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August 8, 1977

Director of Regulatory Operations
ATTN: Mr. R. H. Engelken
NRC Operations Office, Region V
1990 North California Boulevard
Walnut Creek Plaza, Suite 202
Walnut Creek, California 94596

Reference: NRC Inspection Results of Inspection 77-9

Gentlemen:

In reply to your inspection conducted by R. T. Dodds and H. L. Canter on May 31, June 1 and June 20-23, 1977, we offer the following explanations and corrective actions which will assure full compliance with NRC requirements.

Appendix B of your letter states:

"With respect to the detection of leaks in the reactor coolant system, Section 4.2.3.7 of the Final Safety Analysis Report states, in part, 'Changes in the reactor coolant leakage rate in the Reactor Building may cause changes in the control room indication of the Reactor Building atmosphere particulate and gas radioactivities...'

"Contrary to the above, it was found during the inspection that the Reactor Building atmosphere particulate and gas monitors had their high range alarms activated. The particulate monitor was indicating above full scale and the gaseous monitor was indicating in the upper (10^5 cpm) decade range. These conditions rendered the monitors ineffective as one of the means to detect changes in the reactor coolant leakage rate."

SMUD REPLY TO DEVIATION A

Sustained full power operation at Rancho Seco has slowly increased the contained radioactivity within the Reactor Building.

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The radioactivity increase was recognized by the operations personnel who have brought the problem to the Plant Review Committee. The Committee recognized the problem of high radioactivity within the Reactor Building and concluded that purging to maintain a low level should not be permitted. The Reactor Building should be sealed and purged only when entry is required. The decision was based on safety to the general public in that radioactivity decay in the building is better than radioactivity decay in the environment. In other words, any decay in the Reactor Building is that much less radioactivity released offsite, which is in agreement with the PRC interpretation of "as low as practical." At the time of the PRC review the particulate and gaseous monitors were high but not offscale. The Reactor Building Radiation monitors have been observed to be cyclic and are dependent on the use of process equipment within the Reactor Building. The monitors, depending on the operations activities, vary approximately one decade. A check of the recording chart indicates that prior to the NRC inspection, the monitor was on scale but during inspector's observation the monitor was at the high side of the cycle. At the time of the audit, Radiation Monitors R-15001A and R-15C01B were considered inoperable and not capable of detecting reactor coolant leakage as specified in Technical Specification 3.1.6.

Facility personnel understood by interpretation that the Reactor Building Area Monitors R-15025, R-15026 and R-15027 were included in the Technical Specification 3.1.6 and FSAR Section 4.2.3.7. Specifically, the FSAR states:

> "Leakage of reactor coolant into the Reactor Building during reactor operation will be detected by one or a combination of the following methods.
>
> A. Sump and Tank Levels...
> B. Reactor Coolant System Inventory...
> C. Radioactivity
>
> "Changes in the reactor coolant leakage rate in the Reactor Building may cause changes in the control room indication of the Reactor Building atmosphere particulate and gas radioactivities and of the Reactor Building radiation monitors."

All sump and tank levels were in service and all systems to measure the reactor coolant system inventory were operable. Therefore since the leadin statement requires only "one or a combination of the above," the requirement has been complied with.

The Technical Specification 3.1.6.7 requires:

> "During power operation, two reactor coolant leak detection systems of different operating principles shall be in operation, with one of the two systems sensitive to radioactivity. The systems sensitive to radioactivity may be out-of-service for 48 hours provided two other means are available to detect leakage."

The bases, page 3-14, also qualify this requirement and include:

"B. Radioactivity - Changes in the reactor coolant leakage rate in the Reactor Building may cause changes in the control room indication of the Reactor Building atmosphere particulates and gas radioactivities and of the Reactor Building radiation monitors."

The interpretation concerns the extent and qualification of the monitors. SMUD believes that any one of the Reactor Building monitors will qualify as a leak detector and offers the following calculations to qualify the Reactor Building Area Monitors as part of the specification.

Assumptions:

1. Primary coolant activity levels released are those used in the FSAR response and can be seen in the 100-day column of Table 14D-4 for 1% defective fuel and Table 14D-8 for 0.1% defective fuel.

2. Reactor Building free air space is: 1.98×10^6 ft^3.

3. Reactor primary coolant volume is 3.31×10^8 cc.

4. Dose equivalent curies (Xe-133) = $A_i \dfrac{\overline{E}_i}{\overline{E}_{Xe-133}}$

Where A_i = Total activity in curies

Isotope	$\overline{E}_i / \overline{E}_{Xe-133}$	Dose Equivalent Curies: 1% Defective Fuel	Dose Equivalent Curies: 0.1% Defective Fuel
Kr 85	6.18×10^{-2}	192	14.2
Kr 85m	2.21	1,242	79.1
Kr 87	13.17	4,000	258.1
Kr 88	25.6	25,440	1,612.8
Xe 131m	2.025	1,610	105.3
Xe 133	-	89,500	5,800
Xe 133m	2.88	2,970	189.5
Xe 135	3.26	6,040	386.6
Xe 135m	6.55	2,170	142.1
Xe 138	5.19	960	62.3
I 131	7.16	8,320	543.4
I 132	26.1	45,600	1,378.1
I 133	8.15	11,320	722.9
I 134	29.4	5,350	314.6
I 135	26.8	18,620	1,198
Totals		223,334	12,807

Reactor Building Dose Rates:

1% Defective Fuel - 1 gpm leak rate

$$\underset{(mrem/hr)}{Dr} = \frac{(9.12\times10^5\ mrem/hr/MeV\text{-}Ci/cc)\ (0.081\ MeV)\ (223,334\ Ci)}{(3.31\times10^8\ cc)\ (6.99\times10^{13}\ cc)}(4.73\times10^6\ cc/gal/min)$$

$= 3.37$ mr/hr

Assuming this semi-infinite dose rate is further adjusted due to the heavy concrete shielding wall it is attached to, the value most likely to be encountered would be:

$= (3.37)\ (1/2)$

$= 1.7$ mr/hr following the first minute of release this value would in turn increase by 1.7 mrem/hr for each additional minute of release.

0.1% Defective Fuel - 1 gpm leak rate

$$Dr = \frac{(9.12\times10^5)\ (0.081)\ (12,807)\ (4.73\times10^6)}{(3.31\times10^8)\ (6.99\times10^{13})}$$

$= 0.193$

Adjusting for concrete wall

$(0.193)\ (1/2)$

$= 0.1$ mr/hr

Conclusion

Assuming that the operator would become aware of the leakage at the time the radiation monitor "Alert" alarm sounds, the response time for the three Reactor Building area monitors would be:

	R-15025 Monitor	R-15026 Monitor	R-15027 Monitor
Alert Alarm Point Settings*	10 mr/hr	100 mr/hr	100 mr/hr
Existing Readings**	1 mr/hr	6 mr/hr	8 mr/hr
1% Defective Fuel Response Times	6 minutes	60 minutes	60 minutes
0.1% Defective Fuel Response Times	90 minutes	990 minutes	990 minutes

*Rancho Seco Process Standards
**As of August 2, 1977 at 1800 hours.

If on the other hand, other parameters discussed in the FSAR indicate the likelihood of a leak and the area radiation instruments are being used to confirm this condition, then 5-10 minutes and 1-2 hours would be required from initiation of the 1% and 0.1% defective fuel leakage, respectively, until a distinctly noticeable change in the log rate meter readings would occur.

The FSAR, "Answers to Questions," 4A.6, and the Technical Specifications Section 3.16 Bases state the response times for the gaseous radiation monitor (R-15001B) are:

Coolant Activity	Response Time
1% defective fuel	67 seconds
0.1% defective fuel	5.3 minutes

The airborne particulate radiation monitor response time is dependent upon the speed of filter paper advance which, during normal operation, will be the slow speed. Thus, assuming either 0.1 percent defective fuel and a 1 gpm leak or expected corrosion product activity and a 1 gpm leak, the response time will be about 1 to 2 hours. This time period is associated with filter tape movement from the point of particle deposition to the detector. If leakage is indicated by another leak detection method, the filter paper can be manually advanced to verify that a substantial leak has occurred. By stopping the filter tape advance mechanism, an integrated sample can be taken over a short period of time (e.g. 5 minutes) for a quick evaluation of the situation.

Coolant Activity	Response Time Excluding Filter Advance
1% defective fuel	40 seconds
0.1% defective fuel	41 seconds
No defective fuel, corrosion products only.	18 minutes

The radiation monitoring system depends entirely upon reactor coolant activity in order to provide reactor coolant leakage rate detection capability.

It is therefore concluded that the area monitors would respond more slowly than the Reactor Building gas monitor, but more quickly than the particulate monitor and most certainly provide a reasonable backup to these two instruments.

Respectfully submitted,

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