GPU Nuclear

GPU Nuclear Corporation
Post Office Box 480
Route 441 South
Middletown, Pennsylvania 17057-0191
717 944-7621
TELEX 84-2386
Writer's Direct Dial Number:

March 1, 1984
5211-84-2049

Dr. Thomas E. Murley
Region I, Regional Administrator
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA. 19406

Dear Sir:

Three Mile Island Nuclear Station, Unit I (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Annual Report

Enclosed is the 1983 Annual Report for Three Mile Island Nuclear Station, Unit I. This report is submitted per TMI-1 Technical Specification Section 6.9.1.B. The Report contains the following information:

Attachment I - Tabulation of Personnel Exposure Data for the calendar year 1983. (T. S. Section 6.9.1.B.1.).

Attachment II - Aircraft Movement Data from Harrisburg International Airport for the calendar year 1983. (T. S. Section 6.9.1.B.2).

Attachment III - Leak Reduction Program Test Information for the calendar year 1983. (T. S. Section 6.9.1.B.3).

Attachment IV - Pressurizer Power Operated Relief Valve and Pressurizer Safety Valve Challenges for the calendar year 1983. (T. S. Section 6.9.1.B.4).

Sincerely,

H. D. Hukill,
Director, TMI-1

HDH:JGB:mle
Attachments
cc.: Director, Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555 (40 copies)

TMI (PWR)

ATTACHMENT I
PAGE 2 of 2

NUMBER OF PERSONNEL AND MAN REMS BY WORK AND JOB FUNCTION
January 1, 1984 Through December 31, 1983
TMI UNIT 1

Job Category Job Function	Station Number	Personnel Rems	Utility Number	Personnel Rems	Contractor Number	Personnel Rems
REFUELING						
Maintenance Personnel	1	.002	0	.000	0	.000
Supervisory Personnel	1	.000	0	.000	0	.000
TOTAL BY JOB FUNCTION						
Maintenance Personnel	214	178.589	8	5.907	291	449.136
Operating Personnel	104	79.134	1	.028	8	5.753
Health Physics Personnel	112	53.191	6	.020	35	4.276
Supervisory Personnel	102	35.962	4	.031	43	22.827
Engineering Personnel	89	11.855	36	1.282	140	40.662
Administrative Personnel	116	8.873	27	.145	34	4.195
GRAND TOTAL	737	367.604	82	7.413	551	526.849

TMI 1 (PWR)

ATTACHMENT 1
Page 1 of 2

NUMBER OF PERSONNEL AND MAN REMS BY WORK AND JOB FUNCTION
January 1, 1983 Through December 31, 1983
TMI UNIT 1

Job Category / Job Function	Station Number	Personnel Rems	Utility Number	Personnel Rems	Contractor Number	Personnel Rems
REACTOR OPERATIONS/SURV.						
Maintenance Personnel	147	1.747	1	.008	50	.201
Operating Personnel	93	11.376	1	.013	3	.014
Health Physics Personnel	99	34.667	6	.020	27	2.819
Supervisory Personnel	80	2.374	4	.027	22	.061
Engineering Personnel	77	2,411	17	.081	57	.230
Administrative Personnel	98	1.203	26	.017	27	.153
ROUTINE MAINTENANCE						
Maintenance Personnel	185	15.647	1	.000	52	.301
Operating Personnel	71	.309	0	.000	3	.031
Health Physics Personnel	78	1.622	0	.000	3	.007
Supervisory Personnel	55	.919	0	.000	8	.016
Engineering Personnel	21	.240	4	.012	19	.053
Administrative Personnel	64	.137	0	.000	5	.030
INSERVICE INSPECTION						
Maintenance Personnel	57	1.428	1	.002	48	1.030
Operating Personnel	39	.659	1	.009	1	.005
Health Physics Personnel	44	.347	0	.000	1	.000
Supervisory Personnel	31	.779	0	.000	4	.157
Engineering Personnel	17	1.584	10	.038	41	4.450
Administrative Personnel	9	.005	1	.100	9	.044
SPECIAL MAINTENANCE						
Maintenance Personnel	183	145.134	5	5.727	283	447.364
Operating Personnel	74	57.840	1	.006	6	5.639
Health Physics Personnel	62	15.549	0	.000	6	.572
Supervisory Personnel	72	29.395	1	.004	29	22.262
Engineering Personnel	56	6.190	23	1.151	89	35.901
Administrative Personnel	47	6.098	2	.028	16	3.968
WASTE PROCESSION						
Maintenance Personnel	90	14.631	3	.170	31	.240
Operating Personnel	67	8.950	0	.000	2	.064
Health Physics Personnel	57	1.006	0	.000	6	.878
Supervisory Personnel	23	2.495	0	.000	5	.331
Engineering Personnel	6	1.430	1	.000	5	.028
Administrative Personnel	11	1.430	0	.000	2	.000

ATTACHMENT 1

(1)

April 5, 1982

Meeting w/ GPU

TMI-1 S.G. Repair

GPU- Joe Kuehm
- Dave Ethridge
- Mary Jane Graham (201) 299-2404
et al

After a general mtg w/ GPU to discuss the S.G. tube expansion job, I met with the above individuals to discuss GPU's latest date estimates for the job. Some of the Q's asked appear in the next page. Below is a list of how the orig est compares with the current est of man-rem.

Original Est for tube expansion only	268		Δ = 325-330
Current " " " "	593-596		

Additional Items not in 1st est:

• Pre-repair work:	- RCS Insp.	12(A)		
	- Pre-Repair tube Work	120	137	
	- " " fiberscope	5		
• Major items:	- Eddy Current	45		
	- Plugging + Stabilization	235	480	667-697
	- W rolled plugs	75		
	- End fittings	125		
• Post-repair work:	- task	30		
	- Brace (s) + Support (s)	10	50-80	
	- tube free pack	10-40		

10

- End milling (after expansion, tube ends were cracked 125 (est) Δ125 (A)
  and had to be milled smooth - not anticipated)
- plugging 475 tubes plugged + stabilized (using welding) Δ235
- W rolled plugs 240 rolled - this procedure Δ75
  doesn't required welding ∴ less dose
- [illegible] / drip (not initially incl) Δ10
- EC (not initially planned for) Δ10
- tube free path (a remote air gun shot felt Δ10-40
  pads thru tubes to remove any debris).
- Close out 5-10 (est 2) Δ3-8

- What % of [illegible] misfired? ([illegible] est was 1%)
  ~4% 1st fire, 2.6% 2nd fire

Items not in orig est EC, (45)
plug. (235)
W roll (75)
End mill (125)
480

pre repair	RCS insp	12
	Pre Rep. [illegible] WK	120
	" " fiber	5
		137

	[illegible]	
Post Rep.	SOAK	30
	Bubble	5
	Drip	5
	Insp.	10-40
		50-80

667-697

still good?

/ additional dose

- 1/3 rem / tube (How many tubes plugged?) 250+240 tubes W plug, 475 tubes stabilized + plugged

- was 1/2 of S.G. tube sheet covered during expansion? yes

yes

- What was dose rate in S.G. head? (est 1 R/hr w/shielding
  - flush reduced rates 25% (in shielded levels) from 1.3 R/hr (unshielded) to 1 R/hr

Original est did not include:

- RCS inspection — 12 (A)
- Pre-repair tube work — 120 (A)
  (sampling / stab / plugging) (these were tubes that were initially plugged (~250 tubes) by W method before [illegible])
- Pre-repair test ([illegible]) — 5 (A)
- EC test (not in my est) (100% of tubes received remote baseline EC.) — 35 (A)
- 1st expansion (higher than est due to camera problems, misfires + inserts which were pulled out by the expansion + had to be reinserted) — 168 (A) (est 45) — Δ↑ 123
- 1st pass insert removal (higher due to misfires and debris removal: 60 rem from manual removal) — 132 (A) (est 50) — Δ↑ 82
- 2nd exp. (higher due to (1) use of hold down devices, (2) additional debris removal, + add. care in [illegible]) — 167 (A) (est 35) — Δ↑ 132
- 2nd pass insert removal [illegible] (use of tube [illegible] improved means of debris removal (from top not bottom)) — 75 (A) (est 55) — Δ↑ 20
- Flush (actual dose = 18.6 rem) — 30 (est 51) — -Δ 21
- Soak (not [illegible] initially) — (—) — Δ 30

((1) job performed well (2) smaller charge used = less debris + easier insert removal)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON D C 20555

OCT 07 1982

MEMORANDUM FOR: Gus C. Lainas, Assistant Director
for Operating Reactors, DL

FROM: R. Wayne Houston, Assistant Director
for Radiation Protection, DSI

SUBJECT: ENVIRONMENTAL IMPACT APPRAISAL INPUT FOR THREE MILE ISLAND UNIT 1 (TMI-1) ONCE-THROUGH STEAM GENERATOR (OTSG) TUBE REPAIR PROJECT

Enclosed is the RAB input to the EIA for the TMI-1 OTSG tube repair project. This review was performed by M. Wangler, RIS/RAB.

R. Wayne Houston, Assistant Director
for Radiation Protection
Division of Systems Integration

Enclosure:
As stated

cc: R. Mattson
E. Congel
W. Pasciak
M. Wangler

8211018514 17pp.
XA

4

RADIOLOGICAL IMPACT SECTION INPUT TO
THREE MILE ISLAND OTSG TUBE
REPAIR PROJECT REVIEW

ENVIRONMENTAL IMPACT ASSESSMENT

4.0 Radiological Assessment

4.1 Environmental Significance of Occupational Exposure

General Public Utilities (GPU) has estimated that the once through steam generator (OTSG) tube repair project for the Three Mile Island Unit 1 (TMI-1) will require the expenditure of 270 person-rems.[1]

To determine the relative environmental significance of the estimated maximum occupational dose of 270 person-rems, comparisons were made with 1) the doses expected from normal operation of plants, and 2) other non-nuclear risks.

Most of the dose to nuclear plant workers results from external exposure to radiation coming from radioactive materials outside of the body rather than from internal exposure from inhaled or ingested radioactive materials. Experience shows that the dose to nuclear plant workers varies from reactor to reactor and from year to year. For radiological impact purposes, it can be projected by using the experience to date with modern PWRs. Recently licensed 1000-MWe PWRs are operated in accordance with the post-1975 regulatory requirements and guidance that place increased emphasis on maintaining occupational exposure at nuclear plants ALARA. These requirements and guidance are outlined primarily in 10 CFR Part 20,[2] Standard Review Plan Chapter 12 (NUREG-0800)[3], and

Regulatory Guide 8.8,[4] "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable."

GPU's proposed implementation of these requirements and guidelines for the OTSG tube repair project for TMI-1 has been reviewed by the NRC Staff, and the results of that review are reported in the Staff's Safety Evaluation Report.

Table 4.1 shows the occupational dose history for TMI-1.[5,6] With the addition of 270 person-rems for the OTSG tube repair project, the average annual dose for the 7 years of dose history at Unit 1 (1974 through 1981) will be approximately 280 person-rems. Occupational exposure estimates were not specifically considered in the TMI-1 and 2 FES.[7]

Table 4.2 summarizes the annual occupational radiation doses at U.S. commercial nuclear power reactors for the years 1969 through 1981.[6] Average collective occupational dose information for 239 PWR reactor years of operation is available for those plants operating between 1974 and 1981. (The year 1974 was chosen as a starting date because the dose data for years prior to 1974 are primarily from reactors with average rated capacities below 500 MWe). These data indicate that the average reactor annual collective dose at PWRs has been about 440 person-rems, with some plants experiencing

an average plant life-time annual collective dose to date as high as 1300 person-rems.[6, 8] These dose averages are based on widely varying yearly doses at PWRs. The wide range of annual collective doses experienced at PWRs in the United States results from a number of factors such as the amount of required maintenance and the amount of reactor operations and inplant surveillance.

Although the dose for some plants far exceeds the average of 440 person-rems for PWR's, these doses are included in the average and are considered normal deviations from the average, particularly since such maintenance contributes to effective and safe plant operation and since it is carried out with procedures that maintain exposures ALARA. As Table 4.2, shows, the 270 person-rems estimate for OTSG tube repair project is less than the historical average for a single unit in a year.

We further calculate that 270 person-rems, the occupational dose estimate for the OTSG tube repair project, corresponds to a risk of less than 0.04 premature fatal cancer in the exposed work force population. We also calculate that 270 person-rems corresponds to a risk of less than 0.07 genetic effect to the ensuing five generations. These risks are based on risk estimators derived in the BEIR I Report[9] and WASH-1400[10] from data for the population as a whole. New information in the BEIR III Report[11]

would lead to an even lower estimated risk for premature fatal cancers. These risks are incremental risks (risks in addition to the normal risks of fatal cancers and genetic effects we all face continuously).

For a population of 1000 these normal risks, which are unrelated to TMI-1 Nuclear Station, would be expected to result in about 190 cancer deaths and about 60 genetic effects in the existing population (genetic effects are genetic diseases or malfunctions),[9,12] plus about 300 more genetic effects among their descendants.

To make the health risk associated with radiation dose more understandable, risk comparisons can be made with non-nuclear activities commonly participated in by many individuals. One rem of radiation is numerically comparable to a lifetime mortality risk of about 10^{-4}[9].

In addition to comparing the risk of potential fatal cancers for an exposed individual to the risk of the natural incidence of fatal cancers, the risk to nuclear plant workers can be compared to risks incurred in other occupations by use of average mortality rates. As indicated in Table 4.3 the risk to a nuclear power plant worker exposed at the industry wide average exposure is comparable to that of workers in other industries**. Based on these comparisons, the

**The risk to a maximally exposed worker would be about 15 times higher than the risk to an average plant worker shown in Table 4.3. It should be noted that the mortality rates in Table 4.3 are for average workers and not for the worker at maximum risk.

staff concludes that the risk to an average plant worker is within the range of the risks associated with other occupations. In addition, since the dose to an individual worker is controlled by 10 CFR Part 20, any increase in individual risk as a result of the repair program is not considered significant.

Some have criticized occupationally related cancer estimates as being overly conservative.[13] However, most experts feel the risk estimates in Table 4.3 relating to occupational exposure to low-LET radiation are also overestimates.

In our opinion, the comparisons just presented are reasonable ones. The risks of occupational exposures in the range of 0.5 rem per year to 5 rem per year do not significantly affect a typical worker's total risk of mortality.

In summary, the NRC staff has drawn the following conclusions regarding occupational radiation dose. GPU's estimate of 270 person-rems for the OTSG tube repair project at TMI-1 is reasonable. This dose falls within the normal range of annual occupational doses which have been observed in recent years at operating reactors. Although the doses resulting from the OTSG tube repair program will increase the annual occupational dose average of TMI-1 to approximately 280 person-rems, this is still less than the annual average for all PWR's.[8] GPU has taken appropriate steps to ensure that occupational

doses will be maintained within the limits of 10 CFR Part 20 and ALARA. The additional health risks due to these doses over normal risks are quite small, less than one percent of normal risk to the project work force as a whole. The risk to an average individual in the work force will be lower than the risk incurred from participation in many commonplace activities. The individual risks associated with exposures involved in the OTSG tube repair program will be controlled and limited so as not to exceed the limits set forth in 10 CFR Part 20 for occupational exposure. For the foregoing reasons, the Staff concludes that the environmental impact due to occupational exposure will not significantly affect the quality of the human environment.

4.2 Public Radiation Exposure

GPU has estimated the amount of radioactivity that will be released in liquid and gaseous effluents as a result of the OTSG tube repair project. Those estimates are presented in Table 4.4. Table 4.4 presents effluent releases for years 1979[14], 1980[15] and 1981[16] from TMI-1 and the FES[7] annual average release estimates. Table 4.4 shows that the expected releases from the OTSG tube repair program project are small compared to both the FES estimates and TMI-1's actual annual releases.

Therefore, on the basis of this comparison, we conclude that the offsite environmental impact that may occur during the period of this

procedure will be significantly smaller than that which occurs during normal operation.

We have estimated the doses to individual members of the public as well as the population as a whole in the area surrounding TMI-1 based on the radioactive effluents which GPU estimated for the OTSG tube repair project (summarized in Table 4.4) and on the calculational methods presented in Regulatory Guides 1.109[17], and 1.113[18]. Using a maximum liquid release source term 1.5×10^{-4} curies of Cesium 134 and 6.1×10^{-4} curies of Cesium 137 (Table 4.4) we calculated the maximum individual total body dose* for an adult to be less than 0.001 mrem for the operation. This is equivalent to a dose of about 0.004 percent of the limits of 40 CFR Part 190. The annual limits of 40 CFR Part 190 are 25 millirems to the total body or any organ except the thyroid and 75 millirems to the thyroid. The doses to the population of 2,200,000 within 50 miles was estimated to be less than 4.5×10^{-3} person-rems to the total body from liquid effluents.

*Our calculations (using the LADTAP Computer Program) for the maximum individual total body dose for an adult considered the following pathways:

1. consumption of fish (21 kilograms per year) caught in the discharge area, and
2. drinking water (730 liters per year) from the discharge area.

A conservative dilution factor of 1 or no dilution was assumed for each of the above two pathways in our evaluation of radiological exposure due to the releases of Cesium from TMI-1 via liquid effluents which are expected to result from the repair program.

The LADTAP II program implements the radiological exposure models described in U.S. NRC Regulatory Guide 1.109, Rev. 1 (Appendix A) for radioactivity releases in liquid effluent.

By comparison, every year the same population of about 2,200,000 will receive a cumulative total body dose of more than 220,000 person-rems from natural background radiation (about 0.1 rem per year per person) in the vicinity of TMI-1. Thus, the population total body dose from the tube repair project is less than 2.04×10^{-6} percent of the annual dose due to natural background. On this basis, we conclude that the doses to individuals in unrestricted areas and to the population within 50 miles due to liquid effluents from the OTSG tube repair project will not be environmentally significant.

In summary, the radioactive releases resulting from the OTSG tube repair program will be less than those due to normal plant operation. These releases are also much less than the estimates presented in the FES. The doses due to these releases are small compared to the limits of 40 CFR Part 190 and to the annual doses from natural background radiation. Therefore, the radiological impact of the OTSG tube repair project will not significantly affect the quality of the human environment.

4.3 Conclusion

Based on our review of the proposed OTSG tube repair program, we conclude that:

(1) The estimated occupational exposure of 270 person-rems for the OTSG tube repair project is less than the expected range of doses incurred at light water power reactors in a year.

(2) Workers are limited by regulation to 3 rems/calendar quarter with a maximum annual dose of 12 rems given that workers satisfy certain dose history criteria. Since the dose to an individual worker is controlled by 10 CFR 20 any increase in individual risk as a result at the repair is not considered significant. Although the collective dose to plant workforce increases as a result of this repair, the estimated impacts to the worker population are not significant.

(3) General Public Utilities has taken appropriate steps to ensure that occupational dose will be maintained as-low-as-reasonably-achievable and within the limits of 10 CFR 20.

(4) Offsite doses resulting from the project will be:

(a) smaller than those incurred during normal operation of TMI-1 and

(b) negligible in comparison to the dose members of the public in the vicinity of TMI-1 receive from natural background radiation.

On the basis of the foregoing, we conclude that the proposed OTSG tube repair project at the TMI-1 will not significantly affect the quality of the human environment.

We have reviewed this proposed OTSG tube repair project relative to the requirements set forth in 10 CFR Part 51 and the Council of Environmental Quality's Regulations 40 CFR Part 1500. We have determined that the proposed action will not significantly affect the quality of the human environment.

On the basis of the foregoing analysis, it is concluded that there will be no significant environmental impact attributable to the proposed action. Having made this conclusion, the Commission has further concluded that no environmental impact statement for the proposed action need be prepared and that a negative declaration to this effect is appropriate.

TABLE 4.1

ANNUAL COLLECTIVE[3]
OCCUPATIONAL DOSE AT THREE MILE ISLAND UNIT NO. 1*

YEAR	COLLECTIVE OCCUPATIONAL DOSE (person-rems)
1975	37
1976	143
1977	180
1978	252
1979	722**
1980	166**
1981	179**

*First commercial operation 9/74

**From preliminary data compiled by Gordon Lodde, Porter Consultants, TMI

TABLE 4.2

ANNUAL OCCUPATIONAL RADIATION DOSES AT U.S. COMMERCIAL NUCLEAR POWER REACTORS[6]
(person-rems per reactor unit)

Year	PWR Average	BWR Average	Low	High
1969	165	195	42	298
1970	684	127	44	1639
1971	307	255	50	768
1972	464	286	61	1032
1973	783	380	85	5262
1974	331	507	71	1430
1975	318	701	21	2022
1976	460	549	58	2648
1977	396	628	87	3142
1978	429	604	48	1621
1979	510	733	31	2140
1980	578	1,135	22	3626
1981*	656*	985*	68*	3254*

*Calculated by C. Hinson, U.S. NRC, RPS, RAB, from data supplied by operating reactor sites in compliance with 10 CFR Part 20, Section 20.407.

TABLE 4.3

Incidence of job-related mortalities

Occupational Group	Mortality Rates (premature deaths per 10^5 person-years)
Underground metal miners*	~1300
Uranium miners*	420
Smelter workers*	190
Mining**	61
Agriculture, forestry, and fisheries**	35
Contract construction**	33
Transportation and public utilities**	24
Nuclear-plant worker***	23
Manufacturing**	7
Wholesale and retail trade**	6
Finance, insurance, and real estate**	3
Services**	3
Total private sector**	10

*The President's Report on Occupational Safety and Health, "Report on Occupational Safety and Health by the U.S. Department of Health, Education, and Welfare," E. L. Richardson, Secretary, May 1972.

**U.S. Bureau of Labor Statistics, "Occupational Injuries and Illness in the United States by Industry, 1975," Bulletin 1981, 1978.

***The nuclear-plant workers' risk is equal to the sum of the radiation-related risk and the nonradiation-related risk. The estimated occupational risk associated with the industry-wide average radiation dose of 0.8 rem is about 11 potential premature deaths per 10^5 person-years due to cancer, based on the risk estimators described in the following text. The average non-radiation-related risk for seven U.S. electrical utilities over the period 1970-1979 is about 12 actual premature deaths per 10^5 person-years as shown in Figure 5 of the paper by R. Wilson and E. S. Koehl, "Occupational Risks of Ontario Hydro's Atomic Radiation Workers in Perspective," presented at Nuclear Radiation Risks, A Utility-Medical Dialog, sponsored by the International Institute of Safety and Health in Washington, D.C., September 22-23, 1980. (Note that the estimate of 11 radiation-related premature cancer deaths describes a potential risk rather than an observed statistic.)

TABLE 4.4

RADIOACTIVE EFFLUENTS FROM THREE MILE ISLAND UNIT NO. 1

Type of Radioactive Effluent	Estimates for Releases During OTSG Tube Repair (Ci)	Three Mile Island No. 1 Releases (Ci)			FES[7] Estimate of Annual Releases (Ci)
		1979	1980	1981	
Gaseous					
Noble Gases	Negligible[b]	2.2(+3)	4.6(-3)	5.8(-2)	3.6(+3)
Iodine & Particulates[a]	Negligible[b]	1.2(-2)	2.9(-4)	5.1(-4)	2.2(-1)
Tritium	Negligible[b]	6.4(+)	1.8(+1)	1.5(-2)	d
Liquid					
Mixed fission and activation products (Cs 134 and Cs 137)	7.6(-4)	7.2(-1)	1.8(-1)	8.6(-2)	3.0(0)
Tritium	Negligible[b]	7.1(1)	3.3(1)	7.1(0)	1.0(+3)

[a] Radioactive half lives 8 days or more

[b] Below lower limits of detectability for plant instrumentation

[c] $2.2(+3) = 2.2 \times 10^{+3}$

[d] No estimate was given in FES

REFERENCES

1. Three Mile Island Nuclear Station, Unit 1 OTSG Tube Repair Program prepared by General Public Utilities, August 1982.

2. U.S. Nuclear Regulatory Commission, Code of Federal Regulations, 10 CFR Part 20, "Standards For Protection Against Radiation," as of January 1, 1981. U.S. Government Printing Office, Washington, D.C.

3. NUREG-0800, "Radiation Protection," in: "Standard Review Plan," Chapter 12, July 1981 (formerly issued as NUREG-75/087).

4. U.S. Nuclear Regulatory Commission, Regulatory Guide 8.8, Revision 3, "Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," June 1978.

5. NUREG-0713, Vol. 1, Occupational Radiation Exposure at Commerical Nuclear Power Reactors, 1979, U.S.N.R.C., March 1981.

6. NUREG-0713, Vol. 2, Occupational Radiation Exposure at Commerical Nuclear Power Reactors, 1980, U.S.N.R.C., December 1981.

7. Final Environmental Statement related to operation of Three Mile Island Unit 1, United States Atomic Energy Commission, December 1972.

8. NUREG-0692, Final Environmental Statement Related to Steam Generator Repair at Surry Power Station, Unit 1, July 1980.

9. The Effects on Populations of Exposure to Low Levels of Ionizing Radiation, "BEIR Report," report of the Advisory Committee on the Biological Effects of Ionizing Radiations, National Academy of Sciences - National Research Council, November 1972.

10. WASH-1400, "Reactor Safety Study - An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants," U.S.N.R.C., October 1975.

11. The Effects on Population of Exposures to Low Levels of Ionizing Radiation "BEIR III Report," report of the committee on the Biological Effects of Ionizing Radiations, National Academy of Sciences - National Research Council, 1980.

12. 1979 Cancer Facts and Figures, American Cancer Society.

13. R. Peto, "Distorting the Epidemiology of Cancer, the Need for a More Balanced Overview," Nature 284, 297-300 (March 27, 1980).

14. General Public Utilities, TMI, Unit No. 1, Semiannual Monitoring Reports, January 1, 1979 through June 30, 1979 and July 1, 1979 through December 31, 1979.

15. See footnote 14. Semiannual Monitoring Reports, January 1980 through June 30, 1980 and July 1, 1980 through December 31, 1980.

16. See footnote 14. Semiannual Monitoring Reports, January 1981 through June 30, 1981 and July 1, 1981 through December 31, 1981.

17. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I" (Revision 1), U.S.N.R.C., October 1977.

18. Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," U.S.N.R.C.

19. User's Manual for LADTAP II - "A Computer Program for Calculating Radiation Exposure to Man from Routine Releases of Nuclear Reactor Liquid Effluents." NUREG/CR-1276, U.S.N.R.C. (May 1980).

20. NCRP No. 45, "Natural Background Radiation in the United States," National Council on Radiation Protection and Measurements, 1975.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON D C 20555

OCT 1 8 1983

Docket No.: 50-289

MEMORANDUM FOR: Gus C. Lainas, Assistant Director for Operating Reactors, DL

FROM: Daniel R. Muller, Assistant Director for Radiation Protection, DSI

SUBJECT: SUPPLEMENT TO SAFETY EVALUATION REPORT INPUT FOR RETURN TO SERVICE OF TMI-1 STEAM GENERATORS (TAC #47484)

PLANT NAME: Three Mile Island Unit 1
LICENSING STAGE: OR
DOCKET NUMBER: 50-289
RESPONSIBLE BRANCH: ORB#4; J. VanVliet, PM
DESCRIPTION OF RESPONSE: SSER Input For Return to Service of TMI-1's OTSG
REVIEW STATUS: Complete

The Radiation Protection Section of the Radiological Assessment Branch has completed its review of Revision 3 of TMI-1's plant safety assessment for return to service after the OTSG repair (Topical Report 008). This report contains finalized person-rem exposures as well as the total number of tubes plugged during the OTSG project. The attached Safety Evaluation Report Supplement updates exposure and tube number data which are contained in the August 25, 1983 TMI-1 OTSG Safety Evaluation Report.

This review was performed by C. Hinson, RPS/RAB.

Daniel R. Muller, Assistant Director
for Radiation Protection
Division of Systems Integration

Enclosure:
SSER Input For Return to
Service of TMI-1

cc: w/encl.
R. Mattson
J. Stolz
J. VanVliet
R. Silver
F. Congel
O. Lynch
C. Hinson

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INPUT TO SAFETY EVALUATION REPORT SUPPLEMENT FOR RETURN TO SERVICE OF TMI-1 STEAM GENERATORS

Following completion of the OTSG Repair Program, GPU issued Revision 3 to Topical Report 008, which included revised person-rem exposure and tube repair numbers for TMI-1. The total exposure for the OTSG project was 1233 person-rems. Of this total, 579 person-rems weredue to kinetic expansion alone. The balance of 654 person-rems was expended for other portions of the program such as preparatory work, tube plugging, end milling, cleanup, and testing. The licensee plugged 347 tubes prior to kinetic expansion. An additional 886 tubes were plugged as part of the OTSG program. Tube plugging and stabilization accounted for over half of the non-kinetic expansion exposure. The balance of this exposure was due to RCS inspection, eddy current testing, end milling, cleanup, and testing. The total exposure for the OTSG program of 1233 person-rems is comparable to exposures from steam generator repairs at other facilities and is acceptable. The licensee's dose reduction techniques used during the OTSG repair are described in the August 25, 1983 TMI-1 Safety Evaluation Report.