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:

April 9, 1985
5211-85-2069

Mr. Thomas T. Martin, Director
Division of Radiation Safety and Safeguards
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pa. 19406

Dear Mr. Martin:

Three Mile Island Nuclear Station Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Response to IR 85-04

Inspection Report 85-04, dated March 11, 1985, reported the results of the review of worker allegations relative to radiological controls implemented for certain steam generator tasks. It was requested that GPUN submit a plan to implement the long term corrective actions set forth in Section 3.3 of the inspection report. The following information describes the actions that were taken to complete the long term corrective actions. We believe no further action is necessary.

1. Radiological Engineering will ensure that in-head samples, representative of work breathing zones, are collected to support future OTSG entries by February 15, 1985.

   Response

   Immediately following identification of OTSG airborne activity concerns, work in the OTSG head was terminated until a new ALARA review was conducted (see Section 3.3 of the Inspection Report). The revised ALARA review requires a sample to be taken by a lapel air sampling device (RAS pump) for each entry into the OTSG head area. This will provide an accurate and representative air sample of the worker's breathing zone.

   All ALARA reviews for OTSG in-head work since December 28, 1984 have required a breathing zone air sample.

2. Radiological Engineering will re-evaluate past OTSG entries and determine if the respirator protection afforded was commensurate with measured concentrations, considering past sampling techniques by March 1, 1985.

Response

A review of OTSG air sample data, stay times, respiratory devices in use, and whole body count data was conducted. Based on reviewing the above items, it is concluded that adequate respiratory protection was provided for all previous OTSG entries. It must be noted that while such a comprehensive evaluation of airborne radioactivity protection had not been done previously, evaluation of this area has been ongoing throughout all OTSG work periods, as required by the Radiological Protection Plan.

A review of OTSG air samples taken from 1/3/85 to 3/11/85 indicates that ventilation unit suction air samples will typically yield results that agree with measured in-head concentrations within a factor of 10, provided that both samples are started and stopped at approximately the same time. See Attachment 1.

During work associated with kinetic expansion (Fall 1982 to Summer 1983), ventilation unit air samples typically ranged from 5E-9 to 5E-8 uCi/cc Co-60. If actual in-head concentrations are assumed to be up to a factor of 10 higher than samples taken at the ventilation unit suction, the resulting MPC-Hour fraction with a respiratory protection factor of 1000 is 0.054 MPC-Hrs/Hr. See Attachment 2.

The maximum in-head air sample activities seen during several recent evolutions including welding, grinding, and stabilization was 1.3E-7 uCi/cc Co-60 and 1.7E-10 uCi/cc gross alpha. Samples of OTSG contaminants sent to an outside laboratory for analysis determined the alpha emitting activity to be due to Pu-238, Pu-239/240, Am-241 and Cm-243/244. See Attachment 3.

Since the maximum time any individual could spend in the OTSG in one quarter is 4 hours due to external exposure limitations, the maximum MPC-hrs. an individual could receive is 0.2 MPC-hrs. Based on a protection factor $\geqslant$ 1000 for respirators utilized throughout all work evolutions, the airborne activity concentration would have to be approximately 1E-5 uCi/cc Co-60 to exceed the protection factor of the respirator.

Respirators with a protection factor of 50 were used on some OTSG entries for inspection only. The maximum time spent by any individual in the OTSG area with this type of respiratory protection in any calendar quarter was less than two hours. Since airborne activities during these inspections are less than those during periods when actual work is performed, the maximum MPC-hrs. an individual could have received during any quarter is $<$ 2 MPC-hrs. It is also unlikely that the protection factor of these respirators would have been exceeded at any time. This is supported by the results of bioassay conducted during the OTSG repairs. There were no cases of whole body counts showing activities greater than 20 nCi of Co-60 that were not attributable to a specific incident (e.g., skin contamination). This also includes whole body counting done as a quality control check on the respiratory protection program performed on 10 random individuals per quarter.

3. Radiological Engineering will have OTSG samples analyzed for alpha emitters and adjust "MPC-Hour" assignments as appropriate by March 31, 1985.

   Response

   OTSG smears were obtained and sent to an offsite vendor for alpha spectrometry analysis to define specifically which alpha emitting radioisotopes were present. This qualification allows comparison of air concentration to the appropriate MPC value in 10 CFR 20. MPC-hr. assignments have been adjusted and are contained in the Evaluation of Internal Dose (see Exposure History file) and the REM System for the affected workers.

4. Radiological Engineering will reassess the validity of the 2E-12 uCi/cc, alpha permissable concentration value as it pertains to the assignment of personnel "MPC-Hours" by March 31, 1985.

   Response

   The 2E-12 uCi/cc MPC in air for Plutonium is for soluble Plutonium-239 and is utilized in procedure as a conservative value for unknown alpha emitting mixtures. Experience in Light Water Reactor operation has shown that Plutonium stemming from reactor fuel commonly found in systems and waste is of the insoluble form. By contrast, Cesium, which is the predominant radioactive element in TMI-1 at this time cannot normally be found in high activity samples associated with the steam generators due to its solubility. The predominant isotope associated with the steam generators is Cobalt, and remains in the generator (as it is insoluble). In performing isotopic analysis of generator alpha activity, it was found that radioisotopes of Plutonium, Americium and Curium are present. In the case that these elements were readily soluble, one would not expect to see their presence on samples, especially in light of the very high beta/gamma to alpha ratio, where only very small quantities of alpha activity are present.

   Utilization of soluble Plutonium-239 can be seen as overly conservative. A more accurate, yet conservative MPC value of 3E-11 uCi/cc based on insoluble Plutonium-238 can be applied when a specific case isotopic abundance is unknown, based on known plant radioisotope presence of Pu-238, Pu-239, Pu-240, Pu-241, Pu-242, Am-241, Cm-242, Cm-243, Cm-244.

As indicated in the Inspection Report, applicable procedures would be revised if necessary. As a result of the evaluation of the incident, a procedure change has been made for MPC-hour assignment to utilize 3E-11 uCi/cc for unknown abundance alpha so that overly conservative alpha MPC-hr. values will not be assigned to individuals.

In addition, clarification of some of the material contained in the report is necessary. In Section 3.1, Initial Findings, the verbage "licensee refusing to provide respirator protective equipment" is found. A refusal implies that some request was associated with respirator issuance. No such request was ever made at the pre-job briefing. Also, under Section 3.1 the report states:

> "Subsequent Whole Body Counts (WBC) performed by the licensee revealed unexpected high results on five of the individuals involved, i.e., 50 to 100 nanocuries, predominately Co-60. Such levels required the assignment of personnel exposure due to internal deposition of radioactive material."

The range of whole body counts was made from non-detectable to 110.7 nanocuries. This was provided during the inspection via Radiological Investigation Report 84-014. The assignment of personnel exposure was only necessary in three cases out of five.

IR 85-04, Section 3.2, Details, did not mention the fact that a formal pre-job briefing was held with all involved workers.

Sincerely,

H. D. Hukill
Director, TMI-1

HDH/SMO/spb:0222A

Attachments

cc: R. Conte
J. Thoma

ATTACHMENT 1

COMPARISON OF AIR SAMPLE DATA

DATE	VENT UNIT ACTIVITY Time On	Time Off	Activity	IN-HEAD ACTIVITY Activity	Time On	Time Off	In-Head Activity / Vent Unit Activity
01/03/85	0845	0941	β γ 7.2E-11	β γ 3.3E-10	0852	0932	4.6
01/04/85	1001	1055	β γ 7.7E-11	β γ 3.2E-10	1022	1052	4.2
01/08/85	1017	1043	Co-60 2.1E-9	β γ 1.9E-8	1013	1042	9.0
01/24/85	0923	1003	β γ 1.8E-10	Co-60 1.8E-9	0931	1001	10.0
01/25/85	1220	1328	Co-60 2.1E-9	β γ 2.6E-9 β γ 5.3E-10 β γ 3.6E-9 β γ 2.0E-9	1240 1245 1307 1314	1243 1305 1311 1325	1.7
02/15/85	0904	1058	β γ 6.4E-11	β γ 5.6E-10 β γ 3.7E-10	0921 1026	1025 1044	8.8
02/16/85	0817	0954	β γ 1.2E-10	β γ 2.57E-9	0850	0929	21.4
03/11/85	0930	0955	β γ 6.9E-11	β γ 3.7E-10	0933	0938	5.4

MPC FRACTION CALCULATION

1. $\frac{5E\text{-}7\ uCi/cc\ Co\text{-}60}{(9E\text{-}9\ uCi/cc)(1000)} = .054\ \frac{MPC\text{-}Hrs}{Hr}$

2. $\frac{1.3E\text{-}7\ uCi/cc\ Co\text{-}60}{(9E\text{-}9\ uCi/cc)(1000)} = .014\ \frac{MPC\text{-}Hr}{Hr}$

$\frac{1.7E\text{-}10\ uCi/cc\ Pu\text{-}238}{(3E\text{-}11\ uCi/cc)(1000)} = .005\ \frac{MPC\text{-}Hr}{Hr}$

ISOTOPE	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVERAGE
Pu-238	28.6%	27.9%	29.4%	28.6%
Pu-239/240	27.2%	32.5%	28.7%	29.5%
Am-241	33.8%	34.8%	30.9%	33.2%
Cm-243/244	8.7%	3.9%	7.4%	6.7%
	98.3%	99.1%	96.4%	98%

Isotopes with average proportions <1% of total activity are not included.