4.0. SOLID WASTE

A total volume of 9828.5 ft^3 (278.25 m^3) of solid waste was transported in 23 shipments during the January through June, 1988 reporting period. The total activity of the waste shipped was 197.~~27~~ 39 Ci; 196 Ci contained in dewatered spent resins, ~~1.19~~ 1.37 Ci in Dry Active Waste (DAW), and 7.59 E-2 Ci in other (absorbed liquids).

A. Dewatered Spent Resin

Dewatered resins accounted for 4468.5 ft^3 (126.5 m^3) of the radioactive wastes shipped during the reporting period. The burial containers were ES-190 and ES-142 liners provided by NUPAC Services, Inc. The total activity of the resins shipped during the reporting period was 196 Ci. The principle nuclides and their percent contribution to the total activity are listed in Table 4-3. The solid wastes were shipped to the U.S. Ecology, Hanford burial site using flat bed trailers, and NUPAC 14-210H, NUPAC 10-142, or LN-14-170 casks as appropriate.

The counting error associated with the total activity has been found to be less than 1.0% at one standard deviation in previous effluent reports and to decrease with increasing activity. The statistical counting error is assumed to be 1% for the purpose of this error evaluation.

Other parameters considered in estimating the total error of the activity shipped included the error in measuring the absolute volume, the weight of the waste in the liners, the representativeness of the sample taken, the homogeneity of the nuclide distribution within a batch or liner and the geometry error in the gamma spectroscopy analysis. The gamma spectroscopy calibration error was approximately 5%. The best estimate of the total error in the activity of spent resin shipped was assumed to be less than or equal to 20%.

B. Dry Active Waste (DAW)

A total of 5330 ft^3 (150.4 m^3) of DAW was shipped in 58 Container Products Corporation, B-25 steel boxes. The total activity of the DAW shipped was ~~1.19~~ 1.37 Ci. The values for the activities shipped were determined by using dose rate-to-curie conversion factors. The conversion factors were based on nuclide distribution taken from analysis of contamination found in each of the major DAW production areas. The nuclide distribution is updated monthly. Short lived nuclides were eliminated based on decay of the DAW prior to shipment. A meaningful counting error cannot be generated for the DAW, however, the total error may be assumed to be less than or equal to 20% since DAW would be subjected to similar error contributions as the spent resins.

C. Absorbed Liquids

A total of 30 ft^3 (0.85 m^3) of absorbed liquids was shipped during the reporting period. The total activity of the shipped absorbed liquid was 7.59E-2 Ci. The liquid consisted of sump sludges absorbed in Aqueset and Aqueset II in 55 gallon Type 7A drums in order to meet burial ground requirements. The drums were 17C, 17H and 17E/H designation but, were shipped only as strong tight containers (STCs) per DOT requirements.

The values for the activities shipped were determined by using dose-rate-to-curie conversion factors and were based on sample analysis of the liquid at time of absorption. As with DAW, the total error is assumed to be less than or equal to 20% due to the likelihood of similar contributing errors to those associated with resins.

4.1 Scaling Factor Methodology

Scaling factors are based on outside laboratory (SAIC) analysis of hard-to-measure nuclides. The process of updating scaling factors has been initiated. For those waste streams where the scaling or the scaled nuclide concentration is not sufficient to provide a viable scaling factor, the final EPRI Report "Updated Scaling Factors in Low Level Radwaste", NP-5077, March 1987 has been used as a basis for the determination of a scaling factor.

H-3

Sampling of individual waste streams was performed with analysis performed by an outside lab. The H-3 concentration was measured per gram of waste material. This value was compared to the Reactor Coolant System H-3 concentration. The scaling factor is derived from the ratio of the H-3 concentration in the waste stream to RCS H-3 concentration.

C-14, Tc-99, I-129

Sampling of the individual waste stream was performed with analysis by off-site lab to determine isotopic concentration. Ratios were developed between the scaled nuclide to the scaling nuclide concentration determined by analysis. In those cases where the scaling nuclide is not available in large enough quantities to develop reliable (viable) scaling factors, the recommendations made in section 7 of the referenced EPRI report for the plant in the initial stages of operation are used.

TRU, Sr-90, Ni-63

TRU nuclides would be scaled to Ce-144. As recommended by the AIF report "Methodolgies for Classification of Low Level Radioactive Waste from Nuclear Power Plants". These nuclides are not considered to be present if the scaled values are less than: 1 nCi/g for TRU, 35 nCi/g for Pu-241 or 200 nCi/g for Cf-242. TRU nuclides will be reported if the scaling nuclide (Ce-144) is reliably detected and Cs-137 is also present.

Sampling of individual waste streams has been performed with analysis by an outside laboratory. Cs-137 and Sr-90 concentrations were measured in each waste stream except waste oil. The ratio of Cs-137 to Sr-90 has been determined and is used as the scaling factor for Sr-90 from Cs-137. For waste oil, the values from the referrenced EPRI Report will be used for scaling factors. The values obtained in the referenced EPRI report were used for scaling factors. Co-60 and Ni-63 concentrations were measured in each of the sampled waste streams. The ratio of Co-60 to Ni-63 has been determined and is used as the scaling factor for Ni-63 from Co-60.

Table 4-1 lists those scaling factors by waste stream for those nuclides that are required to be reported. Table 4-2 lists those scaling factors for the conditional nuclides that are reported only when the scaling nuclide is found to be present.

4.2 Process Control Program

The Process Control Program (PCP) used to control solidification at WNP-2 will be provided by the vendor waste processor, Pacific Nuclear Inc. in accordance with Contract C-20452, and will be subjected to POC review prior to any solidification of radwaste. Two Pacific Nuclear generic solidification PCP's, TP-04, "Portable Solidification System and TP-05, "Radwaste Solidification System" are currently under NRC review. As an alternative, approved High Integrity Containers (HIC's) could be used for the transport of wastes requiring stabilization. Other portions of the radwaste program are controlled by the WNP-2 procedures PPM 1.12.1, "Radwaste Management Program", PPM 1.12.2, "Radwaste Process Control Program", and 1.12.3, "Contract (Vendor) Waste Processing". The only significant change was in transportation contractor from Pacific Nuclear to LN Technologies.

SCALING FACTORS

Table 4-1 - Required Nuclides

Ratio	DAW	RWCU POWDER RESIN	CFD POWDER RESIN	EDR/FDR POWDER RESIN	EDR/FDR BEAD RESIN	SLUDGE	OIL
H-3/Rx Coolant	3.5E-1	4.55E-1	4.55E-1	4.55E-1	3.56E-1	3.10E-1	4.0E-5+
C-14/Co-60	~~1.47E-4~~ 4.92E-4	1.69E-5	6.2E-4++++	1.18E-3	5.81E-2	8.81E-5	1.3E-2+
Tc-99/Cs-137	4.6E-4+	1.94E-6	9.3E-5+	9.3E-5+	9.3E-5+	9.3E-5+	4.2E-5+
I-129/Cs-137	4.6E-4+	2.23E-5	3.9E-5+	3.9E-5+	3.9E-5+	3.9E-5+	6.3E-5+

Table 4-2 - Conditional Nuclides

Ni-63/Co-60	~~1.86E-2~~ 6.05E-2	7.73E-3	1.3E-2	4.53E-2	6.36E-2	1.5E-2+++	1.2E0+
Fe-55/Co-60	~~2.62E-1~~ 9.52E-1	2.37E-1	5.16E-1	6.03E-1	1.9E-2	4.10E-1	1.5E0+
Sr-90/Cs-137	2.6E-3+	1.19E-4	3.88E-2	2.92E-3	1.11E-3	2.67E-5	3.3E-1+
Pu-239/Ce-144	4.5E-3+	9.1E-3+	9.7E-3+	9.7E-3+	9.7E-3+	8.7E-4+	1.1E-2+
Pu-238/Pu-239	1.5E0+	1.3E0+	1.7E0+	1.7E0+	1.7E0+	1.7E0+	1.6E0+
Pu-241/Pu-239	1.1E2+	8.8E1+	9.6E1+	9.6E1+	9.6E1+	9.1E1+	1.2E2+
Am-241/Pu-239	9.1E-1+	9.0E-1+	6.6E-1+	6.6E-1+	6.6E-1+	1.7E0+	4.7E-1+
Cm-242/Pu-239	9.5E-1+	1.0E0+	9.7E-1+	9.7E-1+	9.7E-1+	5.7E-1+	3.1E-1+
Cm-244/Pu-239	7.2E-1+	8.3E-1+	7.6E-1+	7.6E-1+	7.6E-1+	7.8E-1+	2.9E-1+

\+ Scaling or scaled nuclide not present in enough concentration to make determination of scaling factor. In these cases the scaling factor obtained from the "Updated Scaling Factors in Low-Level Radwaste" EPRI NP-5077 Final March 1987.

++ The report from SAIC, showed the H-3 concentration in RHCU equal to Reactor Coolant concentration. The resin mix used in RHCU and CFD are the same. The reactor coolant and condensate H-3 concentration are approximately the same. The Scaling Factor for CFD is 4.55E-1 which is more representative of H-3 retention on the two resin streams.

+++ The report from SAIC, showed the Ni-63 concentration of sludges at 4.03E-3 uCi/gm which compares to the Co-60 concentration of 3.52E-2 uCi/gm. This comparison would yield a Scaling Factor of 1.14E-1. The above mentioned EPRI Report recommends a Scaling Factor of 1.5E-2. Because of the long period of time between the generation of the waste and the counting of the sample (approximately 1 year) the EPRI Number is considered more accurate.

++++ The report from SAIC showed the C-14 concentration in CFD of 1.12E-2 uCi/gm which compares to the Co-60 concentration of 1.08E-2 uCi/gm. This comparison would yield a Scaling Factor of 1.02E0. The above mentioned EPRI report recommends a Scaling Factor of 6.2E-4. It is felt that there was cross contamination of the sample at the lab resulting in high concentration of C-14. The recommended EPRI number will be used.

Table 4-3
WNP-2 SOLID WASTE SHIPMENTS

January - June 1988

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

1. Type of Waste

Waste Stream	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3 Ci	126.5 196.0	20
b. Dry active waste, contaminated equip., etc.	m^3 Ci	150.9 1.31 ~~1.19~~	20
c. Irradiated components, control rods, etc.	m^3 Ci	No Shipment	
d. Other, (absorbed aqueous liquid)	m^3 Ci	0.85 7.59E-2	20

2. Estimate of major nuclide composition (by type of waste):

a. Dewatered Spent Resins

Nuclide	%	Ci
1 Zn-65	54.6	1.07E2
2 Co-60	16.2	3.17E1
3 Cr-51	7.76	1.52E1
4 Co-58	4.69	9.19E0
5 Nb-95	3.08	6.03E0
6 Fe-55*	3.01	5.89E0
7 Cs-137	2.47	4.84E0
8 Cs-134	2.22	4.36E0
9 Mn-54	1.89	3.70E0
10 Zr-95	1.73	3.40E0

*Indicates scaled nuclide

b. Dry Active Wastes (DAW)

Nuclide		%	Ci
1 Zn-65	38.	~~42.2~~	5.02E-1
2 Co-60	33.7	~~37.6~~	4.42E-1
3 ~~Cr-51~~ Fe-55*	10.3	~~4.47~~	~~5.32E-2~~ 1.35E-1
4 ~~Fe-55*~~ Cr-51	4.06	~~4.08~~	~~4.85E-2~~ 5.32E-2
5 H-3*	3.31	~~3.64~~	~~4.33E-2~~ 4.33E-2
6 ~~Co-58~~ Ni-63*	1.94	~~1.82~~	~~2.17E-2~~ 2.51E-2
7 ~~Ni-63*~~ Co-58	1.66	~~1.76~~	~~2.09E-2~~ 2.17E-2
8 Mn-54	1.45	~~1.60~~	~~1.90E-2~~ 1.90E-2
9 Nb-95	1.32	~~1.50~~	1.79E-2
10 Cs-137	0.336	~~0.37~~	4.40E-3

c. Irradiated Components - None

d. Other - Absorbed Liquids

Nuclide	%	Ci
1 Co-60	76.47	5.80E-2
2 Zn-65	17.0	1.29E-2
3 Mn-54	5.61	4.26E-3
4 Ni-63*	0.69	5.23E-4
5 Co-57	7.39E-2	5.61E-5

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
23	Flat bed trailer (6) 14-210H Cask (5) 10-142 Cask (1) 14-170 Cask (11)	US Ecology Richland, WA

B. IRRADIATED FUEL SHIPMENTS (Disposition)

None

*Indicates scaled nuclide

8/26/88

FILE COPY

Internal Distribution:
TE Chapman - 1020
RA Chitwood - 1020
LF Coleman - 927S
KD Cowan - 988U
AI Davis - 927S
GH Godfrey - 1023
Docket File - 956B

Mail Drop:
RG Graybeal - 927S
CR Hexum - 981G
DE Larson - 1020
GV Oldfield - 1020
AL Oxsen - 1023
AG Hosler - 956B
WNP-2 Files - 964Y

FD Quinn w/o - 1020
S Regev - 1020
VE Schockley - 927S
GC Sorensen - 280
CMP/lb - 927M
PL2/lb - 956B
Ops Files - 1216 - 927S
Ops File--1316.2 - 927S

G02-88-177
August 10, 1988

Docket No. 50-397

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

Gentlemen:

Subject: NUCLEAR PLANT NO. 2
SEMI-ANNUAL EFFLUENT REPORT
JANUARY 1, 1988 - JUNE 30, 1988

In accordance with Title 10 of the Code of Federal Regulations, Part 50.36a (a) (2), the subject report is herewith being submitted.

Should you have any questions, please contact Mr. R. G. Graybeal, Manager, WNP-2 Health Physics Chemistry.

Very truly yours,

C. M. Powers
WNP-2 Plant Manager

TEC/bk

cc: JB Martin - NRC RV
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NRC Site Inspector - 901A
C Eschels - EFSEC
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TR Strong - DSHS

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Date:	8-8-88	8/8/88			

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