U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-275/87-17, 50-323/87-16

Docket Nos. 50-275, 50-323

License Nos. DPR-80, DPR-82

Licensee: Pacific Gas and Electric Company
77 Beale Street
San Francisco, California 94106

Facility Name: Diablo Canyon Units 1 and 2

Inspection at: San Luis Obispo County, California

Inspection Conducted: April 13-17, 1987

Inspector: G. H. Hamada — 5/4/87
G. H. Hamada, Radiation Laboratory Specialist — Date Signed

W. TenBrook — 5/4/87
W. TenBrook, Radiation Specialist — Date Signed

Approved By: G. P. Yuhas — 5/4/87
G. P. Yuhas, Chief — Date Signed
Facilities Radiological Protection Section

Summary:

Inspection of April 13-17, 1987 (Report Nos. 50-275/87-17, 50-323/87-16)

Areas Inspected: Assess adequacy of radioactivity analysis through cross-check measurements. These measurements involved the Region V Mobile Laboratory. The status of the new chemistry laboratory and new equipment was reviewed. This inspection covered Modules 79701 and 84725.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

*J. Boots, Manager, Chemistry and Radiation Protection
*D. Chen, Engineer, Chemistry and Radiation Protection
*J. E. Gardner, Sr. Engineer, Chemistry and Radiation Protection
*F. A. Guerra, Foremen, Chemistry
*M. Hug, Engineer, Regulatory Compliance
*R. L. Johnson, General Foreman, Chemistry
*D. Unger, Radiochemical Engineer

*Indicates personnel present at exit interview.

2. Discussion

The NRC mobile laboratory was brought onsite to perform cross-check measurements on selected sample categories for which radioactivity measurements are required. The results are summarized below:

Table 1

Waste Gas (in Glass Bulb)

Nuclide	DCPP µCi/cc	NRC µCi/cc	Ratio DCPP/NRC	*Agreement Range
Xe-133	1.15 E-2	1.55 E-2	0.74	0.75 - 1.33
Xe-131M	4.58 E-4	5.64 E-4	0.81	0.60 - 1.66

*See enclosure for explanation.

The results in Table 1 indicate marginal agreement for the waste gas category. The NRC calibration for the glass bulb geometry, however, was performed with a glass bulb of slightly different capacity and wall thickness than the bulb used to obtain this sample. Given the uncertainties associated with this measurement, the agreement is adequate.

Table 2

Iodine Cartridge

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
I-131	6.14 E-10	5.04 E-10	1.22	0.75 - 1.33
I-132	5.10 E-11	2.44 E-11	2.09	0.40 - 2.50
I-133	2.61 E-10	2.00 E-10	1.31	0.60 - 1.66
I-135	9.97 E-11	1.07 E-10	0.93	0.50 - 2.00
BR-82	1.89 E-10	1.13 E-10	1.67	0.60 - 1.66

Table 2 lists the results obtained for the iodine cartridge geometry. Because Diablo Canyon routinely uses silver zeolite for iodine collection, a silver zeolite cartridge rather than a charcoal cartridge was used for this test. The low activities observed in this sample are reflected by the relatively wide agreement range indicated in the table. In general, the agreement is adequate.

Table 3

Liquid Waste

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
Mn-54	8.54 E-7	1.16 E-6	0.74	0.60 - 1.66
Co-57	2.89 E-7	1.65 E-7	1.75	0.40 - 2.50
Co-58	1.07 E-4	1.20 E-4	0.89	0.80 - 1.25
Co-60	8.54 E-6	9.43 E-6	0.91	0.75 - 1.33
I-131	7.52 E-6	1.30 E-5	0.58	0.75 - 1.33
Cs-134	1.50 E-6	1.83 E-6	0.82	0.60 - 1.66
Cs-137	1.81 E-6	2.33 E-6	0.78	0.60 - 1.66

The results for split samples of chemical drain tank liquid waste are summarized in Table 3. Except for I-131, adequate agreement is indicated for all other nuclides identified. The lack of agreement for I-131 could be attributed to heterogeneous fractionation of iodine between the split fractions. While the peak stripping routine can sometimes cause anomalous results to occur, the 364 Kev I-131 peak appears to be "clean," unencumbered by interfering peaks, and a difference of this magnitude appears to be too large to attribute to peak stripping alone. On the other hand, the calibration for this geometry appears to be adequate as indicated by the agreement achieved for the other activities present.

Table 4

Reactor Coolant (Liquid)

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
Na-24	1.09 E-3	1.04 E-3	1.05	0.75 - 1.33
Mn-54	8.24 E-4	6.80 E-4	1.21	0.75 - 1.33
Co-58	3.05 E-4	4.62 E-4	0.66	0.60 - 1.66
I-131	1.96 E-3	2.02 E-3	0.97	0.75 - 1.33
I-132	4.17 E-3	4.56 E-3	0.91	0.80 - 1.25
I-133	4.33 E-3	4.64 E-3	0.93	0.80 - 1.25
I-134	7.59 E-3	7.58 E-3	1.00	0.75 - 1.33
I-135	6.94 E-3	5.73 E-3	1.21	0.75 - 1.33
Cs-134	6.65 E-4	5.89 E-4	1.13	0.60 - 1.66
Cs-137	5.33 E-4	5.63 E-4	0.95	0.60 - 1.66
Cs-138	2.11 E-2	2.29 E-2	0.92	0.75 - 1.33
Ba-139	1.58 E-3	1.86 E-3	0.85	0.60 - 1.66

The results for a reactor coolant liquid sample summarized in Table 4 indicate adequate agreement for this matrix and this set of nuclides.

Table 5

Suspended Solids
(April 14, 1987)

Nuclide	DCPP μCi/ml	NRC μCi/ml	Ratio DCPP/NRC	Agreement Range
Cr-51	4.06 E-5	4.51 E-5	0.90	0.80 - 1.25
Mn-54	3.20 E-6	3.82 E-6	0.84	0.75 - 1.33
Mn-56	1.65 E-5	1.70 E-5	0.97	0.75 - 1.33
Fe-59	2.38 E-6	1.80 E-6	1.32	0.60 - 1.66
Co-58	6.72 E-5	8.06 E-5	0.83	0.80 - 1.25
Co-60	9.56 E-6	9.99 E-6	0.96	0.80 - 1.25
Ni-65	-	3.46 E-6	-	0.60 - 1.66
Zr-95	5.95 E-6	7.00 E-6	0.85	0.80 - 1.25
Zr-97	9.76 E-6	1.11 E-5	0.88	0.80 - 1.25
Nb-95	4.64 E-6	5.47 E-6	0.85	0.80 - 1.25
Nb-97	1.11 E-5	1.22 E-5	0.91	0.80 - 1.25
I-131	1.16 E-6	1.26 E-6	0.92	0.75 - 1.33
I-132	2.30 E-6	2.10 E-6	1.10	0.60 - 1.66
I-133	2.03 E-6	2.52 E-6	0.81	0.75 - 1.33
I-135	1.59 E-6	2.43 E-6	0.65	0.60 - 1.66
Cs-134	6.52 E-7	4.99 E-7	1.31	0.50 - 2.00
Cs-138	1.57 E-5	1.58 E-5	0.99	0.60 - 1.66
Sn-117M	5.04 E-7	4.10 E-7	1.24	0.75 - 1.33
Ba-139	7.33 E-6	8.92 E-7	0.82	0.75 - 1.33

Table 6

Suspended Solids
(April 16, 1987)

Nuclide	DCPP μCi/ml	NRC μCi/ml	Ratio DCPP/NRC	Agreement Range
Na-24	3.95 E-7	3.82 E-7	1.03	0.60 - 1.66
Cr-51	6.20 E-5	7.42 E-5	0.84	0.80 - 1.25
Mn-54	5.63 E-6	6.27 E-6	0.90	0.80 - 1.25
Mn-56	1.96 E-5	2.38 E-5	0.82	0.80 - 1.25
Fe-59	2.21 E-6	2.25 E-6	0.98	0.75 - 1.33
Co-58	9.70 E-5	1.12 E-4	0.87	0.85 - 1.18
Co-60	1.35 E-5	1.44 E-5	0.94	0.80 - 1.25
Sn-117M	8.85 E-7	7.26 E-7	1.22	0.75 - 1.33
Zr-95	1.45 E-5	1.73 E-5	0.84	0.80 - 1.25
Zr-97	2.33 E-5	2.63 E-5	0.89	0.80 - 1.25
Nb-95	1.00 E-5	1.21 E-5	0.83	0.80 - 1.25
I-131	1.71 E-6	1.42 E-6	1.20	0.75 - 1.33
I-132	2.01 E-6	2.20 E-6	0.91	0.75 - 1.33
I-133*	1.39 E-6	2.48 E-6	0.56	0.75 - 1.33

I-135	3.12 E-6	3.03 E-6	1.03	0.75 - 1.33
Cs-134	8.70 E-7	1.13 E-6	0.77	0.75 - 1.33
Cs-137	1.02 E-6	1.22 E-6	0.84	0.75 - 1.33
Ba-139*	2.02 E-5	1.39 E-5	1.45	0.75 - 1.33
Ba-140	-	2.29 E-6	-	-
W-187	-	2.19 E-6	-	-
Np-239	-	5.42 E-7	-	-

Tables 5 and 6 are the summaries of results obtained for suspended solids in reactor coolant. These samples were obtained by filtering one liter of reactor coolant through a 47 mm membrane filter and were obtained to simulate particulate filter samples. The particulate filter sample obtained from Unit one containment did not provide enough activity to permit a meaningful test.

A second suspended solids sample (April 16) was obtained when a measurement of the first sample with the new Canberra gamma spectroscopy system (24 hours after sampling) indicated that significant decay had taken place and thus did not contain the spectral mix desired for this test. The Canberra spectroscopy system is a recently acquired system with new software. This system was still in an acceptance test mode and had not yet been fully calibrated and thus could not provide quantitative results. However, a peak analysis report was obtained for review. The peak analysis appears to be "standard" peak analysis and as in other systems, the number of peaks identified can vary widely depending on the values chosen for the peak sensitivity parameters.

Licensee data shown in Tables 5 and 6 were obtained with the "old" gamma spectroscopy system. Because of operational needs, this system has been routinely used as a "2 K" system, i.e., spectral information is collected in 2048 channels at 1 Kev per channel instead of the more conventional 4096 channels at 0.5 Kev per channel. While the 2 K mode appears to provide adequate quantitative information in general, anomalies can and do occur. For example, both I-133 and Ba-139 in Table 6 fail the agreement test. Examination of the raw spectral data show fully resolved 526 Kev and 529 Kev peaks in the NRC measurement. The 529 Kev line is the key line for I-133 and the 526 Kev line is a potentially interfering secondary line from I-135 decay. The licensee's initial peak analysis shows a single 526 Kev line in this region. In the licensee's system, operators are trained to visually examine (on the screen) regions that appear likely to contain multiplet peaks. This was done for this energy region and a secondary peak analysis was performed using operator selected values for beginning and end channels for peaks. A 529 Kev peak was identified and quantified after the secondary peak analysis was performed. At 1 Kev per channel, two peaks 3 Kev apart are separated by only two channels. This situation does not lend itself to accurate resolution and quantification of the peaks, especially as the contribution from the interfering peak becomes more significant. For the April 14 suspended solids samples (Table 5), better agreement for I-133 is indicated. In this case, however, the interference from I-135 was less as indicated by the smaller concentration of I-135 in this sample.

For Ba-139 (165 Kev) in the April 16 sample (Table 6), the licensee's initial peak analysis showed a single peak at 159 Kev. After operator

input, the secondary peak analysis indicated peaks at 158 Kev and 166 Kev. The 158 Kev line is due to Sn-117M and the 166 Kev line is from Ba-139. The NRC peak analysis showed three fully resolved peaks at 158 Kev, 162 Kev (a secondary line from Ba-140) and 165 Kev. The problem here is similar to that for I-133 discussed above.

It should be noted that the NRC measurements involved longer than normal counting times to enhance sensitivity and improve counting statistics. Therefore, certain activities not detected by the licensee were observed in the NRC measurements. These have been included in the tables only to show the variety of nuclides present in these samples.

Although the overall agreement is adequate, it could be better, and the frequency of anomalies observed should be reduced or eliminated. It is expected that all of these issues will be resolved when the newly acquired spectroscopy system becomes fully operational. This system can easily accommodate a number of 4 K spectra or even 8 K spectra at the same time. Specific software modifications are being performed by the vendor to conform with the licensee's specific needs and full scale calibrations are expected to commence soon thereafter. This system is expected to be operational by early summer.

The new chemistry laboratory has been completed and the transfer and installation of equipment and supplies are in progress. Space is ample and the modular structure of the laboratory separates various laboratory functions from each other. This should enhance the laboratory's ability to perform certain types of trace measurements. The equipment is state-of-the-art, and laboratory staffing has been increased from a year ago when the last confirmatory measurements inspection was conducted. This laboratory is expected to be fully operational within a few months.

The Diablo Canyon chemistry laboratory does not participate in any external laboratory cross-check program directly. It does, however, participate in an internal cross-check program administered by its own Department of Engineering Research (DER) in San Ramon, California. The DER in turn does participate in the EPA cross-check program.

3. <u>Exit Interview</u>

Inspection findings were discussed with licensee personnel indicated in paragraph 1. It was also indicated that as a further check on measurements involving beta and soft x-ray emitters, a spiked sample containing these and other nuclides would be provided by the NRC for analysis by the licensee or its vendor laboratory. (Item No. 87-17-01).

Enclosure

Criteria for Accepting the Licensee's Measurements

Resolution	Ratio
<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.

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Summary:

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Areas Inspected: Assess adequacy of radioactivity analysis through cross-check measurements. These measurements involved the Region V Mobile Laboratory. The status of the new chemistry laboratory and new equipment was reviewed. This inspection covered Modules 79701 and 84725.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

   *J. Boots, Manager, Chemistry and Radiation Protection
   *D. Chen, Engineer, Chemistry and Radiation Protection
   *J. E. Gardner, Sr. Engineer, Chemistry and Radiation Protection
   *F. A. Guerra, Foremen, Chemistry
   *M. Hug, Engineer, Regulatory Compliance
   *R. L. Johnson, General Foreman, Chemistry
   *D. Unger, Radiochemical Engineer

   *Indicates personnel present at exit interview.

2. Discussion

   The NRC mobile laboratory was brought onsite to perform cross-check measurements on selected sample categories for which radioactivity measurements are required. The results are summarized below:

Table 1

Waste Gas (in Glass Bulb)

Nuclide	DCPP µCi/cc	NRC µCi/cc	Ratio DCPP/NRC	*Agreement Range
Xe-133	1.15 E-2	1.55 E-2	0.74	0.75 - 1.33
Xe-131M	4.58 E-4	5.64 E-4	0.81	0.60 - 1.66

*See enclosure for explanation.

The results in Table 1 indicate marginal agreement for the waste gas category. The NRC calibration for the glass bulb geometry, however, was performed with a glass bulb of slightly different capacity and wall thickness than the bulb used to obtain this sample. Given the uncertainties associated with this measurement, the agreement is adequate.

Table 2

Iodine Cartridge

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
I-131	6.14 E-10	5.04 E-10	1.22	0.75 - 1.33
I-132	5.10 E-11	2.44 E-11	2.09	0.40 - 2.50
I-133	2.61 E-10	2.00 E-10	1.31	0.60 - 1.66
I-135	9.97 E-11	1.07 E-10	0.93	0.50 - 2.00
BR-82	1.89 E-10	1.13 E-10	1.67	0.60 - 1.66

Table 2 lists the results obtained for the iodine cartridge geometry. Because Diablo Canyon routinely uses silver zeolite for iodine collection, a silver zeolite cartridge rather than a charcoal cartridge was used for this test. The low activities observed in this sample are reflected by the relatively wide agreement range indicated in the table. In general, the agreement is adequate.

Table 3

Liquid Waste

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
Mn-54	8.54 E-7	1.16 E-6	0.74	0.60 - 1.66
Co-57	2.89 E-7	1.65 E-7	1.75	0.40 - 2.50
Co-58	1.07 E-4	1.20 E-4	0.89	0.80 - 1.25
Co-60	8.54 E-6	9.43 E-6	0.91	0.75 - 1.33
I-131	7.52 E-6	1.30 E-5	0.58	0.75 - 1.33
Cs-134	1.50 E-6	1.83 E-6	0.82	0.60 - 1.66
Cs-137	1.81 E-6	2.33 E-6	0.78	0.60 - 1.66

The results for split samples of chemical drain tank liquid waste are summarized in Table 3. Except for I-131, adequate agreement is indicated for all other nuclides identified. The lack of agreement for I-131 could be attributed to heterogeneous fractionation of iodine between the split fractions. While the peak stripping routine can sometimes cause anomalous results to occur, the 364 Kev I-131 peak appears to be "clean," unencumbered by interfering peaks, and a difference of this magnitude appears to be too large to attribute to peak stripping alone. On the other hand, the calibration for this geometry appears to be adequate as indicated by the agreement achieved for the other activities present.

Table 4

Reactor Coolant (Liquid)

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
Na-24	1.09 E-3	1.04 E-3	1.05	0.75 - 1.33
Mn-54	8.24 E-4	6.80 E-4	1.21	0.75 - 1.33
Co-58	3.05 E-4	4.62 E-4	0.66	0.60 - 1.66
I-131	1.96 E-3	2.02 E-3	0.97	0.75 - 1.33
I-132	4.17 E-3	4.56 E-3	0.91	0.80 - 1.25
I-133	4.33 E-3	4.64 E-3	0.93	0.80 - 1.25
I-134	7.59 E-3	7.58 E-3	1.00	0.75 - 1.33
I-135	6.94 E-3	5.73 E-3	1.21	0.75 - 1.33
Cs-134	6.65 E-4	5.89 E-4	1.13	0.60 - 1.66
Cs-137	5.33 E-4	5.63 E-4	0.95	0.60 - 1.66
Cs-138	2.11 E-2	2.29 E-2	0.92	0.75 - 1.33
Ba-139	1.58 E-3	1.86 E-3	0.85	0.60 - 1.66

The results for a reactor coolant liquid sample summarized in Table 4 indicate adequate agreement for this matrix and this set of nuclides.

Table 5

Suspended Solids
(April 14, 1987)

Nuclide	DCPP µCi/ml	NRC µCi/ml	Ratio DCPP/NRC	Agreement Range
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Mn-56	1.65 E-5	1.70 E-5	0.97	0.75 - 1.33
Fe-59	2.38 E-6	1.80 E-6	1.32	0.60 - 1.66
Co-58	6.72 E-5	8.06 E-5	0.83	0.80 - 1.25
Co-60	9.56 E-6	9.99 E-6	0.96	0.80 - 1.25
Ni-65	-	3.46 E-6	-	0.60 - 1.66
Zr-95	5.95 E-6	7.00 E-6	0.85	0.80 - 1.25
Zr-97	9.76 E-6	1.11 E-5	0.88	0.80 - 1.25
Nb-95	4.64 E-6	5.47 E-6	0.85	0.80 - 1.25
Nb-97	1.11 E-5	1.22 E-5	0.91	0.80 - 1.25
I-131	1.16 E-6	1.26 E-6	0.92	0.75 - 1.33
I-132	2.30 E-6	2.10 E-6	1.10	0.60 - 1.66
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Table 6

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Mn-56	1.96 E-5	2.38 E-5	0.82	0.80 - 1.25
Fe-59	2.21 E-6	2.25 E-6	0.98	0.75 - 1.33
Co-58	9.70 E-5	1.12 E-4	0.87	0.85 - 1.18
Co-60	1.35 E-5	1.44 E-5	0.94	0.80 - 1.25
Sn-117M	8.85 E-7	7.26 E-7	1.22	0.75 - 1.33
Zr-95	1.45 E-5	1.73 E-5	0.84	0.80 - 1.25
Zr-97	2.33 E-5	2.63 E-5	0.89	0.80 - 1.25
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I-131	1.71 E-6	1.42 E-6	1.20	0.75 - 1.33
I-132	2.01 E-6	2.20 E-6	0.91	0.75 - 1.33
I-133*	1.39 E-6	2.48 E-6	0.56	0.75 - 1.33

I-135	3.12 E-6	3.03 E-6	1.03	0.75 - 1.33
Cs-134	8.70 E-7	1.13 E-6	0.77	0.75 - 1.33
Cs-137	1.02 E-6	1.22 E-6	0.84	0.75 - 1.33
Ba-139*	2.02 E-5	1.39 E-5	1.45	0.75 - 1.33
Ba-140	-	2.29 E-6	-	-
W-187	-	2.19 E-6	-	-
Np-239	-	5.42 E-7	-	- -

Tables 5 and 6 are the summaries of results obtained for suspended solids in reactor coolant. These samples were obtained by filtering one liter of reactor coolant through a 47 mm membrane filter and were obtained to simulate particulate filter samples. The particulate filter sample obtained from Unit one containment did not provide enough activity to permit a meaningful test.

A second suspended solids sample (April 16) was obtained when a measurement of the first sample with the new Canberra gamma spectroscopy system (24 hours after sampling) indicated that significant decay had taken place and thus did not contain the spectral mix desired for this test. The Canberra spectroscopy system is a recently acquired system with new software. This system was still in an acceptance test mode and had not yet been fully calibrated and thus could not provide quantitative results. However, a peak analysis report was obtained for review. The peak analysis appears to be "standard" peak analysis and as in other systems, the number of peaks identified can vary widely depending on the values chosen for the peak sensitivity parameters.

Licensee data shown in Tables 5 and 6 were obtained with the "old" gamma spectroscopy system. Because of operational needs, this system has been routinely used as a "2 K" system, i.e., spectral information is collected in 2048 channels at 1 Kev per channel instead of the more conventional 4096 channels at 0.5 Kev per channel. While the 2 K mode appears to provide adequate quantitative information in general, anomalies can and do occur. For example, both I-133 and Ba-139 in Table 6 fail the agreement test. Examination of the raw spectral data show fully resolved 526 Kev and 529 Kev peaks in the NRC measurement. The 529 Kev line is the key line for I-133 and the 526 Kev line is a potentially interfering secondary line from I-135 decay. The licensee's initial peak analysis shows a single 526 Kev line in this region. In the licensee's system, operators are trained to visually examine (on the screen) regions that appear likely to contain multiplet peaks. This was done for this energy region and a secondary peak analysis was performed using operator selected values for beginning and end channels for peaks. A 529 Kev peak was identified and quantified after the secondary peak analysis was performed. At 1 Kev per channel, two peaks 3 Kev apart are separated by only two channels. This situation does not lend itself to accurate resolution and quantification of the peaks, especially as the contribution from the interfering peak becomes more significant. For the April 14 suspended solids samples (Table 5), better agreement for I-133 is indicated. In this case, however, the interference from I-135 was less as indicated by the smaller concentration of I-135 in this sample.

For Ba-139 (165 Kev) in the April 16 sample (Table 6), the licensee's initial peak analysis showed a single peak at 159 Kev. After operator

input, the secondary peak analysis indicated peaks at 158 Kev and 166 Kev. The 158 Kev line is due to Sn-117M and the 166 Kev line is from Ba-139. The NRC peak analysis showed three fully resolved peaks at 158 Kev, 162 Kev (a secondary line from Ba-140) and 165 Kev. The problem here is similar to that for I-133 discussed above.

It should be noted that the NRC measurements involved longer than normal counting times to enhance sensitivity and improve counting statistics. Therefore, certain activities not detected by the licensee were observed in the NRC measurements. These have been included in the tables only to show the variety of nuclides present in these samples.

Although the overall agreement is adequate, it could be better, and the frequency of anomalies observed should be reduced or eliminated. It is expected that all of these issues will be resolved when the newly acquired spectroscopy system becomes fully operational. This system can easily accommodate a number of 4 K spectra or even 8 K spectra at the same time. Specific software modifications are being performed by the vendor to conform with the licensee's specific needs and full scale calibrations are expected to commence soon thereafter. This system is expected to be operational by early summer.

The new chemistry laboratory has been completed and the transfer and installation of equipment and supplies are in progress. Space is ample and the modular structure of the laboratory separates various laboratory functions from each other. This should enhance the laboratory's ability to perform certain types of trace measurements. The equipment is state-of-the-art, and laboratory staffing has been increased from a year ago when the last confirmatory measurements inspection was conducted. This laboratory is expected to be fully operational within a few months.

The Diablo Canyon chemistry laboratory does not participate in any external laboratory cross-check program directly. It does, however, participate in an internal cross-check program administered by its own Department of Engineering Research (DER) in San Ramon, California. The DER in turn does participate in the EPA cross-check program.

3. Exit Interview

Inspection findings were discussed with licensee personnel indicated in paragraph 1. It was also indicated that as a further check on measurements involving beta and soft x-ray emitters, a spiked sample containing these and other nuclides would be provided by the NRC for analysis by the licensee or its vendor laboratory. (Item No. 87-17-01).

Enclosure

Criteria for Accepting the Licensee's Measurements

Resolution	Ratio
<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.