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YANKEE ATOMIC ELECTRIC COMPANY

Rowe, Massachusetts 01367

January 29, 1975

United States Nuclear Regulatory Commission
Directorate of Regulatory Operations
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Reference: License No. DPR-3 (Docket No. 50-29)

Gentlemen:

In accordance with the requirements of Section 20.405 (a) (1) of 10 CFR 20, Yankee Atomic Electric Company hereby reports the fact that the plant records indicate that six individuals were exposed to airborne concentrations of radioactive material in excess of the provisions of Section 20.103 of 10 CFR 20.

The records upon which this conclusion is based consist of the airborne sampling measurements obtained in the area of Steam Generator No. 4 during the period June 3, 1974 through June 9, 1974. A brief outline of the work that was being performed on SG No. 4 during this period is as follows:

June 3, 1974	Inspection for tube leaks
June 4, 1974	Tube sheet inspection and survey
June 6, 1974	Eddy-current examination and tube marking
June 7, 1974	Tube plugging
June 8, 1974	Tube grinding, plugging and inspection
June 9, 1974	Tube sheet inspection and tube plugging

The above work was performed by a combination of three permanent plant staff members and three contractor employees. The following delineates the exact participation of each individual involved:

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Individual #	SG No. 4 Work Performed
1	June 3, 1974 Inspection
	June 4, 1974 Inspection and survey
	June 6, 1974 Eddy-current examination
	June 7, 1974 Tube plugging
	June 8, 1974 Tube plugging
	June 9, 1974 Tube plugging
2	June 3, 1974 Inspection
	June 7, 1974 Tube plugging
	June 8, 1974 Tube grinding
3	June 4, 1974 Inspection and survey
	June 6, 1974 Eddy-current examination
	June 8, 1974 Inspection
4	June 4, 1974 Inspection and survey
	June 6, 1974 Eddy-current examination
	June 7, 1974 Tube plugging
	June 8, 1974 Tube plugging
	June 9, 1974 Tube plugging
5	June 3, 1974 Inspection
	June 4, 1974 Inspection and survey
	June 6, 1974 Tube marking
6	June 4, 1974 Inspection and survey
	June 6, 1974 Eddy-current examination

A review of Loop No. 4 airborne sampling records and radiation work permits for the period indicate that the above individuals were performing their duties within working environments with average airborne concentrations of insoluble radionuclides and for total exposures times as follows:

Individual #	Average Airborne Concentration (uCi/cc)	Total Exposure Time (hours)
1	7.25×10^{-7}	10.8
2	4.23×10^{-7}	4.83
3	2.36×10^{-7}	7.5
4	7.25×10^{-7}	9.72
5	6.09×10^{-7}	3.6
6	6.88×10^{-7}	1.75

* Total of all radionuclides identified to be present.

Based on the results of gamma spectroscopy measurements of representative Loop No. 4 airborne samples, the radionuclides and their relative activity distribution within the above average airborne concentration totals were as follows:

Radionuclide	Distribution(s)
Co-57	0.077
Co-58	28.0
Co-60	40.8
Cr-51	10.4
Zr-95	0.4
Mn-54	10.0
Fe-59	5.9
Sb-124	1.7
Nb-95	2.7

The effective occupational 40 hr. MPC_a for the above distribution of radionuclides is 1.8×10^{-8} uCi/cc. Using this effective MPC_a the above stated average airborne concentrations and total exposure times the individuals were, by calculation of airborne exposure without applying any credit for respiratory protective devices, exposed to the following values of MPC_a hours during the entire seven day period:

Individual #	Total Exposure (MPC_a hours)	Factor Above 20.103
1	433	10.8
2	113.4	2.8
3	97.9	2.4
4	389	9.7
5	121	3.0
6	66.5	1.7

Dose commitment calculations have been performed for the individuals for the above stated exposure concentrations and durations. The results are as follows:

Individual #	Total Dose Commitment (D_∞) (rems) Lung	LLI
1	3.58	0.18
2	0.94	0.048
3	0.81	0.041
4	3.22	0.163
5	1.00	0.05
6	0.55	0.028

As previously mentioned, the exposure concentrations, factors above Section 20.103, and dose commitments presented above are all based on exposure calculations without the application of any credit for respiratory protection devices that were actually employed for the individuals involved. During the conduct of all the SG No. 4 work during this period, each of the six individuals was provided respiratory protection in the form of a full face respirator with either bottled supplied air operated in the demand flow mode, or a particulate filter. Per Table 6.1 of WASH-1287, the respiratory protection factor applicable to this form of protection is 100. Such a protection factor cannot be applied to these exposures because technically, the plant does not have an "approved" respiratory protection program in all respects. The issuance of the draft modification to Section 20.103 of 10 CFR 20 in August, 1974 precipitated a thorough review of the current respiratory protection program at the plant. This review has been completed and company management has approved the extensive recommendations

for program improvement that the Plant Health Physics staff requested. Equipment is being purchased and within the next year program improvements will be such that the plant will have the respiratory protection program called for the current draft change to 20.103.

As for a demonstration of the actual respiratory protection afforded these individuals during the SG No. 4 work, data on the measured amounts of actual internal deposition of the airborne radionuclides is available in the form of body burden counting records. Each of the six individuals was analyzed in the Yankee mobile body burden counter following the completion of the subject work. The results of these measurements indicate that the actual respiratory protection factors attributable to these exposures range from a low of 5.5 to a high of 22 for the radionuclides identified in the body burden counting. We attribute this anomoly to the people being counted at various time intervals subsequent to the steam generator work and having been in an environment where measurable concentrations of airborne activity existed. The implied protection factors would also be lower than expected if some portion of the activity indicated by the body burden analysis is due to external examination of the individual.

Dose commitment calculations have been performed for the individuals based on the results indicated by the body burden analyses. The results are as follows:

Individual #	Total Dose Commitment (D_∞) (rems)	
	LUNG	LLI
1	0.32	0.014
2	0.066	0.002
3	0.085	0.004
4	0.145	0.007
5	0.01	0.004
6	0.1	0.004

As to an identification of the cause of the situation necessitating this report, a review has been performed of the radiation protection criteria that were applied to the SG No. 4 related work. This review has revealed that a misinterpretation

of previous work practices occurred at the plant prior to the shutdown. In previous steam generator work the individuals working within the water box were provided with full environmental isolation. During the 1974 refueling other personnel directly associated with the steam generator work in areas outside of the water box were provided with respiratory protection, but not full environmental isolation; and were inadvertently considered to be covered by previous steam generator work practices. In addition, body burden counting was not promptly completed on all affected personnel.

As for corrective action to prevent recurrence of the over-exposures indicated herein, a three point program has been initiated. They are as follows:

1. The misinterpretation that steam generator work is exempted from 20.103 limitations has been corrected. The radiation protection criteria employed in the past, i.e. that the requirements of 20.103 are to be complied with, is to be implemented.

2. A review of the specifics involved in steam generator inspection eddy-current examination, and tube plugging will be conducted for the purpose of identifying whether further application of engineering controls is possible to effect a reduction in airborne levels of radioactivity associated with steam generator work. A loop purge and filtration system was utilized during this most recent shutdown. It will be reviewed in relation to the problem and modified if possible.

3. As previously mentioned, a thorough review of the upcoming requirements (draft change to 20.103) of an acceptable respiratory protection program has been completed and has resulted in approval of extensive improvements such that as soon as equipment can be supplied and procedures written the plant will have a program that complies with the modified 20.103. It is anticipated that these improvements will be completed within the next year.

It is recognized that the timeliness of this report is not in accordance with the requirement of 20.405. The reason for the delay is attributable to the previously described misinterpretation regarding the application of 20.103 limitation to steam generator work. The assumption that this work was exempted meant, that there was no reporting requirement. The recently conducted review of the plant's respiratory protection program in relation to the draft change to 20.103 brought the misinterpretation to light and, therefore, the reporting obligation.

Pursuant to 10 CFR 19.13(d), a copy of this modification has been forwarded to the subject individuals.

We trust you will find this notification satisfactory; however, should you desire any additional information feel free to contact us.

Respectfully submitted,
YANKEE ATOMIC ELECTRIC COMPANY

H. A. Autio
Plant Superintendent

HAA/meg
1 Enclosure

cc: (6) Director of Regulatory Operations
United States Nuclear Regulatory Commission
Washington, D. C. 20555

(1) Each individual on enclosure

ENCLOSURE TO YANKEE ATOMIC 10 CFR 20.405 (a)
NOTIFICATION REPORT

Dose commitment calculations based on body burden analysis.