GENERAL ELECTRIC

NUCLEAR ENERGY
PROGRAMS
DIVISION

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70-1308

DMD-226

September 25, 1978

Office of Nuclear Material Safety & Safeguards
Attn: Mr. Sheldon Meyers, Director
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

SUBJECT: REVISION B1, *OPERATING EXPERIENCE - IRRADIATED FUEL STORAGE - MORRIS OPERATION* NEDO-20969B, MAY 1978

We are pleased to send you ten (10) copies of the subject revision to the operating experience report for General Electric's Morris Operation. This revision incorporates environmental monitoring reports for 1977, as well as editorial changes. Table 3-3 has been revised to incorporate offsite concentrations as well as gross releases.

Please contact our H.A. Rogers if there are questions regarding this revision.

Respectfully,

D.M. Dawson, Manager
Licensing & Transportation
408*925-6330 MC 861

DMD:HAR:bn

Enclosure

7811090065

Operating Experience - Irradiated Fuel Storage

Morris Operation

REVISION INDEX for Revision B1 September 1978

Incorporates errata and Appendix B-1:
Environmental Monitoring Report for 1977

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*: "Backup" page - no change in subject matter. These pages retain previous publication number and date.

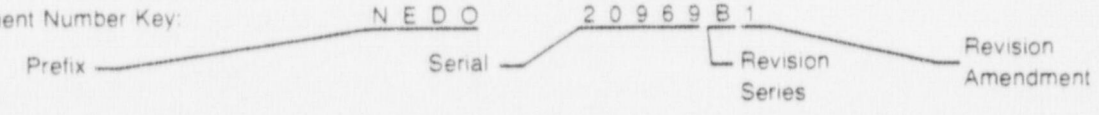
OPERATING EXPERIENCE — IRRADIATED FUEL STORAGE MORRIS OPERATION

REVISION SUMMARY

Revision & Amendment	Date	Summary
NEDO-20969B	5/78	Reissue and update — Replaced issue dated 8/75
NEDO-20969B1	9/78	Incorporates errata and Appendix B1, environmental monitoring report for 1977

Revision Coding Key: New or changed information is indicated by vertical bars in the right-hand margin opposite the new or changed information: "N" indicates new information; "E" indicates editorial changes or corrections.

Document Number Key:



2.3.5.1 Outages

There have been four times in the 6 years of experience at Morris Operation when the facility was not available for fuel receipt. The first instance was 13 days following the cask tipping incident in June of 1972. The second was a planned outage in August of 1976 for 10 days when the cable in the cask crane was replaced. The third period occurred when the old fuel storage racks were being removed and new fuel storage system hardware was being installed. This occurred in October and November of 1975 (a total of 34 days). Finally, 26 days in January 1977 were used to repair minor damage to an IF-300 cask head-to-cask sealing surface. This work was performed with the cask on the decontamination pad, blocking movement of other casks. E

Annual outages of about two weeks per year have been scheduled so that routine maintenance items could be accomplished more expeditiously. In addition, there have been short periods (of less than a day) when operations have been suspended for crane inspections, maintenance and repairs. Most support systems do not have an immediate or direct effect on fuel receipt and storage, and these systems can be shut down for various periods of time without any adverse effect on operations. The types, typical lengths and purposes of subordinate outages are given in Table 2-3.

Table 2-3

SUMMARY OF SUBORDINATE OUTAGES

Type	Approximate Annual Frequency	Approximate (Length) (days)	Purpose(s)
Boiler	1	3 to 5	Inspection and tests
	3	<1	Minor maintenance
Cooler	Various	Up to 44	Maintenance
			Basin response tests
			Minimum cooling period
Filter	Various	Up to 65	Maintenance and
			Basin Response tests
Ventilation	1	<1/3	Inspection and tests

A pneumatic quick drain system, insulation on the pipes and distribution boxes, and additional propane heaters have been installed to prevent a reoccurrence of cold weather problems. Cooling system pumps have been connected to the standby electrical power system.

Pending these modifications and warmer weather, the coolers remained shut down and basin water temperature was allowed to come to equilibrium. The increase from 31°C in January of 1977 to 45°C in March (averages) shown in Figure 3-1 resulted from this cooler shutdown.[3-1] With the onset of warmer weather, an undamaged portion of the cooler was placed in operation and the damaged section was repaired.

3.2.2.1 Heat Load | E

The heat input to the basin from decay of radioactivity in the fuel has increased gradually with an increase in the amount of fuel stored. Figure 3-2 shows the approximate heat load history. The increases in 1975 and 1976 reflect the receipt of more recently discharged fuel, some out of the reactor only 122 to 150 days at the time of receipt at Morris Operation.

3.2.2.2 Cooler Contamination | E

Radioactive material from the basin water has accumulated on the inner surfaces of cooler piping, tubes, and headers. A sample of material taken from the inner surface of the cooler piping in March 1977 contained Cs-134 (15%), Cs-137 (45%), and Co-60 (40%). Average monthly exposure rates are shown in Figure 3-3. The rapid increase in the second half of 1977 was caused by the underwater cleaning of an insert for the IF-300 cask.

3.2.3 Cooler Operation Summary

In summary, experience has shown that the fin-fan coolers will provide the cooling service required by water basin fuel storage, but that cold weather provisions

3-1 The scale of Figure 3-1 does not show the equilibrium period (about 47°C for two weeks).

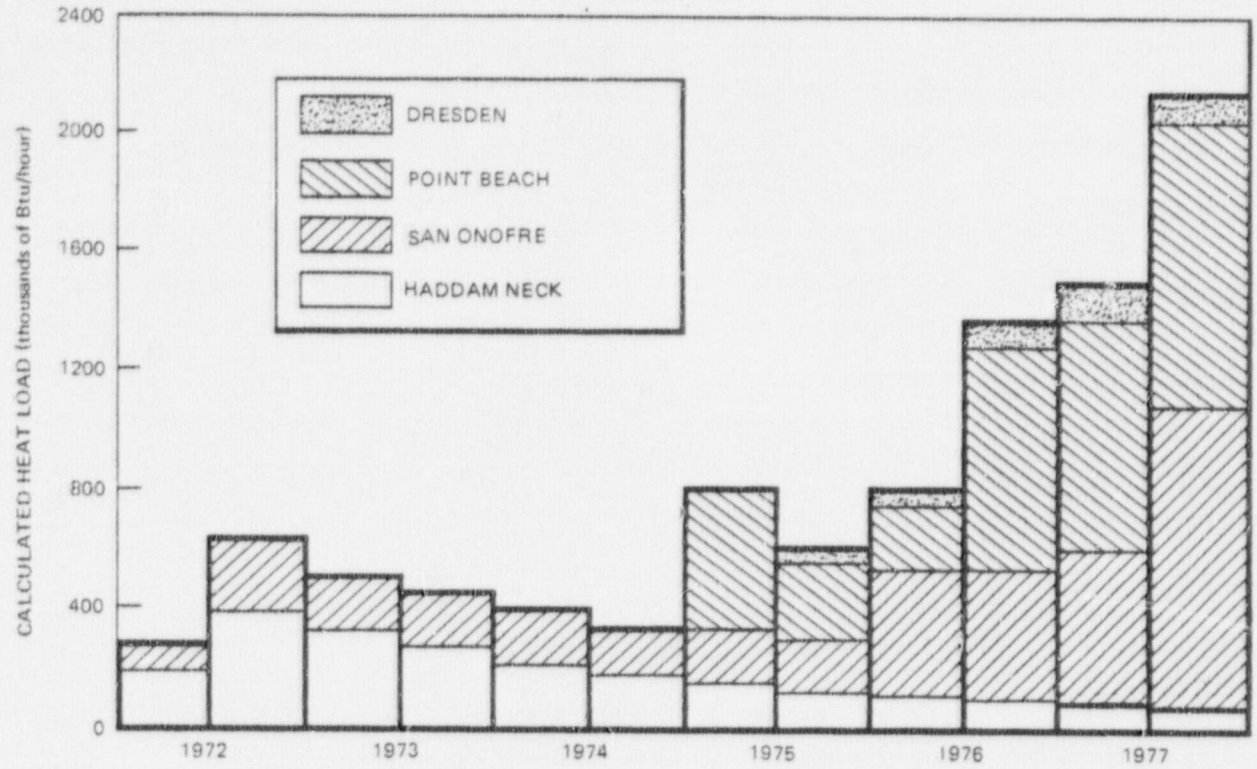


Figure 3-2. History of the Heat Generated by Fuel Stored at Morris Operation

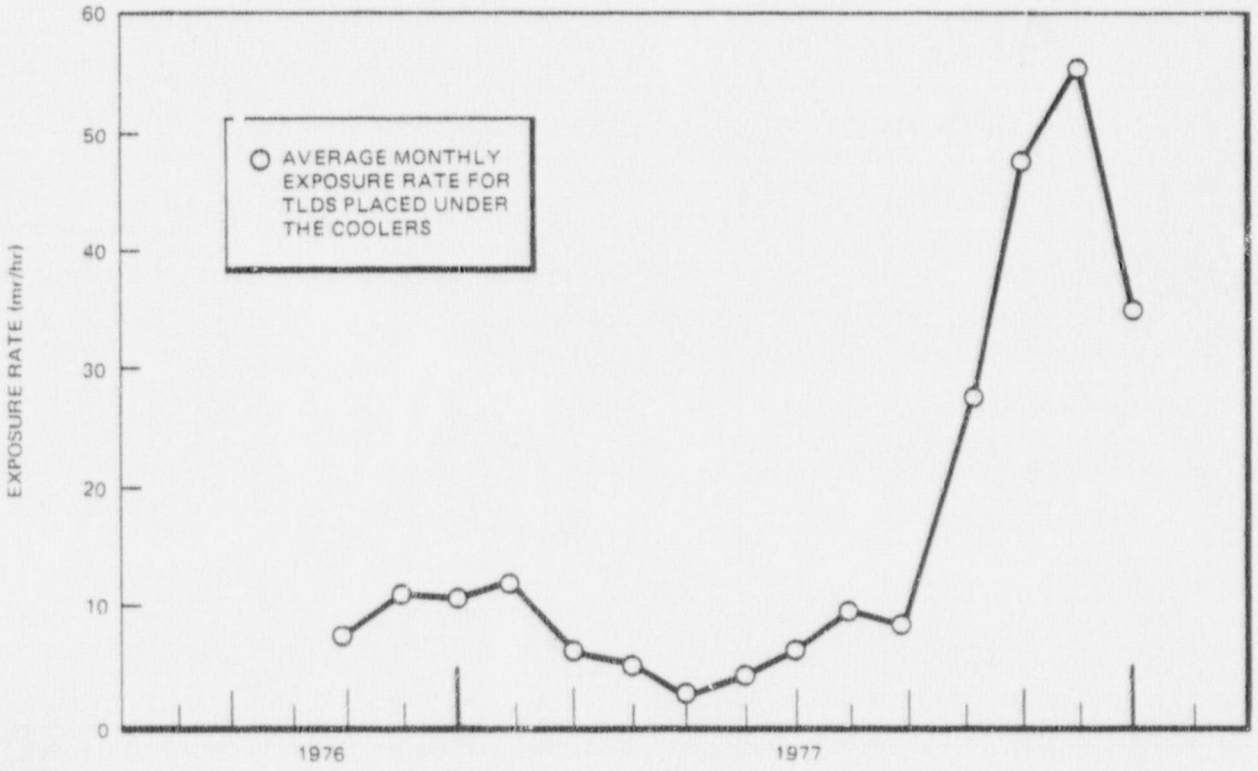


Figure 3-3. History of Cooler Exposure Rates

averaged about 3×10^{-4} and 1×10^{-4} μci/mℓ, respectively, except for periods when the filter system was not operated (MPC_w for restricted areas for Cs-134[3-5] is 3×10^{-4}; for Co-60 it is 1×10^{-3}).

The history of the concentration of tritium in the basin water is shown in Figure 3-5. This data is consistent with an annual transfer from fuel of 120 to 135 mCi. This is reduced by an effective basin water evaporative loss of 50 to 100 gal/day. Since the evaporation rate of H_2O is greater than that of tritiated water, tritium tends to concentrate. The concentration of tritium is expected to reach equilibrium, when the losses through evaporation and tritium decay equal the transfer rate, at about 5.5×10^{-4} μCi/mℓ.

3.3.2 Chemical Cleanup

In early 1972 a substantial quantity of sodium nitrate ($NaNO_3$) was introduced into the basin water. This material had been used as antifreeze in several casks and contaminated the basin water to the extent of at least 250 parts per million. This reduced the effectiveness of the resin ion-exchanger in control of chloride and radiocesium. No special efforts were made to remove the $NaNO_3$ other than one period of increased filter change frequency in late 1972. This resulted in a brief acceleration of the reduction in $NaNO_3$ concentration (Figure 3-6). The chloride concentration remained relatively constant through the entire period when $NaNO_3$ was present at concentrations greater than 10 parts per million. The routine use of the filter system resulted in gradual removal of the sodium nitrate. In March of 1976 the frequency of filter change was accelerated - on one occasion, six changes were made in two days. As the sodium nitrate approached five parts per million, the chloride concentration began to drop rapidly. By the end of April 1976, chloride, sodium, and nitrate were all below analytical detection limits (0.02 ppm Cl, 0.2 ppm Na, and 0.2 ppm NO_3), where they have remained.

3 Referred to as Project 1. Because of anticipated fuel mix (as of March, 1978) the capacity will probably be about 700 TeU.

3-4 A proprietary product of the Norton Co.

3-5 Cs-134 is used as a basis, since this is more restrictive than the MPC for Cs-137.

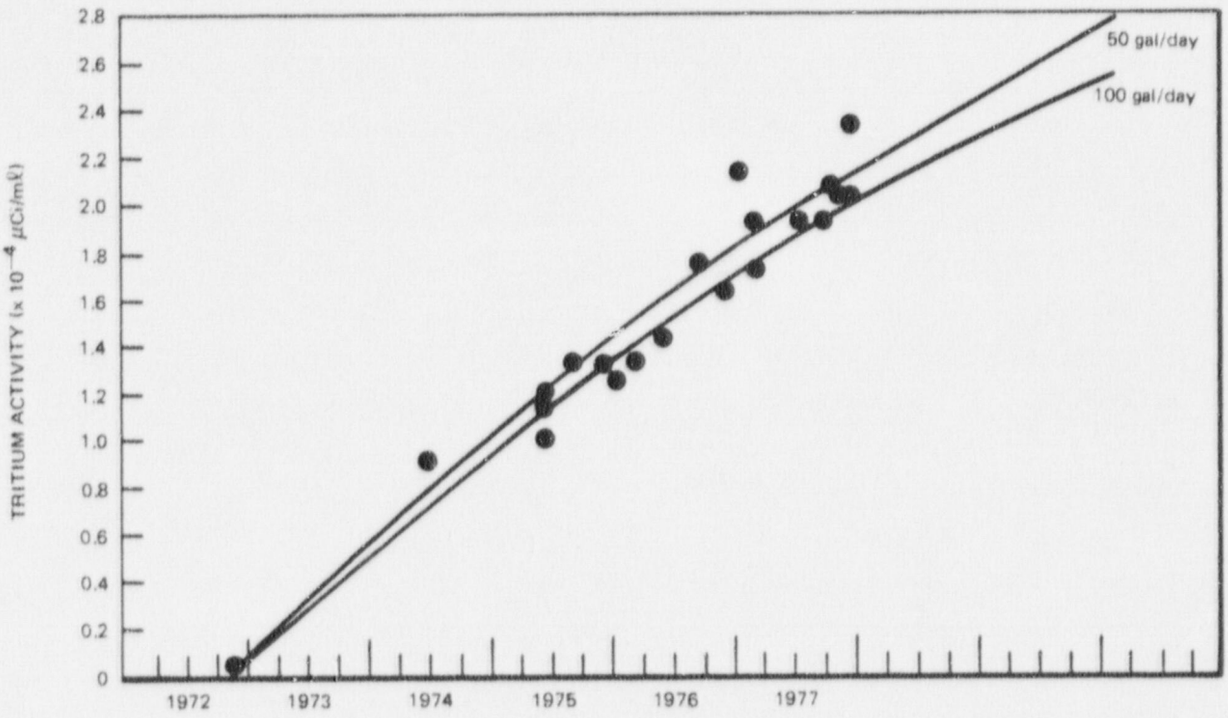


Figure 3-5. Tritium Activity

In October 1975 when the sodium concentration was about five parts per million, a twelve liter sample of basin water was evaporated to a solid which was analyzed for 71 elements by spark source mass spectrography (SSMS) and for nitrate tetraborate, chloride, and sulfate by wet chemical methods. The elements at or above concentration levels of 0.01 parts per million in the original basin water are listed in Table 3-1 (uranium is also included).[3-6]

3.3.3 Ionic Cleanup

The removal of ionic impurities by ion exchange is predictable. At ionic concentrations in water above a few parts per million, the resins can be loaded to saturation, and the amount removed is governed by the chemical capacity of the resin. At lower concentrations the distribution coefficient for the species in question governs the equilibrium loading of the resin.

For cation exchange the distribution coefficient for cobalt and cesium were found to be about 10^6 and 10^5 mℓ/g respectively.[3-7] Once the concentrations of impurities were reduced, application of this resin allowed the content of radiocobalt in the basin to be held below 0.5 curies. However, the resin was less effective in removing cesium, so an effort was made to find a more efficient method.

3.3.3.1 Zeolon Application

Zeolon-100 was first tested in February 1974 and later it was used experimentally in the basin filter system (through 1974-1975). It came into routine use in January 1976 and was found to have a high specific affinity for cesium. In addition, the distribution coefficient for use in high purity water was found to be the unusually large value of 10^7 mℓ/g. Tests have shown that only

3-6 Currently, with reduction of the total ionic content to a demineralized water level (conductivity one micromho per centimeter) concentrations of metallic elements are probably even lower than listed in Table 3-1.

3-7 The ratio of concentration of adsorbed ion in the resin to ionic concentration in the water is expressed:

$$\frac{\text{gm ion/gm resin}}{\text{gm ion/mℓ water}}$$

E

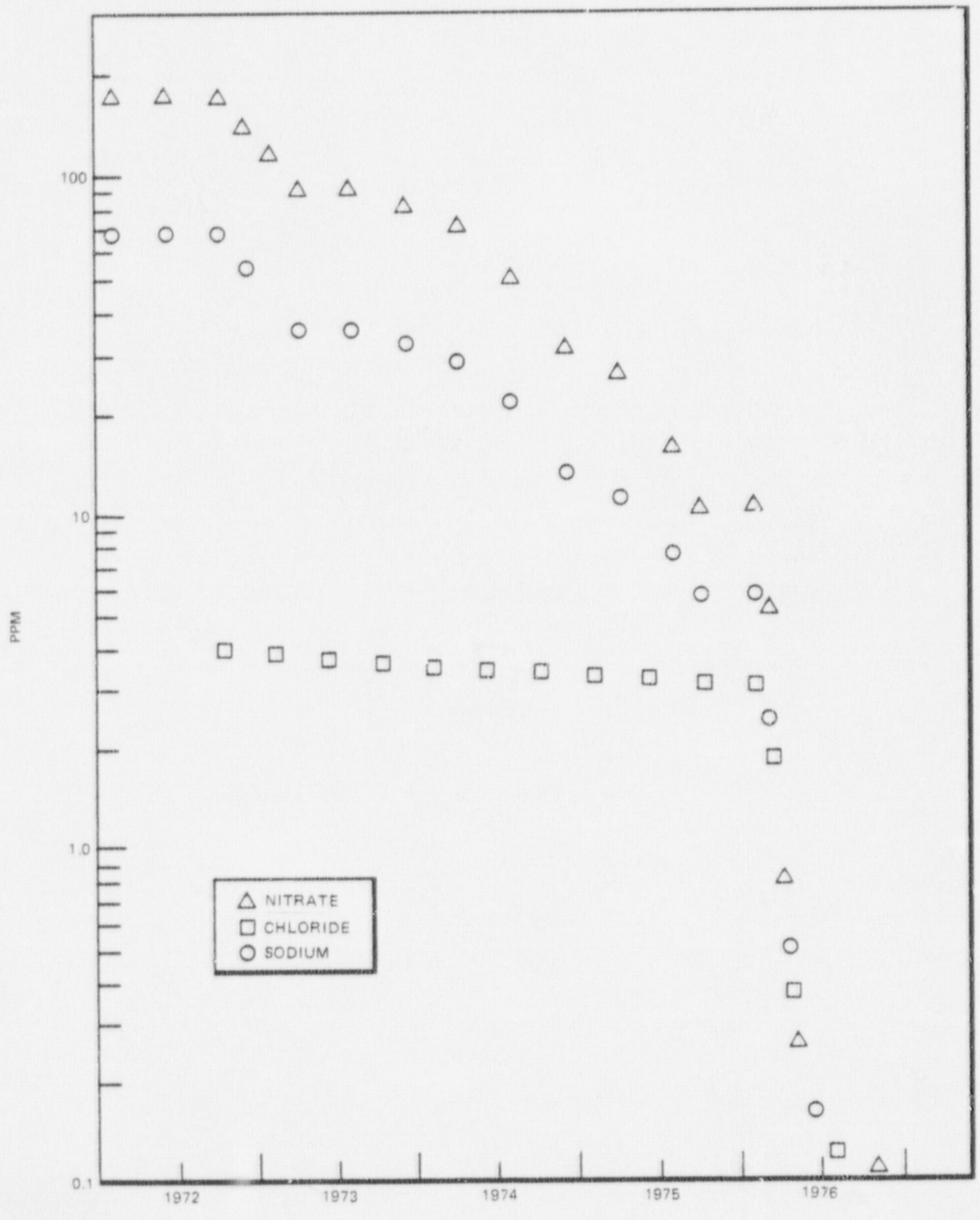


Figure 3-6. Chemical Contaminants in the Morris Fuel Storage Basin Water, 1972-1977

Table 3-1

IONIC IMPURITIES IN BASIN WATER |E
(October 1975)

Element	PPMw	Method
Li	0.02	SSMS*
Mg	0.01	SSMS
Al	0.01	SSMS
Cl	0.8	SSMS
K	0.08	SSMS
U	0.008	SSMS
NO_3	7.9	Wet Chem.
B_4O_7	2.7	Wet Chem.
Cl	1.6**	Wet Chem.
SO_4	0.05	Wet Chem.

*Spark Source Mass Spectrography

**Limit of detection

2 kilograms of Zeolon-100 are needed to partition the radiocesium in the basin so that 88% is captured by the exchanger and only 12% remains in the water. For example, the application of 2 kilograms of Zeolon-100 to the basin filter three times in succession would reduce an initial basin inventory of 1000 curies to less than 2. In this case, as with any true ion-exchanger which is not pushed to capacity, the limiting rate of removal is determined by the rate of approach to equilibrium. Since the turn-over rate of the basin water is 45 hours, the time to reach equilibrium is several days.[3-8]

3-8 Details of these studies are contained in the following paper: L. L. Denio, D. E. Knowlton, E. E. Voiland; *Control of Nuclear Fuel Storage Basin Water Quality by use of Powdered Ion Exchange Resin and Zeolites;* ASME 77-JPGC-NE-15 (June, 1977).

3.4 VENTILATION SYSTEM

Air quality in the Morris Operation fuel storage areas (main building) and environs is controlled through the building ventilation system, the sand filter, and the stack.

3.4.1 Work Area Air Concentrations

Table 3-2 gives the concentrations of particulate radioactive materials in air within the building and the exhaust air. Without exception these concentrations have been much less than the applicable MPC values.

Table 3-2

AVERAGE CONCENTRATIONS OF RADIOACTIVITY IN AIR IN WORK AREAS AT MORRIS OPERATION - 1976/1977

Location	Gross Alpha Activity[1] x 10^{-12} µCi/mℓ		Gross Beta Activity[2] x 10^{-12} µCi/mℓ	
	1976	1977	1976	1977
Decontamination Area	0.06		2.6	
Upper		0.01		0.23[3]
Lower		0.05		15.0[3]
Basin	0.11	0.03	2.2	4.0
Canyon	0.04	0.03	7.9	4.3
Laboratory	0.08	0.04	0.27	0.24
Outside Air	0.19	0.10	0.49	0.46

Notes: 1. U natural basis $MPC_A = 1 \times 10^{-10}$ µCi/mℓ
2. Cs-134 basis $MPC_A = 1 \times 10^{-8}$ µCi/mℓ
3. Single monitor replaced by two in 1977

An increase in concentrations in the basin exhaust plenum occurred during the fourth quarter of 1976, attributed to work in a greenhouse[3-9] on the decon pad. Ventilation air from the greenhouse was exhausted directly into the plenum.

Concentrations of airborne radioactivity in many portions of the process building, as typified by values in the Laboratory, are lower than those in the outside air. This is the result of filtration of the air as it is drawn into the building. Concentrations of radioactivity in the building exhaust, downstream of the sand filter have been lower than the applicable MPC values, without taking credit for atmospheric dilution. The amount of radioactive materials, in Curies, released to the environment by way of the stack during each of the past three years is shown on Table 3-3.

Table 3-3
SUMMARY OF RELEASES OF RADIOACTIVITY AT MORRIS OPERATION VIA THE MAIN STACK

	Gross Alpha Activity		Gross Beta Activity	
Half Year	Amount µCi	Highest Off-Site Concentration*[1] µCi/cm^3	Amount µCi	Highest Off-Site Concentration*[2] µCi/cm^3
2nd Half 1974**	78	6.6×10^{-19}	115	9.6×10^{-19}
1st Half 1975	16	3.8×10^{-20}	51	1.2×10^{-19}
2nd Half 1975	10	3.2×10^{-20}	33	1.0×10^{-19}
1st Half 1976	7	2.7×10^{-20}	18	6.8×10^{-20}
2nd Half 1976	11	4.5×10^{-20}	28	1.2×10^{-19}
1st Half 1977	4	2.3×10^{-20}	15	8.5×10^{-20}
2nd Half 1977	6	3.1×10^{-20}	119	6.1×10^{-19}

Notes: *Averaged over the period indicated
**Data not tabulated prior to July 1974

1. U natural basis $MPC_A = 5 \times 10^{-12}$ µCi/cm^3
2. Co-60 basis $MPC_A = 3 \times 10^{-10}$ µCi/cm^3

3-9 A temporary enclosure erected to control contamination while cutting up hardware from the original fuel storage system.

3.4.2 The Sand Filter

The sand filter has operated effectively in removing radioactive particulates from the main building exhaust air. Two incidents occurred that reduced air flow capacity.

3.4.2.1 Sand Filter Problems

In May 1972 a plugged ventilation line between the fluorine building and the sand filter, and an increase in the pressure drop across the sand filter prompted a sand filter inspection. The top surface of the sand was found to be caked with electrolyte from the fluorine building. The top layer of sand was raked to return it to its original consistency, and the ventilation line from the fluorine building was routed directly to the air via a 35-ft stack. In addition, monitoring of the sand filter at various depths was begun. (Since then the fluorine generating equipment and hydrogen fluoride have been removed from the site.)

In 1973 another increase in sand filter pressure drop was observed, this time in the bottom of the filter. Inspection via an air-tunnel entry uncovered a partial clogging of the inlet screens. This was attributed to process start-up work. The screens were cleaned, and a second set of screens, more readily accessible than the first, was placed upstream.

3.4.2.2 Filter Efficiency

Twice, efforts were made to determine the particulate removal efficiency for the sand filter. The first time the downstream activity was so low it could not be determined, and the second time, the downstream activity was near the threshold for detection. Based on the values determined in the second assessment the efficiency was found to be 98.9% for Co-60 and 99.8% for Cs-137 and Cs-134.

Table 3-5

HISTORY OF LAW VAULT CONTENTS

Date	Volume of Vault Contents (Gallons)	Approximate Gross β Concentrations* μCi/mℓ	Approximate Density* g/cm^3
3-6-74	367,000	0.014	
2-18-75	169,000	0.039	
6-5-75	411,000	0.033	1.060
11-16-75	187,000	0.13	1.141
8-15-76	343,000	0.11	1.000
12-12-76	206,000	0.27	1.204
2-20-77	224,000	0.21	1.122
10-9-77	338,000	0.18	1.080
12-31-77	238,000	0.36**	1.125

*The density and concentration of the solution in the LAW vault vary with depth. These values should not be used to compute the total solids or activity in the vault.

**The major contributing isotopes were the following:

Co-58	0.0074	μCi/mℓ
Co-60	0.028	μCi/mℓ
Cs-134	0.065	μCi/mℓ
Cs-137	0.28	μCi/mℓ

3.5.1.2 Cladding Vault

By comparison to the LAW vault, the cladding vault has been little used. Table 3-6 shows the activity in the cladding vault over about the same period as Table 3-5 for the LAW vault. Because of little use, the increase in concentrations and activities in the cladding vault have been much smaller. New accumulations since the initial retransfer of water back to the LAW vault have averaged only about 7,000 gallons per year. Presently, the cladding vault contains only about 50,000 gallons of waste water. Cladding vault use is summarized in Table 3-7.

Table 3-6

HISTORY OF CLADDING VAULT RADIOACTIVE MATERIAL CONCENTRATION

Date	Gross β (μCi/mℓ)
July 1973	0.004×10^{-3}
November 1973	0.97×10^{-3}*
January 1975	5.1×10^{-3}
November 1975	5.3×10^{-3}
November 1977	4×10^{-3}

*Estimated from the then current LAW Vault Activity.

Table 3-7

HISTORY OF CLADDING VAULT USAGE

Event	Date	Cladding Vault Net Change (Gallons)
Accumulation	to 10-5-73	+ 49,000
Transfer from LAW Vault	to 10-17-73	+ 146,000
Accumulation	to 2-18-75	+ 17,000
Partial Jet-out to LAW Vault	to 5-20-75	- 23,000
Pump-out to LAW Vault	to 6-4-75	- 156,000
Accumulation	to 12-31-77	+ 17,000
	on 12-31-77	50,000

3.5.1.3 Radioactive Waste Summary

During the 6 years of operation of the vaults there have been few problems. The accumulation of water in the leak detection system (which is collected and returned as radioactive waste water) has been so small that measurements of it are uncertain. Best values of leakage as determined by modified isotope dilution techniques are given in Table 3-8. | E

5. ENVIRONMENTAL IMPACT

5.1 INTRODUCTION

Six years of receiving and storing irradiated nuclear fuel at the Morris Operation have not caused any measurable impact on the environment. Experience during this time indicates that fuel storage and associated fuel handling and waste treatment offers very little potential for any significant environmental impact.

5.2 MORRIS OPERATION EFFLUENTS AND CONTAINMENT

Two types of solid wastes result from fuel storage operations: Ordinary nonradioactive trash and solid waste contaminated with low-level radioactive material. Trash disposal is through an authorized disposal company. The contaminated waste is packaged in accordance with NRC and DOT regulations and shipped to a NRC-licensed waste disposal facility.

The low-level radioactive liquid waste is maintained in the LAW vault and, if needed, the cladding vault. None is released to the environment.

Nonradioactive liquid waste consists of: (1) waste from regenerating the water demineralizer units which is routed to the evaporation pond (none released beyond the site boundary), (2) sanitary waste which is routed to the sanitary lagoons and (3) condensate blowdown water from the utility boiler, blowdown waste from the air compressor cooling tower, and intrusion water from the LAW vault which are also routed to the evaporation pond. No liquid wastes are discharged from the site.

A holding pond has been added to the sanitary waste system. Effluent from the holding pond can be chlorinated, and applied to land in the GE tract in an irrigation program.

The only waste effluents from Morris Operation consist of the following:

a. Exhaust from the utility boiler which is combustion gases from a maximum rated 25,000 lb/hr natural gas fired steam boiler.

b. Exhaust from the auxiliary diesel generator which is combustion gases from a rated 815 hp diesel engine, normally operated only on an intermittent basis (∿1 hr/wk).

c. Ventilation air and vapor from the main process building, via the sand filter and stack.

As indicated in the discussion of the ventilation system, the building off-gas contains virtually no radioactive material. Doses calculated from measured releases of radioactive material are less than one billionth of the average dose from background radiation.[5-1]

5.3 ENVIRONMENTAL MONITORING

Environmental radiation monitoring near the Morris site has been done by Commonwealth Edison since 1958. In late 1967 General Electric joined with them to expand the program to fit the combined needs of the two facilities.

By June 1973, all the samples were being taken and analyzed that would have been required if fuel reprocessing were to start up. The Dresden environmental reports are a matter of public record. The reports for 1974 and 1976 are presented in Appendix A and B (for comparison).[5-2] N

The results of the monitoring program have not identified any radioactive materials off-site or any increase in off-site dose rates resulting from fuel storage (or the previous process testing) at Morris Operation. Furthermore,

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[5-1] Background radiation: naturally occurring radiation from the earth and from outer space which amounts to about 140 mRem/year, and man-made radiation not associated with nuclear power, e.g., watch dials, television and medical x-rays which amount to ∿60 mRem/year on the average. Natural background can be as high as 2000 mRem/year.

[5-2] Reports for subsequent years will be added by revisions as Appendix B-1, B-2, etc. N

APPENDIX B-1

RADIOACTIVE WASTE AND ENVIRONMENTAL MONITORING

January - December 1977

GENERAL ELECTRIC COMPANY

MORRIS OPERATION

RADIOACTIVE WASTE AND ENVIRONMENTAL MONITORING

JANUARY THROUGH JUNE 1977

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Introduction

The General Electric Morris Operation (GE-MO) is located approximately twelve miles southwest of Joliet, Illinois, immediately south of and adjacent to the Dresden Nuclear Power Station. The facility is used to store spent nuclear fuel, and is designed to contain all radioactive liquids and essentially all of the airborne particulate radioactivity in its effluents. Traces of gaseous radionuclides, mainly Kr-85, and tritium may be released to the atmosphere. The facility may also release small amounts of hydrogen fluoride. Releases to the atmosphere via the 91 meter stack are estimated by analyses of continuously collected composites samples of particulate matter (filter) and of fluorides (scrubbed condensate). The monthly average atmospheric dispersion factor (X/Q) is calculated using on-site meteorological data for the period. The gamma radiation doses from GE-MO releases and Dresden plus GE-MO combined are calculated based on isotopic analyses of effluents and meteorological data for the period.

Environmental monitoring is conducted around GE-MO to measure changes in fluoride concentrations and radiation or radioactivity levels that may be attributable to plant operations. If significant changes in environ concentrations are measured, these changes are correlated with effluent release data to estimate any GE-MO contributions.

Summary

GE-MO was used only for storage during the reporting period. No significant amounts of radioactive materials were released in gaseous or liquid effluents.

Effluents to the Atmosphere

Released to the atmosphere are summarized in Table A. Atmospheric dilution factors measured for the period are given in Table B. No measurable Kr-85 was released during the period. A total of 2.2 kg of hydrogen fluoride was released during the six-month period.

TABLE A

GE-MO RELEASES TO THE ATMOSPHERE

January through June 1977

Month	HF(a) Kg	μCi Gross Alpha	μCi Gross Beta
January	0.2	0.6	3.7
February	0.4	0.6	2.0
March	1.0	0.5	1.5
April	0.6	0.8	2.2
May	-	1.0	1.6
June	-	0.8	3.0
Six-month Total	2.2	4.3	14.0

(a) Anhydrous HF and Fluorine generating equipment were removed from site in March and April. Monitoring subsequently discontinued.

TABLE B

Maximum Off-site Relative Concentrations (sec/m^3)

GEMO Main Chimney
January-June 1977
(times 10^{-8})

Sector	6 month Average	Month					
		January	February	March	April	May	June
N	5.2	6.2	5.4	4.8	5.2	6.9	2.7
NNE	5.4	6.6	5.4	5.6	3.3	6.8	4.8
NE	7.8	10.6	8.8	4.7	4.6	8.6	6.9
ENE	6.5	4.7	6.4	5.3	7.6	8.9	6.2
E	8.8	19.2	11.2	9.2	3.3	4.7	6.1
ESE	1.7	6.1	2.6	1.8	3.8	6.3	4.7
SE	1.7	2.7	2.8	1.9	1.2	0.4	2.1
SSE	1.8	1.9	5.6	1.9	1.7	0.0	7.8
S	1.1	1.0	1.3	0.6	0.9	0.5	3.2
SSW	1.6	1.1	0.9	0.0	3.1	2.0	2.8
SW	1.7	0.9	0.6	0.6	2.4	3.5	2.3
WSW	1.8	1.0	0.2	0.5	2.5	3.9	2.5
W	2.3	0.7	0.4	1.2	3.1	5.7	2.8
WNW	3.4	0.9	0.2	4.9	4.5	5.2	4.6
NW	5.4	0.4	0.8	9.2	7.9	6.1	8.3
NNW	5.6	1.8	3.0	8.7	6.7	6.6	7.1

ENVIRONMENTAL MONITORING RESULTS

The GE-MO environmental monitoring program is conducted in conjunction with a more extensive program for the Dresden Nuclear Power Station. Results from the combined GE-MO/Dresden environmental monitoring program important to GE-MO are summarized in Tables C, through L. The semiannual report for Dresden may be used to obtain additional information.

The purpose of the GE-MO environmental monitoring program is to verify the adequacy of stack effluent monitoring and to help answer questions concerning possible environmental impact of releases.

Tritium concentrations were measured in water from:

1. Pond approximately 800 meters west of the GE-MO stack.
2. Corps of Engineers pump basin approximately 2400 meters southeast of the GE-MO stack.
3. Illinois River at Morris.
4. Thorsen well.
5. Grass from approximately 300 meters east-northeast of the stack.
6. Soil from the same location as grass.
7. On-Site Well GE-MO.

These results are summarized in Tables C and G. The results of the tritium analysis on an adult rabbit indigenous to the GE-MO site are given in Table G. First and second quarter analyses of fluoride strips are recorded in Table F. None of these analyses indicates any measureable environmental impact from GE-MO effluents.

TABLE C

SITE MONITORING RESULTS

January through June 1977

	UNITS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
Grass Fluoride (D-40)	µg/g	NR	NR	NR	NR	2.2	2.1
Davidson's Milk							
I-131	pCi/l	<4	<4	<4	<0.5	<0.5	<0.5
Sr-90	pCi/l	3 ± 1	4 ± 2	3 ± 1	2 ± 1	1 ± 1	1 ± 1
Cs-134	pCi/l	<5	<5	<5	<5	<5	<5
Cs-137	pCi/l	<5	<5	<5	<5	<5	<5
Mather Farm Milk							
I-131	pCi/l	<4	<4	<4	<0.5	<0.5	<0.5
Tritium Analyses							
Water from Pond West of GE-MO (D-35)	nCi/l	NR	NR	0.3 ± 0.1	NR	NR	0.3 ± 0.1
D-33 Corps of Eng. Pump Basin	nCi/l	(a)	0.3 ± 0.1	NR	<0.2	NR	NR
IL River at Hwy 47	nCi/l	Quarterly Composite		0.2 ± 0.1	Quarterly Composite		<0.2
Thorsen Well	nCi/l	0.5 ± 0.1	NR	NR	0.7 ± 0.1	NR	NR
On-Site Well (GE-MO)	nCi/l	NR	NR	<0.2	NR	NR	<0.2
Grass Near GE-MO(D-39)	nCi/l	NR	NR	(a)	NR	NR	1.2 ± 0.4
Moisture Content of Soil at 10-15 cm (D-39)	nCi/l	NR	NR	0.5 ± 0.1	NR	NR	0.7 ± 0.4

NR = Not Required
(a)Sample lost in processing.

NEDO-20969B1
September 1978

TABLE C (cont'd)

SITE MONITORING RESULTS

January through June 1977

		UNITS	JANUARY - MARCH	APRIL - JUNE	SIX-MONTH TOTAL
Gamma Exp. calculated GE-MO Contribution					
Bennitt	D-09	mR/Week	0	0	0
Joliet	D-03	"	0	0	0
Clay Prod.	D-15	"	0	0	0
Goose Lake Village	D-44	"	0	0	0
Pheasant Trail	D-45	"	0	0	0
Collins Road	D-46	"	0	0	0
Gamma Exposure, All Sources Measured					
Bennitt	D-09	"	1.1 ± 0.5	1.9 ± 0.3	3.0
Joliet	D-03	"	1.1 ± 0.2	1.1 ± 0.1	2.2
Clay Prod.	D-15	"	1.1 ± 0.2	1.0 ± 0.1	2.1
Goose Lake Village	D-44	"	1.2 ± 0.1	1.2 ± 0.1	2.4
Pheasant Trail	D-45	"	1.2 ± 0.2	1.1 ± 0.2	2.3
Collins Road	D-46	"	1.2 ± 0.3	1.7 ± 0.3	2.9

TABLE D

PLUTONIUM IN AIR PARTICULATE FILTER COMPOSITES

January through June 1977

Stations Composited:

Bennitt
Clay Products
On-Site [a]
Pheasant Trail
Collins Road
Joliet
Morris
Coal City
Minooka
Goose Lake Village

Month of Composite	10^{-4} pCi/m^3
January	<0.03
February	<0.02
March	<0.04
April	<0.04
May	<0.02
June	<0.07

Data reported as "<" are at the 99% confidence level. All other data are at the 95% confidence level, all based on counting errors.

TABLE E-I.

MONTHLY AVERAGE GROSS BETA CONCENTRATIONS IN AIR PARTICULATES

Collection Site	JANUARY (10^{-2} pCi/m^3)	FEBRUARY (10^{-2} pCi/m^3)	MARCH (10^{-2} pCi/m^3)	APRIL (10^{-2} pCi/m^3)	MAY (10^{-2} pCi/m^3)	JUNE (10^{-2} pCi/m^3)
Indicator Stations						
D-09 Bennitt	8 ± 2	7 ± 1	8 ± 2	26 ± 4	53 ± 7	45 ± 7
D-15 Clay Products	7 ± 2	5 ± 1	8 ± 2	22 ± 4	49 ± 6	41 ± 6
D-18 On-Site 3	7 ± 1	5 ± 1	9 ± 2	22 ± 4	48 ± 6	40 ± 6
D-45 Pheasant Trail	8 ± 2	7 ± 1	8 ± 2	25 ± 4	51 ± 7	37 ± 5
D-46 Collins Road	7 ± 2	6 ± 1	8 ± 1	22 ± 4	51 ± 6	41 ± 6
Background Stations						
D-03 Joliet	5 ± 2	6 ± 1	10 ± 2	26 ± 4	55 ± 7	45 ± 7
D-06 Morris	7 ± 1	7 ± 1	9 ± 1	24 ± 4	51 ± 2	45 ± 7
D-08 Coal City	7 ± 2	7 ± 1	10 ± 2	27 ± 4	49 ± 6	40 ± 6
D-14 Minooka	8 ± 2	7 ± 1	8 ± 2	19 ± 3	52 ± 7	44 ± 7
D-44 Goose Lake Village	8 ± 2	6 ± 1	7 ± 1	25 ± 4	52 ± 7	43 ± 6

TABLE E-II.

GROSS ALPHA IN AIR PARTICULATES

Collection Site	JANUARY (10^{-3} pCi/m^3)	FEBRUARY (10^{-3} pCi/m^3)	MARCH (10^{-3} pCi/m^3)	APRIL (10^{-3} pCi/m^3)	MAY (10^{-3} pCi/m^3)	JUNE (10^{-3} pCi/m^3)
Indicator Stations						
D-09 Bennitt	< 5	< 5	< 5	1 ± 1	< 5	< 5
D-15 Clay Products	< 5	< 5	< 5	2 ± 1	< 5	< 5
D-18 On-Site 3	< 5	< 5	< 5	2 ± 1	< 5	< 5
D-45 Pheasant Trail	< 5	< 5	< 5	1 ± 1	< 5	< 5
D-46 Collins Road	< 5	< 5	< 5	2 ± 1	< 5	< 5
Background Stations						
D-03 Joliet	< 5	< 5	< 5	2 ± 1	< 5	< 5
D-06 Morris	< 5	< 5	< 5	2 ± 1	< 5	< 5
D-08 Coal City	< 5	< 5	< 5	2 ± 1	< 5	< 5
D-14 Minooka	< 5	< 5	< 5	2 ± 1	< 5	< 5
D-44 Goose Lake Village	< 5	< 5	< 5	1 ± 1	< 5	< 5

TABLE F

ANALYSES OF FLUORIDE ABSORBENT STRIPS

LOCATION		$\mu gF^-/dm^2/day$ (average) First Quarter	Second Quarter
D-02	Elwood	.41 ± .05	0.7 ± 0.2
D-03	Joliet Brandon Road	1.90 ± .20	3.1 ± 0.6
D-04	Wilmington	.15 ± .02	0.6 ± 0.1
D-06	Morris	.14 ± .02	0.6 ± 0.1
D-07	Lisbon	.17 ± .02	0.3 ± 0.1
D-08	Coal City	.19 ± .02	0.5 ± 0.2
D-11	Channahon	.22 ± .02	0.7 ± 0.4
D-16	On-Site 1	.14 ± .02	0.3 ± 0.1
D-17	On-Site 2	.08 ± .01	0.3 ± 0.1
D-18	On-Site 3	.09 ± .01	0.3 ± 0.1
D-40	300 Meters E. of MFRP Plant	.93 ± .09	0.4 ± 0.1
D-40	West of MFRP Plant at Site Boundary	.32 ± .03	2.0 ± 0.5
D-40	On-Site	.89 ± .09	1.1 ± 0.2

TABLE G

MISCELLANEOUS ANALYSES

D-40 RABBIT - GEMO AREA

Collection Date	Blood Tritium pCi/ml	Thyroid I-131 pCi/animal	Muscle Cs-137 pCi/gm	Bone Sr-90 pCi/gm
04/23/77	22 ± 2	(a)	(a)	(a)

D-39 TRITIUM IN SOIL MOISTURE (Simulator Area)

Collection Date	Tritium Concentration pCi/ml soil moisture
03/05/77	.52 ± .11
06/12/77	.73 ± .35

D-39 TRITIUM IN GRASS

Collection Date	pCi/ml (loose Water)
03/05/77	Insufficient water for analysis
06/12/77	1.2 ± 0.4

D-35 POND WEST OF MFRP

Collection Date	Tritium pCi/l
03/05/77	250 ± 100
06/04/77	300 ± 100

D-33 GOOSE LAKE, CORP. OF ENGINEERS PUMPING STATION

Collection Date	pCi/l	
	Gross Beta	Tritium
01/08/77	Insufficient sample for analysis	
02/05/77	4 ± 2	280 ± 90
04/02/77	4 ± 2	<200

(a) Insufficient sample for analysis.

TABLE H

GROSS ALPHA AND GROSS BETA IN
SURFACE WATER SAMPLES

Collection Site	Collection Date	Gross α (pCi/l)	Gross β (pCi/l)
Sanitary Lagoon (D-54)	01/08/77	<2.0	18 ± 3
	02/05/77	<1.1	10 ± 4
	03/05/77	<0.6	7 ± 2
	04/02/77	<1.0	3 ± 2
	05/14/77	<0.7	9 ± 2
	06/04/77	<0.7	13 ± 3
Evaporation Pond (D-55)	01/01/77	(a)	(a)
	02/05/77	(a)	(a)
	03/12/77	<1.0	8 ± 2
	04/02/77	<1.0	11 ± 2
	05/14/77	<0.7	6 ± 2
	06/04/77	1 ± 1	10 ± 2

TABLE I

GROSS BETA AND TRITIUM IN WELL WATER SAMPLES

Collection Site	Collection Date	pCi/l	
		Gross β	Tritium
D-38 MFRP Well	03/05/77	13 ± 2	<200
	06/04/77	25 ± 3	<200

Data reported as "<" are at the 99% confidence level. All other data are at the 95% confidence level, all based on counting errors.

(a)Sample not available due to excavation interference with pond.

TABLE J

NITRATES IN SURFACE WATER AND WELL WATER SAMPLES

Collection Site	Collection Date	Nitrates (as nitrogen) ppm
Goose Lake Corporation of Engineering (D-33)	01/08/77	<1
	02/05/77	<1
	03/05/77	9
	04/02/77	<1
	05/14/77	18
	06/04/77	<1
6" Law Well (D-56)	01/08/77	<1
	02/05/77	55
	03/05/77	16
	04/02/77	<1
	05/14/77	<1
	06/04/77	22
G.E. Surface Water (D-57)	12/31/76	9
	02/05/77	9
	03/05/77	11
	04/02/77	158
	05/07/77	480
	06/04/77	18

TABLE K

FLUORIDE IN VEGETATION SAMPLES

Collection Site	Collection Date	µg/g Annuals(1)	µg/g Perennials(2)	µg/g Evergreens
On-Site GE-MO	01/08/77			*330 (µg/g)
(Area 1)	05/28/77	1.7	6.1	4.9
	06/12/77	3.1	1.8	4.5
Dresden Locks - Northwest	01/08/77			*290 (µg/g)
(Area 2)	05/28/77	2.2	2.4	2.7
	06/12/77	1.6	2.0	1.6
West Boundary	01/08/77			*300 (µg/g)
(Area 3)	05/28/77	2.0	1.6	1.3
	06/12/77	0.9	2.2	1.4
East Boundary	01/08/77			*170 (µg/g)
(Area 4)	05/28/77	3.1	8.9	2.2
	06/12/77	2.9	3.1	2.7

(1) Grass
(2) Deciduous leaves
* Combined sample of grass and evergreens. Believed to be contaminated in the Laboratory.

TABLE L

RADIONUCLIDE CONCENTRATIONS IN PRECIPITATION

January - June 1977

Collection Site	Collection Date	Gross Beta (pCi/l)	Gross Beta (pCi/m^2)	H-3 as Water (pCi/l)
On-Site 2 (D-17)	Jan.	39 ± 4	517 ± 53	<360 (a)
	Feb.	53 ± 6	420 ± 50	260 ± 90
	Mar.	87 ± 9	2800 ±300+	520 ± 110
	Apr.	71 ± 7	2800 ±300+	380 ± 80
	May	290 ±30	1600 ±200+	< 500(a)
	June	72 ± 7	2100 ±200+	370 ± 100
Davidson Farm (D-30)	Jan.	40 ± 6	318 ± 48	<360 (a)
	Feb.	45 ± 5	480 ± 50	250 ± 90
	Mar.	49 ± 5	2600 ±300+	780 ± 110
	Apr.	96 ±10	3400 ±300+	550 ± 90
	May	200 ±20	1100 ±100+	< 200
	June	65 ± 7	2900 ±300+	270 ± 100
Brandon Lock (D-32)	Jan.	40 ± 7	318 ± 56	<360 (a)
	Feb.	63 ± 6	500 ± 50	210 ± 130
	Mar.	100 ±10	2700 ±300+	460 ± 110
	Apr.	300 ±30	5500 ±600+	430 ± 90
	May	180 ±20	960 ±100	530 ± 350(a)
	June	100 ±10	2900 ±300+	260 ± 100
Mather Farm (D-53)	Jan.	21 ± 5	167 ± 40	<360 (a)
	Feb.	48 ± 6	380 ± 50	<200
	Mar.	50 ± 5	1900 ±200+	610 ± 110
	Apr.	310 ±30	4900 ±500+	440 ± 90
	May	100 ±10	540 ± 50	230 ± 100
	June	68 ± 7	2000 ±200+	260 ± 100

+Unusual reading

Data reported as "<" are at the 99% confidence level. All other data are at the 95% confidence level, all based on counting errors.
(a)Insufficient sample for more sensitive analysis. Samples were direct counted.

GENERAL ELECTRIC COMPANY

MORRIS OPERATION

RADIOACTIVE WASTE AND ENVIRONMENTAL MONITORING

JULY THROUGH DECEMBER 1977

TABLE OF CONTENTS

Introduction

The General Electric Morris Operation (GE-MO) is located approximately twelve miles southwest of Joliet, Illinois, immediately south of and adjacent to the Dresden Nuclear Power Station. The facility is used to store spent nuclear fuel, and is designed to contain all radioactive liquids and essentially all of the airborne particulate radioactivity in its effluents. Traces of gaseous radionuclides, mainly Kr-85, and tritium may be released to the atmosphere. Releases to the atmosphere via the 91 meter stack are estimated by analyses of continuously collected composite samples of particulate matter (filter). The monthly average atmospheric dispersion factor (χ/Q) is calculated using on-site meteorological data for the period. The gamma radiation doses from GE-MO releases and Dresden plus GE-MO combined are calculated based on isotopic analyses of effluents and meteorological data for the period.

Environmental monitoring is conducted around GE-MO to measure changes in radiation or radioactivity levels that may be attributable to plant operations. If significant changes in environ concentrations are measured, these changes are correlated with effluent release data to estimate any GE-MO contributions.

Summary

GE-MO was used only for storage during the reporting period. No significant amounts of radioactive materials were released in gaseous or liquid effluents.

Effluents to the Atmosphere

Released to the atmosphere are summarized in Table A. Atmospheric dilution factors measured for the period are given in Table B. No measurable Kr-85 was released during the period.

TABLE A

GE-MO RELEASES TO THE ATMOSPHERE

July through December 1977

Month	μCi	
	Gross Alpha	Gross Beta
July	0.8	3.0
August	1.4	3.5
September	0.8	3.1
October	2.0	4.8
November	0.9	2.6
December	0.5	2.8
Six-month Total	6.4	19.8

TABLE B

Maximum Off-Site Relative Concentrations (sec/m^3)

GEMO Main Chimney

July-December 1977

(times 10^{-8})

Sector	6 month Average	Month					
		July	August	September	October	November	December
N	6.4	6.6	7.7	5.6	7.3	5.1	5.8
NNE	7.4	9.4	9.3	4.0	7.7	4.2	9.6
NE	6.7	14.8	9.2	4.2	2.7	5.2	4.2
ENE	8.1	12.6	7.6	7.4	4.4	6.9	9.8
E	7.4	5.2	7.9	6.7	5.3	9.9	22.6
ESE	2.6	0.8	2.5	2.6	2.4	2.6	6.9
SE	1.6	0.8	2.6	3.0	1.8	1.4	2.5
SSE	1.5	0.7	2.2	1.3	2.8	1.7	4.5
S	2.0	1.4	2.0	3.3	3.2	2.1	4.4
SSW	1.4	1.6	1.5	1.4	1.3	2.6	0.3
SW	1.9	1.7	1.1	3.4	1.2	6.0	1.2
WSW	1.7	1.0	0.9	4.3	2.1	1.3	1.3
W	2.7	0.8	3.0	4.6	4.3	0.9	4.4
WNW	3.7	6.0	3.4	3.6	3.4	3.6	2.2
NW	4.4	3.9	3.9	4.6	2.9	5.8	5.7
NNW	6.4	5.2	3.9	9.3	4.3	8.7	8.5

ENVIRONMENTAL MONITORING RESULTS

The GE-MO environmental monitoring program is conducted in conjunction with a more extensive program for the Dresden Nuclear Power Station. Results from the combined GE-MO/Dresden environmental monitoring program important to GE-MO are summarized in Tables C, through L. The semiannual report for Dresden may be used to obtain additional information.

The purpose of the GE-MO environmental monitoring program is to verify the adequacy of stack effluent monitoring and to help answer questions concerning possible environmental impact of releases.

Tritium concentrations were measured in water from:

1. Pond approximately 800 meters west of the GE-MO stack.
2. Corps of Engineers pump basin approximately 2400 meters southeast of the GE-MO stack.
3. Illinois River at Morris.
4. Thorsen well.
5. Grass from approximately 300 meters east-northeast of the stack.
6. Soil from the same location as grass.
7. On-Site Well GE-MO.

These results are summarized in Tables C and G. The results of the tritium analysis on an adult rabbit indigenous to the GE-MO site are given in Table G. Third and fourth quarter analyses of fluoride strips are recorded in Table F. None of these analyses indicates any measureable environmental impact from GE-MO effluents.

TABLE C

SITE MONITORING RESULTS

July through December 1977

	UNITS	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Grass Fluoride (D-40)	$\mu gF^-/dm^2/day$	NR	NR	1.3 ± 0.33	NR	NR	0.57 ± 0.33
Davidson's Milk							
I-131	pCi/l	<0.5	<0.5	<0.5	21.0 ± 2.2	0.76 ± 0.32	<0.5
Sr-90	pCi/l	<2	(a)	2 ± 2	2 ± 1	NR	NR
Cs-134	pCi/l	<5	<5	<5	<5	NR	NR
Cs-137	pCi/l	<5	(a)	<5	<5	NR	NR
Mather Farm Milk							
I-131	pCi/l	<0.5	<0.5	<0.5	10.5 ± 1.2	<0.5	<0.5
Tritium Analyses							
Water from Pond West of GE-MO (D-35)	nCi/l	NR	NR	0.3±0.1	NR	NR	NR
D-33 Corps of Eng. Pump Basin	nCi/l	NR	<200	NR	0.2±0.1	NR	NR
IL River at Hwy 47	nCi/l	NR	NR	0.2±0.1	NR	NR	NR
Thorsen Well	nCi/l	0.4±0.2	NR	NR	0.3±0.1	NR	NR
On-Site Well (GE-MO)	nCi/l	NR	NR	<0.2	NR	NR	NR
Grass Near GE-MO (D-39)	nCi/ml	1.5 ± 0.4	5.1 ± 0.9	1.5 ± 0.5	1.4 ± 0.5	NR	NR
Moisture Content of Soil at 10-15 cm (D-39)	nCi/ml	NR	NR	0.7 ± 0.4	NR	NR	NR

(a) Sample lost in processing.
NR = not required

TABLE C cont'd

SITE MONITORING RESULTS

July through December 1977

		UNITS	JULY - SEPTEMBER	OCTOBER - DECEMBER	SIX-MONTH TOTAL
Gamma Exp. calculated GE-MO Contribution					
Bennitt	D-09	mR	0	0	0
Joliet	D-03	mR	0	0	0
Clay Prod.	D-15	mR	0	0	0
Goose Lake Village	D-44	mR	0	0	0
Pheasant Trail	D-45	mR	0	0	0
Collins Road	D-46	mR	0	0	0
Gamma Exposure, All Sources Measured					
Bennitt	D-09	mR	16.9 ± 2.6	26.0 ± 2.6	42.9 ± 3.7
Joliet	D-03	mR	14.3 ± 1.3	23.4 ± 2.6	37.7 ± 2.9
Clay Prod.	D-15	mR	14.3 ± 1.3	23.4 ± 3.9	37.7 ± 4.1
Goose Lake Village	D-44	mR	15.6 ± 2.6	23.4 ± 3.9	39.0 ± 4.7
Pheasant Trail	D-45	mR	13.0 ± 3.9	24.7 ± 2.6	37.7 ± 4.7
Collins Road	D-46	mR	16.9 ± 2.6	27.3 ± 3.9	44.2 ± 4.7

TABLE D

PLUTONIUM IN AIR PARITUCLATE FILTER COMPOSITES

July through October 1977

Stations Composited:

Bennitt
Clay Products
On-Site 3
Pheasant Trail
Collins Road
Joliet
Morris
Coal City
Minooka
Goose Lake Village

Month of Composite	10^{-4} pCi/m^3
July	40 ±4
August	<0.05
September	0.06±0.06
October	0.03±0.01

Data reported as "<" are at the 99% confidence level. All other data are at the 95% confidence level, all based on counting errors.

TABLE E-1

MONTHLY AVERAGE GROSS BETA CONCENTRATIONS IN AIR PARTICULATES

Collection Site	JULY (10^{-2} pCi/m^3)	AUGUST (10^{-2} pCi/m^3)	SEPTEMBER (10^{-2} pCi/m^3)	OCTOBER (10^{-2} pCi/m^3)	NOVEMBER (10^{-2} pCi/m^3)	DECEMBER (10^{-2} pCi/m^3)
Indicator Stations						
D-09 Bennitt	27 ± 4	27 ± 4	14 ± 2	39 ± 22	10 ± 2	11 ± 2
D-15 Clay Products	31 ± 5	23 ± 4	13 ± 3	39 ± 6	NR	13 ± 2
D-18 On-Site 3	37 ± 5	28 ± 4	14 ± 2	42 ± 6	14 ± 2	10 ± 2
D-45 Pheasant Trail	42 ± 6	24 ± 4	20 ± 4	(a)	9 ± 2	9 ± 1
D-46 Collins Road	27 ± 5	24 ± 4	13 ± 2	39 ± 6	13 ± 2	
Background Stations						
D-03 Joliet	31 ± 5	30 ± 4	16 ± 3	40 ± 6	15 ± 2	NR
D-06 Morris	29 ± 5	21 ± 3	12 ± 2	39 ± 5	17 ± 3	NR
D-08 Coal City	19 ± 3	21 ± 3	13 ± 2	34 ± 5	17 ± 3	NR
D-14 Minooka	29 ± 5	23 ± 4	8 ± 2	27 ± 4	19 ± 3	NR
D-44 Goose Lake Village	29 ± 5	23 ± 4	23 ± 3	53 ± 6	18 ± 3	NR

(a)Sample not available; power out at site.
NR=Not required

TABLE E-11

GROSS ALPHA IN AIR PARTICULATES

Collection Site	JULY (10^{-3} pCi/m^3)	AUGUST (10^{-3} pCi/m^3)	SEPTEMBER (10^{-3} pCi/m^3)	OCTOBER (10^{-3} pCi/m^3)	NOVEMBER (10^{-3} pCi/m^3)	DECEMBER (10^{-3} pCi/m^3)
Indicator Stations						
D-09 Bennitt	<5	<5	<5	<5	<5	NR
D-15 Clay Products	<5	<5	<5	<5	NR	NR
D-18 On-Site 3	<5	<5	<5	<5	<5	NR
D-45 Pheasant Trail	<5	<5	<5	<5	<5	NR
D-46 Collins Road	<5	<5	<5	<5	<5	NR
Background Stations						
D-03 Joliet	<5	<5	<5	<5	<5	NR
D-06 Morris	<5	<5	<5	<5	<5	NR
D-08 Coal City	<5	<5	<5	<5	<5	NR
D-14 Minooka	<5	<5	<5	<5	<5	NR
D-44 Goose Lake Village	<5	<5	<5	<5	<5	NR

NR = not required

TABLE F

ANALYSES OF FLUORIDE ABSORBENT STRIPS

Location		$\mu gF^-/dm^2/day$ Third Quarter	Fourth Quarter
D-02	Elwood	0.61±0.06	0.38±0.05
D-03	Joliet Brandon Road	1.2 ±0.5	1.10±0.36
D-04	Wilmington	0.51±0.05	0.23±0.02
D-06	Morris	0.41±0.04	0.27±0.03
D-07	Lisbon	0.45±0.19	0.20±0.02
D-08	Coal City	0.73±0.22	0.26±0.03
D-11	Channahon	0.55±0.06	0.30±0.03
D-16	On-Site 1	0.19±0.02	0.13±0.01
D-17	On-Site 2	0.43±0.04	0.11±0.01
D-18	On-Site 3	0.15±0.04	0.42±0.04
D-40	300 Meters E. of MFRP Plant	0.90±0.09	0.73±0.07
D-40	West of MFRP Plant at Site Boundary	2.0 ±0.3	0.90±0.09
D-40	On-Site	1.0 ±0.6	0.09±0.01

TABLE G

MISCELLANEOUS ANALYSES

D-42 RABBIT - GEMO AREA

Collection Date	Blood Tritium pCi/ml	Thyroid I-131 pCi/animal	Muscle Cs-137 pCi/gm	Bone Sr-90 pCi/gm
10/21/77	0.8 ± 0.7	16 ± 5	<0.1	0.3 ± 0.1

D-39 TRITIUM IN SOIL MOISTURE (Simulator Area)

Collection Date	Tritium Concentration pCi/ml soil moisture
09/03/77	0.7 ± 0.4

D-39 TRITIUM IN GRASS

Collection Date	pCi/ml (loose Water)
07/09/77	1.5 ± 0.4
08/06/77	5.1 ± 0.9
09/03/77	1.5 ± 0.5
10/02/77	1.4 ± 0.5

D-35 POND WEST OF MFRP

Collection Date	Tritium pCi/l
09/03/77	330 ± 120

D-33 GOOSE LAKE, CORP. OF ENGINEERS PUMPING STATION

Collection Date	pCi/l	
	Gross Beta	Tritium
07/23/77	<5	<200
10/02/77	8 ± 2	200 ± 100

TABLE H

GROSS ALPHA AND GROSS BETA IN
SURFACE WATER SAMPLES

Collection Site	Collection Date	Gross α (pCi/l)	Gross β (pCi/l)
Sanitary Lagoon (D-54)	07/09/77	<1.0	13 ± 2
	08/06/77	<1.0	13 ± 2
	09/03/77	<1.0	11 ± 2
	10/02/77	<5	11 ± 4
	11/05/77	<6	12 ± 4
	12/03/77	<2	10 ± 2
Evaporation Pond (D-55)	07/09/77	<0.7	8 ± 2
	08/06/77	2 ± 1	8 ± 2
	09/03/77	<1.0	6 ± 2
	10/02/77	<3	13 ± 4
	11/05/77	<5	10 ± 4
	12/03/77	3 ± 2	12 ± 2

TABLE I

GROSS BETA AND TRITIUM IN WELL WATER SAMPLES

Collection Site	Collection Date	pCi/l	
		Gross β	Tritium
D-38	09/03/77	19 ± 2	<200

Data reported as "<" are at the 99% confidence level. All other data are at the 95% confidence level, all based on counting errors.

TABLE J

NITRATES IN SURFACE WATER AND WELL WATER SAMPLES

Collection Site	Collection Date	Nitrates (as nitrogen) ppm
Goose Lake Corporation of Engineering (D-33)	07/23/77	4
	08/06/77	<1
	09/10/77	9
6" Law Well (D-56)	07/09/77	<1
	08/06/77	<1
	09/03/77	<1
	10/02/77	<1
G.E. Surface Water (D-57)	07/09/77	13
	08/06/77	18
	09/03/77	123
	10/02/77	42

TABLE K.

FLUORIDE IN VEGETATION SAMPLES

Collection Site	Collection Date	ug/g Annuals(1)	ug/g Perennials(2)	ug/g Evergreens
On-Site GE-MO (Area 1)	07/09/77	2 ± 1	2 ± 1	1 ± 1
	08/12/77	4 ± 1	3 ± 1	3 ± 1
	09/03/77	2 ± 1	2 ± 1	1 ± 1
	10/02/77	4 ± 1	1 ± 1	1 ± 1
Dresden Locks - Northwest (Area 2)	07/09/77	2 ± 1	2 ± 1	2 ± 1
	08/12/77	4 ± 1	3 ± 1	3 ± 1
	09/03/77	1 ± 1	2 ± 1	2 ± 1
	10/02/77	6 ± 1	1 ± 1	1 ± 1
West Boundary (Area 3)	07/09/77	3 ± 1	1 ± 1	3 ± 1
	08/12/77	3 ± 1	2 ± 1	2 ± 1
	09/03/77	1 ± 1	3 ± 1	1 ± 1
	10/02/77	5 ± 1	2 ± 1	1 ± 1
East Boundary (Area 4)	07/09/77	2 ± 1	1 ± 1	1 ± 1
	08/12/77	2 ± 1	2 ± 1	3 ± 1
	09/03/77	2 ± 1	12 ± 1	2 ± 1
	10/02/77	10 ± 1	1 ± 1	2 ± 1

(1) Grass
(2) Deciduous leaves

TABLE L

RADIONUCLIDE CONCENTRATIONS IN PRECIPITATION

July - December 1977

Collection Site	Collection Date	Gross Beta (pCi/l)	Gross Beta (pCi/m²)	H-3 as Water (pCi/l)
On-Site 2 (D-17)	July	200 ± 20	5300 ± 500	400 ± 120
	Aug.	26 ± 3	5300 ± 500	320 ± 50
	Sept.	68 ± 7	9000 ± 900	350 ± 100
	PRECIPITATION PROGRAM DISCONTINUED			
Davidson Farm (D-30)	July	130 ± 13	3400 ± 300	280 ± 100
	Aug.	19 ± 2	3900 ± 400	220 ± 50
	Sept.	47 ± 5	7500 ± 800	360 ± 100
	PRECIPITATION PROGRAM DISCONTINUED			
Brandon Lock (D-32)	July	230 ± 23	6100 ± 600	290 ± 100
	Aug.	16 ± 2	3400 ± 400	130 ± 50
	Sept.	37 ± 4	6000 ± 600	200 ± 100
	PRECIPITATION PROGRAM DISCONTINUED			
Mather Farm (D-53)	July	83 ± 8	2200 ± 200	180 ± 100
	Aug.	40 ± 4	4200 ± 400	130 ± 50
	Sept.	60 ± 6	7900 ± 800	220 ± 100
	PRECIPITATION PROGRAM DISCONTINUED			

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