
Evaluation of Nuclear Facility Decommissioning Projects

Summary Report
Enrico Fermi-1 Reactor

Prepared by R. L. Miller, B. W. Link

UNC Nuclear Industries

Prepared for
U.S. Nuclear Regulatory
Commission

NOTICE

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability of responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights.

Availability of Reference Materials Cited in NRC Publications

Most documents cited in NRC publications will be available from one of the following sources:

1. The NRC Public Document Room, 1717 H Street, N.W.
Washington, DC 20555
2. The NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission,
Washington, DC 20555
3. The National Technical Information Service, Springfield, VA 22161

Although the listing that follows represents the majority of documents cited in NRC publications, it is not intended to be exhaustive.

Referenced documents available for inspection and copying for a fee from the NRC Public Document Room include NRC correspondence and internal NRC memoranda; NRC Office of Inspection and Enforcement bulletins, circulars, information notices, inspection and investigation notices; Licensee Event Reports; vendor reports and correspondence; Commission papers; and applicant and licensee documents and correspondence.

The following documents in the NUREG series are available for purchase from the NRC/GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, and NRC booklets and brochures. Also available are Regulatory Guides, NRC regulations in the *Code of Federal Regulations*, and *Nuclear Regulatory Commission Issuances*.

Documents available from the National Technical Information Service include NUREG series reports and technical reports prepared by other federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal and periodical articles, and transactions. *Federal Register* notices, federal and state legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free upon written request to the Division of Technical Information and Document Control, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, and are available there for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

Evaluation of Nuclear Facility Decommissioning Projects

Summary Report
Enrico Fermi-1 Reactor

Manuscript Completed: December 1982
Date Published: February 1983

Prepared by
R. L. Miller, B. W. Link

UNC Nuclear Industries
Office of Surplus Facilities Management
Richland, WA 99352

Prepared for
Division of Engineering Technology
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
NRC FIN B7568

ABSTRACT

This report summarizes information concerning the decommissioning of the Enrico Fermi-1 reactor. Decommissioning data from available documents and other decommissioning records were input into a computerized data-handling system in a manner that permits specific information to be readily retrieved. The information is presented both in detail in its computer output form, and as a manually assembled summarization, generated for the purpose of highlighting the more important aspects of the decommissioning program.

CONTENTS

ABSTRACT

1.0	INTRODUCTION	1-1
1.1	Background Information	1-2
1.2	Acronyms & Definitions	1-3
2.0	FACILITY SUMMARY REPORT	2-1
2.1	Facility Description	2-1
2.2	Summary of Costs & Radioactive Waste	2-1
2.3	Comparison of Cost Items	2-1
2.3.1	Dollar Costs	2-2
2.3.2	Man-Rem Costs	2-2
3.0	DESCRIPTION OF COMPUTER REPORTS	3-1
3.1	General Information	3-1
3.2	Decommissioning Code Table Index	3-1
3.3	Significant Event Report	3-1
3.4	Radionuclide Inventory	3-2
3.5	Project Cost/Exposure Report	3-2
3.6	Dose Rate and Contamination Report	3-2
3.7	Project Labor Report	3-2
3.8	ALARA Report	3-2
3.9	Shipment Report	3-2
3.10	Disposal Costs	3-3
3.11	Surveillance Report	3-3

CONTENTS
(continued)

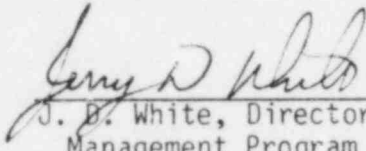
4.0	COMPUTER REPORTS	4-1
	General Information	4-3
	Decommissioning Code Table Index	4-6
	Significant Event	4-11
	Radionuclide Inventory	4-12
	Project Cost/Exposure	4-14
	Dose Rate and Contamination	4-16
	Project Labor	4-18
	ALARA	4-19
	Shipment	4-20
	Disposal Costs	4-21
	Surveillance	4-22

EVALUATION OF NUCLEAR FACILITY DECOMMISSIONING PROJECTS

PROJECT SUMMARY REPORT

ENRICO FERMI-1 REACTOR

Reviewed by DOE-RL:



J. B. White, Director, Surplus Facilities
Management Program Office

1/26/83
Date

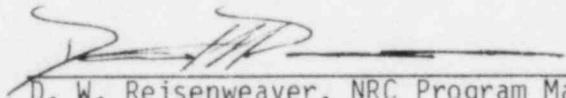
Approved by UNC:



T. E. Dabrowski, Director, Office of Surplus
Facilities Management

1/25/83
Date

Approved by NRC:



D. W. Reisenweaver, NRC Program Manager

2/7/83
Date

1.0 INTRODUCTION

This document presents, in summary form, information pertaining to the decommissioning of the Enrico Fermi-1 reactor. The purpose of this report is to provide the Nuclear Regulatory Commission (NRC) and its licensees with comparative data to assist in their assessment of decommissioning alternatives and ALARA methods for future decommissioning projects.

Data were assembled in a form that permitted input into a computerized data-handling system. The computer program* used produces a flexible data accumulation, manipulation, and retrieval system which provides decommissioning performance information such as:

- ALARA responsiveness
- Cost estimate accuracy
- Schedule adherence
- Project labor hours and costs
- Exposure accountability, and
- Radwaste generation and disposition

When sufficient decommissioning data have been obtained from an adequate number of facilities of any one type (BWR, PWR, Research), comparisons can be made between the experiences at the facilities and with NRC decommissioning NUREGs. The comparisons will be documented to facilitate the assessment of future nuclear facility decommissioning plans.

The more major portions of this decommissioning project were completed by the end of 1974. The amount and quality of retrievable documentation for the project fulfilled regulatory requirements in existence at the time. The lack of certain decommissioning information to be noted in subsequent sections tends to emphasize an existing need for improvement in such documentation of future projects.

*MAPPER is the computer software package selected for the program. MAPPER stands for Maintain, Prepare, and Produce Executive Reports. This system is used with DOE's UNIVAC system at Richland, Washington.

Reactor decommissioning studies completed and published are listed below:

<u>Facility</u>	<u>Decommissioning Mode</u>	<u>NUREG No.</u>
Elk River Reactor (BWR)	DECON	CR-2985
Enrico Fermi-1 (FBR)	SAFSTOR	CR-3116

These reports may be obtained from:

GPO Sales Program
Division of Technical Information and Document Control
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

1.1 BACKGROUND

In 1981 the NRC Staff initiated a multi-year program to document and evaluate the methods, radiation exposure and costs associated with the decommissioning of retired nuclear reactors. The program objective is to provide the NRC with data that will assist in the assessment of future decommissioning plans to assure implementation of NRC's ALARA policy.

The program was originated under the auspices of the Office of Nuclear Regulatory Research through its Chemical Engineering Branch. UNC Nuclear Industries (UNC) is responsible for the technical direction of the program and for preparation of documentation and summary comparisons of evaluated projects. See NUREG/CR-2522 "Evaluation of Nuclear Facility Decommissioning Projects" for a complete description of the Program Plan.

Licensees currently decommissioning reactor facilities or licensees who are planning such projects have been, or will be solicited for possible inclusion in the program. After collection of sufficient data, analyses

of each project will be completed. Then comparisons will be made between the actual methods, costs and exposure used by licensees and with data contained in reference decommissioning studies.

1.2 ACRONYMS - ABBREVIATIONS - DEFINITIONS

Definitions of Decommissioning Alternatives

DECON - to immediately remove all radioactive material to permit unrestricted release of the property.

SAFSTOR - to fix and maintain property so that risk to safety is acceptable for period of storage followed by decontamination and/or decay to an unrestricted level.

ENTOMB - to encase and maintain property in a strong and structurally long-lived material (e.g., concrete) to assure retention until radioactivity decays to an unrestricted level.

Acronyms - Abbreviations

A/C	Activated or Contaminated
AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
BEATT	Beatty, Nevada (Waste Disposal Site)
BIO	Biological
BWR	Boiling Water Reactor
CANOG	Canoga Park, California (Sodium Reactor Experiment)
CI	Curie
CS	Carbon Steel
CU FT	Cubic Feet
DDS	Decommissioning Data System
DEC	Detroit Edison Company
DNA	Data Not Available
DOE	Department of Energy
DOS RED FCT	Dose Reduction Factor
DPM	Disintegrations per Minute
EF-1	Enrico Fermi-1 reactor
FBR	Fast Breeder Reactor
HTGR	High Temperature Gas-Cooled Reactor
HX	Heat Exchanger
ICPP	Idaho Chemical Processing Plant
INEL	Idaho National Engineering Laboratory
LMFBR	Liquid Metal Fast Breeder Reactor
MAPPER	<u>M</u> aintain, <u>P</u> repare, and <u>P</u> roduce <u>E</u> xecutive <u>R</u> eports
MORHD	Moorhead, Kentucky (waste disposal site)
MW	Megawatt

MWD	Megawatt Days
MWDE	Megawatt Days Electric
MWDT	Megawatt Days Thermal
MWE	Megawatt Electrical
MWT	Megawatt Thermal
NRC	U.S. Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NECO	Nuclear Engineering Company (presently U.S. Ecology)
PRDC	Power Reactor Development Company
PSIG	Pounds/Square Inch Gauge
PWR	Pressurized Water Reactor
RCPA	Rural Cooperative Power Association
RICH	Richland
RR	Railroad
SCHED	Scheduled
SHEFF	Sheffield
SPEC NO	Specification Number
SS	Stainless Steel
SYS/COMP	System Component
TRIP LEN	Trip Length
TYP	Type
UNC	UNC Nuclear Industries, Operations Division
UPA	United Power Association
W.O.	Work Order

2.0 FACILITY SUMMARY REPORT

This report is a summarized duplication of information found in the computer printout in Section 4.0. The intent of this summary is to show, at a glance, the data necessary to familiarize the reader with the reactor facility.

2.1 FACILITY DESCRIPTION

Name: Enrico Fermi-1 Location: Monroe, Michigan
Owner: PRDC (presently DEC) Decommissioning Mode: SAFSTOR
Reactor Type: FBR
Startup Date: 1963
Shutdown Date: 1972
Power Rating: Electrical 140
(MW) Thermal 430
Lifetime Power: Electrical DNA
(MWD) Thermal 5,941
Reason for Decommissioning: Inadequate funding for continuation of experimental program.

2.2 SUMMARY OF COSTS AND RADIOACTIVE WASTE

Total Decommissioning Costs: (1974\$) 7,164,988*
Personnel Exposure: (Man-rem) 28.04
Radioactive Waste-Volume: (Cubic Feet) Data incomplete
Radioactive Waste-Activity: (Curie) 5,000 (est.)

2.3 COMPARISON OF COST ITEMS

The statistical significance of the following comparative information is not fully developed at the present time. Comparative numbers should be meaningful when additional decommissionings have been accomplished.

*See page 4-1 for inflation rate table to adjust costs to year of interest

2.3.1 Dollar Costs

The following listed items are compared to the total dollar cost for the decommissioning project.

Total Decommissioning Cost: \$7,164,988 (1974 Dollars)*

<u>Item</u>	<u>Unit of Measurement</u>	<u>No. of Units</u>	<u>No. of Dollars Spent per Unit</u>
Radioactivity	Ci	5,000 (est.)	\$1433 per Ci
Radioactive Waste	Cu Ft	DNA	DNA
Lifetime Power Output	MWD	5,941	\$1206 per MWD
Lifetime Electr. Output	MWD	DNA	DNA
Spending Rate	Months	36	\$199,027 per Mo.

2.3.2 Man-rem Costs

The following listed items are compared to the amount of radiation exposure taken by decommissioning personnel.

Total man-rem used: 28.04

<u>Item</u>	<u>Unit of Measurement</u>	<u>No. of Units</u>	<u>No. of Units per Man-rem</u>
Radioactivity	Ci	5,000 (est.)	178.3 Ci per man-rem
Radioactive Waste	Cu Ft	DNA	DNA
Decommissioning Cost	Dollar (1974)	7,164,988	\$255,527 per man-rem

*See page 4-1 for inflation rate table to adjust costs to year of interest.

3.0 DESCRIPTION OF REPORTS

The reports described below are the basic reports used in the DDS program. The descriptions, as presented, are intentionally idealized. It should be understood that all functional facets of the reports will not always be utilized, simply because the documentation of decommissioning information will vary from project to project. In addition to the basic reports, MAPPER provides the ability to produce supplementary reports by manipulating the data available in the basic reports.

3.1 General Information

This report is a free format input report designed to accommodate descriptive data of any kind. Entries may be given any title and related to any facility system by a system component number. Data are entered in any format on any subject. The report should be used to record information that does not fit into any of the report types organized by column. This includes facility location, description, owners, operators, builders. Summary data may also be included where it is not readily derivable from other reports or for convenient reference.

3.2 Decommissioning Code Table Index

The code table contains a list of unit items, including facility buildings, systems and system components, and budgetary items, with a corresponding identification number for each unit. The identification system is used throughout DDS to relate data to specifically identified units.

This basic report type may be expanded to include tables or indices of other kinds related to facility decommissioning. Candidate tables are labor category wage rates, shipping company rates, shipping company name codes, disposal site name codes and rates, or archived file tape names.

One of the basic values of this report is the fact that, by utilizing an index which can ultimately be made common to all reactor facilities included in the program, the report can become the intercomparison base for the DDS. The full utilization of this base will not be possible until a certain minimum number of facilities as yet unspecified, are included in the DDS.

3.3 Significant Event Report

This report is used to record the facility's operating history, which in some cases could impact facility decommissioning. It contains dates, system/component numbers, and event descriptions. Noteworthy events such as construction completion, startup, shutdowns, significant incidents, and accidents are recorded in this report.

3.4 Radionuclide Inventory

An inventory of radionuclides present in each facility system will be made prior to the start of decommissioning. The amount of each radionuclide or its concentration, the measurement date, and a description of each system's material composition will be recorded. It will be noted whether a radionuclide present in a system is the result of neutron activation or contamination.

3.5 Project Cost/Exposure Report

Costs, schedules, man-hours, man-rem, both estimated and actual, are listed for each activity specification number. These costs may be broken out on lines having a subactivity specification number. This report is the main repository of cost and exposure information for a decommissioning project.

3.6 Dose Rate and Contamination Report

Dose rates at locations throughout each facility are recorded prior to decommissioning. Locations relative to a reference map, elevation, system/component number, and type of measurement are recorded for each measurement. Both upper and lower limits of dose rates or contamination levels (in disintegrations per minute) are listed.

3.7 Project Labor Report

Decommissioning labor costs, exposure, and man-weeks for each activity specification are recorded at a to-be-determined frequency. This supplements the project cost/exposure report by providing data on how costs and exposures accumulate over the course of a decommissioning project.

3.8 ALARA Report

The ALARA report contains records of ALARA efforts by activity specification number. The affected facility system, date, cost items, exposure information, and a description of the ALARA effort are listed. This report can be used to calculate by activity specification number or for all activities the total estimated man-rem saved as well as total cost incurred through the implementation of the ALARA effort.

3.9 Shipment Report

Volumes, weights, and other physical data are recorded by waste type for material produced by each activity specification. These data are listed for each shipment of material from the decommissioning site. Trip lengths and vehicle dose rates are recorded in order to calculate public exposure.

3.10 Disposal Costs

The costs associated with each waste disposal shipment are recorded in the Disposal Costs Report. Costs are divided into transportation, burial, and container categories. Costs for each container type on the shipment are also listed.

3.11 Surveillance Report

The surveillance report is used to record annual costs and exposures associated with long term surveillance of a decommissioned facility. Under normal conditions a surveillance report would not be required for a facility decommissioned under Mode DECON.

4.0 COMPUTER REPORTS

Dollar values listed are in 1974 dollars. For adjusting costs listed in the computer reports to year of interest, use the inflation rate table below.

Normalized Cost Escalation Table

Annual Inflation Rate *	Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
0.029	1966													
0.029	1967													
0.042	1968													
0.054	1969													
0.059	1970	1.000												
0.043	1971	1.043	1.000											
0.033	1972	1.076	1.033	1.000										
0.062	1973	1.138	1.095	1.062	1.000									
0.110	1974	1.248	1.295	1.172	1.110	1.000								
0.091	1975	1.339	1.296	1.263	1.201	1.091	1.000							
0.058	1976	1.397	1.354	1.321	1.259	1.149	1.058	1.000						
0.065	1977	1.462	1.419	1.386	1.324	1.214	1.123	1.065	1.000					
0.077	1978	1.539	1.496	1.463	1.401	1.291	1.200	1.142	1.077	1.000				
0.113	1979	1.652	1.609	1.576	1.514	1.404	1.313	1.255	1.190	1.113	1.000			
0.135	1980	1.787	1.744	1.711	1.649	1.539	1.448	1.390	1.325	1.248	1.135	1.000		
0.089	1981	1.876	1.833	1.800	1.738	1.628	1.537	1.479	1.414	1.337	1.224	1.089	1.000	
0.060**	1982	1.936	1.893	1.860	1.798	1.688	1.597	1.539	1.474	1.397	1.284	1.149	1.060	1.000

Example: A cost paid in 1971 dollars would increase to a cost of 1.893 times the original, if paid in 1982 dollars.

*Source: Statistical abstract of the United States, 1981 Consumer Price Index.

**1982 data are interim estimated.

In planning for large decommissioning projects which cover long time spans or are scheduled to start at some time in the future, cost estimates should consider the "worth" of current money and then adjust cost estimates to reflect this consideration. This exercise, referred to as a "time value cost analysis", considers the year of expenditure, interim surveillance and maintenance costs, major non-routine maintenance costs, and inflation rates. "Worth" of current money is usually based upon an average yield on stable, non-speculative investments such as long and short-term treasury bills. A "time value cost analysis" results in a percentage value, referred to as the discount rate, which is used to discount the cost of a future project to the current "worth" of money. This discount rate includes consideration of financial uncertainties, such as project cost overruns, recovery costs for major accidents, etc.

Example - A discount rate of two percent yields the following table:

<u>Year</u>	<u>Discount Factor</u>	<u>Year</u>	<u>Discount Factor</u>
1	0.9804	6	0.8880
2	0.9612	7	0.8706
3	0.9423	8	0.8513
4	0.9238	9	0.8535
5	0.9057	10	0.8204

If project is estimated to cost \$10,000 during a time period six years from today, the amount of money presently required to be invested is (\$10,000) (0.8880) or \$8,800.

Detailed discussions and suggested assumptions may be found in the following references:

1. Methodology for Establishing Decommissioning Priorities
U.S. Department of Energy, Richland Operations Office, RLO/SFM-82-7, June, 1982.
2. The Rate of Discount for Evaluating Public Projects
Mikesell, R. F., 1977

American Enterprise Institute for Public Policy Research,
Washington, D.C.
3. Navigating through the Interest Rate Morass: Some Basic Principles
Santoni, G. J., and C. C. Stone 1981
Federal Reserve Bank of St. Louis Review, March, 1981

EF-1SFSTOR UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1104

SYSTEM/COMPONENT .SYS/COMP. ENTRY TITLE

DESCRIPTION . NUMBER . OPERATING HISTORY

NAME: ENRICO FERMI-4 STARTUP DATE: AUGUST 1963
LOCATION: MONROE, MI - 30MI SW SHUTDOWN DATE: OCTOBER 72
DETROIT
OWNER: POWER REACTOR DEVELOPMENT MEGAWATT DAYS: 5941 THERMAL
ASSOCIATION (PRDC)
OPERATOR: PRDC MAJOR SHUTDOWNS: DEC. 1968-JULY 1978
ARCHITECT/ENGINEER: PRDC DECOMMISSIONING MODE: SAFSTOR
BUILDER: PRDC DECOMMISSIONING PERIOD: NOV 72-OCT 75
N555: PRDC

REFERENCES

- 1. REPORTS: 1. ENRICO FERMI ATOMIC POWER PLANT, AP04-124, JAN 1959
- 2. ENRICO FERMI ATOMIC POWER PLANT, TECH-INFO-RATION AND HAZARD SUMMARY
- 3. REPORT, VOL. 5 1,2,3.
- 4. SUPP. NO. 1 OF ABOVE

PAPERS: NONE

DECOMMISSIONING INFORMATION

PERSONNEL RADIATION EXPOSURE

- NUMBER OF PERSONNEL MONITORED: DNA
- AVERAGE DOSE MANREM: DNA
- TOTAL MANREM USED: 28,040 (3 YEARS)
- DOSE TO PUBLIC-MANREM: DNA

COST SUMMARY (COST BREAKDOWN INFORMATION INCOMPLETE)

TOTAL DECOMMISSIONING COST: \$7,465E6 (QUOTED IN FINAL REPORT)

MANPOWER COSTS DNA

PREDECOMMISSIONING ENGINEERING: DNA
MANAGEMENT: DNA
QA: DNA

SECURITY: DNA
HEALTH & SAFETY: DNA
DECOMMISSIONING WORKERS: DNA
SUBCONTRACTS: DNA

LABOR RATES (\$/HR) 18.05-DECOMMISSIONING WORKERS, 12.00-ENGINEERING,
REPAIRS-DNA

DECOMMISSIONING OPERATIONS CONTRACTOR-DNA
MANAGERS: DNA
PROJECT ENGINEER: DNA

.EF-1SFSTOR UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1184
* .SYS/COMP.

* SYSTEM/COMPONENT . NUMBER . ENTRY TITLE
----------*

. SUPERVISORS: DNA
. CLERICAL: DNA
. REACTOR OPERATIONS: DNA
. DECON TECH: DNA
. GUARDS: DNA
. HF TECH: DNA
. ELECTRICIANS: DNA
. LABORERS: DNA
. JANITORS: DNA

. SUBCONTRACTORS DNA
. MANAGERS: DNA
. FOREMAN: DNA
. HEAVY EQUIP. OPERATOR: DNA
. LABORERS: DNA

. WASTE DISPOSAL COSTS DNA WASTE DISPOSAL RATES DNA
. BURIAL CHARGES: DNA BURIAL COSTS PER CU FT: DNA
. TRANSPORT CHARGES: DNA CASK RENTAL RATES: DNA
. CONTAINER COSTS: DNA TRANSPORTATION RATE: DNA
. SURCHARGES: DNA

. OTHER COSTS (\$ YEAR) DNA
. UTILITIES: DNA
. MISC. SUPPLIES: DNA
. NUCLEAR INS.: DNA
. LICENSE FEES: DNA
. FINAL SITE SURVEY: DNA
. TAXES: DNA
. REAL ESTATE SALE VALUE: DNA

.WASTE DISPOSAL DATA (INCOMPLETE)

. NUMBER OF SHIPMENTS: 15(EXCLUDING BLANKET SUBASSEMBLY SHIPMENTS)
. TOTAL VOLUME-RADWASTE: (CU FT) DNA
. TOTAL VOLUME-CLEAN: (CU FT) DNA
. TOTAL MASS -RADWASTE: (POUNDS) DNA
. TOTAL MASS -CLEAN: (POUNDS) DNA
. NUMBER OF CONTAINERS: DNA
. TOTAL RADWASTE INVENTORY: (CI) 5000

.FINAL SITE SURVEY SUMMARY DNA

. BASIS FOR CRITERIA: DNA
. CRITERIA SUMMARY: DNA
. INSTRUMENTS USED: DNA
. SURVEY RESULT SUMMARY: DNA

.EF-1SFSTOR UNC DECOMMISSIONING DATA SYSTEM GENERAL INFORMATION REPORT 72C1184

* .SYS/COMP.

* SYSTEM/COMPONENT . NUMBER . ENTRY TITLE

. TOTAL COST OF DECOMMISSIONING(\$7,164,988)
 .----- = COST/UNIT
 .COMPARISON ITEMS
 .*****
 . NO. OF UNITS COMPARISON ITEMS \$

ITEMS	NO. OF UNITS	COMPARISON COSTS
. CURIE 5000	1433	DOLLARS/CURIE
. RAD WASTE (CU FT) DNA	DNA	DOLLARS/CU FT
. SPENDING RATE (MONTHS) 36	199.027	DOLLARS/MONTH
. POWER RATING MEGAWATT 140	51.478	DOLLARS/MWE
* ELECTRICAL (MWE)		
. LIFETIME MEGAWATT DAYS 5941	1206	DOLLARS/MWDT
* THERMAL (MWDT)		
. MANREM 28.04	255.527	DOLLARS/MANREM

. NO OF UNITS COMPARISON ITEM
 .----- = UNITS\MANREM
 . TOTAL MANREM USED (28.04)

ITEM	NO OF UNITS	COMPARISON
. CURIES	DNA	CI\MANREM
. RAD WASTE (CU FT)	DNA	CU FT\MANREM
. TOTAL COST (\$)	7,164,988	255527
. LIFETIME MEGAWATT DAYS		DOLLARS\MANREM
* THERMAL (MWDT)	5941	211.9
. POWER RATING (MWE)	200	7.13
		MWDT\MANREM
		MWE\MANREM

.ASSUMPTIONS
 .*****

. COSTS ARE LISTED IN 1974 DOLLARS.

-EF-15F5TOR U-N-C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 728-1162

```

* FACILITY - SYS/CAMP.
* SYSTEM/COMPONENT - NUMBER *
*****
* REACTOR CONTAINMENT 01
* BUILDING
*
* MACHINERY COME 01.01
* PRIMARY SHIELD TANK 01.02
* GRAPHITE SHIELDING 01.02.01
* STAINLESS STEEL 01.02.02
* SHIELDING 01.02.03
* STEEL SHOT SHIELDING 01.02.03
* REACTOR VESSEL 01.03
* ROTATING PLUG 01.03.01
* UPPER DRIVE MECH'S 01.03.02
* (4)
* COREBLANKET SWEEP 01.03.03
* MECH
* HOLD-DOWN ASSEMBLY 01.03.04
* COREBLANKET SUPRTS 01.03.05
* OFFSET HANDLING 01.03.06
* MECHANISM
* TRANSFER ROTOR 01.04
* CONTROL ROD DRIVE 01.05
* TECH.
* MELT-DOWN PAN 01.06
* IHX (3) 01.07
* PRIMARY PUMPS (3) 01.08
* THROTTLE VALVES (3) 01.09
* PRIM. NA OVERFLOW 01.10
* TANK:
* OVERFLOW PUMPS 01.11
* CASE CAR 01.12
* OVERHEAD CRANES 01.13
* AIR CONDITIONING 01.14
* EQUIP
* BIOLOGICAL SHIELD 01.15
* WALL
*****
* FUEL AND REPAIR BLDG. 02
*
* FUEL TRANSFER TANK 02.01
* FUEL TRANSFER ROTOR 02.01.01
* TRANSFER ROTOR SHAFT 02.01.02
* & DRIVE
* CLEANING CHAMBER 02.02
* CLEANING MACHINE 02.02.01
* DRIVE
* DECAY POOL 02.03
* CUT UP POOL 02.04
* FUEL CUT UP MACHINE 02.04.01
* MAINTENANCE ROOM 02.05
* TRANSFER TANK SODIUM 02.06
* CLEANUP

```

EF-15FSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 7281482

FACILITY	SYS/CMP.	NUMBER
BRIDGE CRANE		02.07
CONTROL ROOM		02.08
LIQUID WASTE DISPOS.		02.09
SYSTEM		
DUMP TANK		02.09.01
METERING PUMP SUPP.		02.09.02
TANK		
LIQUID WASTE TEST		02.09.03
TANK		
LIQUID WASTE SURGE		02.09.04
TANK (3)		
METERING PUMP		02.09.05
ION EXCHANGE UNIT		02.09.06
WASTE GAS DISPOSAL		02.10
SYSTEM		
WASTE GAS STORAGE		02.10.01
TANK (2)		
REPAIR PIT		02.11
MECHANICAL EQUIP RM		02.12
FUEL VAULT (2)		02.14
POOL SUMP (1)		02.15
HOT SUMP PIT (2)		02.16
CLEAN SHOP		02.17
COLD TRAP ROOM		02.18
WASTE TANK ROOM		02.19
WASTE TANK		02.19.01
SODIUM SERVICE BLDG		03
COLD TRAP ROOM		03.01
VALVE ROOM		03.02
STORAGE ROOM		03.03
STORAGE TANKS		03.03.01
SODIUM GALLERY EAST		03.04.01
SODIUM GALLERY WEST		03.04.02
INERT GAS TUNNEL		03.05
VENT BLDG		04
VENT BLDG. EQUIP PIT		04.01
HEALTH PHYSICS BLDG		05
OFFICE & LAB		05.01
LOCKER ROOM		05.02
FIRST AID ROOMS		05.03
CHEM LABS		05.04

REF-1SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 7281182

```

* FACILITY -SYS/COMP -
* SYSTEM/COMPONENT - NUMBER -
*****
FISSION PROD DETECTOR 88.
*BLDG.
*****
VENT BLDG.      87.
*****
CORE-STEAM CLEAN
*(AFSF)
+
*LABOR 788-1
*OUTSIDE SERVICES & 195.4574
*MATERIAL
*****
CORE STEAM CLEAN
*(REACTOR)
+
*LABOR 788-2
*OUTSIDE SERVICES & 195.4572
*MATERIAL
*****
CORE-CUT UP
+
*LABOR 788-3
*OUTSIDE SERVICES & 195.4573
*MATERIAL
*****
MAINT. EQUIPMENT
+
*LABOR 788-5
*OUTSIDE SERVICES & 195.4575
*MATERIAL
*****
CASK 1
+
*LABOR 788-6
*OUTSIDE SERVICES & 195.4576
*MATERIAL
*****
CASK 2
+
*LABOR 788-7
*OUTSIDE SERVICES & 195.4577
*MATERIAL
*****
BATTELLE-PREP. & SHIP

```


EF-15FSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 7281582

```
* FACILITY *
* SYSTEM/COMPONENT * NUMBER *
*****
* LABOR 788-8
* OUTSIDE SERVICES & 195.1578
* MATERIAL
*****
SHIPPING TO SAVANNAH
* RIVER
* LABOR 788-9
* OUTSIDE SERVICES & 195.1579
* MATERIAL
*****
REC-REPROD. &
* CONVERSION
* LABOR 788-10
* OUTSIDE SERVICES & 195.1578
* MATERIAL
*****
* REMOVE RADIAL BLANKETS FROM REACTOR. STEAM CLEAN AND STORE IN POOL. LOAD
* IN SHIPPING CASK AND TRAFFER TO TRUCK FOR SHIPPING. INCLUDES CASK, LOAD
* SHIPPING AND BURIAL COSTS.
* LABOR 718-1
* OUTSIDE SERVICES & 195.1564
* MATERIAL
*****
* LOAD AXIAL BLANKETS IN SHIPPING CASK FROM CUT-UP POOL. TRAFFER TO TRUCK
* FOR SHIPPING. INCLUDES CASK, SHIPPING AND BURIAL COSTS.
* LABOR 718-2
* OUTSIDE SERVICES & 195.1562
* MATERIAL
*****
* MAINTENANCE OF EQUIPMENT-BLANKET FUEL HANDLING
* LABOR 718-3
* OUTSIDE SERVICES & 195.1563
* MATERIAL
*****
* REMOVE ALL SODIUM FROM PRIMARY & SECONDARY SYSTEMS, AND PREPARE FOR
* SHIPMENT TO BURIAL SITE. INCLUDES BARRELS SHIPPING, BURIAL COSTS AND
* COST OF LOADING FACILITY
* LABOR 728-1
* OUTSIDE SERVICES & 195.1581
```

.EF-1SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DECOMM CODE TABLE/INDEX 7281402

* FACILITY .SYS/COMP.
 * SYSTEM/COMPONENT . NUMBER .
 *MATERIAL
 *+++++

.DISMANTLE COLD TRAP AND RELATED EQUIPMENT INCLUDES CASK, SHIPPING AND
 *BURIAL COSTS.
 + +

LABOR 720-2
 OUTSIDE SERVICES & 195.1582
 *MATERIAL
 *+++++

.REMOVE PRIMARY SODIUM SERVICE PIPES AND EQUIPMENT, SEAL PRIMARY SYSTEM
 *GAS AND SODIUM LINES TO CONTAIN PRIMARY SYSTEM WITHIN THE REACTOR BLDG.
 *SEAL REACTOR VESSEL AND PRIMARY SHIELD TANK.
 + +

LABOR 730-1
 MATERIAL 195.1591
 *+++++

.DECONTAMINATE PIPING AND OTHER EQUIPMENT REMOVED FROM REACTOR BLDG.
 *INCLUDES FARB POOLS AND OTHER MISCELLANEOUS.
 + +

LABOR 730-2
 MATERIAL 195.1592
 *+++++

.ACCUMULATE CONTAMINATED SOLID WASTE MATERIALS FOR BURIAL. INCLUDES
 *CASK, SHIPPING, AND BURIAL COSTS.
 + +

LABOR 730-3
 MATERIAL 195.1593
 *+++++

.INSTALL SURVEILLANCE EQUIPMENT AND SECURE BUILDINGS AND SERVICE SYSTEMS
 + +

LABOR 730-4
 MATERIAL 195.1594
 *+++++

.MISCELLANEOUS DECOMMISSIONING EXPENSES
 + +

LABOR 730-5
 MATERIAL 195.1595

.EF-1SFSTOR UNC DECOMMISSIONING DATA SYSTEM - SIGNIFICANT EVENT REPORT 72D4406

*EVENT .SYS/COMP.

* DATE .NUMBER . SIGNIFICANT EVENT DESCRIPTION

500000	FORMATION OF DOW-DETROIT STUDY GROUP
.550330	SUBMITTAL OF PROPOSAL TO USAEC UNDER ROUND ONE OF POWER
*	REACTOR DEMONSTRATION PROGRAM
.550808	PROPOSAL TO THE AEC ACCEPTED DURING FIRST GENEVA CONFERENCE
.560808	GROUND BREAKING
.601201	SODIUM FILL OF PRIMARY SYSTEM
.610509	1000 F ISOTHERMAL NON-NUCLEAR TEST
.621011	LOW-POWER OPERATING LICENSE ISSUED
.630823	FIRST CRITICALITY AND START OF LOW POWER TESTS
.630823	1.46E6 KWH AT 22 MWE DISTRIBUTED THROUGH DETROIT EDISON'S
*	POWER GRID
.651217	HIGH-POWER OPERATING LICENSE ISSUED
.651229	START OF HIGH-POWER TESTING
.660708	FIRST 100 MWE OPERATION
.661005	PARTIAL SUBASSEMBLY MELTDOWN
.700718	RESUMPTION OF OPERATION FOLLOWING REPAIRS
.701016	COMPLETION OF NUCLEAR AND PLANT TEST PROGRAM AT INCREASED
*	POWER OF 200 MW
.711201	FINISHED 10-DAY HIGH-POWER OPERATION LOGGING 1660 MWD
.720922	LAST PLANT OPERATION AT LOW POWER FOR OPERATOR
*	LICENSING EXAMINATIONS
.721127	DECISION TO DECOMMISSION THE PLANT
.751231	DECOMMISSIONING COMPLETED

FE - REACTOR U.N.C. DECOMMISSIONING DATA SYSTEM - RADIOISOTOPIC INVESTIGAT H4116

SYSCOMP	SURFPT	SOURCE MATERIAL DESCRIPTION	C. DATE	NAME	AMOUNT	CONCENT	DM#	DNA
01-05		INTELSAFETY ROD CHANNELS (SS)	A 730601	AT 63	2			DNA
01-05		INTELSAFETY ROD CHANNELS (SS)	A 730601	FE 55	92			
01-05		SAFETY ROD CHANNELS (SS)	A 730601	CH 58	23			
01-05		SAFETY ROD CHANNELS (SS)	A 730601	CO 68	19			
01-05		MECHANISM (SS)	A 730601	AT 63	8			
01-05		MECHANISM (SS)	A 730601	FE 55	294			
01-05		MECHANISM (SS)	A 730601	CH 58	4			
01-05		MECHANISM (SS)	A 730601	CO 68	238			
01-05		MECHANISM (SS)	A 730601	AT 63	22			
01-05		MECHANISM (SS)	A 730601	FE 55	794			
01-05		MECHANISM (SS)	A 730601	CH 58	42			
01-05		MECHANISM (SS)	A 730601	CO 68	181			
01-05		MECHANISM (SS)	A 730601	AT 63	27			
01-05		MECHANISM (SS)	A 730601	FE 55	798			
01-05		MECHANISM (SS)	A 730601	CH 58	1			
01-05		MECHANISM (SS)	A 730601	CO 68	97			
01-05		MECHANISM (SS)	A 730601	AT 63	258			
01-05		MECHANISM (SS)	A 730601	FE 55	22			
01-05		MECHANISM (SS)	A 730601	CH 58	502			
01-05		MECHANISM (SS)	A 730601	CO 68	1			
01-05		MECHANISM (SS)	A 730601	AT 63	29			
01-05		MECHANISM (SS)	A 730601	FE 55	3			
01-05		MECHANISM (SS)	A 730601	CH 58	204			
01-05		MECHANISM (SS)	A 730601	CO 68	3			
01-05		MECHANISM (SS)	A 730601	AT 63	2			
01-05		MECHANISM (SS)	A 730601	FE 55	2			
01-05		MECHANISM (SS)	A 730601	CH 58	304			
01-05		MECHANISM (SS)	A 730601	CO 68	283			
01-05		MECHANISM (SS)	A 730601	AT 63	7			
01-05		MECHANISM (SS)	A 730601	FE 55	209			
01-05		MECHANISM (SS)	A 730601	CH 58	594			
01-05		MECHANISM (SS)	A 730601	CO 68	35			
01-05		MECHANISM (SS)	A 730601	AT 63	204			
01-05		MECHANISM (SS)	A 730601	FE 55	18			
01-05		MECHANISM (SS)	A 730601	CH 58	304			
01-05		MECHANISM (SS)	A 730601	CO 68	2			
01-05		MECHANISM (SS)	A 730601	AT 63	204			
01-05		MECHANISM (SS)	A 730601	FE 55	1			
01-05		MECHANISM (SS)	A 730601	CH 58	204			
01-05		MECHANISM (SS)	A 730601	CO 68	1			
01-05		MECHANISM (SS)	A 730601	AT 63	4			
01-05		MECHANISM (SS)	A 730601	FE 55	452			
01-05		MECHANISM (SS)	A 730601	CH 58	204			

```

FE-1SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - RADIONUCLIDE INVENTORY - H1112
A. RESSUR. (-----) RADIONUCLIDE (-----)
SYS/COMP .
NUMBER . SOURCE MATERIAL DESCRIPTION . C. DATE . NAME . CT . CONCENT. (PPM) .
-----
01.03 LOWER REACTOR HEAD SHIELDING (SS) A 730601 CO 60 4
01.04 TRANSFER ROTOR (SS) A 730601 NI 63 DNA
01.04 TRANSFER ROTOR (SS) A 730601 FE 55 1
01.04 TRANSFER ROTOR (SS) A 7306 1 CO 58 DNA
01.04 TRANSFER ROTOR (SS) A 7303 CO 60 1
01.03.06 OFFSET HANDLING MECHANISM (SS) A 7306 NI 63 1
01.03.06 OFFSET HANDLING MECHANISM (SS) A 7306 FE 55 44
01.03.06 OFFSET HANDLING MECHANISM (SS) A 730601 CO 58 DNA
01.03.06 OFFSET HANDLING MECHANISM (SS) A 730601 CO 60 6
01.03 REACTOR VESSEL A 730601 NI 63 DNA
01.03 REACTOR VESSEL A 730601 FE 55 DNA
01.03 REACTOR VESSEL A 730601 CO 58 DNA
01.03 REACTOR VESSEL A 730601 CO 58 DNA
COMMENT-ALL PREVIOUS INFORMATION CALCULATED FROM PRE-DECOMMISSIONING EFFORT
RADIOACTIVE WATER FILTERED TO RELEASE 9.99 3.4E-4
AND DISCHARGED (APPROX. 560 CUBIC METERS)

```

EF-4SFSTOR UNC DECOMMISSIONING DATA SYSTEM - PROJECT COST/EXPOSURE 7484422

*ACTIVITY	COST ITEM/ACTIVITY	SYS/COMP. NUMBER	A.START DATE	COMPL DATE	MAN HOURS	ESTIM. COST \$	ESTIM. MAN	ACTUAL START DATE	ACTUAL COMPL DATE	ACTUAL HOURS	ACTUAL COST \$	ACTUAL MAN
-----------	--------------------	------------------	--------------	------------	-----------	----------------	------------	-------------------	-------------------	--------------	----------------	------------

COMMENT- INFORMATION CONTAINED IN THIS REPORT IS NOT SUFFICIENT FOR USE IN OBTAINING DECOMMISSIONING TOTALS.

COMMENT- ALL BLANKS IN THIS REPORT ARE TO BE CONSIDERED AS DNA (DATA NOT AVAILABLE).

COMMENT- MANHOURS ESTIMATED FROM DOCUMENTED COST INFORMATION, USING \$40.05 HOURLY RATE QUOTED FOR 1973.

4954571	CORE STEAM CLEAN (AFSF)										4874	
* 4954572	CORE-STEAM CLEAN (REACTOR)										4350	
4954573	CORE-CUT UP										35698	
4954575	EQUIP. MAINT.										4953	
4954576	CASK NO. 1										84882	
4954577	CASK NO. 2										74198	
4954578	BATTELLE (PREP. & SHIP)										48531	
* 4954579	SHIP (SAVANNAH R)										31335	
4954570	AEC REPROCESSING & CONVERSION										4783770	
700-1	CORE-STEAM CLEAN (AFSF)					3447					34339	
* 700-2	CORE-STEAM CLEAN (REACTOR)					4931					49554	
* 700-3	CORE-CUT UP					5307					53334	
700-5	EQUIP. MAINT.					2974					58892	
700-6	CASK NO. 1					DNA					DNA	
700-7	CASK NO. 2					DNA					DNA	
700-8	BATTELLE (PREP & SHIP)					DNA					DNA	
* 700-9	SHIP (SAVANNAH R)					DNA					DNA	
700-10	AEC REPRODUCE & CONVERSION					DNA					DNA	
4954581	SODIUM REMOVAL										86287	
4954582	COLD TRAP										58791	
720-1	SODIUM REMOVAL					2699					26994	
720-2	COLD TRAP					242					2428	
4954591	GENERAL PIPING & EQUIP										DNA	
* 4954592	DECON. EQUIP										DNA	
4954593	SOLID WASTE										DNA	
4954594	SURVEILL. EQUIP										DNA	
4954595	MISCELL.										DNA	

4-14

.EF-4SFSTOR UMC DECOMMISSIONING DATA SYSTEM - PROJECT COST/EXPOSURE

7481422

*ACTIVITY	COST ITEM/	SYS/COMP	A.START	SCHED	ESTIM.	ESTIM.	ACTUAL	ACTUAL	ACTUAL			
*SPEC NO	ACTIVITY	NUMBER	T.DATE	DATE	HOURS	COST \$	REM	DATE	DATE	HOURS	COST \$	REM
1954596	DECOMM. REP.											DNA
730-1	GEN-PIPING & EQUIP				422						4237	
730-2	DECON. EQUIP				2174						21844	
730-3	SOLID WASTE				2109						21199	
730-4	SURVEILLANCE EQUIP				DNA						DNA	
730-5	MISCELL.				17026						171115	
730-6	DECOMMISSIONING REP.				DNA						DNA	
1954561	BLANKETS-RAD.										17911	
1954562	BLANKETS-AXIAL										1608	
1954563	MAINT. EQUIP.										647	
710-1	BLANKETS-RAD. (LABOR)				13880						139495	
710-2	BLANKETS-AX. (LABOR)				148						1486	
710-3	MAINT. EQUIP.				571						5734	

.EF-1SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DOSE RATE

72G1114

* MAP	.ELEV	MAP	SYS/COMP	MR/HR	MR/HR	DPM	DPM	MEASUR.			
* REFERENCE	BUILDING	FEET	COORD.	NUMBER	TYP.	LOWER	UPPER	LOWER	UPPER	DATE	COMMENT

.COMMENT- DATA NOT AVAILABLE FOR COLUMNS LEFT BLANK.											

	REACTOR			01	C	0.1		100		751101	ABOVE-FLOOR AREA
	REACTOR			01	C	3.0		100		751101	BELOW-FLOOR AREA, B-3 AVE.
	REACTOR			01	C	0.7		100		751101	ADJACENT TO PUMP TANKS
	REACTOR			01	C	3.0		100		751101	ADJACENT TO IHX TANKS
	REACTOR			01	C	0.2		100		751101	ADJACENT TO DECAY TANKS
	REACTOR			01	C	0.7		100		751101	ADJACENT TO 30 INCH LINES
	REACTOR			01	C	15.0		100		751101	SECONDARY SHIELD WALL CAVITY
	REACTOR			01	C	.05		100		751101	ANTI-C BUILDING
	REACTOR			01	C	70.0		100		751101	CASK CAR TRESTLE WAY (3)
	REACTOR			01	C	.02		100		751101	WASTE GAS COMPRESSOR ROOM
	REACTOR			01	C	.02		100		751101	WASTE GAS VALVE ROOM
	REACTOR			01	C	2.0		100		751101	BELOW FLOOR AREA
	REACTOR			01	C	0.1		100		751101	OUTSIDE AUX. FUEL STORAGE AREA
	REACTOR			01	C	30.0		200		751101	OPERATING FLOOR
	REACTOR			01	C	5.0		100		751101	PRIMARY SODIUM STORAGE ROOM
	REACTOR			01.01	C	0.1		200		751101	MACH DOME SURFACE
	REACTOR			01.01	C	1.5		105		751101	MACHINERY DOME INTERIOR
	REACTOR			01.10	C	0.5		100		751101	ADJACENT TO OVERFLOW TANK
	REACTOR			01.15	C	0.05		100		751101	BIOLOGICAL FLOOR AREA
	FARB			02	C	0.03		400		751101	DECONTAMINATION FACILITY
	FARB			02	C	5.0		250		751101	DRY LOADING TUNNEL
	FARB			02	C	0.3		100		751101	CASK CAR MAINT. PIT
	FARB			02	C	1.0		110		751101	CAN ROOM
	FARB			02	C	0.03		100		751101	UNLOADING PIT
	FARB			02.01	C	0.2		100		751101	TRANSFER TANK ROOM EXTERIOR
	FARB			02.01	C	7.0		150		751101	TRANSFER TANK ROOM INTERIOR
	FARB			02.02	C	10.0		1.4E5		751101	STEAM CLEANING CHAMBER
	FARB			02.02	C	0.05		1400		751101	CLEANING CHAMBER EXTERIOR
	FARB			02.02	C	10.0		1.4E5		751101	CLEANING CHAMBER INTERIOR (1-2 AVE)
	FARB			02.03	C	0.4		500		751101	DECAY POOL
	FARB			02.04	C	2.0		300		751101	CUTUP POOL
	FARB			02.09	C	0.2		7000		751101	LIQUID WASTE PUMP ROOM
	FARB			02.09	C	0.7		100		751101	LIQUID WASTE STORAGE ROOM NO. 1
	FARB			02.09	C	0.1		100		751101	LIQUID WASTE STORAGE ROOM NO. 2
	FARB			02.09.04	C	100		100		751101	LIQUID WASTE STORAGE TANK NO. 1
	FARB			02.11	C	1.0		150		751101	REPAIR PSI (0.02 MR/HR. AVE)
	FARB			02.12	C	2.0		0300		751101	MECH. EQUIP ROOM
	FARB			02.14	C	0.3		103		751101	CONTROL/RECEIVING ROOM
	FARB			02.15	C	0.02		100		751101	LOWER FUEL VAULT
	FARB			02.15	C	0.3		100		751101	UPPER FUEL VAULT
	FARB			02.16	C	0.03		100		751101	POOL SUMP
	FARB			02.17	C	100		170		751101	HGT SUMP PIT
	FARB			02.18	C	0.02		100		751101	CLEAN SHOP
	FARB			02.19	C	0.03		126		751101	CGLD TRAP ROOM
	FARB			02.20	L	100		100		751101	WASTE TANK ROOM, NORTH
	FARB			02.20	C	00		100		751101	WASTE TANK ROOM, SOUTH

REF-1SESTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DOSE RATE									
MAP	BUILDING	COORD.	MAP	SYS/COMP.	MS/HR	MR/HR	DPM	UPM	MEASUR.
REFERENCE	NUMBER	TYP	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER	DATE
	SOD.SERV.		03.01	C		3.0	100	751101	PRIMARY SODIUM COLD TRAP ROOM
	SOD.SERV.		03.02	C		0.3	100	751101	PRIMARY SODIUM SERVICE SYSTEM VALVE ROOM
	SOD.SERV.		03.04.01	C		0.02	100	751101	EAST SODIUM GALLERY
	SOD.SERV.		03.04.02	C		0.02	100	751101	WEST SODIUM GALLERY
	SOD.SERV.		03.05	C		0.1	100	751101	INERT GAS TUNNEL
	HLTH PHYS.		05.01	C		0.5	100	751101	HP BLDG. OFFICE & LAB
	HLTH PHYS.		05.02	C		0.03	100	751101	LOCKER ROOM
	HLTH PHYS.		05.03	C		0.02	100	751101	FIRST AID ROOMS
	HLTH PHYS.		05.04	C		0.02	100	751101	CHEM. LABS
	FIS.PROD		06	C		0.03	100	751101	FISSTON PRODUCT DETECTOR BUILDING
	VENT BLDG.		07	C		0.03	100	751101	VENT BUILDING
	VENT BLDG.		07.01	C		0.02	100	751101	VENT BLDG. EQUIP PIT

 . COMMENT- C UNDER Y INDICATES CONTAMINATED MATERIAL
 Y
 P

EF-15FSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - PROJECT LABOR

74F1132

*ACTIVITY. . MAN.LABOR .MAN.

*SPEC NO . DATE . LABOR CATEGORY .WKS.COST \$.REM .

COMMENT- COST INFORMATION IS ACTUAL-MANWEEK INFORMATION IS ESTIMATED, BASED
ON \$10.05 PER HOUR, THE QUOTED SKILLED LABOR RATE FOR 1973.

700-1	DNA	ALL						85	34339	DNA
700-2	DNA	ALL						123	49554	DNA
700-3	DNA	ALL						133	53334	DNA
700-5	DNA	ALL						75	30092	DNA
+ +	+	+	+	+	+	+	+			
710-1	DNA	ALL						347	139495	DNA
710-2	DNA	ALL						4	1486	DNA
710-3	DNA	ALL						147	5734	DNA
+ +	+	+	+	+	+	+	+			
720-1	DNA	ALL						68	26994	DNA
720-2	DNA	ALL						6	2428	DNA
+ +	+	+	+	+	+	+	+			
730-1	DNA	ALL						11	4237	DNA
730-2	DNA	ALL						54	21844	DNA
730-3	DNA	ALL						53	21199	DNA

EF-1SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - ALARA REPORT	72E1110	MAN-	DOS.
ACTIVITY.SYS/COMP.	ALARA.REM	INITIAL	FINAL
SPEC NO	NUMBER	DATE	ALARA COST ITEM
			COST \$
			SAVED
			MR/HR
			MR/HR
			FCI
			ALARA EFFORT DESCRIPTION
<p>COMMENT- THE ITEMS LISTED BELOW REPRESENT ALARA EFFORTS ASSOCIATED WITH THE DECOMMISSIONING OF THE SUBJECT FACILITY. MAN-REM AND COST INFORMATION WAS NOT AVAILABLE.</p> <p>1. COMPLETED FIVE 'DRY RUNS' TO TEST SPECIALIZED HANDLING PROCEDURES, AND TO ESTABLISH EXPOSURE TIME REQUIREMENTS AND LIMITATIONS FOR BLANKET ASSEMBLY CUTTING OPERATIONS.</p> <p>2. DESIGNED AND FABRICATED A ROTATING LEAD SHIELD TO BE UTILIZED FOR WELD-SEALING FILLED CASK LINERS.</p> <p>3. DESIGNED AND CONSTRUCTED PORTABLE CONCRETE SHIELDING PANELS FOR CRANE OPERATORS, USED IN CONJUNCTION WITH MIRRORS.</p> <p>4. MODIFIED A 'HYDRAULIC FLUSHER' TO BE UTILIZED AS AN AXIALLY INSERTED EXPANDABLE LIFTING TOOL, USED IN CONJUNCTION WITH A PRESSURIZED WATER SUPPLY AND ELONGATED HANDLE.</p> <p>5. SPECIAL REMOTE-HANDLING TOOL USED TO MANIPULATE CASK LINER LIDS.</p>			

REF-1SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - SHIPMENT REPORT 74C1124 DOT (--- WASTE ---)

TRIP .MR/HR .MR/HR .MR/HR .ACTIVITY. WASTE .SHIP .CUBIC .SHIP .CUBIC .POUNDS .
 .LENS .MILES.COMTCT.6 FEET. CAB .NAME .AMOUNT .SPEC NO .DESCRIPTION.P. FORM .FORM .CLASS.FEET .POUNDS .
 .DATE .NUM .MILES.COMTCT.6 FEET. CAB .NAME .AMOUNT .SPEC NO .DESCRIPTION.P. FORM .FORM .CLASS.FEET .POUNDS .

COMMENT- INFORMATION CONTAINED IN THIS REPORT IS NOT SUFFICIENT FOR USE
 IN OBTAINING DECOMMISSIONING TOTALS.
 COMMENT- ALL BLANKS INDICATE DATA NOT AVAILABLE(DNA)

ID	QTY	UNIT	MIXED	PERCENT	DESCRIPTION	U-PINS	U-PINS NAOH	U-PINS SODA	U-PINS ASH	WASTE
750923	1	350	MIXED	18%	SCRAP, PINS	C	U-PINS NAOH	U238		15
					URAN, PINS	SCRAP	SODA	ASH		
750626	1	350	MIXED	55.5	CUT-OFF	C	METAL	90SR,ARCO	LSA	
					NOZZLES			54MN,437CS		
750624	1	350	MIXED	55.5	CUT-OFF	C	METAL	90SR,ARCO	LSA	
					NOZZLES			54MN,437CS		
750620	1	350	MIXED	55.0	NOZZLES	C	METAL	90SR,ARCO	LSA	
					NOZZLES			54MN,437CS		
750508	1	350	MIXED	210	RADIWASTE	C	ROUWTE	137CS,ARCO	LSA	613.9
								90SR,54MN		
741001	1	350	MIXED	4E-6	MISC.	C	MIXED	137CS,ARCO	LSA	1123
748515	1	2300	22 NA	52E-6	NA FILLED	C	METAL	NA,MET	LSA	
					PIPE					
740501	1	350	DNA	DNA	RADIWASTE	C	MIXED		LSA	460
740401	2	1900	DNA	DNA	RADIWASTE	C	MIXED		LSA	1332
750709	1	350	MIXED	DNA	RESTIN TANK	C	MIXED	UNKNOWN	LSA	27
					RESINS					
750701	1	1600	DNA	DNA	CUT-UP	C	METAL	UNKNOWN	LSA	NDA
					2000					
751020	1	350	MIXED	DNA	MACHINE BAG	C	METAL	UNKNOWN	LSA	7.5
					CHIPS					
7505	2	1600	MIXED	DNA	SHIPPING	C	METAL	UNKNOWN	LSA	
					CASKS					
750418	14	1600	239PU	DNA	BLANKET	A	OXIDE	U-PU OXIDE	LSA	
					SUBASSEM.					

COMMENT-BLANKET SUBASSEM. 962 PCS, 6524 GM PU 741217 - 750418, SHIPPED TO INEL FOR REPROCESSING
 COMMENT-MISC. ITEMS DECONTAMINATED, SOLD, DONATED OR SCRAPPED-NA HX, VALVING, PIPING, GRIPPER, TRANSFER POTS, OTHER MISC. HARDWARE, NO FURTHER INFO.

EF-4SFSTOR U.N.C. DECOMMISSIONING DATA SYSTEM - DISPOSAL COSTS 7401126																	
SHIP .SHIP .DISP		BURIAL CHARGES \$		TRANSPORTATION CHARGES \$		CONTAINER CHARGES \$											
DATE	NUM	SITE	BASIC	CURIE	SP/RND	OTHER	TOTAL	COMPANY	SHIPPING	PERMIT	OTHER	TOTAL	CONTAINER TYPE	NO.	CONT	CONT	RENT
73700	1	DNA	1686				1686	NFCO					SELF-CONTAINED	DNA			
73000	1	DNA	15250				15250	IRM					DNA	DNA			
74030	1	DNA	1450				1450	NFCO					DNA	DNA			
74040	1	BEATT	DNA				DNA	NFCO					BOX	DNA			
74050	1	MORHD	3964				3964	NFCO					BOX	DNA			
74051	1	CANOG	DNA				DNA	TRISTATE			3095		SELF-CONTAINED	DNA			
74060	1	DNA	1457				1457	NFCO					DNA	DNA			
74100	1	MORHD	2120				2120	NFCO					SELF-CONTAINED	DNA			
75050	1	MORHD	1216				1216	NFCO					ROVES, DRUMS, PIPE	55			
75050	2	INEL	DNA				DNA	DNA					NOTE	DNA			
75062	1	MORHD	DNA				DNA	DNA					DNA (CASKS)	2			
75062	1	MORHD	DNA				DNA	DNA					DNA (CASKS)	2			
75070	1	MORHD	DNA				DNA	DNA					DNA (CASKS)	2			
75070	1	MORHD	5090				5090	DNA					DNA	DNA			
75070	1	ICPP	DNA				DNA	DNA					BOX	1			
75092	1	SHEFF	DNA				DNA	DNA					DRUMS	2			
75102	1	MORHD	3095				3095	NFCO					DRUM	4			
75110	1	DNA	2104				2104	NFCO					DNA	DNA			
76020	1	DNA	270				270	NFCO					DNA	DNA			

COMMENT - INFORMATION CONTAINED IN THIS REPORT IS NOT SUFFICIENT FOR USE IN OBTAINING DECOMMISSIONING TOTALS.

COMMENT - MISCELLANEOUS ITEMS OF CONTAMINATED AND SOLD, DONATED OR SCRAPPED - SODIUM HX, VALVING, PIPING, GRIPPERS, TRANSFER POTS, OTHER HARDWARE

EF-19FSTOR U.N.C. DECOMMISSIONING DATA - SURVEILLANCE REPORT 74E4138

S. (----- ANNUAL -----)								
* YEAR	MODE	M.	ITEM	FREQ.	REM.	HOURS	COST	EXPENDITURE ITEM DESCRIPTION
76	SAFSTOR	M	INSURANCE	A			7500	NUCLEAR
76	SAFSTOR	M	INSURANCE	A			4100	PROPERTY
76	SAFSTOR	M	MAINT.	CONT			14500	MATERIALS & LABOR
76	SAFSTOR	M				0.010		YEARLY TOTAL FOR ALL TASKS
77	SAFSTOR	M	INSURANCE	A			7500	NUCLEAR
77	SAFSTOR	M	INSURANCE	A			4100	PROPERTY
77	SAFSTOR	M	MAINT.	CONT			14500	MATER. & LABOR
77	SAFSTOR	M				0.102		YEARLY TOTAL FOR ALL TASKS
78	SAFSTOR	M	INSURANCE	A			7500	NUCLEAR
78	SAFSTOR	M	INSURANCE	A			4100	PROPERTY
78	SAFSTOR	M	MAINT.	CONT			14500	MATER. & LABOR
78	SAFSTOR	M				0.101		YEARLY TOTAL FOR ALL TASKS
79	SAFSTOR	M	INSURANCE	A			7500	NUCLEAR
79	SAFSTOR	M	INSURANCE	A			4100	PROPERTY
79	SAFSTOR	M	MAINT.	CONT			14500	MATER. & LABOR
79	SAFSTOR	M				0.124		YEARLY TOTAL FOR ALL TASKS
80	SAFSTOR	M	INSURANCE	A			7500	NUCLEAR
80	SAFSTOR	M	INSURANCE	A			4100	PROPERTY
80	SAFSTOR	M	MAINT.	CONT			14500	MATER. & LABOR
80	SAFSTOR	M				0.207		YEARLY TOTAL FOR ALL TASKS
81	SAFSTOR	M	INSURANCE	A			7500	NUCLEAR
81	SAFSTOR	M	INSURANCE	A			4100	PROPERTY
81	SAFSTOR	M	MAINT.	CONT			14500	MATER. & LABOR
81	SAFSTOR	M				0.081		YEARLY TOTAL FOR ALL TASKS
* * * * * .COMMENT- EXPENDITURE ITEMS LISTED HERE WERE INCLUDED AS PART OF FERMI-2 BUDGET .AND COULD NOT BE ESTIMATED-- UTILITY COSTS, TAXES, LICENSING, SECURITY * * * * * .COMMENT- RADIOLOGICAL AND ENVIRONMENTAL DATA PRESENTED BELOW ARE ESTIMATED * * * * *								
YRLY	SAFSTOR	M	WATER	W		52	523	CONTINUITY TEST ON ALARM SYSTEM
*			INTRUSION					
YRLY	SAFSTOR	M	SODIUM	W		52	523	CONTROLLED AREA ENTRANCE & INSPECT
*			INSPECTION					
YRLY	SAFSTOR	M	CONTROL AREA	M		12	121	INSPECT DOORS, FENCE, GATES PUMPS, ETC.
*			INSPECTION					
YRLY	SAFSTOR	M	SMEAR&RAD.	Q		12	121	SIX AREAS
*			SURVEY					
YRLY	SAFSTOR	M	WATER	SA		14	60	FUNCTIONAL TEST OF ALARM
*			INTRUSION					
YRLY	SAFSTOR	M	RAW WATER	SA		6	60	SIX LOCATIONS, RADIOLOG.
*			SAMPLING					
YRLY	SAFSTOR	M	SEDIMENT	SA		6	60	SIX LOCATIONS, RADIOLOG.
*			SAMPLING					

4-22

REF-15FSTOR U.N.C. DECOMMISSIONING DATA - SURVEILLANCE REPORT

YEAR	MODE	ITEM	FREQ.	REP.	MAN- HOURS	ANNUAL COST	EXPENDITURE ITEM DESCRIPTION
YRLY	SAFSTOR	M CO-2 COVER GAS	4		4	40	SYSTEM PRESSURE TESTS
YRLY	SAFSTOR	M CO-2 COVER GAS	4	A	4	40	PRESSURE RELIEF VALVE TEST

NRC FORM 335 (7-77)		U.S. NUCLEAR REGULATORY COMMISSION BIBLIOGRAPHIC DATA SHEET		1. REPORT NUMBER <i>(Assigned by DDC)</i> NUREG/CR-3116	
4. TITLE AND SUBTITLE <i>(Add Volume No., if appropriate)</i> Evaluation of Nuclear Decommissioning Projects Project Summary Report Enrico Fermi-1 Reactor				2. <i>(Leave blank)</i>	
7. AUTHOR(S) R. L. Miller, B. W. Link				5. DATE REPORT COMPLETED MONTH YEAR December 1982	
9. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS <i>(Include Zip Code)</i> Office of Surplus Facilities Management UNC Nuclear Industries P.O. Box 490 Richland, WA 99352				DATE REPORT ISSUED MONTH YEAR February 1983	
12. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS <i>(Include Zip Code)</i> Division of Engineering Technology Office of Nuclear Regulatory Research U.S. Nuclear Regulatory Commission Washington, D.C. 20555				6. <i>(Leave blank)</i>	
13. TYPE OF REPORT Technical				10. PROJECT/TASK/WORK UNIT NO.	
15. SUPPLEMENTARY NOTES				11. CONTRACT NO. NRC FIN B7568	
16. ABSTRACT <i>(200 words or less)</i> This report summarizes information concerning the decommissioning of the Enrico Fermi-1 reactor. Decommissioning data from available documents and other decommissioning records were input into a computerized data-handling system in a manner that permits specific information to be readily retrieved. The information is presented both in detail in its computer output form, and as a manually assembled summarization, generated for the purpose of highlighting the more important aspects of the decommissioning program.				14. <i>(Leave blank)</i>	
17. KEY WORDS AND DOCUMENT ANALYSIS Decommissioning, Reactors Program Plan, ALARA, Radiation Exposure Cost, Comparison Studies				17a. DESCRIPTORS	
17b. IDENTIFIERS/OPEN-ENDED TERMS					
18. AVAILABILITY STATEMENT Unlimited				19. SECURITY CLASS <i>(This report)</i> Unclassified	
20. SECURITY CLASS <i>(This page)</i> Unclassified				21. NO. OF PAGES 5	

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

FOURTH CLASS MAIL
POSTAGE & FEES PAID
USNRC
WASH D C
PERMIT No. 967

120555078877 1 AN10
US NRC
ADM DIV OF TDC
POLICY & PUB MGT BR-PDR NUREG
W-501
WASHINGTON DC 20555

NUREG/CH-3116

EVALUATION OF NUCLEAR FACILITY DECOMMISSIONING PROCESS

EPNOM 1 1987