

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-361/84-20 and 50-362/84-20

Docket Nos. 50-361, 50-362 License Nos. NPF-10, NPF-15

Licensee: Southern California Edison Company  
2244 Walnut Grove Avenue  
Rosemead, California 91770

Facility Name: San Onofre Unit 2 and Unit 3

Inspection at: Camp Pendleton, California

Inspection conducted: June 18-21, 1984

Inspectors: GP Yuhas Per 7/24/84  
G. Hamada Radiation Laboratory Specialist Date Signed

GP Yuhas Per 7/24/84  
H. North, Senior Radiation Specialist Date Signed

Approved By: G Yuhas 7/24/84  
G. Yuhas, Chief, Reactor Radiation Protection Section Date Signed

Summary:

Inspection of June 18-21, 1984 (Report Nos. 50-361/84-20 and 50-362/84-20)

This was a routine, announced, confirmatory measurements inspection involving the Region V Mobile Laboratory. A total of 68 onsite inspection hours were expended by two inspectors.

Results: No violations of NRC requirements were identified in the areas examined.

DETAILS

1. Persons Contacted

- \*E. J. Bennett, Quality Assurance
- \*L. D. Brevig, Chemistry Supervisor
- \*S. Chick, Chemistry
- \*P. Croy, Compliance Manager
- \*J. M. Curran, Quality Assurance
- \*J. G. Haynes, Station Manager
- \*P. King, Quality Assurance
- \*J. Z. Mortensen, Chemistry
- \*H. Pemberton, ISEG
- \*D. Schone, Manager, Site Quality Assurance
- \*M. Speer, Compliance
- \*J. C. Young, Chemistry

\*Denotes those present at the exit interview.

2. Discussion

This inspection was conducted to assess the adequacy of the radioactivity measurements program at Units 2 and 3. Split sample analyses were performed on liquid, gas and particulate categories and involved the Region V Mobile Laboratory.

The results are presented below.

Table 1

Steam Generator 88 (Unit 2)

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement* Range</u>
Na-24	1.05 E-4	1.05 E-4	1.00	0.80 - 1.25
I-131	3.49 E-5	3.70 E-5	0.94	0.80 - 1.25
I-132	2.02 E-5	1.76 E-5	1.15	0.75 - 1.33
I-133	4.46 E-5	5.60 E-5	0.80	0.80 - 1.25
I-134	1.01 E-5	8.72 E-6	1.16	0.4 - 2.5
I-135	3.24 E-5	3.33 E-5	0.97	0.75 - 1.33

\*See Enclosure

Table 2

Steam Generator 89 (Unit 2)

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
Na-24	1.02 E-5	1.02 E-5	1.00	0.75 - 1.33
I-131	4.71 E-6	5.04 E-6	0.93	0.75 - 1.33
I-132	3.88 E-7	3.94 E-7	0.98	0.60 - 1.66
I-133	6.02 E-6	5.88 E-6	1.02	0.60 - 1.66

Although, the mobile laboratory was brought to the San Onofre site on the expectation that both Units 2 and 3 would be in full operation during the inspection period, when the mobile laboratory arrived, Unit 3 was already in a shut-down mode and Unit 2 was experiencing steam generator leak problems. The leak rate for the leaky generator was being monitored through analysis of steam generator blow-down samples using both Na-24 and I-131 activities as the key indicators. It became evident that if the leak rate continued to increase at the observed rate, it would be necessary to shut-down the unit within a matter of days. Because this decision was to be based on the results obtained for the blow-down sample, a split was obtained for verification by the NRC. Table 1 shows the good agreement achieved for this sample. Table 2 shows that radionuclide concentrations for the second steam generator are about an order of magnitude lower than the first.

Table 3

Unit 3Steam Generator 89

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
I-131	1.09 E-5	1.14 E-5	0.96	0.85 - 1.18
I-133	5.28 E-8	6.40 E-8	0.83	0.50 - 2.0
Cs-134	1.62 E-7	1.60 E-7	1.01	0.60 - 1.66
Cs-136	2.04 E-7	1.78 E-7	1.15	0.60 - 1.66
Cs-137	7.31 E-7	7.15 E-7	1.02	0.75 - 1.33

Table 3 lists the results for a steam generator sample from Unit 3.

Table 4

Particulate Filter  
(at Air Ejector)

<u>Nuclide</u>	<u>SCE</u> <u>uCi/cc</u>	<u>NRC</u> <u>uCi/cc</u>	<u>Ratio</u> <u>SCE/NRC</u>	<u>Agreement</u> <u>Range</u>
I-131	8.74 E-14	1.69 E-13	0.52	0.50 - 2.0
Cs-138	1.65 E-10	-	-	-
Ba-139	4.18 E-12	-	-	-

Table 4-A

Charcoal Cartridge\*  
(at Air Ejector)

<u>Nuclide</u>	<u>SCE</u> <u>uCi/ml</u>	<u>NRC</u> <u>uCi/ml</u>	<u>Ratio</u> <u>SCE/NRC</u>	<u>Agreement</u> <u>Range</u>
I-131	3.56 E-11	4.87 E-11	0.73	0.5 - 2.0

\*There is a significant difference in configuration between this sample and NRC's cartridge standard.

Table 5

Charcoal Cartridge  
(Reactor Building - Unit 2)

<u>Nuclide</u>	<u>SCE</u> <u>uCi/ml</u>	<u>NRC</u> <u>uCi/ml</u>	<u>Ratio</u> <u>SCE/NRC</u>	<u>Agreement</u> <u>Range</u>
I-131	3.56 E-10	3.40 E-10	1.05	0.80 - 1.25
I-132	8.30 E-12	-	-	-
I-133	1.30 E-10	8.73 E-11	1.49	0.60 - 1.66
I-135	3.75 E-11	-	-	-

Tables 4-A and 4 list the results for a charcoal cartridge and its associated particulate filter obtained at the air ejector of Unit 2. Although it is not strictly valid to compare NRC's measurement of the charcoal cartridge to the result obtained by Southern California Edison (SCE) because of significant differences in cartridge dimensions used to calibrate the NRC system, these measurements were made to provide some indication of the magnitude of releases occurring from the secondary side of the plant. Despite this difference in cartridge geometry the results are not too far apart, indicating that the activity is deposited mostly on the surface.

The charcoal cartridge used to obtain the results shown in Table 5 is similar to that used by the NRC and therefore represent data more appropriate for comparison. The results indicate adequate agreement. It should be noted that, in general, when NRC shows no result for nuclides that have been identified by the licensee, it is due to the relatively short half lives of these nuclides. When both parties perform measurements on the same sample, the licensee usually makes the first measurement. Frequently, the NRC measurement is made many hours after the licensee's measurement and consequently the shorter lived nuclides have undergone considerable decay and often do not have sufficient activity to be detected.

Table 6

Liquid Waste

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
I-131	1.12 E-5	1.16 E-5	0.97	0.80 - 1.25
I-133	-	6.37 E-8	-	0.80 - 1.25
Cs-134	1.50 E-7	1.62 E-7	0.93	0.80 - 1.25
Cs-136	1.83 E-7	1.90 E-7	0.96	0.80 - 1.25
Cs-137	7.47 E-7	8.16 E-7	0.92	0.80 - 1.25

Table 7

Waste Gas Decay Tank

<u>Nuclide</u>	<u>SCE (2 ml samp.) uCi/ml</u>	<u>SCE (5 ml samp.) uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
Kr-85m	4.44 E-4	4.07 E-4	3.37 E-4	1.21	0.5 - 2.0
Xe-131m	-	8.33 E-3	6.55 E-3	1.27	0.4 - 2.5
Xe-133	1.42 E0	1.29 E0	1.12 E0	1.15	0.8 - 1.25
Xe-133m	1.76 E-2	1.52 E-2	1.36 E-2	1.12	0.6 - 1.66
Xe-135	3.37 E-2	2.94 E-2	2.54 E-2	1.16	0.6 - 1.66

Tables 6 and 7 show the results obtained for samples of liquid and gaseous waste respectively. The results indicate adequate agreement for both categories.

Table 8

Reactor Coolant Liquid (Unit 2)  
(June 19 - 15:25 pm)

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
Na-24	5.29 E-2	5.19 E-2	1.02	0.85 - 1.18
Co-58	2.07 E-3	1.79 E-3	1.16	0.75 - 1.33
Rb-88	1.49 E-1	1.37 E-1	1.09	0.60 - 1.66
I-131	1.48 E-2	1.43 E-2	1.03	0.85 - 1.18
I-132	1.76 E-2	1.60 E-2	1.10	0.80 - 1.25
I-133	1.92 E-2	2.24 E-2	0.86	0.85 - 1.18
I-134	1.91 E-2	1.72 E-2	1.11	0.75 - 1.33
I-135	1.93 E-2	1.86 E-2	1.04	0.75 - 1.33
Cs-137	9.95 E-4	7.17 E-4	1.39	0.60 - 1.66
Cs-138	6.65 E-2	5.22 E-2	1.27	0.75 - 1.33

Table 8-A

Reactor Coolant - Stripped Gas (Unit 2)  
(June 19 - 15:25 pm)

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
Ar-41	4.04 E-2	4.09 E-2	0.99	0.75 - 1.33
Kr-85m	1.94 E-2	1.93 E-2	1.01	0.80 - 1.25
Kr-87	2.20 E-2	2.34 E-2	0.94	0.75 - 1.33
Kr-88	3.73 E-2	4.32 E-2	0.86	0.80 - 1.25
Xe-133	3.55 E-1	3.97 E-1	0.89	0.85 - 1.18
Xe-133m	8.09 E-3	9.73 E-3	0.83	0.75 - 1.33
Xe-135	9.24 E-2	1.09 E-1	0.85	0.80 - 1.25

The results shown in Tables 8 and 8-A indicate that adequate agreement was obtained for both reactor coolant liquid and dissolved gas categories. These categories were of particular interest because of the higher than normal activity levels previously reported for reactor

coolant in Unit 3. While the above results are for coolant from Unit 2, because the same laboratory serves both Units 2 and 3, a measurement verification test on samples from either unit would be valid for the other as well.

Table 9

RCS - Suspended Solids\*

<u>Nuclide</u>	<u>SCE uCi/ml</u>	<u>NRC uCi/ml</u>	<u>Ratio SCE/NRC</u>	<u>Agreement Range</u>
Na-24	3.37 E-5	3.39 E-5	0.99	0.75 - 1.33
Cr-51	1.82 E-3	1.90 E-3	0.96	0.85 - 1.18
Mn-54	5.91 E-5	6.14 E-5	0.96	0.80 - 1.25
Mn-56	1.67 E-3	1.73 E-3	0.97	0.80 - 1.25
Fe-59	6.93 E-5	7.40 E-5	0.94	0.75 - 1.33
Co-57	1.66 E-6	1.98 E-6	0.84	0.60 - 1.66
Co-58	9.56 E-4	1.00 E-3	0.96	0.85 - 1.18
Co-60	9.42 E-5	1.00 E-4	0.94	0.75 - 1.33
Ni-65	1.09 E-4	1.15 E-4	0.95	0.75 - 1.33
Cu-64	3.50 E-4	4.77 E-4	0.73	0.4 - 2.5
Zn-65	4.7 E-6	4.0 E-6	1.18	0.60 - 1.66
Sb-122	8.22 E-6	8.37 E-6	0.98	0.75 - 1.33
Sb-124	-	2.8 E-6	-	0.50 - 2.0
Np-239	2.43 E-5	2.62 E-5	0.93	0.75 - 1.33
Zr-95	7.88 E-5	7.31 E-5	1.08	0.80 - 1.25
Zr-97	8.75 E-5	8.36 E-5	1.05	0.80 - 1.25
Nb-95	7.06 E-5	7.39 E-5	0.96	0.80 - 1.25
Nb-97	8.50 E-5	9.46 E-5	0.90	0.80 - 1.25
Mo-99	2.48 E-5	2.39 E-5	1.04	0.50 - 2.0
Ru-103	3.65 E-6	4.71 E-6	0.77	0.50 - 2.0
I-131	2.13 E-5	2.34 E-5	0.91	0.75 - 1.33

I-132	1.76 E-5	2.63 E-5	0.67	0.60 - 1.66
I-133	2.42 E-5	2.62 E-5	0.92	0.75 - 1.33
Ba-139	1.25 E-4	1.08 E-4	1.16	0.60 - 1.66
Ce-141	-	2.08 E-6	-	0.50 - 2.0
As-76	1.40 E-5	1.66 E-5	0.84	0.75 - 1.33
Sn-113	3.20 E-6	3.90 E-6	0.82	0.50 - 2.0
W-187	1.05 E-4	1.27 E-4	0.83	0.80 - 1.25

Table 9 shows the results for a suspended solids sample obtained through filtration of a measured quantity (500 ml) of coolant. This special sample was obtained because similar samples in the past contained a variety of nuclides including those not normally encountered in routine samples. Experience had shown that soon after shut down, significant quantities of a multitude of activation and fission products could be observed in the reactor coolant. Much of this activity is associated with suspended solids and can be separated through filtration. Also, because the geometry for this type of sample is the same as that for particulates, this comparison would be a valid test for the particulate filter geometry. It can be seen that there is general agreement for the nuclides identified. Because the NRC obtained somewhat greater sensitivity than SCE for this particular measurement, several nuclides identified by the NRC were not detected by SCE. While this fact is of no significance in this case, these nuclides are included in the table to serve as a reminder that these entities were indeed identified and should be expected as a part of this type of mix.

Based on the results obtained, it can be stated that the sensitivity and accuracy of the gamma radioactivity measurements program at Units 2 and 3 are satisfactory.

A liquid waste sample was split for analysis for tritium, Sr-89, Sr-90 and Fe-55 by both NRC's contractor laboratory (Radiological and Environmental Sciences Laboratory of the Department of Energy) and SCE's contractor laboratory. (Open Item No. 84-20-01)

### 3. Exit Interview

Inspection findings were discussed with licensee personnel indicated in paragraph 1. Licensee management was informed that no violations of NRC regulations were identified for this phase of the inspection and all independent measurement comparisons were found to be in agreement.



Criteria for Accepting the Licensee's Measurements

<u>Resolution</u>	<u>Ratio</u>
< 4	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
200	0.85 - 1.18

Comparison

1. Divide each NRC result by its associated uncertainty to obtain the resolution. (Note: For purposes of this procedure, the uncertainty is defined as the relative standard deviation, one sigma, of the NRC result as calculated from counting statistics.)
2. Divide each licensee result by the corresponding NRC result to obtain the ratio (licensee result/NRC).
3. The licensee's measurement is in agreement if the value of the ratio falls within the limits shown in the preceding table for the corresponding resolution.