U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-397/84-30

Docket No. 50-397 License No. NPF-21

Licensee: Washington Public Power Supply System
P. O. Box 968
Richland, Washington 99352

Facility Name: WNP-2

Inspection at: Hanford Site

Inspection conducted: September 20-21, October 1-4, 1984

Inspector: G. H. Hamada 10-26-84
G. H. Hamada, Radiation Laboratory Specialist Date Signed

Approved By: [signature] 10/26/84
G. Tuhas, Chief Date Signed
Reactor Radiation Protection Section

Summary:

Inspection of September 20-21, October 1-4, 1984 (Report No. 50-397/84-30)

Areas Inspected: Inspection consisted of a review of chemical and radiochemical procedures and practices, and their associated quality assurance programs. It included split sample radioactivity measurement verification involving the Region V Mobile Laboratory.

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

DETAILS

1. Persons Contacted

*D. Bennett, Radiochemist I
*R. Craig, Radiological Services Supervisor
A. Davis, Senior Radiochemist
*R. Graybeal, Manager, Health Physics and Chemistry
H. Hansen, Health Physics/Chemistry Foreman
V. LeGore, Health Physics/Chemistry Foreman
*L. Morrison, Chemistry Supervisor

*Indicates personnel present at exit interview.

2. Discussion

During the period of this inspection the reactor was in shutdown stacus.

Several of the sample categories tested contained little or no measurable activity. No activity above background could be detected for a 1 liter liquid waste sample obtained from equipment drain tank 4. No activity was detected in a particulate filter sample from primary containment. The iodine cartridge associated with the filter contained no detectable activity other than Br-82. Br-82 can be readily produced from neutron activation of stable Br-81 and has been observed at other facilities in Region V as well as in other Regions. While there have been speculations about where the bromine is coming from, its source (or sources) has not been clearly established.

Table 1

Iodine Cartridge

Nuclide	WNP-2 uCi/cc	NRC uCi/cc	Ratio WNP-2/NRC	*Agreement Range
Br-82	2.00 E-13	3.91 E-13	0.51	0.50-2.00

*See enclosure for agreement criteria.

Table 2

Reactor Coolant
(10-2-84)

Nuclide	WNP-2 uCi/ml	NRC uCi/ml	Ratio WNP-2/NRC	Agreement Range
Na-24	8.27 E-6	1.06 E-5	0.78	0.50-2.0
Cr-51	3.59 E-4	3.74 E-4	0.96	0.60-1.66
Mn-54	3.27 E-5	3.91 E-4	0.84	0.60-1.66
Mn-56	3.32 E-5	4.12 E-5	0.81	0.60-1.66
Fe-59	2.33 E-5	3.04 E-5	0.77	0.60-1.66
Co-58	9.31 E-4	1.08 E-3	0.86	0.80-1.25
Co-60	3.45 E-5	4.48 E-5	0.77	0.75-1.33
Cu-64	2.38 E-2	2.56 E-2	0.93	0.75-1.33
Zn-65	1.90 E-4	2.22 E-4	0.86	0.75-1.33
As-76	9.54 E-5*	1.27 E-4	0.75	0.60-1.66
Tc-99M	3.04 E-5	3.13 E-5	0.97	0.60-1.66
Sb-22	1.24 E-5	1.39 E-5	0.89	0.40-2.50

*Hand calculated value.

Although the agreement for the above sample category is adequate, results obtained by WNP-2 appear to be biased low relative to the NRC.

The licensee's software generated summary table for the above sample did not include As-76 even though the peak program contained peaks from this nuclide. This can happen if a nuclide is not included in the nuclide library file. An estimate of As-76 activity was calculated using raw peak data and an assumed efficiency (based on the efficiency for the 564 Kev energy, whereas the key line for As-76 is 559 Kev). As can be seen, the agreement for this line is adequate.

Table 3

Reactor Coolant
(10-3-84)

Nuclide	WNP-2 uCi/ml	NRC uCi/ml	Ratio WNP-2/NRC	Agreement Range
Cr-51	1.37 E-4	8.73 E-5	1.57	0.60-1.66
Mn-54	1.35 E-5	1.69 E-5	0.80	0.60-1.66
Fe-59	4.75 E-6	1.01 E-5	0.47	0.40-2.50
Co-58	3.30 E-4	3.66 E-4	0.90	0.80-1.25
Co-60	9.33 E-6	1.34 E-5	0.70	0.60-1.66
Cu-64	5.36 E-3	6.50 E-3	0.82	0.75-1.33
Zn-65	4.69 E-5	6.91 E-5	0.68	0.60-1.66
I-132	1.01 E-5	1.03 E-5	0.98	0.50-2.00

Table 4

Reactor Coolant
(10-2-84)

Nuclide	WNP-2 EOF uCi/ml	NRC uCi/ml	Ratio EOF/NRC	Agreement Range
Na-24	1.02 E-5	1.06 E-5	0.96	0.50-2.00
Cr-51	3.43 E-4	3.74 E-4	0.92	0.60-1.66
Mn-54	3.60 E-4	3.91 E-4	0.92	0.60-1.66
Mn-56	3.84 E-5	4.12 E-5	0.93	0.60-1.66
Fe-59	3.34 E-5	3.04 E-5	1.10	0.60-1.66
Co-58	9.09 E-4	1.08 E-3	0.84	0.80-1.25
Co-60	3.65 E-5	4.48 E-5	0.81	0.75-1.33
Cu-64	2.40 E-2	2.56 E-2	0.94	0.75-1.33
Zn-65	2.03 E-4	2.22 E-4	0.91	0.75-1.33

Table 5

Particulate Filter Standard

Nuclide	WNP-2 uCi	NRC uCi	Ratio WNP-2/NRC	Agreement Range
Co-57	2.32 E-3	2.51 E-3	0.92	0.80-1.25
Co-60	3.27 E-2	3.31 E-2	0.99	0.80-1.25
Sr-85	2.41 E-4	3.39 E-4	0.71	0.50-2.0
Y-88	3.48 E-3	3.36 E-4	1.04	0.75-1.33
Cd-109	9.10 E-2	9.76 E-2	0.93	0.80-1.25
Sn-113	1.87 E-3	2.05 E-3	0.91	0.75-1.33
Cs-137	3.11 E-2	3.33 E-2	0.93	0.80-1.25
Ce-139	1.01 E-3	1.04 E-3	0.97	0.75-1.33

Table 6

Charcoal Cartridge Standard

Nuclide	WNP-2 uCi	NRC uCi	Ratio WNP-2/NRC	Agreement Range
Co-57	1.37 E-3	1.26 E-3	1.09	0.80-1.25
Co-60	1.59 E-2	1.62 E-2	0.98	0.80-1.25
Y-88	1.69 E-3	1.48 E-3	1.14	0.75-1.33
Cd-109	5.18 E-2	4.67 E-2	1.11	0.80-1.25
Sn-113	9.92 E-4	1.10 E-3	0.90	0.75-1.33
Cs-137	1.63 E-2	1.50 E-2	1.09	0.80-1.25
Ce-139	4.88 E-4	4.83 E-4	1.01	0.80-1.25

Data in Tables 2, 3 and 4 represent results for reactor coolant sampled on consecutive days. Table 4 are the comparisons obtained between NRC and the backup laboratory in the Emergency Operations Facility (EOF). The results indicate that adequate agreement was achieved in all cases.

Tables 5 and 6 represent results obtained on NRC calibration standards for particulate filter and charcoal cartridge. Because virtually no activity could be found in these categories for samples obtained from primary containment, NRC's calibration standards for both categories were measured for comparison. Although the results agree reasonably well, it should be pointed out that the normal procedure at WNP-2 for counting charcoal cartridge samples involves removing the charcoal from its casing and homogenizing the granules through mixing prior to measurement. For the above test, a filter paper calibration curve was used for the charcoal cartridge on the assumption that calibration parameters for paper should be similar to that of a "face-loaded" charcoal cartridge, which indeed was the case for the NRC cartridge standard. An unambiguous test for iodine can be realized when enough activity can be collected onto charcoal for more precise measurements.

A measurement test for the waste gas category was not even attempted because of the nonoperational status of the reactor during this inspection period. Even under operational conditions, however, fission gas activity is expected to be low at WNP-2. For this reason, WNP-2 has developed a procedure to concentrate fission gases onto charcoal chilled to -37 degrees centigrade. Experimental data as well as literature references were cited as justification for this method. A review of the material provided indicated that this was a valid method for noble gases under the stated conditions. An actual split test for fission gases, possibly during the next inspection, would provide a more direct verification of the procedure.

It is noteworthy that most of the radioactivity detected at WNP-2 consisted of activation products rather than fission products. The main source of these activation products are the corrosion products derived from the brass condensers used at this facility.

The chemical and radiochemical quality assurance program at WNP-2 includes quarterly analysis of spiked solutions administered by a commercial vendor who in turn has a traceability program with the National Bureau of Standards. Spikes include radionuclides as well as stable elements such as chlorides, fluorides, boron, etc. In addition, the laboratory also participates in the EPA water analysis crosscheck program.

It was agreed that WNP-2 would analyze a spiked solution provided by the NRC through its contractor laboratory (Radiological and Environmental Services Laboratory of the DOE in Idaho Falls). (Item No. 84-30-01)

3. Exit Interview

Inspection findings were discussed with WNP-2 personnel indicated in paragraph 1. Licensee personnel were informed of the general agreement obtained for those sample categories that permitted a direct test. They were also informed that the NRC will be submitting a spiked sample for analysis as an additional measurement verification test.

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.