

EFFLUENT SEMIANNUAL REPORT

06-JAN-92 THROUGH 05-JUL-92

SUPPLEMENTAL INFORMATION

Facility: Prairie Island Nuclear Generating Plant

Licensee: Northern States Power Company

License Numbers: DPR-42 & DPR-60

A. Regulatory Limits

1. Liquid Effluents:

- a. The dose or dose commitment to an individual from radioactive materials in liquid effluents released from the site shall be limited to:

for the quarter	3.0 mrem to the total body 10.0 mrem to any organ
for the year	6.0 mrem to the total body 20.0 mrem to any organ

2. Gaseous Effluents:

- a. The dose rate due to radioactive materials released in gaseous effluents from the site shall be limited to:

noble gases	≤500 mrem/year total body ≤3000 mrem/year skin
I-131, H-3, LLP	≤1500 mrem/year to any organ

- b. The dose due to radioactive gaseous effluents shall be limited to:

noble gases	≤10 mrad/quarter gamma ≤20 mrad/quarter beta ≤20 mrad/year gamma ≤40 mrad/year beta
I-131, H-3, LLP	≤15 mrem/quarter to any organ ≤30 mrem/year to any organ

**B. Maximum Permissible Concentration**

1. Fission and activation gases in gaseous releases:  
10 CFR 20, Appendix B, Table 2, Column 1
2. Iodine and particulates with halflives greater than 8 days in gaseous releases:  
10 CFR 20, Appendix B, Table 2, Column 1
3. Liquid effluents for radionuclides other than dissolved or entrained gases:  
10 CFR 20, Appendix B, Table 2, Column 2
4. Liquid effluent dissolved and entrained gases:  
2.0E-04 uCi/ml Total Activity

**C. Average Energy**

Not applicable to Prairie Island regulatory limits.

**D. Measurements and approximations of total activity**

1. Fission and activation gases in gaseous releases:	Total Nuclide	GeLi GeLi	±25%
2. Iodines in gaseous releases:	Total Nuclide	GeLi GeLi	±25%
3. Particulates in gaseous releases:	Total Nuclide	GeLi GeLi	±25%
4. Liquid effluents	Total Nuclide	GeLi GeLi	±25%

**E. Manual Revisions**

1. Offsite Dose Calculations Manual latest Revision number: 12  
Revision date : 30 JUN 91
2. Process Control Program Manual latest Revision number: 4  
Revision date : 23-APR-91

## 1.0 BATCH RELEASES (LIQUID)

- 1.1 NUMBER OF BATCH RELEASES
- 1.2 TOTAL TIME PERIOD (HRS)
- 1.3 MAXIMUM TIME PERIOD (HRS)
- 1.4 AVERAGE TIME PERIOD (HRS)
- 1.5 MINIMUM TIME PERIOD (HRS)
- 1.6 AVERAGE MISSISSIPPI RIVER FLOW (CFS)

QTR: 01	QTR: 02
4.40E+01	1.60E+01
6.67E+01	5.97E+01
2.33E+00	7.75E+00
1.52E+00	3.73E+00
1.22E+00	1.17E+00
1.42E+04	3.49E+04

## 2.0 BATCH RELEASES (GASEOUS)

- 2.1 NUMBER OF BATCH RELEASES
- 2.2 TOTAL TIME PERIOD (HRS)
- 2.3 MAXIMUM TIME PERIOD (HRS)
- 2.4 AVERAGE TIME PERIOD (HRS)
- 2.5 MINIMUM TIME PERIOD (HRS)

QTR: 01	QTR: 02
1.80E+01	1.00E+00
1.93E+02	2.20E+00
2.40E+01	2.20E+00
1.07E+01	2.20E+00
3.30E-01	2.20E+00

## 3.0 ABNORMAL RELEASES (LIQUID)

- 3.1 NUMBER OF RELEASES
- 3.2 TOTAL ACTIVITY RELEASED (CI)
- 3.3 TOTAL TRITIUM RELEASED (CI)

QTR: 01	QTR: 02
1.00E+00	0.00E+00
1.38E-03	0.00E+00
9.46E-01	0.00E+00

## 4.0 ABNORMAL RELEASES (GASEOUS)

- 4.1 NUMBER OF RELEASES
- 4.2 TOTAL ACTIVITY RELEASED (CI)

QTR: 01	QTR: 02
0.00E+00	0.00E+00
0.00E+00	0.00E+00

TABLE 1A  
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

		QTR: 01	QTR: 02
5.0	FISSION AND ACTIVATION GASES		
5.1	TOTAL RELEASE (CI)	1.03E-01	4.40E+00
5.2	AVERAGE RELEASE RATE (UCI/SEC)	1.31E-02	5.60E-01
5.3	GAMMA DOSE (MRAD)	1.52E-05	1.59E-03
5.4	BETA DOSE (MRAD)	2.25E-04	6.59E-03
5.5	PERCENT OF GAMMA TECH SPEC (%)	1.52E-04	1.59E-02
5.6	PERCENT OF BETA TECH SPEC (%)	1.13E-03	3.30E-02
6.0	IODINES		
6.1	TOTAL I-131 (CI)	9.70E-07	0.00E+00
6.2	AVERAGE RELEASE RATE (UCI/SEC)	1.23E-07	0.00E+00
7.0	PARTICULATES		
7.1	TOTAL RELEASE (CI)	2.67E-05	2.33E-05
7.2	AVERAGE RELEASE RATE (UCI/SEC)	3.39E-06	2.96E-06
8.0	TRITIUM		
8.1	TOTAL RELEASE (CI)	8.22E+00	8.44E+00
8.2	AVERAGE RELEASE RATE (UCI/SEC)	1.05E+00	1.07E+00
9.0	TOTAL IODINE, PARTICULATE AND TRITIUM (UCI/SEC)	1.05E+00	1.07E+00
10.0	DOSE (MREM)	2.03E-02	1.52E-02
11.0	PERCENT OF TECH SPEC (%)	1.35E-01	1.01E-01
12.0	GROSS ALPHA (CI)	0.00E+00	0.00E+00

TABLE 1C  
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

## 13.0 FISSION AND ACTIVATION GASES

		CONTINUOUS MODE		BATCH MODE	
NUCLIDE	UNITS	QTR: 01	QTR: 02	QTR: 01	QTR: 02
KR-85	CI	8.87E-02			2.33E-01
XE-133	CI	7.51E-03	4.17E+00	7.25E-03	2.64E-04
XE-135	CI			1.40E-05	
TOTAL	CI	9.62E-02	4.17E+00	7.26E-03	2.33E-01

## 14.0 IODINES

		CONTINUOUS MODE		BATCH MODE	
NUCLIDE	UNITS	QTR: 01	QTR: 02	QTR: 01	QTR: 02
I-131	CI	9.70E-07			
TOTAL	CI	9.70E-07	0.00E+00	0.00E+00	0.00E+00

## 15.0 PARTICULATES

		CONTINUOUS MODE		BATCH MODE	
NUCLIDE	UNITS	QTR: 01	QTR: 02	QTR: 01	QTR: 02
BR-82	CI	3.07E-06		6.72E-10	
NB-97	CI		2.33E-05		
SR-89	CI	5.25E-07		2.31E-05	
TOTAL	CI	3.60E-06	2.33E-05	2.31E-05	0.00E+00

TABLE 2A  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	QTR: 01	QTR: 02
16.0 VOLUME OF WASTE PRIOR TO DILUTION (LITERS)	4.21E+07	4.12E+07
17.0 VOLUME OF DILUTION WATER (LITERS)	1.57E+11	8.70E+10
18.0 FISSION AND ACTIVATION PRODUCTS		
18.1 TOTAL RELEASE W/O H-3, RADGAS, ALPHA (CI)	1.78E-01	1.50E-01
18.2 AVERAGE DILUTED CONCENTRATION (UCI/ML)	1.13E-09	1.72E-09
19.0 TRITIUM		
19.1 TOTAL RELEASE (CI)	1.18E+02	1.05E+02
19.2 AVERAGE DILUTED CONCENTRATION (UCI/ML)	7.52E-07	1.21E-06
20.0 DISSOLVED AND ENTRAINED GASES		
20.1 TOTAL RELEASE (CI)	1.90E-03	1.52E-03
20.2 AVERAGE DILUTED CONCENTRATION (UCI/ML)	1.21E-11	1.75E-11
21.0 GROSS ALPHA (CI)	0.00E+00	0.00E+00
22.0 TOTAL TRITIUM, FISSION AND ACTIVATION PRODUCTS (UCI/ML)	7.53E-07	1.21E-06
23.0 TOTAL BODY DOSE (MREM)	1.58E-03	4.63E-04
24.0 CRITICAL ORGAN		
24.1 DOSE (MREM)	1.58E-03	1.86E-03
24.2 ORGAN	TTL BODY	GI TRACT
25.0 PERCENT OF TOTAL BODY TECH SPEC LIMIT (%)	5.27E-02	1.54E-02
26.0 PERCENT OF CRITICAL ORGAN TECH SPEC LIMIT (%)	5.27E-02	1.86E-02

Subject: Northern States Power, Prairie Island, Abnormal Liquid Release first quarter 1992

Normal radioactive liquid waste is released to the river through an underground eight and twelve inch cast iron pipe to the discharge canal. The cast iron pipe connects to a twelve inch polypropylene pipe which extends to near the sluice gates at the end of the discharge canal. The radwaste discharge pipe was designed to transfer liquid radioactive waste from the auxiliary building to the discharge canal where it is combined with cooling tower blowdown water.

Tritium was detected in on-site test wells located southwest of the radwaste pipe. Based on the anticipated groundwater flow direction, a hydrostatic test of the underground portion of the liquid radwaste discharge pipe was conducted on April 30, 1992. This test showed the pipe to be leaking slightly. Immediately after the hydro, the liquid waste discharge pipe was isolated and all subsequent radioactive releases were completed to the discharge canal via a temporary, above-ground discharge line. Some accessible sections of the old discharge pipe were excavated and examined. No leakage point was found. Work is in progress to install a new underground discharge pipe.

Without confirming that a leak existed under release conditions, it is our assumption that a leak existed in some section of the pipe. Given the normal discharge flow rate (less than 100 gpm) which results in the pipe being only partially filled, the release to the soil has been conservatively calculated at less than 0.5 gallons per minute. The leak would have occurred in the unsaturated zone above the groundwater and flowed down until it is entrained in the groundwater. All radionuclides except for tritium would have been removed soon after the liquid enters the soil. Soil is an excellent filter for ionic molecules as well as particulate material. No radionuclides other than tritium (and naturally-occurring uranium decay products) have been found in the test wells.

The released radioactivity would form a plume in the groundwater. This plume would have been diluted as it fanned out in the crossflow direction and as it moved in the direction of flow. Radioactive decay also would serve to reduce the concentration. Groundwater flow estimates indicated that a release may take from 10 to 70 years to

travel from the Mississippi River to the well distances in the direction of the Vermillion River. This would translate into significant dilution as well as decay for tritium which has a radioactive half-life of 12.3 years.

Sampling of surface and groundwater sources by the Radiological and Environmental Monitoring Program (REMP) identified some areas on site which may have been affected by the discharge pipe leak. Sample results have shown tritium slightly higher than normal background levels. Besides tritium, no other isotopes other than normal background nuclides have been detected. Test well P-10 showed the highest tritium concentrations at  $1.5\text{E-}6$   $\mu\text{Ci/ml}$ . The most recent results are about  $6.5\text{E-}7$   $\mu\text{Ci/ml}$ . The EPA drinking water limit is  $2\text{E-}5$   $\mu\text{Ci/ml}$ . It is possible that the activity seen in P-10 is from past releases to the head of the discharge canal before we added the polypropylene extension to the discharge line.

For the semi-annual period of 06-Jan-92 to 05-Jul-92, there were 47 liquid waste discharges up until 30-Apr-92. The duration of these releases totaled 71.45 hours. Assuming the leak existed throughout the entire reporting period at the conservative leak rate of 0.5 gpm, a total volume of  $8.12\text{E+}06$  mls would have been released to the soil in the area surrounding the leak. Using the concentration and nuclide mix of the waste tanks released during the period, a total activity (excluding tritium) of  $1.38\text{E+}03$   $\mu\text{Ci}$  and  $9.46\text{E+}05$   $\mu\text{Ci}$  of tritium would have been released. This activity has been reported as a single abnormal release in the first quarter of the semi-annual report.



TABLE 2A  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

## 27.0 INDIVIDUAL LIQUID EFFLUENT

NUCLIDE	UNITS	CONTINUOUS MODE		BATCH MODE	
		QTR: 01	QTR: 02	QTR: 01	QTR: 02
AG-110M	CI			1.68E-02	1.32E-02
BE-7	CI			1.15E-03	4.14E-05
CO-57	CI			6.88E-05	1.10E-04
CO-58	CI			2.82E-02	3.18E-02
CO-60	CI			1.19E-02	6.62E-03
CR-51	CI			6.44E-03	9.85E-04
CS-134	CI			6.54E-06	3.44E-06
CS-137	CI			2.20E-04	
CU-64	CI			1.56E-03	
FE-55	CI	2.26E-03	2.55E-02	7.62E-02	6.10E-02
FE-59	CI			6.63E-03	1.55E-03
I-133	CI			4.81E-06	
I-134	CI				4.97E-06
LA-140	CI			7.04E-06	
MN-54	CI			7.34E-04	3.02E-04
NA-24	CI			1.71E-05	
NB-95	CI			1.45E-04	2.00E-05
NB-97	CI			6.37E-06	
RH-105	CI				3.32E-05
SB-122	CI			2.51E-03	
SB-124	CI			1.29E-02	4.74E-03
SB-125	CI			1.03E-02	4.75E-03
SB-126	CI			6.25E-05	

CONTINUED

TABLE 2A  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

## 27.0 INDIVIDUAL LIQUID EFFLUENT (CONTINUED)

SC-47	CI			4.28E-04	1.29E-05
SN-113	CI			1.30E-03	5.67E-04
SR-92	CI			1.22E-05	
W-187	CI			1.58E-05	4.78E-06
Y-93	CI				3.42E-05
ZN-65	CI				1.53E-05
ZR-95	CI			1.65E-04	8.65E-05
ZR-97	CI				3.88E-06
TOTAL	CI	2.26E-03	2.55E-02	1.76E-01	1.24E-01

## 28.0 DISSOLVED AND ENTRAINED GASES

		CONTINUOUS MODE		BATCH MODE	
NUCLIDE	UNITS	QTR: 01	QTR: 02	QTR: 01	QTR: 02
XE-133	CI			1.88E-03	1.52E-03
XE-135	CI			2.15E-05	
TOTAL	CI	0.00E+00	0.00E+00	1.90E-03	1.52E-03