) determination of the analysis target DNBR limits at two limiting pressure-temperature statepoints (low pressure and high temperature points as shown in Table 1), and (2) a parametric analysis for various axial power shapes by iterating the hot assembly power until the target DNBR limit is reached. The new comparative results are given in the attached Table 1 (for target DNBRs), and Figure 1 and Table 2 (for the MAP limits).

Analysis Target DNBR Limits:

In Table 1, the analysis target DNBR results at the pressure-temperature limit statepoints as well as the bounding T-H data are shown. The GPU Nuclear target DNBR results are 1.1834 at the low pressure statepoint and 1.1824 at the high temperature statepoint. The corresponding values of the vendor analysis are 1.1802 and 1.1855, respectively, which agree with the GPU Nuclear results to within 0.3%.

RPS MAP Limits:

As shown in Figure 1 and Table 2, the new GPU Nuclear MAP results agree well with the vendor results. For the axial peaks from 1.1 to 1.2, the agreement of MAP limits is excellent (within 1%) and GPU Nuclear predictions for the axial peaks from 1.5 to 1.9 are 0.7% to 2.8% more conservative than those of the vendor analysis.

For the axial peak of 1.3 at the bottom portion of the fuel assembly (X/L = 0.2), the GPU Nuclear result (MAP = 2.3803) is 2.2% higher than the vendor result (MAP = 2.329). However, the impact of this 2.2% higher MAP limit at the bottom portion of the fuel assembly (X/L = 0.2) on the setpoint analysis is insignificant because, as illustrated in Figure 5.5 (page 110) of TR-092P (included in this response as Figure 2), the MAP limits are not limiting in the determination of the negative core offset (or axial imbalance) limit but are limiting for the positive core offset limit ($X/L \geq 0.5$). The GPU Nuclear MAP limits for the 1.3 axial peak would result in a more conservative setpoint than the vendor MAP limits considering that GPU Nuclear MAP limits are

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more conservative than those of the vendor in the upper half of fuel assembly ($X/L \geq 0.5$) in Figure 1. Additionally, it is noted that the GPU Nuclear MAP limits are determined using the VIPRE-01, Mod 02 code consistent with GPU Nuclear Topical Report TR-087, whereas the vendor MAP limits are determined using the LYNXT code

Furthermore, as described in Section 3.6.3 (page 60) of TR-092P, the MAP margin verification analyses are to be performed during the reload design process to ensure reasonable peaking margins in determining the setpoints. This verification analysis is needed to determine the real DNBR margin by incorporating the actual axial power distribution data directly into VIPRE-01 replacing a smooth, mathematically-derived axial power distribution used in the MAP analysis. This MAP margin verification analysis will identify and correct any problem for cases where a non-conservative MAP margin exists.

TABLE 1. ANALYSIS TARGET DNBR LIMIT

Bounding T-H Input Data	Low Pressure Point	High Temperature Point
Pressure (psia)	1800	1837.8
RCS Inlet Enthalpy (Btu/lbm)	568.9	572.15
Heat Flux (MBtu/hr-ft2)	0.20175	0.20175
RCS Flow (Mlbm/hr-ft2)	2.537	2.5283
RCS Inlet Temperature (F)	566.65	569.2

Target DNBR Limit Results	Low Pressure Point	High Temperature Point
Vendor Target DNBR	**1.1802**	**1.1855**
GPUN Target DNBR	**1.1834**	**1.1824**
DNBR % Difference	**0.27**	**-0.26**

TABLE 2. TMI-1; RPS MAP COMPARISON BETWEEN GPUN & VENDOR (BOUNDING DATA)

AXIAL PEAK	PEAK LOCATION			MAP DIFF.
	(X/L)	VENDOR MAP	GPUN MAP	(%)
1.1	0.2	1.907	1.9069	-0.01
1.1	0.4	1.901	1.8990	-0.10
1.1	0.6	1.888	1.8952	0.38
1.1	0.8	1.866	1.8704	0.23
1.2	0.2	2.117	2.1382	1.00
1.2	0.4	2.104	2.1102	0.30
1.2	0.6	2.078	2.0796	0.08
1.2	0.8	2.032	2.0148	-0.85
1.3	0.2	2.329	2.3803	2.20
1.3	0.4	2.304	2.3108	0.30
1.3	0.6	2.265	2.2360	-1.28
1.3	0.8	2.175	2.1255	-2.27
1.5	0.2	2.758	2.7204	-1.36
1.5	0.4	2.673	2.5975	-2.83
1.5	0.6	2.537	2.4666	-2.78
1.5	0.8	2.391	2.3285	-2.62
1.7	0.2	3.033	2.9807	-1.73
1.7	0.4	2.886	2.8288	-1.98
1.7	0.6	2.718	2.6682	-1.83
1.7	0.8	2.577	2.5096	-2.62
1.9	0.2	3.205	3.1820	-0.72
1.9	0.4	3.042	3.0101	-1.05
1.9	0.6	2.877	2.8344	-1.48
1.9	0.8	2.725	2.6647	-2.21

NOTES: MAP DIFF. = (GPUN-VENDOR)/VENDOR*100

FIGURE 1. Maximum Allowable Peaking Limits

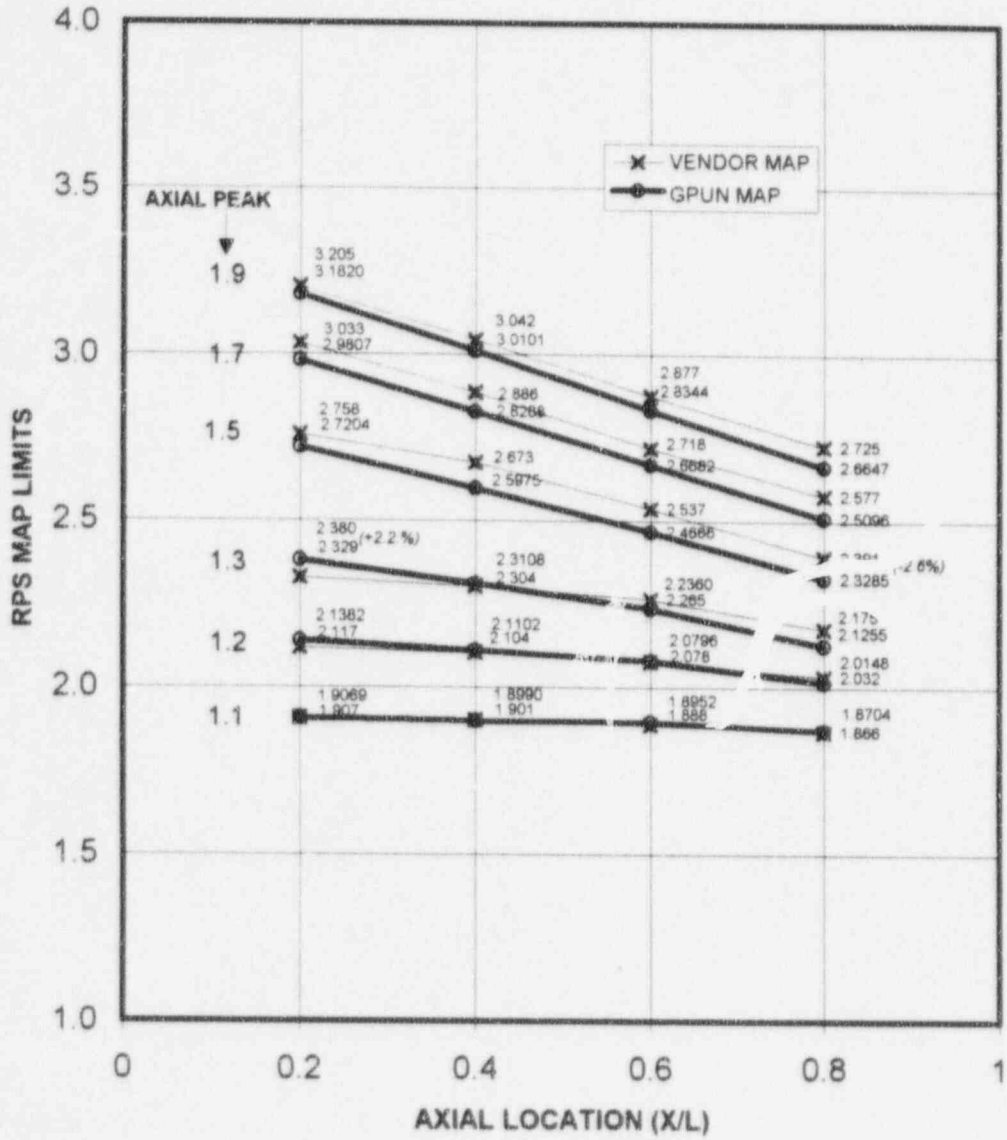

FIGURE 2. DETERMINATION OF AXIAL OFFSET LIMIT BASED ON CFM & MAP MARGINS

(Figure 5.5 on page 110 of GPUN Topical Report TR-092P)