U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-344/85-31

Docket No. 50-344

License No. NPF-1

Licensee: Portland General Electric Company
121 S. W. Salmon Street
Portland, Oregon 97204

Facility Name: Trojan Nuclear Plant

Inspection at: Rainier, Oregon

Inspection conducted: September 9-27, 1985

Inspector: G. H. Hamada 10-17-85
G. H. Hamada, Radiation Laboratory Specialist — Date Signed

G. B. Nelson 10-17-85
G. B. Nelson, Chemist — Date Signed

Approved By: G. P. Yuhas for 10/17/85
G. P. Yuhas, Chief — Date Signed
Facilities Radiological Protection Section

Summary:

Inspection of September 9-27, 1985 (Report No. 50-344/85-31)

Areas Inspected: Confirmatory split sample measurements of gamma emitting radionuclides in gas, liquid, charcoal and particulate samples. Laboratory capability for performing trace element analysis (in the parts per trillion range) was also reviewed.

The inspection involved 54 onsite hours by two inspectors. Offsite inspection totaled six hours.

Results: No items of noncompliance were identified in the areas examined.

DETAILS

1. Persons Contacted

*S. Bauer, Onsite Regulation Engineer
*G. C. Kernion, Plant Chemist
*D. Keuter, Manager, Technical Service
R. Roth, Chemistry and Radiation Protection Technician
L. Timme, Chemistry Technician
W. Van Dusen, Chemistry Technician

*Indicates personnel present at exit interview.

2. Discussion

Split sample comparisons of gamma radioactivity measurements for various sample categories were performed utilizing the Region V Mobile Laboratory. The results are summarized below.

Table 1

Charcoal Cartridge

Nuclide	Trojan uCi/cc	NRC uCi/cc	Ratio Trojan/NRC	*Agreement Range
I-131	1.57 E-11	1.49 E-11	1.05	0.60 - 1.66
I-132	2.00 E-11	2.01 E-11	1.00	0.60 - 1.66
I-133	7.88 E-11	8.14 E-11	0.97	0.75 - 1.33
I-134	8.68 E-12	8.71 E-12	1.00	0.50 - 2.00
I-135	7.56 E-11	7.43 E-11	1.02	0.60 - 1.66
Cs-138	2.11 E-11	2.46 E-11	0.86	0.40 - 2.50

*See enclosure for explanation.

Table 2

Filter Paper

Nuclide	Trojan uCi/cc	NRC uCi/cc	Ratio Trojan/NRC	Agreement Range
Cs-138	8.07 E-10	1.01 E-9	0.80	0.75 - 1.33
Ba-139	3.27 E-11	3.60 E-11	0.91	0.60 - 1.66

The data in Tables 1 and 2 are for the charcoal cartridge and filter paper samples obtained from the secondary side at the air ejector discharge. It can be seen that the agreement is adequate.

Table 3

Liquid Waste

Treated Radwaste Monitor Tank

Nuclide	Trojan uCi/ml	NRC uCi/ml	Ratio Trojan/NRC	Agreement Range
Co-58	3.08 E-7	3.25 E-7	0.95	0.60 - 1.66
Co-60	2.21 E-6	2.40 E-6	0.92	0.75 - 1.33
I-131	1.22 E-7	1.25 E-7	0.98	0.60 - 1.66
Cs-134	4.88 E-7	4.81 E-7	1.01	0.75 - 1.33
Cs-137	5.40 E-7	6.47 E-7	0.83	0.75 - 1.33

Table 4

Gaseous Waste

Waste Gas Decay Tank

Nuclide	Trojan uCi/cc	NRC uCi/cc	Ratio Trojan/NRC	Agreement Range
Xe-131M	1.21 E-3	9.92 E-4	1.22	0.60 - 1.66
Xe-133	9.92 E-2	1.02 E-1	0.97	0.85 - 1.18
Xe-133M	4.36 E-4	4.59 E-4	0.95	0.75 - 1.33

Tables 3 and 4 summarize the data obtained for a large liquid matrix and a gas matrix. Good agreement was obtained for both categories.

Table 5

RCS Liquid

Nuclide	Trojan uCi/ml	NRC uCi/ml	Ratio Trojan/NRC	Agreement Range
Ar-41	6.60 E-2	4.90 E-2	1.35	0.60 - 1.66
Rb-89	2.45 E-1	2.66 E-1	0.92	0.75 - 1.33
I-131	2.38 E-2	2.59 E-2	0.92	0.75 - 1.33
I-132	3.89 E-1	3.68 E-1	1.06	0.80 - 1.25
I-133	2.36 E-1	2.39 E-1	0.99	0.80 - 1.25
I-134	6.62 E-1	6.82 E-1	0.97	0.75 - 1.25
I-135	4.69 E-1	4.85 E-1	0.97	0.75 - 1.33
Cs-138	7.42 E-1	7.52 E-1	0.99	0.80 - 1.25

Table 6

Stripped RCS Gas

Nuclide	Trojan uCi/cc	NRC uCi/cc	Ratio Trojan/NRC	Agreement Range
Kr-85M	6.68 E-2	7.04 E-2	0.95	0.80 - 1.25
Kr-87	1.62 E-1	1.58 E-1	1.03	0.80 - 1.25
Kr-88	1.78 E-1	1.86 E-1	0.96	0.80 - 1.25
Xe-133	2.18 E-1	2.72 E-1	0.80	0.80 - 1.25
Xe-133M	1.69 E-2	1.10 E-2	1.54	0.50 - 2.00
Xe-135	4.85 E-1	5.01 E-1	0.97	0.85 - 1.18
Xe-135M	1.34 E-1	1.68 E-1	0.80	0.75 - 1.33
Xe-138	6.64 E-1	7.35 E-1	0.90	0.80 - 1.25

Tables 5 and 6 show the results obtained for activity in reactor coolant and fission gas activity stripped from the coolant, respectively. To determine total reactor coolant gaseous activity, Trojan uses a procedure whereby a reactor coolant sample is collected into a sample bomb under pressure, with subsequent depressurization and stripping of the gases from the liquid phase into an evacuated vessel. A sample of the stripped gas is obtained for analysis. To obtain non-gaseous activity, a separate sample of reactor coolant liquid is obtained for analysis and only non-gaseous activities are quantified. After applying an appropriate factor to correct for volume, the gas activities derived from gas analysis are added to the activities obtained for the liquid. In general, the liquid analyzed is not the liquid fraction from which the gases were stripped for analysis. Because the procedure as currently applied assumes a high gas stripping efficiency, a test was conducted to determine the actual stripping efficiency by analyzing for total gas activity in both the stripped liquid and gas fractions. The results indicated that as much as 10 percent or more could remain in the liquid fraction.

(NOTE: When quantifying the gaseous activity in the stripped liquid, buildup of additional gas activity from the iodine parent must be accounted for. Also, I-135 interferes with Xe-135M analysis.)

Based on the above finding, Trojan is changing its procedure to require that the stripped liquid fraction be analyzed and that the gas activity remaining in the liquid be included in the total.

A new laboratory facility for performing trace element analysis has been completed and is currently operational. It is equipped with state-of-the-art measurement systems (ion chromotograph and high sensitivity atomic absorption units) and staffed with qualified individuals. Procedures have been developed to preclude interference from potential contaminants that could bias the results. For example, plastic sample bottles constructed of chlorine free material are used. Additionally, these bottles are pre-soaked with high purity water prior to use to remove surface contaminants and any other leachable material that could be present. During analysis, the sample is fed into the ion

chromatograph through a plastic tube which exits the sample bottle through a close fitting hole in the bottle cap. This procedure minimizes sample contact with ambient air. Laboratory air is filtered air and flow is balanced such that significant pressure differentials are not created in any given location. This laboratory appears to be well suited to perform trace analyses. The ability of the plant to measure and control trace contaminants in its water systems to industry recommended levels will not only enhance the durability of plant systems, but could also significantly decrease occupational exposure in keeping with the ALARA principle.

3. Exit Interview

Inspection findings were discussed with Trojan personnel indicated in paragraph 1. Management was informed of the generally good agreement achieved in the split sample tests for all sample categories.

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.