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November 24, 1982

Office of Nuclear Reactor Regulation
Attn: D. G. Eisenhut
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Congressional Request for Information Concerning
Steam Generator Tube Integrity (Generic Letter No. 82-22)

The following responses are supplied at your request for information dated October 26, 1982 for TMI Unit 1 operation from 1979 to the present.

1. How many days of unscheduled outages can be attributed to steam generator-related difficulties per year at your site?

None. Although TMI-1 is currently undergoing steam generator repairs, the unit would be in outage at the present time. Because these issues remain to be resolved, the extent to which steam generator-related work may impact the 1983 schedule is unknown.

2. During each of the years in question, how many steam generator tubes have been (a) plugged and (b) sleeved in each generator?

Twelve tubes in TMI-1's Once Through Steam Generators (OTSGs) were plugged prior to 1979. Three were plugged in 1979, and one in 1980. In late 1981, intergranular stress assisted cracking of the steam generator tubes was identified. In most cases, the damage is located high in the generator, where the tubes are held in place by the two foot thick upper tubesheet. The location of the damage permits the use of a repair method called kinetic expansion. The tube is expanded against the tubesheet, creating a new mechanical joint below the damage. The new joint effectively removes the damaged portion from service, while permitting the remainder of the tube to be used. The kinetic expansion is being performed on the upper ends of all 31,000 TMI-1 tubes. Where damage has occurred on a tube that is too low to be repaired by expansion, plugging is planned. Approximately 1,200 tubes total for the two generators have been or will be plugged as a result of this problem. No sleeving has been done or is planned.

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- 3 Do you anticipate major steam generator repairs in any of your units in the next five years and, if so, how much would these repairs cost, please be specific?

The current repair program is scheduled to be complete in early 1983 with no further major repair work anticipated during the next five years. The final cost of all phases of this repair effort is estimated to be \$35 million.

4. What have been the total costs and specifically replacement power costs associated with steam generator maintenance, repair, and replacement at your plant?

The estimate of \$35 million given in response to Question No. 3 includes inspection, maintenance, and repair for the current program. As discussed in Question No. 1, no additional time has yet been spent in this outage as a result of steam generator difficulties; therefore, there are no associated replacement power costs. Should steam generator related work become the controlling item in the outage schedule, replacement power costs would be approximately \$12-13 million/month.

Note the following in considering responses to Items 5 - 9.

All man-rem values for OTSG work are taken from self reading dosimeter (SRD) records. Thermoluminescent dosimeter (TLD) data is more accurate, but is cumulative over a period of time, and does not provide breakdown by task. There is some uncertainty in the estimates since, in some cases, records of exposure do not include a task description which is adequate to definitively determine if OTSG work was involved.

5. What has been the total occupational radiation exposure (in person-rem) caused by steam generator (a) maintenance and (b) repair/replacement?

Data cannot be separated into maintenance and repair activities. Exposure estimates for 1979 were previously reported to the NRC. Dose from 1980 was not readily retrievable, but exposure estimates are low since steam generator work was limited to normal required eddy current testing and plugging of one tube. For 1979, 1981, and 1982, total OTSG exposure is estimated as follows:

1979	25 person-rem
1981	18 person-rem
1982 (Jan-Oct)	154 person-rem

The details of all the remaining operations have not been established. However, our current estimate is that about 380-450 additional person-rem can be anticipated in association with the current repairs for the period from October 1982 to completion. This estimate includes completing the kinetic expansion, expected plugging, and testing of the repair work.

6. What percentage of total annual employee dose has been attributable to steam generator related work at your site?

As discussed above, data available for 1980 cannot be specifically correlated to steam generator activity, but exposures are judged to have been low. Estimates for 1979, 1981, and 1982:

1979	3%
1981	11%
1982 (Jan-Oct)	60%

7. During the years in question (a) how many workers have received measurable radiation doses from steam generator related work, and (b) what percentage of the total work force do these workers represent?

Data available for 1979 and 1980 cannot be correlated with steam generator activity.

- a. For 1981 and 1982, our best estimates of persons who received measurable radiation dose from OTSG related work are as follows:

1981	152
1982 (Jan-Oct)	244

Measurable radiation dose was defined as greater than 10 mRem on a self reading dosimeter.

- b. These represent approximately the following percentages of all individuals monitored.

1981	10%
1982	28%

8. How many temporary workers (defined by NRC as all workers other than those hired directly by nuclear plants on a conventional, long-term basis) received doses from steam generator related work at your facility each year?

The definition given for temporary worker includes a number of individuals who have worked at TMI for long periods of time. Included in this category are representatives of specialized firms retained to assist in early evaluation of the OTSG damage, Babcock & Wilcox personnel, and advisors from the developers of the kinetic expansion process. There were also a limited number of local craft union personnel hired for short periods of time to perform specific tasks in the generators.

Information available for 1979-1980 has not been correlated with steam generator activities, but the number of temporary workers was small. For 1981 and 1982, the number of temporary workers receiving measurable exposures (greater than 10 mRem) and associated exposure are estimated to be:

	<u>No. Temporary OTSG Workers</u>	<u>OTSG Person-rem</u>
1981	62	13
1982 (Jan-Aug)	189	120

9. What percentage of (a) total workers involved with steam generator related work do temporary workers represent, and (b) of the total work force, do temporary workers represent?
- a. The temporary workers discussed above represent the following estimated percentages of all workers in the OTSGs.

	<u>% OTSG Workers</u>
1981	41%
1982 (Jan-Oct)	78%
1982 (Nov-Dec) (Projected Estimate)	5%

Now that the evaluation phase of the OTSG project is over and actual repair work has begun, approximately 95% of all workers involved with the steam generator kinetic expansion are regular, long-term GPU employees. For subsequent activities, we intend to use speciality contractors, where appropriate, and maximize the use of permanent GPU workers.

- b. Available records cannot readily be correlated to provide an estimate of the percentage of the total work force that temporary employees represent.
10. Has your company used independent firms to find temporary employees who have received an occupational dose from steam generator related work?

Our company has not used any independent firms for the purpose of finding and recruiting temporary employees to work for short periods of time in the steam generators. However, we have used independent firms to provide specified services in some areas of steam generator activity. For example, the NSSS vendor, B&W, has supplied assistance in the current repair effort and the developers of the kinetic expansion repair method have supplied experts in the process. In a very limited number of cases, an independent firm has employed temporary workers to perform portions of a contracted task in the generator.

Sincerely,



P. R. Clark
Executive Vice President

U. S. NUCLEAR REGULATORY COMMISSION

Approved by OMB
 3150-0092

STEAM GENERATOR-RELATED - QUESTIONNAIRE

	RESPONSE BY YEAR			
	1979	1980	1981	1982
HOW MANY DAYS OF UNSCHEDULED OUTAGES CAN BE ATTRIBUTED TO STEAM GENERATOR-RELATED DIFFICULTIES PER YEAR AT YOUR SITE? (1)	0	0	0	0
DURING EACH OF THE YEARS IN QUESTION, HOW MANY STEAM GENERATOR TUBES HAVE BEEN PLUGGED IN EACH STEAM GENERATOR? (2)	3	1	0	~300 ~900(1983)
SLEEVED IN EACH STEAM GENERATOR? (2)	0	0	0	0
WHAT HAVE BEEN THE TOTAL COSTS AND SPECIFICALLY REPLACEMENT POWER COSTS ASSOCIATED WITH STEAM GENERATOR MAINTENANCE, REPAIR AND REPLACEMENT AT YOUR PLANT? (4)	----	----	----	\$35 Million
WHAT HAS BEEN THE TOTAL OCCUPATIONAL RADIATION EXPOSURE (IN PERSON-REMS) CAUSED BY STEAM GENERATOR MAINTENANCE? (5)	} 25	----	} 18	} 154 (Jan.-Oct.)
REPAIR/REPLACEMENT? (5)	} 3	----	} 11	} 60 (Jan.-Oct.)
WHAT PERCENTAGE OF TOTAL ANNUAL EMPLOYEE DOSE HAS BEEN ATTRIBUTABLE TO STEAM GENERATOR RELATED WORK AT YOUR SITE(S)? (6)	3	----	11	60 (Jan.-Oct.)
DURING THE YEARS IN QUESTION				
HOW MANY WORKERS HAVE RECEIVED MEASUREABLE RADIATION DOSES FOR STEAM GENERATOR RELATED WORK? (7)	----	----	152	244 (Jan.-Oct.)
WHAT PERCENTAGE OF THE TOTAL WORKFORCE DO THESE WORKERS REPRESENT? (7)	----	----	10	28 (Jan.-Oct.)
HOW MANY TEMPORARY WORKERS (defined by the NRC as all workers other than those hired directly by nuclear power plants on a conventional, long-term basis) RECEIVED DOSES FROM STEAM GENERATOR-RELATED WORK AT YOUR FACILITY EACH YEAR? (8)	----	----	62	189 (Jan.-Aug.)
WHAT PERCENTAGE OF TOTAL WORKERS INVOLVED WITH STEAM GENERATOR-RELATED WORK DO TEMPORARY WORKERS REPRESENT? (9)	----	----	41	78 (Jan-Oct) 5 (Nov-Dec)
THE TOTAL WORKFORCE DO TEMPORARY WORKERS REPRESENT? (9)	----	----	----	----
HAS YOUR COMPANY USED INDEPENDENT FIRMS TO FIND TEMPORARY EMPLOYEES WHO HAVE RECEIVED AN OCCUPATIONAL DOSE FROM STEAM GENERATOR-RELATED WORK? (10)	No	No	No	No

DO YOU ANTICIPATE MAJOR STEAM GENERATOR REPAIRS IN ANY OF YOUR UNITS IN THE NEXT FIVE YEARS, AND IF SO HOW MUCH WOULD THESE REPAIRS COST, PLEASE SPECIFY.

None beyond the repair currently in progress, scheduled for completion in early 1983.

NOTE: THE DATA IN THIS TABLE CANNOT BE UNDERSTOOD WITHOUT THE SUPPLEMENTARY INFORMATION IN THE FORWARDING LETTER. FOOTNOTES IN THE TABLE REFER TO PARAGRAPH NUMBERS IN THE LETTER.