GPU NUCLEAR

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September 24, 1997

6710-97-2418-1

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

Dear Sir:

Subject: Three Mile Island Nuclear Station, Unit 1, (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Technical Specification Change Request (TSCR) No. 266
Accident Recirculation Systems Leakage Limits
Phase 2 - Supplemental Information, re: LPZ Thyroid Dose

Ref.: 1. GPUN Letter No. 6710-97-2252, dated July 30, 1997
2. GPUN Letter No. 6710-97-2425, dated September 19, 1997

On September 10, 1997 GPU Nuclear (GPUN) Inc. met with representatives of the Nuclear Regulatory Commission (NRC). At that meeting GPUN informed the NRC Staff that a revised calculation had been performed for dose consequences resulting from the maximum hypothetical accident (MHA), specifically related to the low population zone (LPZ) at 30 days. The new calculation revises the thyroid dose analysis to conservatively account for the contribution of the additional ECCS leakage pathways identified in the original TSCR No. 266 submittal. The value for the LPZ (30-day consequence) on Table 1 of Reference 1 above increases from 13.0 to 16.0 rem. This slightly increased value for LPZ dose consequence continues to be a small fraction of the 10 CFR Part 100 guideline limits.

The proposed revisions to the TMI-1 UFSAR design basis accident analyses descriptions of assumptions of TSCR No. 266 to conform the UFSAR to the proposed Technical Specification changes are still applicable. The changed UFSAR pages provided in Enclosure 1 are direct replacements for the draft UFSAR revisions provided in Enclosure 2 of GPUN's July 30th letter (Reference 1.). Of specific note, Table 14.2-20 (p. 14.2-76) is expanded to identify the specific contributions to the Exclusion Area Boundary (EAB) and LPZ totals due to engineered safeguards leakage; however, the EAB totals for Thyroid and Whole Body remain unaffected.

This Phase 2 - Supplemental Information is submitted for NRC review and consideration following the mutually agreed upon two step approach for approval of TSCR No. 266, as described in Reference 2 above, and does not impact upon the safety evaluation performed for the original change request. The Supplement also has no impact upon the "No Significant Hazards Consideration" analysis provided for TSCR No. 266 in accordance with the standards contained in 10 CFR 50.92.

In accordance with 10 CFR 50.91 (b) (1) a copy of this supplemental information has been sent to the chief executives of the township and county in which the facility is located, as the designated official of the Commonwealth of Pennsylvania, Bureau of Radiation Protection. If you have any questions concerning this matter please contact Sr. Licensing Engineer, Mr. G. M. Gurican at (201) 316-7972.

Sincerely,

James W. Langenbach

James W. Langenbach
Vice President and Director, TMI

JWL/GMG/lab

Enclosures: (1) Proposed Revisions to TMI-1 UFSAR, Revised Pages

cc: Administrator Region I
TMI Senior Resident Inspector
TMI Senior Project Manager

ENCLOSURE 1

Three Mile Island Nuclear Station, Unit 1, (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Technical Specification Change Request (TSCR) No. 266
Accident Recirculation Systems Leakage Limits

UFSAR Revised Pages

(Changes from July 30th submittal are in italics; and
p. 14.3-6 which was inadvertently omitted on 7/30/97 is included herewith*)*

The atmospheric dispersion characteristics of the site are described in Section 2.5. A breathing rate of 3.47×10^{-4} m^3/S is assumed for the 2 hour exposure. For the 24 hour exposure, a breathing rate of 3.47×10^{-4} m^3/sec is assumed for the first 8 hours, and a rate of 1.74×10^{-4} m^3/sec is assumed for the remaining 16 hours. For the 30 day exposure, a breathing rate of 2.32×10^{-4} m^3/sec is assumed.

The LOCA doses are bounded by the dose results of the MHA accident discussed in Appendix 14C. Thyroid doses and whole body doses are maintained below 10 CFR 100 guidelines.

b. Effects of Reactor Building Purging

At times during the normal operation of the reactor it may be desirable to purge the Reactor Building while the reactor is operating. If a Large Break LOCA were to occur during purging operations, activity would be released to the environment. Assuming the worst rupture, essentially all of the reactor coolant will have been blown down. (The activity in the Reactor Building is then taken to be the reactor coolant activity after operation with 1 percent failed fuel). For this case, the purge valves will be completely closed in 5 seconds, but a small fraction of the Reactor Building atmosphere will escape through the purge valves before they close. The analysis assumes unrestricted flow through the purge line for the full 5 seconds closing time. No reduction in flow is assumed as the valve closes. The **dose equivalent** iodine released is **5.28 Ci**. The resulting increase in 2 hour thyroid dose at the exclusion distance due to purge valve closing time is **1.84 rem**. ***The resulting increase in thyroid dose at the low population distance due to purge valve closing time is 0.054 rem.*** The additional thyroid dose that results from this release when added to the MHA dose for a loss of coolant accident without purging is well below the 10 CFR 100 guidelines. Therefore, purging operations can be performed during reactor operation. An evaluation of purging as a means of controlling postaccident hydrogen concentration is in Appendix 14D.

14.2.2.4 Small Break Loss of Coolant Accident

14.2.2.4.1 Identification

Small break LOCAs are piping ruptures whose break areas range from 0.0007 ft^2 (3/8 inches diameter pipe) to as large as 0.5 ft^2 (10 inch diameter pipe).

The response of the primary system to a small break will greatly depend on break size, its location in the system, operation of the reactor coolant pumps, the number of ECCS trains functioning, and the availability of secondary side cooling. RCS pressure and pressurizer level histories for various combinations of parameters are presented in order to indicate the wide range of system behavior which can occur for small LOCAs.

The spray removal coefficients, decontamination factors, and iodine source fractions developed in Appendix 14B were used in the sensitivity analysis. It is concluded that the analyzed combinations of reactor building cooling systems have an insignificant affect on the whole body dose and that the use of the first combination of systems will result in a larger thyroid dose.

d. Effects of Engineered Safeguards Leakage During the Maximum Hypothetical Accident

An additional source of fission product leakage during the maximum hypothetical accident can occur from leakage of the engineered safeguards external to the Reactor Building during the recirculation phase for long term core cooling. A detailed analysis of the potential leakage from these systems **is limited by Technical Specification 4.5.4 and boundary valve leakage tests as described in Section 5.4.** It is assumed that the water being recirculated from the Reactor Building sump through the external system piping contains 50 percent of the core saturation iodine inventory. This is the entire amount of iodine release from the reactor cooling system. The 50 percent escaping from the reactor coolant system is consistent with Reference 53. The assumption that all iodine escaping from the Reactor Building is absorbed by the water in the Reactor Building is conservative since much of the iodine released from the fuel will be plated out on the building walls. The iodine is chemically bound to the sodium hydroxide and will not be released to the atmosphere. However, it is conservatively assumed that iodine release does occur.

For ES leakage into the Auxiliary Building, it is assumed that all of the iodine contained in water which flashes is released to the Auxiliary Building atmosphere. **The flashing fraction of 1.25% used in the MHA dose consequence analysis is based on a constant sump temperature of 224°F. This value for flashing fraction is conservative based on the sump temperature profile during post-accident recirculation**. Iodine released from the remaining water is calculated using a gas/liquid partition coefficient of 9×10^{-3}. The activity is assumed to be released **to the environment with no credit for holdup time or decontamination using the Auxiliary Building Ventilation charcoal filters. The analysis assumes 50% of the iodine plates out on the Auxiliary Building surfaces**. Atmospheric dilution is calculated using the 2 hour dispersion factors developed in Section 2.5. The leakage and resulting thyroid dose at the exclusion ***and low population distances*** are shown in Table 14.2-**20.**

Another source of fission product leakage during the maximum hypothetical accident can occur through system valves to the BWST during the recirculation phase. Iodine releases are the limiting factor in this situation; hence, the two hour offsite doses at the site boundary are evaluated for this type of release. All of the coolant reaching the BWST is assumed to be in the liquid phase; therefore, the same *gas/liquid* partition *coefficient* for iodine as assumed in the engineered safeguards leakage calculation (9×10^{-3}) is assumed in this calculation. Recirculation is assumed to begin when there

is 300,000 gallons of empty space in the BWST. The volumetric flow rate of air leaving the BWST is equal to the volumetric flow rate of leakage into the BWST. No credit is taken for iodine plateout in the BWST. Atmospheric dilution is calculated using the 2 hour *and 30 day* dispersion factors developed in Section 2.5. The leakage and resulting thyroid doses at the exclusion *and low population distances* are shown in Table 14.2-20.

14.2.2.6 Waste Gas Tank Rupture

Rupture of a waste gas tank would result in the release of its radioactive contents to the **Auxiliary Building environment.**

TABLE 14.2-20
(Sheet 1 of 1)

ENVIRONMENTAL DOSES RESULTING FROM MHA

Total 2 Hour Dose at Exclusion Distance (Appendix 14C), rem*	
Thyroid	**189**
Whole body	**6.0**
Total 30 Day Dose at Low Population Distance, rem*	
Thyroid	*16*
Whole body	**<1**
Exclusion Area Thyroid Dose (rem) From Reactor Building Leakage	**161.9**
Low Population Zone Thyroid Dose (rem) From Reactor Building Leakage	*12.3*
Reactor Building Design Leak Rate	0.1%/day
Engineered Safeguards Leakage	
Iodine Concentration in **RCS coolant** I-131 dose equiv Ci/ml	**0.0477**
Leakage to Auxiliary Building (gph)	**18**
Flashing Fraction	**1.25%**
Leakage to BWST (gpm)	**3**
Thyroid Dose From Auxiliary Building Leakage, Rem	
Exclusion Distance	*24.3*
Low Population Distance, Rem	*2.9*
Thyroid Dose From Leakage to BWST, Rem	
Exclusion Distance	*0.12*
Low Population Distance	*0.13*
Effects of Reactor Building Purge (Thyroid), Rem	
Exclusion Distance	*1.84*
Low Population Distance	*0.054*

* The current values of 2 hr and 30 day MHA doses on this table are based on power **level of 2568 MWt. The offsite doses were calculated in Reference 7x and conservatively rounded upward to the next whole integer.**

73. BWNT Document 86-1232708-00, "RVVV Liquid Spillover Analysis," September 1994.

74. GPUN Document C-1101-211-5450-008, "RCS Boron Concentration with Credit for Vent Valve Liquid Flow," September 19, 1994.

75. BWFC Letter, RC-94-786, "TMI-1 Cycle 11 Steam Line Break Evaluation," 12/1/94.

76. GPUN SE 135400-022, Rev. 2., "TMI Cycle 11 Reload Design/Redesign," 11/10/95.

7x. GPUN Calc. C-1101-202-E260-329, *Rev. 1*, "Offsite Dose Analysis of the MHA for 2568 MWt", *8/20/97*.

3.0 DOSE RESULTS

Thyroid doses have been computed for the assumed accident conditions. Results obtained for minimum safety features (one spray header pump and one air cooling unit fan operating) show that thyroid doses would be about **189 rem** for 2 hours at the exclusion boundary ***and 16 rem for 30 days at the low population zone boundary.*** **This includes the dose from Reactor Building Leakage, Engineered Safeguards Leakage to the Auxiliary Building and BWST, and the effects of Reactor Building purging. The thyroid dose was calculated in Reference 3 and conservatively rounded upward to the next whole integer. This estimate is well below 10 CFR 100 guidelines.**

Whole body doses have been computed for assumed conditions over the course of the accident. Results obtained from minimum safety features (one spray header pump and one air cooling unit fan operating) show that whole body doses would be about 6 rem for 2 hours at the exclusion boundary ***and less than 1 rem for 30 days at the low population zone boundary.*** **This is well below 10 CFR 100 guidelines. The whole body dose was calculated in Reference 3 and conservatively rounded upward to the next whole integer**.

It is concluded that use of sodium hydroxide spray solution provides adequate removal of iodine to maintain thyroid doses below guidelines with minimum safety features operable. Whole body doses are also maintained below guidelines.

4.0 REFERENCES

1. Pickard, Lowe and Garrick, Inc., Letter dated March 20, 1979, from K. Woodard to R. Lengel-Metropolitan Edison, Subject: "Re-Evaluation of Accident X/Q Values for TMI Using NRC Guide 1.xxx" (Draft dated September 1978). Current Guide is 1.145.

2. GPUN Calculation C-1101-214-E610-016, Rev. 0, "Reactor Building Atmosphere Mixing Analysis", 7/14/97.

3. GPUN Calculation C-1101-202-E260-329, *Rev. 1*, "Offsite Dose Analysis of the MHA for 2568 MWt", *8/20/97*.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF
GPU NUCLEAR INC.

DOCKET NO. 50-289
LICENSE NO. DPR-50

CERTIFICATE OF SERVICE

This is to certify that a copy of the Supplemental Information pertaining to the Technical Specification Change Request No. 266 Appendix A of the Operating License for Three Mile Island Nuclear Station Unit 1, has, on the date given below, been filed with executives of Londonderry Township, Dauphin County, Pennsylvania; Dauphin County, Pennsylvania; and the Pennsylvania Department of Environmental Resources, Bureau of Radiation Protection, by deposit in the United States mail, addressed as follows:

Mr. Darryl LeHew, Chairman
Board of Supervisors of
Londonderry Township
R. D. #1, Geyers Church Road
Middletown, PA 17057

Ms. Sally S. Klein, Chairman
Board of County Commissioners
of Dauphin County
Dauphin County Courthouse
Harrisburg, PA 17120

Director, Bureau of Radiation Protection
PA Dept. of Environmental Resources
Rachael Carson State Office Building
P.O. Box 8469
Harrisburg, PA 17105-8469
Att: Mr. Stan Maingi

GPU NUCLEAR INC.

BY: James W Langenbach
Vice President and Director, TMI

DATE: 9/24/97