

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-275/86-06, 50-323/86-07

Docket Nos. 50-275, 50-323

License No. 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: February 24-28, 1986

Inspector: GP Yuhas Ren 4/18/86
G. H. Hamada, Radiation Laboratory Specialist Date Signed

Approved By: GP Yuhas 4/18/86
G. P. Yuhas, Chief Date Signed
Facilities Radiological Protection Section

Summary:

Inspection of February 24-28, 1986 (Report Nos. 50-275/86-06, 50-323/86-07)

Areas Inspected: Routine announced inspection of radioactivity measurements program and associated quality assurance program. This inspection involved the Region V Mobile Laboratory and covered modules 84725 and 79701.

Results: No items of noncompliance or deviations were identified.

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Details

1. Persons Contacted

*Boots, J.V., Manager, Chemistry and Radiation Protection
*Chen, D., Engineer/Radiochemist, Chemistry and Radiation Protection
Creath, M., Technician, Chemistry and Radiation Protection
Guerra, F., Foreman, Chemistry
*Hinds, J.R., Power Production Engineer, Regulatory Compliance
*Johnson, R., Foreman, Radiochemistry
*O'Hara, W., Senior Chemistry and Radiation Protection Engineer

*Indicates personnel present at exit interview.

2. Discussion

Split samples of gases and liquids were obtained for confirmatory measurements. For the charcoal cartridge and filter paper sample categories, the same samples were analyzed by both the licensee and the NRC. The results are summarized below.

Table 1

Equipment Drain Liquid

<u>Nuclide</u>	<u>Diablo</u> <u>uCi/ml</u>	<u>NRC</u> <u>uCi/ml</u>	<u>Ratio</u> <u>Diablo/</u> <u>NRC</u>	<u>*Agreement</u> <u>Range</u>
Na-24	3.28E-6	3.10E-6	1.06	0.50-2.00
Mn-54	2.82E-5	2.96E-5	0.95	0.75-1.33
Co-57	3.25E-6	2.59E-6	1.25	0.50-2.00
Co-58	1.82E-3	1.67E-3	1.09	0.85-1.18
Co-60	2.77E-4	2.56E-4	1.08	0.80-1.25
I-131	9.21E-6	8.13E-6	1.13	0.60-1.66

* See enclosure for explanation.

The sample indicated for Table 1 was selected to test a liquid matrix containing relatively low concentrations of radioactivity. The ratios indicate that good agreement was achieved for this test.

Table 2

RCS Stripped Liquid

<u>Nuclide</u>	<u>Diablo</u> <u>uCi/ml</u>	<u>NRC</u> <u>uCi/ml</u>	<u>Ratio</u> <u>Diablo/</u> <u>NRC</u>	<u>Agreement</u> <u>Range</u>
Na-24	5.86E-3	6.50E-3	0.90	0.80-1.25
Co-58	1.02E-3	1.06E-3	0.96	0.80-1.25
I-131	3.96E-3	4.22E-3	0.94	0.85-1.18
I-132	2.89E-3	2.63E-3	1.10	0.80-1.25
I-133	3.95E-3	4.90E-3	0.81	0.80-1.25
I-134	3.27E-3	3.59E-3	0.91	0.75-1.33
I-135	2.94E-3	3.90E-3	0.75	0.75-1.33
Cs-138	2.25E-2	2.49E-2	0.90	0.75-1.33

The above test was for a liquid with relatively high concentrations of radioactivity. While the agreement is adequate, there appears to be a slight bias in the data.

Table 3

RCS Stripped Gas

<u>Nuclide</u>	<u>Diablo</u> <u>uCi/cc</u>	<u>NRC</u> <u>uCi/cc</u>	<u>Ratio</u> <u>Diablo/</u> <u>NRC</u>	<u>Agreement</u> <u>Range</u>
Kr-85m	2.87E-3	2.58E-3	1.11	0.80-1.25
Kr-87	4.10E-3	3.54E-3	1.16	0.75-1.33
Kr-88	5.72E-3	5.68E-3	1.01	0.80-1.25
Xe-133	4.15E-2	3.55E-2	1.17	0.85-1.18
Xe-133m	8.85E-4	1.03E-3	0.86	0.60-1.66
Xe-135	1.30E-2	1.21E-2	1.07	0.80-1.25

Table 4

Waste Gas

<u>Nuclide</u>	<u>Diablo</u> <u>uCi/cc</u>	<u>NRC</u> <u>uCi/cc</u>	<u>Ratio</u> <u>Diablo/</u> <u>NRC</u>	<u>Agreement</u> <u>Range</u>
Xe-133	1.33E-2	1.16E-2	1.15	0.80-1.25

Tables 3 and 4 represent comparisons for a waste gas sample and fission gases stripped from reactor coolant. Adequate agreement was achieved for this category as indicated in the tables.

Table 5

Charcoal Cartridge

<u>Nuclide</u>	<u>Diablo</u> <u>uCi/cc</u>	<u>NRC</u> <u>uCi/cc</u>	<u>Ratio</u> <u>Diablo/</u> <u>NRC</u>	<u>Agreement</u> <u>Range "</u>
Br-82	1.65E-10	2.13E-10	0.77	0.75-1.33
I-131	5.91E-10	7.30E-10	0.81	0.80-1.25
I-133	8.68E-11	1.09E-10	0.80	0.75-1.33

The charcoal cartridge category shows adequate agreement but a small bias appears to be present.

Table 6

Particulate Filter

<u>Nuclide</u>	<u>Diablo</u> <u>uCi/cc</u>	<u>NRC</u> <u>uCi/cc</u>	<u>Ratio</u> <u>Diablo/</u> <u>NRC</u>	<u>Agreement</u> <u>Range</u>
Na-24	5.01E-4	5.46E-4	0.92	0.80-1.25
Cr-51	6.56E-5	6.41E-5	1.02	0.80-1.25
Mn-54	4.64E-5	5.46E-5	0.85	0.80-1.25
Fe-59	5.83E-6	6.59E-6	0.88	0.75-1.33
Co-58	1.13E-4	1.30E-4	0.87	0.85-1.18
Co-60	1.35E-5	1.50E-5	0.90	0.80-1.25
Sr-91	7.84E-5	6.48E-5	1.21	0.60-1.66
Zr-95	9.47E-6	1.14E-5	0.83	0.75-1.33
Zr-97	1.01E-5	1.04E-5	0.97	0.60-1.66
Nb-95	1.26E-5	1.44E-5	0.88	0.80-1.25
I-131	2.57E-6	2.17E-6	1.18	0.60-1.66
Cs-134	3.30E-5	3.16E-5	1.04	0.80-1.25
Cs-136	5.41E-6	5.22E-6	1.04	0.75-1.33
Cs-137	5.42E-5	5.72E-5	0.95	0.80-1.25
Ba-140	5.15E-5	4.92E-5	1.05	0.80-1.25
La-140	4.40E-5	4.40E-5	1.00	0.80-1.25
Be-7	1.25E-4	1.36E-4	0.92	0.80-1.25

Because an air particulate sample with sufficient activity to measure was difficult to obtain, a test for this geometry was performed by measuring a particulate filter sample obtained by filtering reactor coolant through a membrane filter. This provided a sample with ample activity representing numerous nuclides. The results indicate good agreement for this test:

The procedure used by counting technicians to evaluate and interpret data was reviewed. During the course of this review, it was revealed that the technician had the option to reject results as not being "significant" when the sum of the counting error at the 95% confidence limit (+1.96 sigma) and the "critical level" (1.645 sigma) value exceeds the nuclide value.

100-100000



Note: The sigma above is the standard deviation for the net count. This sigma is approximately equal to 2 times the standard deviation of background alone for low activity samples. Thus the "critical level" when expressed in terms of the standard deviation of background becomes approximately 2.33 background.

While this procedure provides high assurance that false positives are rejected, it also has a high probability of rejecting true positives. This is inconsistent with accepted statistical practice and regulatory detection limit criteria. When this inconsistency was pointed out, the licensee immediately changed the procedure to require that all values which exceed the 1.96 sigma limit be treated as positive values.

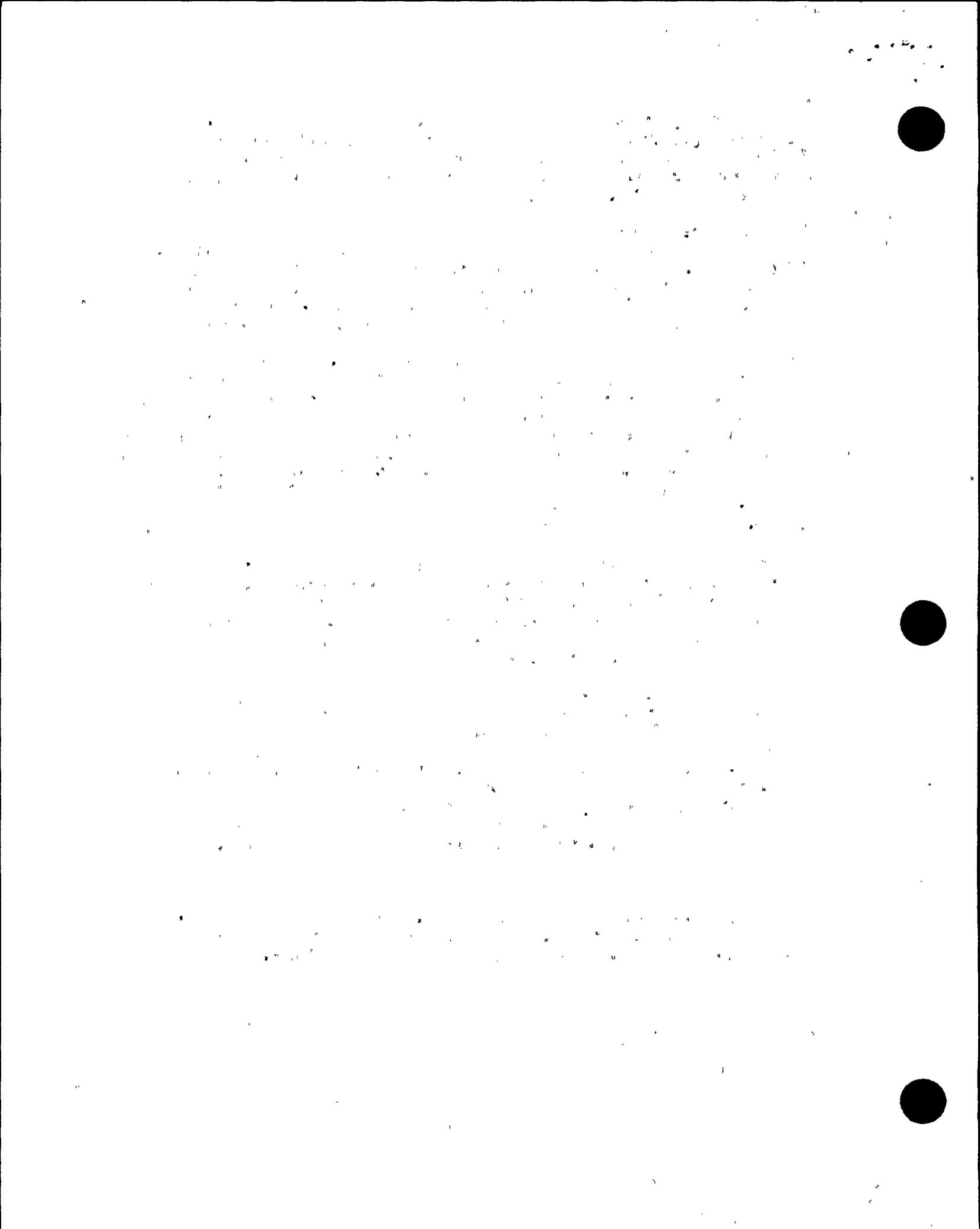
In conjunction with the above, a review of the method used by the system software to calculate sample standard deviation was performed. A description of this procedure is contained in the document, "Germanium Spectroscopy Analysis System Verification and Validation Report", 11/23/83. An incorrect formula for calculating sample standard is given in this document. When the licensee was informed of this discrepancy, a check was made to determine whether or not the software was generating the correct standard deviation term. It was concluded that the software was indeed performing the calculation correctly but the description of this process was incorrectly stated.

Diablo Canyon is in the process of acquiring a new gamma spectroscopy system with new software and expect to have this system operational by early summer. It is also expected that documentation of all phases of the new system, including software, will be available at that time. What this means is that the new documents will supercede current documents including the above mentioned document.

A secondary chemistry review from the standpoint of facility and instrumentation was conducted. A portion of the cold laboratory is currently shared with the hot laboratory. A new secondary chemistry laboratory is currently under construction and is expected to be operational by October 1, 1986. This new laboratory will not only provide more space, but more important; a cleaner environment, which is essential to performing trace analyses. Instrumentation for trace analyses include the ion chromatograph and atomic absorption systems. It is expected that additional instrumentation will be acquired as needed.

3. Exit Interview

Inspection findings were discussed with licensee personnel indicated in paragraph 1. Expected schedules for the new cold chemistry laboratory and the new gamma spectroscopy system were discussed during this session.



Enclosure

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.

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