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March 21, 1975

Mr. R. H. Engelken, Director
Office of Enforcement and Inspection
Region V
U. S. Nuclear Regulatory Commission
1990 N. California Boulevard
Walnut Creek Plaza, Suite 202
Walnut Creek, California 94596

Re: Docket No. 50-133
License No. DPR-7

Dear Mr. Engelken:

On January 8, 1975, Mr. H. North of your office was notified as a matter of information by Messrs. W. A. Raymond and E. D. Weeks of our Humboldt Bay Power Plant of a recurrence of above normal concentrations of airborne activity in the steam jet air ejector and turbine gland seal exhauster enclosure, pipe tunnel, and turbine enclosure. Following this notification, Messrs. H. North and F. Wenslawski of your office arrived at the Plant on January 13, 1975 to conduct a special radiological inspection of the facility. No violations of NRC requirements were identified within the scope of that inspection. During the plant management exit interview, it was agreed that the Company would submit a written report evaluating possible offsite dose effects resulting from the turbine enclosure vent release. This report is submitted to fulfill that commitment and to appraise you of the present pipe tunnel and turbine enclosure airborne conditions.

Background

During operations from December 27, 1974, when the Unit was returned to service following a refueling and maintenance outage, until January 1, 1975, airborne activity levels in the pipe tunnel and turbine enclosure were in the normal range of 5×10^{-8} to 5×10^{-7} uCi/cc (20 to 40 minute effective initial half life material consisting primarily of Cs-138, Rb-88, and Ba-139). The Unit was shut down on January 1 and started up the evening of January 3. Air samples collected on January 4 showed increased airborne activity and corrective efforts were initiated when the Unit load was leveled out at approximately 52 MWe gross. The Unit was operated at approximately 52 MWe until January 9 when reactor feed pump seal and main unit condenser problems made it necessary to

reduce load to 20 MWe. After cleaning the condenser, the load was increased to 40 MWe. Between January 7 and 14, the pipe tunnel activity ranged from 1.78×10^{-7} to 8.1×10^{-6} uCi/cc for 20 to 40 minute effective initial half life material. Pipe tunnel I-131 and 133 activity ranged from 7.35×10^{-12} and 3.14×10^{-11} uCi/cc during the period between December 20 and January 3 and 1.23×10^{-10} and 1.69×10^{-9} uCi/cc during the period between January 7 and 10.

Corrective Efforts and Results

One source of the increased airborne radioactivity was determined to be leaks in the off-gas monitoring system. These leaks were located by using a modified air sampler to draw a sample of air from suspected off-gas leakage points. Analysis of the samples collected made it possible to identify and correct two leaks in the off-gas system. These leaks, located in a valve packing and a flow gauge, were repaired on January 10. This action produced a temporary reduction of approximately a factor of two in the airborne activity level in the pipe tunnel area. Measurements in the vicinity of the gland seal exhauster also indicated possible leakage from this equipment. This leakage source was minimized by adjustment of turbine seal steam flows and the installation of temporary hoods over the exhausters with flexible ducting to the existing ventilation duct. On January 15, an additional drain line was installed on the gland seal condenser and a further reduction in airborne activity was made by running only one gland seal exhauster.

As a result of these corrective actions, airborne activity between January 15 and the February 7 shutdown (for special NDT testing of primary system piping) had returned to its normal range. The pipe tunnel concentration was in the range of 1.3×10^{-7} to 5.6×10^{-7} uCi/cc for 20 to 40 minute effective initial half life material. The turbine enclosure airborne activity during this same period was in the range of 8.1×10^{-8} to 2.7×10^{-7} uCi/cc for 20 to 40 minute initial effective half life material, and the long-lived airborne material was less than 10^{-10} uCi/cc. The I-131 concentration was less than 3×10^{-11} uCi/cc and I-133 less than 2×10^{-10} uCi/cc.

Evaluation of Possible Off-site Dose Effects

An evaluation of the off-site radiation doses resulting from the turbine vent releases was performed by the Company's Engineering Department using the assumptions and references given in Attachment I. A summary of doses from turbine building leakage is as follows:

Organ of Interest	Mrem/Year Distance (Meters) - SE Direction* 200	500	1000
Child's Thyroid from Milk	**	5.61	1.86
Inhalation Thyroid	0.313	.058	.019
Whole Body Beta	7.00	1.29	0.429
Whole Body Gamma	1.64	0.562	0.215

*The SE direction presents the nearest site boundary (200 Meters) and the nearest populated area.
**No milk producers at 200 meters.

For the two-week period during which the turbine enclosure vent releases approached the levels assumed in the source term used in these analyses, the maximum off-site dose would be less than 1/3 mrem for the whole body and less than 1/4 mrem for a child's thyroid. These doses are insignificant compared to the annual limits for the site boundary as given in 10 CFR 20.

Very truly yours,

Philip A. Crane, Jr.

Attachment

Attachment I

An evaluation of the off-site radiation doses resulting from the turbine vent releases was performed using the following assumptions and references:

Assumptions:

1. Turbine Building Leakage Source Terms

Nuclide	Source Term (uCi/sec)	Leakage Rate (cc/sec)	Airborne Concentration (uCi/cc)*
I-131	5×10^{-5}	10^6	5×10^{-11}
I-133	6×10^{-4}	10^6	6×10^{-10}
Ba LA-140	4×10^{-4}	10^6	4×10^{-10}
Noble Gases and Short-lived Daughters	1×10^{1}	10^6	1×10^{-5}

*Source terms are based on conservative values of leakage rate and airborne concentrations.

2. Noble Gas Mixture for Leakage Source Term*

Nuclide	% of Total Noble Gas
Kr-83m	1.29
Kr-85m	1.31
Kr-87	6.85
Kr-88	5.19
Kr-89	1.6
Xe-133m	.03
Xe-133	.48
Xe-135m	17.47
Xe-135	6.72
Xe-137	6.55
Xe-138	52.5

*Representative of air ejector off-gas at 40 minutes decay.

3. References:

1. Draft Regulatory Guide 1.DD for Implementation of Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactors, USAEC, February 20, 1974.

2. Cramer, H. E., Eberly, D. L., and Robinson, L. H., Meteorological and Atmospheric Diffusion in the Vicinity of the Humboldt Bay Power Plant, Meteorological Office, Pacific Gas and Electric Company, November, 1965.

3. Meteorology and Atomic Energy 1968, David H. Salde, Editor, U.S. Atomic Energy Commission, July 1968.

4. USAEC Regulatory Guide 1.42, Interim Licensing Policy on As Low As Practicable for Gaseous Radioiodine Releases from Light-Water-Cooled Nuclear Power Reactors, Revision 1, March, 1974.