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WASH-1516

MASTER

ENVIRONMENTAL STATEMENT

***ELK RIVER REACTOR
DISMANTLING***

Elk River, Minn.

MAY 1972

UNITED STATES ATOMIC ENERGY COMMISSION

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RESPONSIBLE OFFICIAL:

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I. SUMMARY

This environmental statement addresses the potential environmental impact of an administrative action for the dismantling of the Elk River Reactor (ERR). The ERR was constructed by the U.S. Atomic Energy Commission at Elk River, Minnesota, as part of its power reactor demonstration program. The ERR, an indirect-cycle, natural circulation boiling water type reactor, having a thermal rating of 58.2 megawatts, was operated from November 1962 through January 1968.

Consistent with the terms of the AEC contract with the Rural Cooperative Power Association (RCPA), plans have been developed for the dismantling of the ERR. The dismantling operations have been detailed in a dismantling plan, which, when implemented, will result in removal from the ERR site of all detectable reactor originated radioactivity. A radioactivity inventory indicates that less than 10,000 curies remain at the site, consisting of fixed radioactivity in various reactor components and shielding material. Confinement capability will be maintained until the removal of the radioactive materials from the reactor building is completed and appropriate measures will be taken to preclude the spread of radioactivity so that the dismantling operation will not pose any adverse effect on the environment or undue risk to the public health and safety.

All solid materials resulting from the dismantling which contain detectable reactor originated radioactivity will be disposed of outside the State of Minnesota. Contaminated radioactive materials are planned to be shipped to such approved burial grounds as Sheffield, Illinois. Shipments will

conform with the requirements of all applicable standards and regulations. Non-contaminated material will be used as fill at the ERR site or disposed of as normal waste at a local off-site area. The dismantling operations will involve the activities of a construction project nature, including equipment operation and increased vehicular traffic. Because of the existing industrial characteristics of the site, these activities are not believed to pose any significant additional impact on the environment. No additional rail sidings or offsite roads will need to be developed.

Prior to termination of the lease with RCPA for the ERR site, a survey of the site will be made to assure that all detectable reactor originated radioactivity has been removed and that future Federal restrictions resulting from the ERR operations will not be required. RCPA has indicated that the site will be used subsequent to the dismantling for activities and facilities associated with its electric generating system.

The dismantling of the ERR is not expected to result in any significant adverse environmental impact. The proposed action is deemed to be beneficial in that it will remove from the ERR site the detectable reactor originated radioactivity and permit alternative use of the site by RCPA.

In assessing and balancing the benefits of the proposed action against the anticipated costs, and in considering the available alternatives and their environmental impact, the AEC has concluded that the proposed action should be implemented.

II. BACKGROUND

A. Plant History

The ERR was constructed by the AEC on land leased from the RCPA and is located on RCPA's generating site (Figure 1), situated approximately 1,050 feet south of the corporate limits of the village of Elk River, Minnesota, and 660 feet east of the east bank of the Mississippi River.

Elk River, Minnesota, has a population of 2,266 people (1970) and is located approximately 30 miles northwest of Minneapolis, Minnesota (Figure 2).

The ERR, an indirect-cycle, natural circulation boiling water type reactor, was completed in December 1960 as part of the AEC's power reactor demonstration program (Figure 3). The rated electrical capacity of the plant was 22.5 megawatts net (58.2 megawatts thermal). Additional technical characteristics are presented in Table I.

The plant was operated by RCPA for the AEC, under Contract No. AT (11-1)-651 and Operating Authorization DPRA-3, as part of RCPA's electrical generating system. The operating authorization was amended on August 6, 1970, to a "Possession Only" authorization.

Initial reactor criticality was achieved on November 19, 1962, with power operation commencing on July 13, 1964. The plant was operated by RCPA from June 1965 until final shutdown on January 31, 1968. Since January 1968, the ERR has been maintained in a shutdown status with a limited number of systems being operated.

Upon expiration of the operating term of Contract AT (11-1)-651, RCPA waived its option to purchase the plant. Pursuant to the terms of the contract and lease, the AEC is obligated to make the site useable without undue danger to

PLOT PLAN OF ELK RIVER REACTOR
SITE

Figure 1

ELK RIVER REACTOR PLANT LOCATION
Elk River, Minnesota

Figure 2

Artist's Conception of the Plant as it Presently Exists

TABLE I

CHARACTERISTICS OF THE ELK RIVER REACTORGeneral Characteristics

Location	Elk River, Minnesota
Reactor-system designer	Allis-Chalmers Manufacturing Company
Architect-engineer	Sargent & Lundy, Engineers
Owner	USAEC
Operator-lessee	Rural Cooperative Power Association, Elk River, Minnesota
Reactor thermal output	58.2 Mw
Superheater thermal output	14.8 Mw
Total thermal output	73.0 Mw
Gross electric output	23.8 Mw
Net electric output	22.5 Mw
Net efficiency	30.8%
Operating pressure	922 psig
Operating temperature	536 F

Reactor Vessel:

inside height	25 ft
inside diameter	7 ft
wall thickness	3 in
base material	carbon steel, Type A 302 B
cladding material	stainless steel, Type 304
minimum cladding thickness	0.109 in
design pressure	1250 psig
test pressure	1875 psig

Core:

configuration	right cylinder
height	60 in
diameter	60 in
volume fractions of core materials:	
steel	4.25%
zirconium	8.25%
water	68.25%
fuel	19.25%
number of fuel-assembly positions available	164
number of fuel assemblies in a complete loading	148

Fuel Assemblies:

fuel material	sintered thorium-uranium ceramic pellets
fuel-material density	94% of theoretical density
uranium-235 content of uranium in fuel material	93.13%
fuel-pellet diameter	0.407 in
fuel-pellet length	0.500 in
fuel-tube material	borated stainless steel
initial natural-boron content of fuel-tube material..	600 $\pm$ 10 ppm, by weight
fuel-tube inside diameter	0.410 in
fuel-tube wall thickness	0.020 in
fuel-tube length (excluding end plugs)	62 in
number of fuel pellets in each fuel tube	120
uranium-235 content of each fuel tube (regular)	46.1 g
number of fuel tubes in each fuel assembly	25
arrangement of fuel tubes in each fuel assembly	5 x 5 square array
number of removable fuel tubes in each fuel assembly	1
location of removable fuel tubes	center of each assembly
uranium-235 content of entire 148-regular element core	175.043 kg
maximum number of fuel assemblies that can be installed in core .	164
fuel-tube surface temperature	561 F
temperature drop across fuel-tube wall	52 F

Control Rods - General Characteristics:

type	vertically disposed, downward scrambling, neutron-absorbing
total number	13
number of shim rods	12
number of regulating rods	1
weight of each rod	228 lb
maximum withdrawal speed	30 in./min
maximum scram time	2.0 sec

Control-Rod Poison Sections:

cross-sectional configuration	cruciform
nominal length	58 in
nominal thickness	1/4 in
nominal width across opposite blade edges	14-7/8 in
material	borated Type-304 stainless steel
natural-boron content	2.2% $\pm$ 0.2%

Control-Rod Follower Sections:

cross-sectional configuration	cruciform
nominal length	45 in
nominal thickness	1/4 in
nominal width across opposite blade edges	14-1/2 in
material	Zircaloy-2

Control-Rod Extension Sections:

cross-sectional configuration	cruciform
nominal length	80-1/2 in
nominal thickness	1/4 in
nominal width across opposite blade edges	3 in
material	Type-304 stainless steel
drive-coupling type	bayonet

Reactivity Data:

maximum reactivity worth of all control rods (fully loaded, cold core)	0.183
maximum reactivity worth of any one control rod (fully loaded, cold core)	0.032
maximum reactivity worth of burnable poison dispersed in fuel tubes	0.058
reactivity decrease caused by:	
temperature rise from 68 F to 536 F	0.013
Doppler effect of power rise from 0 to 58.2 Mwt	0.003
steam-void formation (clean core)	0.039
equilibrium xenon poisoning	0.023
equilibrium samarium poisoning	0.007
burnup	0.020
unrodded overall temperature coefficient of reactivity (at 536 F)	$-1.5 \times 10^{-4}/^{\circ}\text{C}$
unrodded void-coefficient of reactivity at 0% void ..	$-1.2 \times 10^{-3}/\% \text{ void}$
unrodded void-coefficient of reactivity at 58.2 Mwt .	$-1.9 \times 10^{-3}/\% \text{ void}$

Nuclear Data:

average thermal-neutron flux at beginning of core life.	1.28×10^{13} n/cm ² sec
average thermal-neutron flux at end of core life	1.51×10^{13} n/cm ² -sec
maximum-to-average flux ratio	3.45
prompt neutron lifetime	3.53×10^{-5} sec
average neutron energy	0.059 ev

Heat-Transfer Data:

total volume of primary coolant	4800 gal
volume of primary coolant in reactor vessel	425 gal
depth of water above core during operation	7 ft 2 in
condensate flow rate	516 gpm
condensate temperature	432 F
steam flow rate (at 58.2 Mwt)	258,000 lb/hr
average power density	23.3 kw/liter of core volume
average heat flux in core	90,700 Btu/hr-ft ²
maximum heat flux in core	264,000 Btu/hr-ft ²
burnout heat flux in core	960,000 Btu/hr-ft ²

public health and safety. The final agreement reached between RCPA and the AEC, and defined in Modification No. 18 to the original contract, provided that the ERR will be dismantled and all structures removed approximately to grade level with the underground portions of the reactor building structure also removed to the extent they contain reactor originated radioactivity, and all resulting cavities filled with clean rubble and/or earth.

Upon completion of the dismantling operation, the site will have been returned essentially to the condition that existed prior to the installation of the reactor with all vestiges of the reactor plant structures having been removed and disposed of, except for certain uncontaminated underground foundations. The site will be free of all detectable reactor originated radioactivity upon completion of the dismantling and available to RCPA for other beneficial uses.

B. Plant Status

Since plant shutdown in January 1968, all fuel elements and control rods have been removed from the site. The irradiated fuel was shipped from the ERR site during the periods March 25, 1968, through June 4, 1968, and August 15, 1969, through September 16, 1969, for reprocessing. A plutonium-beryllium startup source was shipped from the site to Argonne National Laboratory, Illinois, on October 28, 1970. Unirradiated fuel was shipped back to the manufacturer, United Nuclear Corporation ^{1/}, on November 14, 1969.

A number of low-level radioactive sources are being maintained at the ERR site for calibration and operational checks of health physics instrumentation

^{1/} Now Gulf United Nuclear Fuels Corporation

which will be used during the dismantling operations. These sources will be retained at the ERR site while needed for calibration and to maintain the health physics instrumentation in proper working order; thereafter they will be removed from the site either by disposal at a licensed radioactive burial ground or by transfer to an authorized recipient. In addition to the removal of all fissionable material from the site, operations have been conducted under the provisions of the ERR operating authorization to prepare for the dismantling operation. The primary system is essentially drained and isolated except for that portion used in maintaining reactor vessel water purity. The shield cooling system has been drained and flushed. The fuel element storage well has been drained, cleaned, fuel storage racks removed and the well refilled with demineralized water. New filter cartridges have been installed and the cooling system is available for service.

The waste disposal system, essential electrical systems and the plant heating and air conditioning systems are available for service as needed. Some other plant equipment and structures necessary for dismantling operations are being maintained in a standby condition.

An access hatch sized to accommodate scrap resulting from the dismantling operation has recently been installed in the reactor building. This hatch has been designed and will be procedurally controlled so as to maintain the confinement capability of the reactor building during the dismantling operations.

C. Calculated Radioactive Inventory

The components of the ERR included in the calculation of the radioactive inventory may be divided into four groups:

1. The reactor pressure vessel.
2. The "Internals," including the Zircaloy and stainless steel shroud structures, the core and shroud mounting plates, the upper and lower baffle plates, the core support barrel, and the inner thermal shield.
3. The "Externals," including the insulation of the pressure vessel and outer thermal shield structure.
4. The "Concrete," including the inmost three feet of the biological shield and the heavy concrete plug below the pressure vessel.

Portions of the structure inside the pressure vessel, i.e., the steam baffles and the spray ring and its associated piping, already have been removed from the reactor vessel and are not included in the calculations. These items contain only minor amounts of activity but will be disposed of as radioactive waste.

Twenty radionuclides, ranging in half-lives from 118 days (0.323 year) to 5,730 years, were included in the inventory which totaled approximately 9,900 curies as of April 30, 1971 (three and one quarter years after shutdown of the reactor).

A list of the radionuclides composing the inventory is shown in Table II which also includes half-lives. Radionuclides with half-lives less than about four months were excluded from the analysis, since they have decayed to negligible levels in the years since shutdown.

Determination of the total activity of the components was based on the weight and material compositions of the components and the average fast and

TABLE II
PROPERTIES OF RADIONUCLIDES WITH PRECURSORS

Nuclide	Half-Life (yr)	Decay Constant (yr ⁻¹)	Parent Nuclides and Reactions	Reaction Cross Section	
				Fast (barns)	Thermal (barns)
Sn ¹¹³	0.323	2.145	Sn ¹¹² (n,γ)	-	1.25
			Sn ¹¹⁴ (n,2n)	0.0003	-
Sn ¹²³	0.353	1.962	Sn ¹²² (n,γ)	-	0.001
Ca ⁴⁵	0.446	1.553	Ca ⁴⁴ (n,γ)	-	0.64
			Ca ⁴⁶ (n,2n)	0.00028	-
Sn ¹¹⁹	0.685	1.013	Sn ¹¹⁸ (n,γ)	-	0.010
			Sn ¹²⁰ (n,2n)	0.001	-
			Sn ¹¹⁹ (n,p)	0.0002	-
Ag ¹¹⁰	0.712	0.974	Ag ¹⁰⁹ (n,γ)	-	3.5
Co ⁵⁷	0.7447	0.931	Ni ⁵⁸ (n,2n)	0.00003	-
			Ni ⁵⁸ (n,d)	0.0025	-
Mn ⁵⁴	0.854	0.812	Mn ⁵⁵ (n,2n)	0.0002	-
			Fe ⁵⁴ (n,p)	0.051	-
V ⁴⁹	0.904	0.767	Cr ⁵⁰ (n,2n)	0.000007	-
			Cr ⁵⁰ (n,d)	0.0144	-
Cd ¹⁰⁹	1.242	0.558	Sn ¹¹² (n,α)	0.000065	-
Fe ⁵⁵	2.4	0.289	Fe ⁵⁴ (n,γ)	-	2.26
			Fe ⁵⁶ (n,2n)	0.00007	-
			Ni ⁵⁸ (n,α)	0.0034	-
Na ²²	2.6	0.267	Na ²³ (n,2n)	0.00007	-
Sb ¹²⁵	2.7	0.257	Sn ¹²⁴ (n,γ)	-	0.14
Co ⁶⁰	5.24	0.132	Co ⁵⁹ (n,γ)	-	38.
			Ni ⁶⁰ (n,p)	0.012	-
			Ni ⁶¹ (n,d)	0.0007	-
H ³	12.26	0.0565	H ² (n,γ)	-	0.0004
Cd ¹¹³	14.	0.0495	Sn ¹¹⁶ (n,α)	0.0000021	-

TABLE II
(continued)

<u>Nuclide</u>	<u>Half-Life (yr)</u>	<u>Decay Constant (yr⁻¹)</u>	<u>Parent Nuclides and Reactions</u>	<u>Reaction Cross Section</u>	
				<u>Fast (barns)</u>	<u>Thermal (barns)</u>
Sn ¹²¹	25.	0.0277	Sn ¹²⁰ (n,γ)	-	0.001
Ni ⁶³	92.	0.00753	Ni ⁶² (n,γ)	-	13.3
			Ni ⁶⁴ (n,2n)	0.00045	-
			Ni ⁶⁴ (n,d)	0.0000004	-
Ag ^{108m}	100.	0.00693	Ag ¹⁰⁷ (n,γ)	-	1.4
			Ag ¹⁰⁹ (n,2n)	0.0011	-
Ar ³⁹	270.	0.00257	Ca ⁴² (n,)	0.0024	-
			K ³⁹ (n,p)	0.024	-
C ¹⁴	5730.	0.000121	C ¹³ (n,γ)	-	0.0008
			O ¹⁷ (n,)	-	0.208

thermal neutron fluxes to which they were exposed. The component weights, positions and compositions were calculated or taken from data on engineering drawings of the components. The results of the radioactivity inventory analysis are shown in Table III. Additional details on the inventory are included in the AEC-Elk River Reactor Dismantling Plan (Reference 2).

TABLE III
RADIOACTIVE INVENTORY
ELK RIVER REACTOR

<u>Component</u>	<u>Activity (curies)</u>
Reactor Vessel and Clad	1,113.5
Shroud and Shroud Plate	1,117.7
Core Plate and Support Barrel	2,138.9
Upper and Lower Baffles	2,327.5
Thermal Shield	3,088.7
External Insulation and Cans	77.2
Concrete	5.2
Bottom Plug	<u>0.6</u>
Total Inventory*	9,869.3

*As of April 30, 1971.

DISMANTLING OPERATIONS

A. Responsibilities

Under the provisions of contract Modification 18, the AEC is responsible for developing the dismantling plan to achieve specified final site condition. RCPA will be responsible for implementation of the dismantling program, including preparation of dismantling work documentation, scheduling of program tasks, complete health and safety monitoring and performance of dismantling operations. RCPA will direct all field work and will be responsible for inspection and quality assurance of the dismantling operations. Gulf United Nuclear Fuels Corporation (Gulf United) has prepared the dismantling plan (Reference 2) and activity specifications defining the work of dismantling. Gulf United will also provide engineering services to RCPA and the AEC upon request and contribute safety committee participation and other services and support for the dismantling, both on and offsite.

The AEC's Division of Reactor Development and Technology (RDT) will maintain programmatic and technical responsibility for all phases of the dismantling. RDT staff will review the dismantling plan, activity specifications,* and the detailed working procedures, monitor the work and provide technical assistance for the dismantling effort. The AEC's Chicago Operations Office (CH) will be responsible for all contract activities, including safety, and the administration of the dismantling contracts with RCPA and Gulf United.

*An activity specification defines the scope, proposed methods, and sequence of accomplishing a major task. Each activity specification is supported by engineering studies required to scope or justify the activity and contains technical guidelines for the preparation of detailed work procedures.

The AEC's Division of Reactor Licensing (DRL) will review the information in the Dismantling Plan and assure that it gives adequate protection to the health and safety of the public and meets the requirements of all applicable regulations; then DRL will issue a Dismantling Order authorizing the dismantling. Inspections during the dismantling operations will be conducted by the AEC's Division of Compliance to assure that the operations are conducted in strict accord with the approved dismantling plan and applicable regulations (10 CFR 20, Dismantling Order, etc.). When the dismantling operations have been satisfactorily completed and confirmed by a final Compliance inspection, DRL will terminate the ERR authorization (including the Dismantling Order). When the Authorization has been terminated and the contracts closed out, the lease for the ERR site will also terminate. RCPA will reassume full responsibility for that portion of its site that had been leased to the AEC.

The dismantling operations will be conducted in accordance with detailed procedures, specifications and schedules. The specifications will define the scope, methods and sequence of accomplishing major tasks. Detailed procedures will be provided when step-by-step instructions are required to insure safe and proper performance of the work.

Where detailed work procedures are required to supplement the specifications, they will be developed by RCPA to meet the existing field conditions, state-of-the-art technology and shipping and burial ground requirements. All procedures will be subject to AEC (CH/RDT) approval. An ERR Safety Review Committee will also review and approve those procedures with safety implications. The Safety Review Committee is composed of senior RCPA

officials, representatives from the University of Minnesota and Gulf United Nuclear Fuels Corporation, and a private consultant. In addition, official observers to the Committee have been designated from the AEC and RCPA.

B. Description of Dismantling Activities

The dismantling program and associated maintenance work is expected to continue for 1 1/2 to 2 years and will consist of:

1. Removal of the reactor pressure vessel and internals, reactor pressure vessel biological shielding, containment vessel and all equipment, concrete, materials and structures located within the space enclosed by the reactor building.
2. Removal of the fossil fired superheater, superheater building, and the superheater building foundation down to approximately one foot below existing ground level and all material, piping, equipment and structures from within the superheater building.
3. Removal of all piping, conduits, cables, conductors, and equipment located in the passageway between the reactor building and the superheater building, the metal superstructure of the passageway and concrete walls of the structure to approximately one foot below existing ground level.
4. Removal of all valves, piping, cables, switches, air lines, wiring or components within the turbo-generator facility if they could potentially contain reactor-originated radioactivity, or if their removal is desired by the AEC for programmatic or economic reasons.

5. The east wall of the RCPA steam-electric generation building (which is the west wall of the superheater building) will be returned to weather-proof condition by sealing and finishing all openings in an appropriate manner, except the rear entrance door at grade level.
6. All cavities remaining after the removal of the structures and equipment will be filled with clean rubble topped with earth to approximately grade level.

All items which contain detectable reactor originated radioactivity will be shipped outside the State of Minnesota for appropriate disposal. The principal repository of radioactive wastes from the ERR dismantling will be the approved burial grounds at Sheffield, Illinois. Other approved burial grounds, such as Morehead, Kentucky, may also be considered as alternate repositories if required. There is agreement with RCPA that rubble which does not contain detectable reactor-originated radioactivity and which is free of wood, piping and combustible materials can be used as fill for the onsite cavities remaining after the removal of the ERR. Other clean rubble which cannot be accommodated onsite will be buried offsite. The burial contractor, Big Lake Sand and Gravel Company, conducts a land-fill operation near Elk River Minnesota, which will accommodate this latter material as replacement for gravel presently being extracted.

After program completion but prior to backfill, a thorough radiation survey of the plant site will be performed to verify that all detectable reactor originated radioactivity has been removed from the site.

Preparatory work will be required prior to the dismantling of the ERR and will include modifications to the existing structures, the addition of new structures and erection of a security fence. This work will involve:

1. Plant security fence and guard stations.
2. A temporary working building to house the dismantling staff.
3. An enlarged change room and personnel decontamination area.
4. Reactor building access structures at the freight door and at a new 12 foot x 15 foot opening.
5. Storage areas for contaminated and uncontaminated wastes.
6. Additional services and utilities.
7. Isolation of reactor plant from the RCPA steam electric facility.
8. Installation of steam electric facility vibration monitoring equipment.
9. Installation of an access hatch in the reactor building to accomodate scrap resulting from the dismantling operation.

During the dismantling operations various plant systems will be required. The systems or components that will be utilized during dismantlement are shown in Table IV.

The removal sequence of systems and components will give priority to identifying and removing radiation "hot-spots" (i.e. 100 mR/hr surface reading or greater) on components and piping segments to reduce back-ground levels and minimize personnel exposure. Dose level, accessibility

TABLE IV

ERR SYSTEMS TO BE UTILIZED DURING DISMANTLING

<u>System or Components</u>	<u>Dismantling Use</u>
1. Radiation Protection Systems	Required throughout dismantlement until all potential sources of radiation have been removed from the site.
2. Electrical Supply	Required throughout dismantlement for lighting, power, etc. Portions of the system may be removed as specific components are permanently de-energized.
3. Makeup Water (RCPA treated water piping only)	Utilized to maintain water in vessel during vessel cutting operations.
4. Shield Cooling	Pumps and filters will be utilized as part of a modified system to maintain vessel water clarity during dismantlement.
5. Emergency Core Cooling	Required during dismantlement to contain water in vessel while cutting.
6. Portable Demineralizer	Required during dismantlement to purify fuel pool water while vessel cutting activities are in progress.
7. Liquid Radioactive Waste Disposal	Required during dismantlement for liquid waste disposal until all sources of potentially contaminated liquids have been removed.
8. Gaseous Waste Disposal	Required during dismantlement for gaseous waste disposal until all sources of potentially contaminated gases have been removed.

Table IV (Continued)

<u>System or Components</u>	<u>Dismantling Use</u>
9. Fuel Element Storage Well System	Pool and water purification system will be utilized during vessel and internals cutting activities.
10. Ventilation	Utilized throughout dismantlement until confinement capability is no longer needed.
11. Air Conditioning and Heating	Utilized throughout dismantlement until confinement capability is no longer needed.
12. Service Water	Required during dismantlement for systems remaining in service (decay heat pump cooling, air conditioning, flushing hoses, etc.).
13. Emergency Electrical	Required throughout dismantling for systems remaining in service (lighting, ventilation, monitoring systems).
14. Service Air	Utilized during dismantlement for chipping, hammers, grinders, etc.
15. Control Air	Required for control of systems remaining in service during dismantlement.
16. Plant Annunciator Systems	Utilized during dismantlement for systems remaining in service.
17. Communication System	Required during vessel cutting to coordinate vessel filling/draining activities.

and exposure during removal will influence the selection of hot-spots to be removed. Removal of piping and components will be accomplished in accordance with procedures for cutting, handling and sealing of contaminated and low-level activated materials provided in the activity specification.

The major components within the reactor vessel consist of the control rod guide and shroud assembly, the core plate, the core support barrel and an inner thermal shield. Each of the components will be handled as a separate entity during the dismantling and will be subsectioned as required before removal from the pressure vessel. The cutting of these components will be performed in a carefully planned and predetermined manner. Each component will be cut into a number of pieces, each of which will be small enough to transfer safely to the fuel element storage well where the shipping casks will be located. The cutting and cask loading will be done under water, which will provide radiation shielding. Cutting of such components will be done with plasma arc torches or mechanical cutting tools modified for underwater operation. The transfer of the internal segments from the vessel to the storage well will be accomplished either under water through the transfer canal or through air. Air transfer will only be permitted where health and safety determinations have verified that there will be no release of radioactivity nor exposure of the dismantling staff in excess of the limits specified in 10 CFR 20.

The immediate work area will be enclosed within a contamination control envelope as illustrated in Figure 4. This envelope will be fabricated

CONTAMINATION CONTROL ENVELOPE

from steel angle-iron and sheet metal. Plexiglass windows and an access door will be included. The envelope will be gasketed to prevent leakage. An inlet prefilter and an absolute filter will process incoming air. The envelope exhaust will also include a prefilter, an absolute filter, and a 1,000 cfm blower exhausting to the containment building. By use of the contamination control envelope radioactive contamination released during cutting will be confined to the immediate work area and will not escape to the reactor building. When filter changeout is required, all cavity work will be stopped and personnel will vacate the cavity and the vicinity of the filters. The cavity exhaust blower will be stopped. Personnel involved in the changeout will wear anti-contamination clothing and respirators. The spent filters will be manually removed, promptly bagged in plastic, and sealed. While awaiting shipment for offsite burial, the bagged filters will be stored in an appropriate container in approved storage areas. New filters will be installed manually and tested for efficiency and proper installation prior to occupancy of the control envelope and resumption of cutting operations.

For removal, the reactor pressure vessel will be cut into a series of rings of right cylindrical configuration. The uppermost ring, which will be approximately six feet in height, has an activity level sufficiently low to allow it to be removed and shipped in one piece after appropriate preparation. The remaining rings will be cut into smaller pieces with the number and locations of the cuts determined by the vessel radioactivity levels consistent with the required optimum

segment size for handling and shipment in the shipping casks. The work area will be enclosed in a contamination control envelope similar to that utilized for removal of vessel internals.

The removal and disposal of the biological shield and containment structures will be accomplished after the removal from the reactor building of the pressure vessel system components and piping except for those items which cannot be transferred through an access hatch. This sequence will be followed in order to minimize any opportunity for the release of reactor induced contamination to the environment, to maintain the health and safety of the dismantling personnel, and to prevent interference with the operating fossil fired power plant adjacent to the reactor plant. The confinement capability, including radiation monitoring and exhaust systems, will be maintained until all radioactive or contaminated materials and equipment have been removed from the reactor building.

Analysis of a concrete boring of the biological shield has shown that the concrete may be activated to a depth of about two feet. When the activated concrete is being removed from the biological shield inner annulus, the dust and small particles generated will be contained by a temporary enclosure at the top of the reactor pit which completely encloses the pit and work area. All access openings below the top of the reactor pit will be sealed. This enclosure will define the closed air space which will be filtered and controlled during the entire operation of removing contaminated concrete. To further minimize the possibility of contamination spread in the reactor building, a carefully defined procedure will be used for concrete removal operations. This procedure will involve axial coring into the concrete on a circumference

about two feet from the inside surface at approximately 18 inch intervals with hydraulic rock jacks (expandable bits) to expand and crack the concrete segments. This will permit the size of the segments to be varied so as to conform with cask loading requirements.

Radiation surveys will be performed to determine the extent of reactor induced radioactivity. Once it has been determined that all contaminated material has been removed from inside the reactor building, confinement capability will no longer be required and normal demolition procedures can be used for the remaining dismantlement.

C. Safety Aspects of Dismantling Operations

All dismantling activities will be performed under controls to assure employee and public safety. To accomplish this end, a set of radiological control and industrial safety standards have been developed which will serve as a basis for accomplishing all activities in a safe manner. Any task involving a potential safety consideration will be reviewed in advance to determine if procedures and standards are adequate. If it is found that a specific circumstance requires further documentation, the appropriate procedure will be further detailed. All detailed dismantling procedures will include health physics and safety sections setting forth specific limitations and requirements, and defining any unusual or abnormal circumstances or conditions which must be considered.

Control envelopes will be constructed of noncombustible material. All materials within the control envelope will also be noncombustible or consist of fire retardant material. Type ABC fire extinguishers will be

located in the immediate work area with a fire watchman on duty when cutting with an open flame is taking place. Other fire prevention practices which are common to industrial operations are in effect and will be continued. Communication will be available at all times between personnel in the control envelope and support personnel outside of the structure. A basket stretcher will be available for retrieval of incapacitated personnel should the need arise.

The probability of an accident occurring in or near the control envelope should be comparable to or less than that of any other construction activity because of the detailed advance preparations made and the close supervision which will be given to the entire dismantling operation. In the event of an accident, RCPA Health Physics and other staff personnel have been trained to provide industrial first-aid treatment. Local medical personnel and facilities are experienced in providing prompt responses in the event of an accident, and trained to treat those involving radiation exposure and contamination. The local fire department personnel are also trained in emergency first-aid and in procedures for handling situations where radioactivity is involved.

Safeguards against the occurrence of accidents include detailed planning and documentation of procedures for the dismantling operations, continuing close supervision of all operations, and the use of highly trained and skilled personnel. Industrial and radiological safety practices which have been implemented since the inception of the ERR project will be continued and augmented where needed. As noted above, additional precautions have been taken and safeguards are available should an accident occur.

Confinement capability and procedures will be utilized to assure that the environment is protected against accidental release of detectable reactor-originated radioactivity during the dismantling operations.

A health physics program will be implemented through a separate RCPA organization consisting of supervisory personnel, technicians and monitors. The use of a separate organization reporting directly to the Manager of the Nuclear Department will ensure that health and safety matters will not be compromised by dismantling expediency. Sufficient health physics personnel will be present at the site when dismantling activities are in progress to provide complete support and health physics supervision.

In developing the plans for the dismantling of the ERR, priority consideration was given to the dismantling and any potential effects it would have on the environment or the health and safety to the public. This close attention will be continued throughout the dismantling operations to assure that discharges to the environs of gaseous and liquid wastes will be minimized and that any release of radioactivity will be lower than the limitations proposed in Appendix I, 10 CFR 50, (which provides numerical guides for light-water-cooled nuclear power reactors to keep radioactivity in effluents as low as practicable).

Solid wastes will be properly packaged in approved containers which will be sealed and thoroughly surveyed for external contamination before they are removed from the reactor building. Containers awaiting shipment from the ERR site will be stored onsite in segregated areas within the secured area with appropriate safeguards. Records will be maintained of the content and disposition of every container leaving the ERR site.

Entry to the fenced area surrounding the reactor site will be controlled and monitored by security personnel on a "round-the-clock" basis. All personnel will be channeled through the main guard stations, while heavy equipment and truck entry will be controlled at an auxiliary station. All regular personnel will be provided with color coded identification badges which must be displayed at all times when working inside the secured area. Individuals not displaying a badge will be denied entry. The security fence will be maintained at least until after all contaminated or activated material and equipment have been shipped offsite.

D. Site Conditions Upon Completion of Dismantling Operations

After the dismantling of the ERR is completed, there will be no AEC licensing restrictions on the site because of its prior use for a nuclear power plant. Before terminating its control of the reactor site, AEC will arrange for removal of all above grade reactor plant structures and equipment, and all activation products and radioactive contamination. Only the foundations below grade and exterior to the containment vessel will be left at the reactor site (Figure 5). Even the foundations or portions thereof will be removed if necessary to assure that no detectable reactor originated radioactivity exists. Following the completion of dismantling, the site is expected to look similar to the artist's rendering as shown in Figure 6. Following completion of the dismantling operation, RCPA has indicated its intent to use the reactor site for facilities associated with its fossil-fired electric generating plant. Pending any new use of the site, RCPA has indicated that it intends to take those measures necessary to prevent soil erosion and to make the appearance of the site consistent with overall site development.

SIMPLIFIED ELEVATION - ERR

CONTAINMENT VESSEL

REACTOR PRESSURE
VESSEL

BIOLOGICAL
SHIELD

115'

GRADE

BELOW-GRADE CONTAINMENT
STRUCTURES

CONTAINMENT VESSEL
FOUNDATION, EXPECTED
TO REMAIN IN PLACE

18'-6"

Artist's Conception of the Plant after Decommissioning

IV. ENVIRONMENTAL IMPACT

A. Radiological

As indicated previously, all reactor fuel has been shipped from the ERR site and no fissionable material remains. The remaining reactor originated radioactive material is contained in solid materials such as the pressure vessel, other reactor components and concrete. The extent of this radioactivity has been determined by a radioactivity inventory (Table II) and is calculated to be less than 10,000 curies.

The potential adverse effects are personnel exposure to the fixed radioactivity (and the minute airborne radioactivity which may evolve from certain cutting operations) and the spread of contamination beyond the control areas or out of the reactor building. Prevention of excessive personnel exposure or spread of fixed contamination will be accomplished by use of written procedures, mock-up testing and radiological control. The health and safety department will identify and maintain control over all radiation or contaminated areas, and restrict access to these areas by means of work permits. The work permits will define the scope of the work activity, the potential hazards involved, and the precautions or special clothing required. During performance of the work, industrial and radiological safety aspects will be monitored by a health physicist. In addition, all personnel will be instructed in industrial and radiological safety and the use of protective equipment.

While cutting contaminated or potentially contaminated items using torch techniques, contamination control envelopes will be utilized such that the evolutions and metallic fragments will be contained within the

envelope. Use of envelopes during mechanical cutting will be limited to those cases where specifically required by the Health Physics Department. Ventilation will be provided with the exhaust passed through an absolute filter before release to the reactor building atmosphere. For large envelopes within which personnel will work, portable vacuum filtration equipment will be used at the point of work, where possible, to minimize the spread of contamination within the envelope. Air-breathing equipment will also be utilized where required.

The necessity for maintaining confinement during dismantling operations has been recognized. The reactor building is penetrated by two airlocks, one freight door, and one newly installed access hatch sized to accommodate scrap resulting from dismantling operations. Each airlock and the access hatch have two sealed doors to prevent the release of radioactive contamination to the outside of the building. The two doors of each airlock and the access hatch are normally kept closed except during the transfer of personnel or materials and equipment. The freight door is sealed to prevent the release of radioactive contamination to the outside.

The access hatch and airlocks will be procedurally controlled so that both doors of each penetration will normally be closed when not in use. When any of these penetrations is being used, it will be standard practice to keep one of the two doors closed. In the event both doors of the newly installed access hatch must be opened during dismantling, the outside supply damper of the building ventilation system will be closed

thereby directing all ventilation inlet air into the reactor building through the open access hatch.

Under these latter conditions, no operations will be permitted in the reactor building which could potentially generate airborne radioactive contaminants.

All material and equipment transferred through the access hatch from the reactor building will be surveyed prior to movement for surface radioactive contamination, and will be decontaminated if necessary. All material and equipment moved through the access hatch, therefore, will be free of detectable surface radioactive contamination. Before the inner door of the access hatch is opened, the adjacent area inside the building will be surveyed to insure that no detectable surface radioactive contamination is present.

The flow of airborne toxic and radioactive materials will be controlled primarily by the reactor building ventilation system. In addition, localized exhaust will be provided in those situations where toxic vapors and/or airborne radioactive contamination may be produced.

Respiratory protection will be worn when levels of toxic nonradioactive substances could exceed the threshold limit values specified by the American Conference of Governmental Industrial Hygienists. Supplied air respiratory protection will be specified when excess levels of airborne vapors and gases could be encountered. For airborne particulates, full face respirators with high efficiency filters will be worn.

For airborne particulate radioactive contamination, the following specifications will apply:

1. Less than 3×10^{-9} microcuries/cc beta-gamma -- no respiratory protection required.
2. Between 3×10^{-9} and 3×10^{-8} microcuries/cc beta/gamma -- full face respirators with high efficiency filters required.
3. Greater than 3×10^{-8} microcuries/cc beta-gamma -- supplied air respiratory protection required.

Supplied air respiratory protection will be provided when detectable gaseous radioactive contamination is present.

All liquid wastes generated at the ERR flow directly to two 3,000 gallon retention tanks, or through floor drains to a sump at the subbasement level where the liquid is pumped to the retention tanks. Liquid waste collected in the retention tanks is released on a batch basis, each release amounting to approximately 3,000 gallons. Prior to release, the waste in a tank is circulated through filters and ion exchange resins. The waste is sampled and analyzed for total beta activity, gross alpha activity, and specific gamma emitters, both before and after recirculation to determine the need for additional purification. Prior to release to the Mississippi River, the radioactive concentration of the waste is further reduced by dilution with condenser cooling water from the turbine generator plant. After dilution, the waste is again sampled and analyzed to confirm concentration and total radioactivity predictions.

Contaminated water will be generated during cutting operations to be performed in both the pressure vessel and fuel storage pool. This water

will be filtered by a modified water purification system to maintain water clarity during cutting and to reduce contamination levels in the liquid waste system prior to final draining of the vessel and pool. The vessel and pool water is drained directly to the liquid waste system and is treated for disposal in the same manner as all liquid wastes as described above.

Liquid wastes generated during clean concrete cutting operations will be filtered and reused where practical. This filtered water will ultimately pass to the floor drains which lead to the liquid radwaste retention tanks. The liquid waste can then be treated for disposal as described previously. When the dismantling proceeds to the point where floor drains are no longer in service and floor removal operations are undertaken, a fracturing of the concrete (rather than cutting) approach is planned which will not require water cooling of the equipment. If, however, cutting is required, methods will be developed and applied to ensure that all liquid radwastes so generated are collected. These wastes will be routed to the liquid radwaste system, or collected and disposed of offsite in accordance with applicable regulations.

Contaminated items for disposal will be packaged for shipment using various methods depending on the size, radioactivity level and the degree of external contamination. Shipments of radioactive material to and from nuclear facilities are governed by the Hazardous Materials Regulations of the U.S. Department of Transportation. Those regulations are published in Title 49 of the Code of Federal Regulations (49 CFR 170-189). Additional packaging standards are imposed by the AEC in its regulations

on packaging of radioactive material for transport (10 CFR 71). All shipments of radioactive materials from the ERR site will be made in accordance with those regulations.

For hazardous material shipments, the common carrier is required to file his intended route within the appropriate State Highway Department. The routes and timing of shipments will be determined based on the circumstances existing at the time a shipment is planned. In the event of an accident involving radioactive material, notification will be made promptly to the AEC's Chicago Operation's Office which functions as the Regional Co-ordinating Office for the Interagency Radiological Assistance Plan (IRAP). This would result in assistance being provided expeditiously. Copies of the IRAP have been provided to such Minnesota agencies as the State Police, and the Department of Health.

Contaminated solid wastes will be disposed of outside the State of Minnesota, and, if contamination levels so require, in AEC approved burial grounds. It is presently planned that materials will be shipped to the approved burial grounds at Sheffield, Illinois. While the actual number of shipments will depend on the mode of shipment (rail or truck), size and weight of the items, packaging requirements and other factors, it is presently estimated that perhaps 100 equivalent truck loads will be involved. All casks (or containers) used in shipment that are to be returned to the ERR site for re-use will be checked for contamination, and decontaminated when required, before leaving the burial ground. Items and spoil without detectable reactor originated radioactivity will be

certified as such and disposed of as normal waste. There is agreement with RCPA that rubble which does not contain detectable reactor-originated radioactivity and which is free of wood, piping and combustible materials can be used as fill for the onsite cavities remaining after the removal of the ERR. Other clean rubble which cannot be accommodated onsite will be buried offsite. The burial contractor, Big Lake Sand and Gravel Company, conducts a land-fill operation near Elk River, Minnesota, which will accommodate this latter material as replacement for gravel presently being extracted. At present, it is estimated that 200 to 300 truck loads of such wastes will be involved. Where there is any question as to the activity of any material, it is to be considered radioactive and treated accordingly.

The procedures mentioned in Section III are developed to: (a) assure that no significant adverse environmental impact from radioactivity will occur during the dismantling operations; and (b) permit the ERR site to be used without any AEC radiological limitations on its subsequent use.

B. Shipping Accident Considerations

As indicated in Table III, the preponderance of the reactor-originated radioactivity to be shipped offsite will consist of non-fissionable material fixed in the metal components and equipment of the ERR. In an accident, the components would be expected to remain intact and not result in the spread of radioactive contamination. Since no fissionable material is present, a criticality incident is impossible. The maximum hazard therefore would be that resulting from direct gamma radiation. The

limiting exposures would be those which are set forth in Section 173.393 of Title 49 of the Code of Federal Regulations. The dose rates permitted under this Department of Transportation regulation are as follows:

- (1) 1,000 mR/hr at 3 ft. from the external surface of the package;
- (2) 200 mR/hr at any point on the external surface of the car or vehicle;
- (3) 10 mR/hr at 6 feet from the external surface from the car or vehicle;
- (4) 2 mR/hr at any normal occupied position in the car or vehicle.

The radioactivity contained in the insulation and concrete to be shipped offsite constitutes less than one percent of the total radioactive inventory. The steel wool type of insulation will be placed in sealed shipping containers which are designed to remain intact in the event of a shipping accident and thus, these materials are not expected to present any inhalation hazard or be amenable to dispersion. Because of the character of this material, several containers will be required for shipment, and thus the maximum radioactivity per package should be relatively small.

The greatest bulk of the material to be shipped for disposal outside the State of Minnesota is expected to be the concrete which contains detectable reactor-originated radioactivity. As noted in Table III, this material in total is estimated to contain less than six curies of radioactivity, and will be of low specific activity. No single shipment (i.e., truck load) is expected to contain more than a fraction of one curie, and some shipments under Federal regulations may not even need to be classified as a radioactive shipment. In the event of an accident this material should pose little if any hazard to the health and safety of the public even if it is assumed to be dispersed at the accident scene.

For accidents involving radioactive shipments, procedures have been developed and emergency plans are in effect as noted previously. Thus for the radioactive shipments from the ERR, there appears to be no foreseeable situations where, even in the event of an accident, the public could be exposed to radiation doses in excess of those permitted under normal shipment criteria.

C. Other Potential Environmental Effects

Other than the radioactivity aspects, the nature of the dismantling operations is similar to that of a heavy construction project and will include the operation of equipment, such as dump trucks, bulldozers, and grading equipment, and the use of rail sidings. The impact of these operations, however, are not expected to be significant since the site already is industrial in character as a result of the existing fossil fired power plant operation. No new rail sidings are required and, except for the immediate vicinity of the ERR, existing roads are available for vehicular traffic. Noise levels during the dismantling operation may be increased at times as a result of heavy equipment operation. Increased vehicular traffic can also be expected both from the work force transportation and from the offsite shipment of wastes and scrap.

The dismantling operations are not expected to involve extensive chemical wastes except perhaps in decontamination operations, and wastes from these operations will be disposed of as radioactive material, or if nonradioactive, can be accommodated in large measure by existing facilities. If, however, additional facilities are required, they will be installed and operated so

as to comply with the applicable Federal, State and local standards. Existing sanitary services will be utilized and supplemented as necessary by temporary facilities, whose wastes can be collected and disposed of offsite in an approved manner.

Because of the existing character of the industrial operations at the ERR site, there are no endangered species that will be affected by the dismantling operation. Neither are there any known features of a historic or unique cultural nature which would be affected by the dismantling.

D. Environmental Surveillance Program

At present, there is an environmental surveillance program for radioactivity that consists of both effluent monitoring and environmental sampling, both of which are further subdivided into onsite and offsite sampling. The offsite sampling program has been a joint effort of the RCPA and the Minnesota Department of Health (MDH) since July 1962. Prior to that date, the MDH and RCPA had been conducting separate sampling programs, the MDH on a state-wide basis and the RCPA in the area immediate to the ERR site.

The air effluent monitoring program consists of both continuous sampling and instrument monitoring of airborne releases. Integrated filter samples of particulate releases are collected over a seven-day period and analyzed for gross beta-gamma radioactivity. The minimum sensitivity for this sampling system is 0.01 pCi/m^3 of beta-gamma activity. The instrumentation used for monitoring of airborne releases consists of a continuous strip-tape filter and two associated beta-sensitive scintillation detectors, one

of which immediately senses radioactivity collected and the other after a six-hour delay. The minimum sensitivity of both particulate detectors is 60 pCi/m³. It is estimated that the combination of the particulate monitoring devices and sampling system is capable of measuring releases from the ERR consistent with proposed 10 CFR 50, Appendix I, guidelines.

While it is possible that releases as high as 2-3 times release limits may not be detected immediately, they would be detected not later than one week after release. Since averaging of releases over a year's period is permitted by the proposed guidelines, releases at the detector sensitivity threshold of short duration are considered acceptable. The major radionuclides on an activity basis that may be released during dismantling operations are Co⁶⁰, Fe⁵⁵ and Ni⁶³.

Liquid waste management practices at the ERR are established such that all liquid radioactive wastes lead directly to two 3,000 gallon retention tanks or through floor drains to a pump at the subbasement level where the liquid is pumped to the retention tanks. Liquid waste collected in the retention tanks is released on a batch basis. Prior to release, the waste in a tank is circulated through filters and ion exchange resins. The waste is sampled and analyzed for total beta activity and specific gamma emitters both before and after recirculation to determine the need for additional purification. Prior to release to the Mississippi River, the radioactive concentration of the waste is further reduced by dilution with condenser cooling water from the turbine-generator plant. After dilution, the waste is again sampled and analyzed as it is released to

confirm concentration and total radioactivity predictions. The minimum sensitivity of liquid waste analysis is 20 pCi/l of total beta activity. Although radioactive effluents should never appear in it, the service water return line is continuously monitored as an additional check.

The onsite sampling program consists of four air sampling stations the locations of which are shown in Figure 7. Air samples are changed weekly and analyzed for total beta activity with a minimum sensitivity of 0.01 pCi/m³. Soil and vegetation samples are collected monthly from these four locations and analyzed for total beta activity. The minimum sensitivity of the analysis is 10 pCi/gm. Gamma background levels are measured with thermoluminescent dosimeters at ten locations at the ERR site which are shown in Figure 8. The dosimeters are changed monthly which results in an equivalent measurement sensitivity of 1 uR/hr.

Samples of potable water, the source of which is a deep well at the site, are collected weekly for total beta analysis.

The offsite sampling program includes nine continuous air sampling stations which also contain thermoluminescent dosimeters for gamma background measurements. The sampling stations, located within a 5 to 15 mile radius of the ERR site are shown in Figure 9. Sampling frequencies and measurement sensitivities are identical to those indicated previously. Soil and vegetation samples are taken from these locations quarterly and analyzed for total beta activity with a minimum sensitivity of 10 pCi/gm. Water samples are obtained daily from the Mississippi River at four locations

ELK RIVER REACTOR
ON SITE
GAMMA BACKGROUND
MEASUREMENT LOCATIONS

47

Figure 8

LEGEND

- EXISTING RCPA SAMPLE LOCATIONS
- NEW RCPA SAMPLE LOCATIONS
- EXISTING DEPT OF HEALTH SAMPLE LOCATIONS

ELK RIVER REACTOR
AIR, SOIL, VEGETATION AND
GAMMA BACKGROUND
SAMPLE LOCATIONS

shown in Figure 10. Water samples from each of the four locations are composited weekly and analyzed for total beta activity. Minimum measurement sensitivity is 20 pCi/l.

All phases of the environmental surveillance program will be continued and revised as appropriate until all detectable reactor originated radioactivity has been removed from the site. Results of the surveillance program are published annually in a formal report prepared jointly by RCPA and the MDH.

E. Summary of Environmental Impact

Although extremely minute amounts of radioactive and nonradioactive contaminants potentially could be introduced to the environment as the result of the dismantling of the ERR, preventive measures as described in Section III will be employed to assure that there will be no releases in excess of applicable limits and that the quality of the air and water resources will not be impaired. These measures will prevent short- or long-term adverse consequences for plant, animal, or human life on or near the site.

The dismantling and removal operations are expected to be completed in about one and a half to two years. An average of about 50 men are expected to be on the job at the site during the dismantling and removal operations. The impact of transportation should not be significant when the limited number of offsite shipments and transportation needs of the work force are considered.

Increased noise levels offsite are not expected to be significant in light of the distance from the village and the present noise levels due to rail and road traffic and the RCPA's fossil fuel station operations. No other environmental impacts of potential adverse consequence are expected.

V. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACT

The scope of the environmental impact was discussed in Section IV. The unavoidable environmental impact which might be considered adverse are essentially those of a construction (i.e. dismantling) nature, increased traffic (vehicular and rail), and disposal of the materials and wastes resulting from the dismantling. The site, as noted previously, is occupied in part by RCPA's coal-fired electric generating station and is, thus, already industrial in character. The dismantling operations internal to the reactor building should not contribute any further adverse impact in this regard. The dismantling of the exterior of the reactor building and grading of the site may for a relatively short duration cause some increased noise and other effects associated with heavy equipment operation, but these should be limited in duration, temporary in effect, and relatively insignificant.

There will be some increase in transportation both for personnel associated with the dismantling and shipment of the dismantled material and waste to a local waste disposal site, salvage point, or to AEC approved burial grounds. The number of shipments are expected to be accommodated without undue burden on the existing roads and rail facilities.

Sanitary and industrial wastes generated during the dismantling can be accommodated by existing facilities or alternate facilities provided so that their disposal will be made in accordance with applicable standards.

Limited quantities of liquid radioactive wastes may be created primarily from decontamination operations, and these will be handled by the reactor plant radwaste system. If radioactive concentrations in the effluent are below the limits of 10 CFR 50, Appendix I, they will be released to the Mississippi River. If concentrations remain above applicable limits, the

liquid will be collected and shipped off site for disposal at an AEC-approved facility.

In light of the nature of the dismantling operation and the detailed program outlined for its implementation, there appears to be no significant unavoidable adverse environmental impact associated with the proposed action.

VI. ALTERNATIVES

The RCPA did not exercise its contract option to purchase the nuclear reactor and associated equipment from the AEC.

Under the terms of its contract with RCPA the AEC has an obligation to take such action as necessary to make the reactor site "useable without undue danger to public health and safety."

Various alternatives for the final disposition of the ERR were considered. These included, at one extreme, suitable entombment of the reactor vessel and contaminated material at the site. Such entombment would have committed the reactor site for a relatively long period of time and no practical alternate use of the entombment structure would have been possible. In addition, continuing or periodic monitoring and control of the facility would have been required for an extended period, probably years. The other extreme was the complete removal and disposal of all manmade structures, equipment, and materials associated with the ERR from the plant site.

In order to comply with its contractual commitment to RCPA the alternatives that could be realistically considered by the AEC were those that removed detectable reactor induced radioactivity from the site and would permit alternate use by RCPA of that portion of the site occupied by the reactor facilities. Thus, only two alternatives were considered practical--complete removal of the reactor facilities and their foundations, or removal of the reactor facilities to ground level plus any subsurface structures which might contain detectable reactor originated radioactivity.

For these two alternatives, the dismantling of above grade structures was deemed to be identical. For below grade portions, however, the latter

resulted in a reduced impact because less material would have to be removed, less shipment and disposal of materials required, it would not be as time consuming, and would not be as expensive in terms of resources expenditures. The selected course of action was to remove all above grade structures and equipment, and all below grade materials, if it contains detectable reactor originated radioactivity. It was believed that this approach was the most suitable for the ERR and would result in the least environmental impact.

VII. RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The nature of the proposed action is the removal of a manmade structure and returning the site to a condition that will not require restrictions on its future use as a result of its prior use for a nuclear power generating station. Thus, the short-term use following the dismantling and the long-term productivity should be enhanced and unrestrained by the proposed action.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The AEC is contractually obligated to RCPA to leave the reactor site so that it is usable without undue danger to public health and safety.

Before control of the reactor site is returned to the RCPA, the AEC will arrange for the removal of all above grade reactor plant structures and equipment, activation products and detectable radioactive contamination. Only the foundations below grade and exterior to the reactor building will be left at the reactor site. Portions of these foundations will also be removed if any reactor produced radioactivity is detected.

The dismantling and removal operations will not involve the irreversible or irretrievable commitment of resources, since these operations are intended to leave the reactor site available for alternate uses.

After completion of the dismantling program, the site is expected to be utilized by RCPA for activities and facilities associated with its electric generating system.

IX. COST BENEFIT ANALYSIS

This proposed action is somewhat different than actions normally considered in environmental statements in that a manmade structure (i.e., the ERR) is to be removed and its site restored to conditions approaching those which had existed prior to its construction and operation. The more general cases are those where actions are proposed to construct a facility or structure, or change an existing use to one that might adversely affect the character of the environment.

As indicated in prior sections of this report, the AEC is contractually obligated, since RCPA did not exercise its option to purchase the ERR, to make the reactor site "usable without undue danger to public health and safety." Since the operation of the ERR has ceased, the options considered by the AEC ranged from leaving the ERR structures in place with radioactivity entombment to that of complete removal of all structures and foundations from the site. These alternatives were discussed in Section VI.

At one extreme, the leaving of the ERR structures in place and entombment of the radioactivity would have resulted in a continuing obligation to maintain integrity of the ERR structures and would have denied RCPA the use of the land presently occupied by the ERR. A modest amount of construction activity would also have been required to put the facility into this "extended storage" condition.

At the other extreme, complete removal of the ERR (including all foundations) as a means of permitting the use of the site by RCPA and removing all detectable reactor originated radioactivity from the site,

would involve more extensive construction effort (including more waste to be disposed of and more fill material) than any other alternative.

The proposed course of action will remove all detectable reactor originated radioactivity from the site and make the site available for alternate use by RCPA. It will require a less lengthy and expensive construction effort than the complete removal alternative. By leaving the major portions of the foundations in place, less waste will be created and less fill will be required. The benefits of this approach will be essentially the same as for complete removal but at less cost, both environmentally and economically.

The proposed dismantling action as described herein is believed to be an approach which will result in the desired beneficial results with minimal economic and environmental costs. The benefits of making the site available for alternate uses without the continuing presence of detectable reactor originated radioactivity is deemed to be a benefit which will outweigh the modest additional economic and environmental costs of the dismantling and demolition effort. Thus, the AEC has assessed and balanced the benefits of the proposed action against the anticipated costs, and has considered the available alternatives and their environmental impact. It has concluded after performing this analysis that the proposed action should be implemented.

X. SUMMARY OF COMMENTS

The Draft Environmental Statement, Elk River Reactor Dismantling, Elk River, Minnesota (WASH-1516), dated December 1971, was transmitted to Federal and State agencies for review on December 23, 1971. In response to this transmittal, comments were received from eight Federal agencies and two State of Minnesota agencies. Federal agencies responding including the Environmental Protection Agency (EPA), Federal Power Commission, and the Departments of Agriculture; Army; Commerce; Health, Education, and Welfare; Interior; and Transportation. State of Minnesota agencies were the Minnesota Pollution Control Agency (MPCA) and the Department of Highways.

Copies of the comments received and the AEC replies are included in Appendix B. In general, the comments reflect the adequacy of the report and validated the conclusion that the dismantling effort should pose no significant adverse environmental impact. The most extensive comments were those received from EPA and MPCA. The EPA comments principally addressed emergency or accident situations or requested greater detailing of those sections of the report which dealt with the identification or disposition of wastes that would be generated during the dismantling action.

The comments from MPCA generally paralleled those of EPA, but were more extensive in that they sought greater details, not only on the draft environmental statement, but also on the Dismantling Plan. Responses to both the EPA and MPCA comments have been developed and included in Appendix B. Where applicable, the Final Environmental Statement has been revised or expanded to reflect these comments.

References

1. Final Hazards Report for the RCPA Elk River Reactor, January 14, 1965, Allis-Chalmers Manufacturing Company, ACNP-65503.
2. AEC-Elk River Reactor Dismantling Plan, August 27, 1971, Rural Cooperative Power Association, Elk River, Minnesota, SS-836.

APPENDIX A
COORDINATION

The dismantling of the ERR is expected to be of interest to various Federal and State agencies, such as the Air Pollution Control, Water Quality, Radiation and Solid Waste Offices of the Environmental Protection Agency (EPA) as well as the Minnesota Department of Health (MDH), and the Minnesota Pollution Control Agency (MPCA). Radiation surveys and monitoring and decontamination procedures will be conducted by RCPA and will be coordinated with MDH. The contractor(s) will perform the dismantling and removal operations under the supervision and direction of RCPA; their work will be coordinated with the U.S. Department of Transportation and other appropriate Federal and State agencies. The AEC will review the Dismantling Plan and, when satisfactory, approve it and issue the Dismantling Order. Also, the AEC will monitor the dismantling activities at the ERR site to assure that the work is conducted in accord with approved procedure and practice. An AEC onsite representative will coordinate AEC support of any operation which could potentially present problems not previously anticipated.

APPENDIX B

STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
ST. PAUL, MINN. 55101

January 4, 1972

Mr. W. H. Pennington
Technical Assistant to the
Assistant General Manager
for Environment and Safety
U.S. Atomic Energy Commission
Washington, D. C. 20545

Draft Environmental Statement
Elk River Reactor Dismantling
Elk River, Minnesota

Dear Mr. Pennington:

The draft environmental statement has been reviewed. We have no specific comments to offer on this statement.

We suggest, however, that your agency be cognizant of regulations governing the size of loads which may be transported on state highways.

Sincerely,

Ray Lappegaard
Commissioner

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. Ray Lappegaard, Commissioner
State of Minnesota
Department of Highways
St. Paul, Minnesota 55101

Dear Mr. Lappegaard:

Thank you for your letter of January 4, 1972, regarding your review of the draft environmental statement for the Elk River Reactor Dismantling. The Rural Cooperative Power Association is aware of the highway regulations of the State of Minnesota and these will be complied with for any offsite highway shipment.

The draft statement has been revised taking into account the comments received from various review groups, and a copy of the final statement is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin", is positioned above the typed name.

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426

IN REPLY REFER TO:
PWR-ER

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, D. C. 20545

JAN 16 1972

Dear Mr. Rubin:

This refers to your letter of December 27, 1971, to Mr. Frederick H. Warren and the accompanying Draft Environmental Statement -- Elk River Reactor Dismantling, Elk River, Minnesota.

As the Elk River Reactor has been shutdown since January 1968, has not entered into the area electric power supply situation in the interim, and is not considered to represent an element of future power supply, we do not plan to submit comments on the proposed action to dismantle the reactor.

Very truly yours,

T. A. Phillips
Chief, Bureau of Power

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. T. A. Phillips
Chief, Bureau of Power
Federal Power Commission
Washington, D.C. 20426

Dear Mr. Phillips:

Thank you for the review and comments on the Atomic Energy Commission's draft environmental statement for the Elk River Reactor Dismantling. The draft statement has been revised and a copy of the final environmental statement, which takes into account the comments received from the various review groups, is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin".

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

cc: Mr. Frederick H. Warren, w/enclosure

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1210 U. S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

IN REPLY REFER TO

NCSED-PB

26 January 1972

Mr. Julius H. Rubin
Assistant General Manager for Environment
and Safety
Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Rubin:

Your letter of 27 December 1971 to Dr. Louis M. Rousselot, Assistant Secretary for Defense inclosing a draft copy of an environmental impact statement for the Elk River Reactor Dismantling, Elk River, Minnesota, has been referred to this office for reply.

The statement has been reviewed and it appears to cover adequately the aspects of the environment which are affected by the proposal and which fall within our purview.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Rodney E. Cox", is written over the typed name.

RODNEY E. COX
LTC, Corps of Engineers
District Engineer

Copy furnished:
Mr. Timothy Atkeson (10 copies)
General Counsel
Council on Environmental Quality
Executive Office of the President
722 Jackson Place, NW
Washington, D.C. 20506

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Lt. Col. Rodney E. Cox, District Engineer
St. Paul District, Corps of Engineers
1210 U.S. Post Office & Custom House
U.S. Department of the Army
St. Paul, Minnesota 55101

Dear Col. Cox:

Thank you for your review of the Atomic Energy Commission's draft environmental statement for the Elk River Reactor Dismantling. Enclosed for your information is a copy of the final environmental statement which incorporates the comments received from other review groups.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin".

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

cc: Dr. Richard S. Wilbur

THE ASSISTANT SECRETARY OF COMMERCE
Washington, D.C. 20230

January 28, 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Room B312
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

We have reviewed the draft environmental impact
statement concerning the proposed Elk River
Reactor Dismantling project, reference WASH-1516,
and have no comments.

Sincerely,

A handwritten signature in cursive script that reads "Sidney R. Galler".

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs
U.S. Department of Commerce
Washington, D.C. 20230

Dear Mr. Galler:

Thank you for your letter of January 28, 1972, regarding your review of the draft environmental statement for the Elk River Reactor Dismantling. Enclosed for your information is a copy of the final environmental statement.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin".

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
U.S. COAST GUARD (WS)
400 SEVENTH STREET SW
WASHINGTON, D.C. 20590
PHONE 202-426-2262

4 FEB 1972

• Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

This is in response to your letter of 27 December 1971 addressed to Mr. Herbert F. DeSimone, Assistant Secretary for Environment and Urban Systems, Department of Transportation, concerning the draft environmental impact statement for the dismantling of the Elk River Reactor, Elk River, Minnesota.

The concerned operating administrations and staff of the Department of Transportation have reviewed the draft statement for this dismantling project. Noted from the review of the Department's Office of Hazardous Material is the following:

"This office has no specific comments to offer other than to note that the discussion of transportation on pages 30-31 of the environmental statement is quite general and does not go into much detail. This appears to be unavoidable since the type of material to be shipped during the dismantling will be objects of varying sizes and shapes, contaminated with varying levels of radioactivity."

The draft statement indicates that all shipments of radioactive material will be shipped in accordance with Department of Transportation regulations. The dismantling of the Elk River Reactor appears to have little impact upon transportation and this Department can see no objection with your proposal.

The opportunity for the Department of Transportation to review the draft environmental impact statement for the Elk River Reactor Dismantling is appreciated.

Sincerely,

U.S. COAST GUARD
DEPT. OF TRANSPORTATION
WASHINGTON, D.C. 20590
FEB 1972

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Rear Admiral W. M. Benkert, Chief
Office of Marine Environment and Systems
United States Coast Guard (WS)
U.S. Department of Transportation
400 Seventh Street, SW.
Washington, D.C. 20590

Dear Admiral Benkert:

Thank you for the review and comment on the Atomic Energy Commission's draft environmental statement for the Elk River Reactor Dismantling. The section of the statement dealing with transportation has been revised and a copy of the final environmental statement, which also incorporates the comments received from other review groups, is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin".

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

cc: Mr. Herbert F. DeSimone

DEPARTMENT OF AGRICULTURE

OFFICE OF THE SECRETARY

WASHINGTON, D. C. 20250

FEB 8 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, DC 20545

Dear Mr. Rubin:

We have reviewed the draft environmental statement for the Elk River Reactor Dismantling, sent with your letter of December 27, 1971, and comments from Agricultural Research Service and Soil Conservation Service are attached.

The Forest Service of the Department of Agriculture has not yet completed its review and will send its comments to you directly at some later date.

Sincerely,

T. C. BYERLY
Coordinator, Environmental
Quality Activities

Attachments

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

The impact on the environment of the dismantling of the reactor will be confined to the radioactive contaminants that might be involved. The radioactive safety aspects of the dismantling operation appear to be adequately provided for in Section III.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

The project will have no detrimental effect on agricultural production, farm or ranch operations, land use, water supply, drainage patterns, or conservation measures. We would suggest, however, that consideration be given to seeding a permanent grass mixture in all areas following removal of buildings and backfilling operations. Establishment of permanent grass in disturbed areas along with trees or shrubs may be beneficial from an aesthetic standpoint and would also be beneficial in reducing any possibility of future wind or water wrosion in these areas.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. T. C. Byerly, Coordinator
Environmental Quality Activities
U.S. Department of Agriculture
Washington, D.C. 20250

Dear Mr. Byerly:

Thank you for your review of the draft environmental statement for the Elk River Reactor Dismantling and your letter of February 8, 1972, transmitting comments on this draft statement from the Agricultural Research Service and Soil Conservation Service. These comments have been considered in the preparation of the final environmental statement, a copy of which is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin", is positioned above the typed name.

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

MAR 2 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

We do not have any specific comments regarding the draft environmental statement for the Elk River Reactor Dismantling project. Apparently no forested land will be affected by this action.

Sincerely,

THOMAS C. NELSON
Deputy Chief

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. Thomas C. Nelson
Deputy Chief
Forest Service
U.S. Department of Agriculture
Washington, D.C. 20250

Dear Mr. Nelson:

Thank you for your review of the draft environmental statement for the Elk River Reactor Dismantling and your letter of March 2, 1972, relating thereto. This draft statement has been revised and a copy of the final environmental statement, which takes into account the comments received from the various review groups, is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin", is positioned above the typed name.

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

cc: Mr. T. C. Byerly, w/o enclosure

MINNESOTA POLLUTION CONTROL AGENCY

717 Delaware Street S.E./ Minneapolis, Minnesota 55440

Telephone: (612) 378-1320

February 11, 1972

Mr. W. H. Pennington
Technical Assistant to the
General Manager for Operations
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Pennington:

Enclosed is our commentary concerning the dismantling of the Elk River Reactor. In connection with the dismantling of the reactor, I would like to request that we be sent copies of all other comments which have been received and pertain to this proposed activity.

I understand that at the present time there are no established procedures for holding a hearing on the Elk River dismantling. If a request for a hearing becomes necessary, we hope that you will have no difficulties in developing procedures which would allow for such a hearing. Such a hearing is certainly envisioned in the Council on Environmental Qualities guidelines as stated in subsection 10e. If your staff has any questions concerning our commentary, please feel free to contact me.

Sincerely yours,

Grant J. Merritt
Executive Director

GJM/KD:jsm

MINNESOTA POLLUTION CONTROL AGENCY STAFF
COMMENTARY ON THE DISMANTLING OF THE ELK RIVER REACTOR

Prepared by
Ken Dzugan
Research Scientist
Division of Special Services

Introduction

The first section of the commentary will consist of general comments and observations which should be considered as applicable to appropriate portions of both the dismantling plan and the draft environmental impact statement. The second section of the report will be composed of comments relating to specified portions of the draft environmental impact statement. The third section of the report will comment on specified portions of the dismantling plan.

I. General Comments

The wastewater treatment system at the Elk River Plant is not presently producing water which is anywhere near the quality of water which has been produced at the Monticello nuclear generating plant. The general level of releases from Elk River, in the past, have been several times 10^{-4} microcuries per milliliter (uc/ml). With any reasonable amount of treatment, the levels

should be less than 10^{-7} uc/ml prior to any dilution in the cooling water. At our request, the Elk River plant people are presently undertaking a change of resins in the ion exchange column. They will also operate the cleanup systems over longer periods of time than has been done previously. Hopefully these two actions will result in discharge water of 10^{-7} uc/ml or less.

In several places in both the dismantling plan and the draft environmental impact statement, reference is made to various AEC regulations such as 10 CFR 20 and the proposed 10 CFR 50, appendix I. These regulations are utilized so as to imply that discharges or releases or concentrations up to the levels in those guidelines are satisfactory and need not be reduced below those levels. It is clear that there will be many times when releases or concentrations can be kept far below such limits. If it is possible to do this, it should be done and this is the only way in which the admonition of keeping dosage and releases as low as practicable will truly be followed. In planning any work procedures to be used, keeping dosages to workers as low as practicable should be a prime consideration. This could be done by using work procedures to keep concentrations far below 10 CFR 20.

II. Comments on the Draft Environmental Impact Statement

In the summary, it states, "All contaminated materials resulting from the dismantling will be disposed of at AEC approved burial grounds." Unless the liquid radwaste treatment system can be upgraded as discussed in the first section, this statement should be changed to reflect the excessive liquid releases.

In the summary, it states that the site survey to be performed will detect any reactor originated material and several times it makes reference to the fact that all material which is contaminated with reactor originated radioactivity will be removed from the site. A clear statement should be given concerning the sensitivity levels to which this survey will be made; both for the gross levels involved and for levels for various isotopes. For isotopes not naturally occurring, detection levels should be below the natural background gross beta gamma activity.

In table 2 in the draft statement, some 20 isotopes are considered to have been produced within the reactor vessel and the surrounding area. To what extent would other radionuclides be present other than the 20 given be produced?

Under section IIIA, reference is made to review by the AEC division of reactor development and technology of activity specifications and detailed working procedures. Certainly these reviews have not been included within the present draft statement and neither is any analysis presented of the possible environmental impact of these specifications and procedures. This should be done and a detailed review of this matter should be contained within the draft statement. If the absence of this review is simply an oversight, then it should be included, but if it is meant to imply that these procedures have not yet been worked out, then the procedures should be worked out and any possible environmental impact they may have should be considered and placed in the final report.

Page 25 of the dismantling plan discusses the storage area in which articles prepared for offsite removal to burial grounds will be stored prior

to shipment. Apparently this storage area is not within the present reactor building. The plans for this hot storage area should be discussed along with a demonstration that the plans will avoid any heavy snow accumulations and flooding in wet weather. As well, the seismic and wind loadings for this storage area should be given along with an assessment of possible releases to the environment of materials from this area during any high winds or seismic events.

Under section IVA, the statement discusses filtration of air which will be done for both the air which will be filtered within some of the special areas to be created inside the building to localize possible contamination and for any filtration being done for air which is being exhausted from the building. A specification should be set up for the efficiency of the filters. Also, the test methods to demonstrate the filter efficiency should be listed along with the period of time which is allowed to go by prior to having the filter re-tested to demonstrate continued efficiency.

Nowhere in the section on environmental consequences does it discuss in detail the various paths which may be taken for either air or water releases and what the assessment would be as a result of these releases. This discussion should definitely be in the final impact statement. Concerning the section on the monitoring program, the external monitoring program should be discussed in more detail and the internal monitoring program for monitoring for releases to either the air or the water should be spelled out in greater detail. The monitoring for releases should contain provision for continuously recorded monitoring of points at which air or water releases might take place. Also in the Environmental Effects Section there is no discussion of accidents

which might occur during shipment of materials to offsite burial. The routes which will be taken by the trucks going from Elk River to AEC disposal sites should be specified and it should be demonstrated that these routes will assure that should there be any accidents that the resulting dosage will be minimized by route selection.

The cost benefit analysis section is not very detailed at all. Cost figures should be provided for the various alternatives which were considered.

III. Dismantling Plan Comments

Section 2.4.3 - calculation of activities. It is stated that there is an assumed figure given for the cobalt content of both carbon and stainless steels. Has any analysis been performed to demonstrate that these figures are correct? If not, this analysis should be performed and included in the final impact statement. In this section, it also discusses a gamma ray spectrometric analysis of coring taken in the shield and the only activities shown are cobalt 60 and europium 152. At what sensitivity was this gamma ray spectrum run and were there any other elements which were shown to be present as a result of the analysis? Also there is a statement given of the composition of the heavy concrete in the bottom plug of the biological shield. Where is the verification for this composition and where is the verification given for the portland cement composition? If it is not readily available, tests should be run to demonstrate that the assumed compositions are correct.

Table 2.8; it is apparent from looking at the dismantling report that there are several areas in which the actual dose has been underestimated. These are principally in the biological shield. Is it possible that the use

of assumed compositions have lead to this error? Has any further work been done to demonstrate what the actual dosages are? This will be important since there will be a great deal of work done in the area of the biological shield during the dismantling of the plant.

Section 2.4.5; at the end of this section a statement indicates that if there are any errors in the previous calculations caused by using inappropriate build-up factors, these errors will be made toward the side of conservatism. This statement should be backed up by further demonstrations of the work that was used and not simply stated without verification.

On page 52 of the dismantling plan, it says that the drains from the hot shower wash basins will be piped to the existing reactor liquid radwaste retention tanks. It is not clear that this decision should have been made, at least at present. If the water can be cleaned up so that it is below the levels that are present in the shower drains then indeed it would be beneficial to have these drains pumped into the radwaste retention tanks for cleaning. However, if the system can't properly be upgraded, then another method should be explored for the discharge of these drains.

On page 58, some cutting operations are discussed. All cutting procedures should be specified in advance of any work so that if there is any possible environmental impact, it can be discussed in the impact statement. If it is not feasible to do this prior to issuing any dismantling statement, then as a minimum requirement a series of steps should be provided giving criteria one uses in discussing any cutting procedures which are to be considered.

On page 59, it mentions that it is possible that air transfers of some of these radioactive materials will be made to where they will be put into shipment casks. It would seem that air transfers should only be considered when it can be shown that dosage to people working in the area will be less than having made the transfers through water.

In the section on removal and disposal of the pressure vessel, it discusses an allowable contact dose of 200 millirems per hour. This seems far too high. Also discussed is the shipment of this ring without any further packaging and this is not appropriate in view of allowing a contact dose as high as 200 mr/hr. It is strongly suggested that packaging procedures be devised and used to keep this dose too far below 200 mr/hr. This would be especially relevant if there were to be any traffic accident along the way in which the contents of the truck would be spilled out. There would be no protective cask surrounding the material at all and any members of the general public could come up and be exposed to the 200 mr/hr dose. In discussing the cutting on the vessel, it says that there will be a shielded work platform that will be used by the workmen. It would seem that it would be expedient here to consider the possibility of using remote control cutting procedures and that this might greatly lessen the amount of dosage the workers would receive. It is hoped that in the final impact statement such a discussion will be presented and indeed if it does result in less dosage to the workers then this should be specified as a method to be used in dismantling the plant.

On the top of page 63 of the dismantling plan, it says that radiation monitoring and exhaust systems will be maintained in operation until all radioactive or contaminated materials or equipment in excess of limits

specified in table 4.1 have been removed from the reactor building. The levels in this table are typically in the order of 100 or 1000 dpm which are levels considerably above background. Consequently, the opportunities exist for having radioactive exposure of the workers as well as possible discharge to the environment even after the radiation monitoring and exhaust systems have been dismantled. Because of the existence of dosage and discharge possibilities after removal of the radiation monitoring and exhaust systems the levels in table 4.1 should be reduced to background rates for gross counts. For those isotopes which are reactor originated but not naturally occurring, table 4.1 should have a section specifying that gamma spectra be run at levels of sensitivity well below gross environmental levels. Any time throughout the report when it refers to decontamination or removal down to the levels in table 4.1, the comments just given above should apply.

On page 69, under phase 1 of the dismantling program, it stated that there were indications of cesium 137 and some beta emitters in the superheater tubes, I think that it should be made clear what isotopes other than cesium 137 were present.

Section 4.7.1; work procedures which are discussed should be detailed and should be included within this section. Also it discusses the possible use of contamination control envelopes when contaminated or potentially contaminated items are being cut. Any time there is contamination or potential contamination it should be a matter of practice to use the contamination control envelopes.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. Grant J. Merritt
Executive Director
Minnesota Pollution Control Agency
717 Delaware Street, SE.
Minneapolis, Minnesota 55440

Dear Mr. Merritt:

Thank you for your review and comment on the draft environmental statement for the Elk River Reactor Dismantling. An Atomic Energy Commission Staff Report on the Minnesota Pollution Control Agency comments is enclosed. The draft statement has been revised to reflect consideration of your comments, as well as those received from other review groups, and a copy of the final environmental statement is enclosed for your information.

With respect to your request for copies of the comments submitted by others, the comments received and the Atomic Energy Commission's responses thereto are included as Appendix B to the enclosed final statement.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin", is positioned above the typed name.

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosures:

1. AEC Staff Report
2. Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

ATOMIC ENERGY COMMISSION STAFF REPORT
ON
MINNESOTA POLLUTION CONTROL AGENCY COMMENTS
ON THE
DRAFT ENVIRONMENTAL STATEMENT
ELK RIVER REACTOR DISMANTLING (WASH-1516)

The AEC responses to comments raised by the Minnesota Pollution Control Agency (MPCA) in its transmittal of February 11, 1972 are presented herein. As in the MPCA transmittal, they are identified as General, or as pertaining to the Draft Environmental Statement or Dismantling Plan.

A. GENERAL COMMENTS

1. Water Discharge Radiation Levels

With respect to your comment concerning the radioactivity level of the water discharges, the numerical guidelines proposed in 10 CFR 50 Appendix I establish as limiting conditions annual releases of 5,000 millicuries and average release concentrations of 20 picocuries per liter. The 1972 plant releases to date have amounted to 1.9 millicuries, with concentrations at the discharge point to the river averaging about 4 picocuries per liter. The Rural Cooperative Power Association is, nevertheless, taking additional steps to reduce these releases and exposures to even lower levels. It should be noted that the background measurements of the Mississippi River in this locale varies between 5 and 20 picocuries per liter.

Improved operating techniques, such as maximizing the usage of waste handling equipment and releasing water inventory over longer periods of time, will lead to substantial reductions from previous levels of both release concentrations and the amount of material actually released -- although the increased generation of liquid waste during dismantling will have some off-setting effect.

A calculation of release levels attainable during dismantling indicates that future releases on an annual basis should be below one millicurie, one 5,000th of the guideline, with average concentrations prior to river dilution of about 1/10 of a picocurie/liter, or one 200th of the guideline. In addition to contemplating full usage of the waste system filters and ion exchange columns and release of the steam plant condensate over a reasonable dilution period, the calculations take into account the increased volume of waste expected to be generated during the dismantling operations. Although the concentration in the retention tanks prior to dilution and release to the river is

not a meaningful control parameter from environmental effect considerations, it should typically be 10^{-6} uCi/cc (1,000 picocuries/liter) or less.

2. Radiation Limits

The reference to various regulations throughout the Draft Environmental Statement was to indicate that recognized and applicable limits would not be exceeded. Consistent with the operations, equipment and other factors, the releases and exposures are expected to be substantially below these limits. Throughout the dismantling operations, releases and personnel exposures will be kept to levels which pose no undue risk to the workers or the public.

As specified in both the Environmental Statement and the Dismantling Plan, radiation work procedures, which are made up shortly before the work begins so that most recent radiological status data may be available, will be required. The following statements, taken from the Health and Safety Manual for the Elk River Reactor, typify the radiation exposure philosophy extant not only at the Elk River Reactor but at all installations where considerable quantities of radioactive material are handled. "The first rule of radiation safety is that any unnecessary exposure is too much exposure." "Although the doses quoted in these guides are permissible doses, every practicable attempt should be made to prevent doses as high as those quoted." The approach in any work involving potential exposure to radiation is always that personnel doses are to be kept as low as practicable, which involves many and varied engineering and operational control techniques as well as administrative techniques such as radiation work procedures.

B. COMMENTS ON THE DRAFT ENVIRONMENTAL STATEMENT

1. Waste Disposal

With respect to your comment on excessive liquid releases, please note that, as indicated in the previous response, the level of liquid releases will be below proposed 10 CFR 50 Appendix I limitations and are not considered excessive. The section of the Final Environmental Statement on solid waste disposal, however, has been revised to provide greater detail.

2. Monitoring Sensitivity

With respect to the sensitivity levels of monitoring during dismantling, the radiation survey of the material to be removed from the reactor building will be performed with

equipment which is capable of measuring radiation levels below the natural background of plant materials. The natural background of structural material at the site which is known to be free of reactor-originated radioactivity will be determined by gross beta-gamma measurements in situ. The specific components of background will be determined by spectrometric analyses of representative material samples. Using these data as a reference, the presence of detectable reactor-originated radioactivity in building structural materials will be determined. After dismantling is completed, a site survey will be performed prior to termination of the AEC-lease to confirm that all detectable reactor-originated radioactivity has been removed from the site using procedures developed previously to identify material for disposal determination.

3. Radionuclides Produced

The 20 isotopes whose characteristics are shown in Table II are those most important from activation considerations. They will result from the exposure of the ASTM specification material present in high flux regions. The listing was used only as a basis for scoping the anticipated extent of activation present and its effect on the development of the dismantling approach. Trace elements were excluded as were radionuclides with half lives less than about four months since they would have decayed to negligible levels since shutdown. While trace amounts of other activation isotopes are expected to be present, they would not contribute sufficiently to the radioactive inventory or calculated dose levels to result in a different approach than that planned for dismantling.

4. Procedure Review

The development of the activity specifications and detailed working procedures is an ongoing activity extending into the dismantling phase. As these documents are prepared, they will be reviewed by the Division of Reactor Development and Technology to assure their adequacy in advance of their acceptance as a basis for the operations conducted. The activity specifications and detailed working procedures are subsidiary to and will be consistent with the basic dismantling concepts. They will not raise new environmental impact considerations and thus are considered to be beyond the scope of the Environmental Statement.

5. Interim Waste Storage

The packaging of solid radioactive waste to be shipped from the ERR site will be determined by the type and levels of radioactivity present. Where special containers are necessary they will conform to the

Department of Transportation specifications. The wastes will be loaded in containers inside the reactor building. Following a thorough radiation survey for external contamination, the containers will be moved to a secured and sheltered storage area outside of the reactor building, but within the fenced area, until a full load is accumulated for transport. The containers themselves provide more than adequate containment to prevent leakage of radioactive contamination. No environmental impact is expected from radioactive materials stored in the area because the integrity of the containers is such that it will not be affected by adverse climatic or seismic effects.

6. Air Filtration

The filters used for cleaning air exhausted from both the contamination control envelope and the reactor building are the so called High Efficiency Particulate Air (HEPA) filters. These filters are designed, constructed and tested (both by the manufacturer and in place after installation) according to manufacturing and testing codes established by the Federal Government and various private and professional groups. A summary of these various codes may be found in the U.S. Atomic Energy Commission Health and Safety Information Bulletin dated March 31, 1971. Filters are changed periodically according to criteria established in the Technical Specifications for the Elk River Reactor. These require that filter ΔP be monitored and that filters be changed when a drop in pressure of two inches of water is attained.

7. Release Pathways

It is assumed that this comment refers to ecological exposure pathways. Inasmuch as the dismantling will conform with the provisions of the proposed 10 CFR 50 Appendix I and approval to utilize higher limitations is not being sought, discussion is not necessary.

8. Monitoring Program

The Final Environmental Statement has been revised to reflect greater detail regarding the monitoring program.

9. Shipping Accidents

Regarding accidents that might occur during shipment of radioactive materials, reference is made to Section 173.398 of Title 49 of the Code of Federal Regulations which details specifications for container design and testing for accident conditions which must be performed on the containers prior to use. For hazardous material shipments, the common carrier is required to file his intended route within the appropriate State

Highway Department. The routes and timing of shipments will be determined based on the circumstances existing at the time a shipment is planned. In the event of an accident involving radioactive material, notification will be made promptly to the AEC's Chicago Operations Office which functions as the Regional Co-ordinating Office for the Interagency Radiological Assistance Plan (IRAP). This would result in assistance being provided expeditiously. Copies of the IRAP have been provided to such Minnesota agencies as the State Police, and the Department of Health.

10. Cost of Alternatives

The cost benefit analysis section of the Final Environmental Statement has been revised to provide greater detail regarding the practical alternatives. It is noted, however, that dollar cost figures are not a meaningful input to an environmental statement unless such costs are to be used to offset some environmental impact. The approach selected for the dismantling of the Elk River Reactor, creates minimal environmental impact.

C. COMMENTS ON THE DISMANTLING PLAN

1. Activity Levels

The assumed cobalt content of both the stainless and carbon steels is the maximum allowed by the ASTM specifications to which the materials were procured. Therefore, for conservative inventory calculations, chemical analyses are not required.

The spectrometric analysis gave positive indications of only cobalt 60, and europium 152. Their secondary peaks could have masked trace amounts of europium 154, cesium 134, sodium 22 and potassium 40. However, if those isotopes do exist, their contribution would be negligible to inventory and dose level calculations as relating to personnel exposures.

The sensitivity of the $\text{Ge(Li)}\ 40\ \text{cm}^3$ detector used in the analysis is $10^{-4}\ \mu\text{Ci/gm}$. The inventory and dose level calculations of the heavy concrete, as was true of the other materials, were intended for planning purposes only, and were expected to be conservative -- our experience indicates that this has actually proven to be the case. When material is being handled during dismantling, personnel exposure controls and material disposition decisions will be based upon direct measurements.

2. Dose Calculations

The buildup factor used for dose rate calculations was that of a point isotropic source. Rockwell's and Moteff's data show that

point isotropic source buildup factors are larger than those for plane monodirectional sources. Since dose rate is directly proportional to buildup factors, point isotropic buildup factors will yield larger calculated dose rates. The comparison was intended to show that while the actual sources more closely approximate plane monodirectional sources, the isotropic point source buildup factors tend to be in the direction of conservatism. This has been borne out by experience to date as indicated in C.1.

3. Radwaste System

The system and facilities presently available are those which have been in place since the reactor was built. The drains from the hot showers and sinks go to a small holding tank from which the waste can either be released directly to the river, trucked out or routed to the radwaste system retention tanks. Standard operating procedure will be to route the waste from this holding tank to the radwaste system since the water from the contaminated shower and sink will be low in activity and will, therefore, provide in-plant dilution for the radwaste system.

4. Cutting Procedures

Detailed working procedures will be prepared in advance of cutting operations. As indicated in response B.4, these procedures are subsidiary to and consistent with the dismantling concepts set forth in the Environmental Statement and the Dismantling Plan and will not raise new environmental impact consideration.

5. Air Transfers

Air transfers will be made remotely and under controlled conditions for those situations where air transfer will minimize personnel exposure or where other considerations indicate air transfer to be the preferred transfer mode. In either mode of transfer, personnel exposure will be maintained to levels consistent with 10 CFR 20 limits.

6. Packaging Procedures

Reference is made to Section 173.393 of Title 49 of the Code of Federal Regulations for the shipment of radioactive materials. The dose rates permitted under this Department of Transportation regulation are as follows: (1) 1,000 mR/hr at 3 ft. from the external surface of the package; (2) 200 mR/hr at any point on the external surface of the car or vehicle; (3) 10 mR/hr at 6 ft. from the external surface from the car or vehicle; (4) 2 mR/hr at any normal occupied position in the car or vehicle. Anticipated exposure rates from the

upper section of the pressure vessel fall well within these limits. The levels would, of course, be confirmed by actual measurement prior to shipment.

7. Pressure Vessel Cutting Procedures

Cutting of the vessel will be performed remotely. This was not confirmed at the time that the Dismantling Plan was prepared.

8. Monitoring Period

Table 4.1 was not intended to be used to determine when radiation monitoring and exhaust systems may be removed from service. These systems and confinement capability will be retained to the extent possible or until no detectable reactor-originated radioactivity remains. Personnel exposures will comply with 10 CFR 20, not to the limits set forth in Table 4.1.

9. Radiation Levels

Details of radiation levels to be achieved are covered in responses A.2, B.2, and C.8.

10. Radiation from Superheater

Samples of the water contained in the superheater were analyzed for gamma emitters and total beta activity. No indication of gamma emitters other than cesium 137 was found as a result of the sample analysis. Concentrations of both gross beta activity and cesium 137 were below Federal standards for the release of liquid radioactive wastes even without further dilution or treatment. Samples of removable contamination were taken of all accessible inner and outer surfaces of superheater piping and were analyzed for total beta activity. The results indicated no statistically significant variation from instrument background.

11. Work Procedures

The work procedures will be detailed. The scope of the Dismantling Plan was not intended to include provision of detailed work procedures. Refer to B.4 and C.4.

12. Contamination Control Envelopes

The use of contamination control envelopes when contaminated or potentially contaminated items are being cut will be given prime consideration; one will be used when torch-cutting highly radioactive components such as the reactor pressure vessel. The

use of contamination control envelopes, however, is not the only control technique which may be used to control the spread of radioactive contamination. Various techniques will be used as conditions dictate, such as localized ventilation, wetting down the work area to fix loose contamination, etc.

ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

25 FEB 1972

OFFICE OF THE
ADMINISTRATOR

Mr. Julius H. Rubin
Assistant General Manager for
Environment and Safety
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Rubin:

We have completed our study of the proposed plan to dismantle the Elk River Reactor facility of the Atomic Energy Commission's power reactor demonstration program. Our detailed comments on the "Draft Environmental Statement - Elk River Reactor Dismantling, Elk River, Minnesota (WASH-1516)" are enclosed.

In general, the final statement should present information on the following:

- The potential for release of radioactive liquids and dust to the environment.
- The short and long-term consequences arising from the disposal of the large quantities of radioactive solid waste associated with the dismantling operation. This should also include a detailed description of the disposal methods to be used.
- The various alternatives to dismantling the facility.

If you have any questions on our comments or related environmental matters, please contact Mr. Craig Roberts of our Office of Radiation Programs.

Sincerely,

Sheldon Meyers
Director
Office of Federal Activities

Enclosure

Detailed Comments on the Draft Environmental
Statement - Elk River Dismantling (Project)

Introduction and Conclusions

These comments represent EPA's evaluation of the Atomic Energy Commission's plan to dismantle the Elk River Reactor located at Elk River, Minnesota. This reactor, a principal element in the AEC power reactor demonstration program, is an indirect-cycle, natural circulation boiling water type with a thermal rating of approximately 58 megawatts. It was operational from November 1962 to January 1968..

The AEC proposes, in fulfillment of the terms of its contract with the Rural Cooperative Power Association, to remove the above-ground reactor structures and associated equipment and to transport all below-ground radioactive waste offsite for disposal. It is estimated that less than 10,000 curies of radioactive substances remain and are mainly confined to reactor components and shielding materials. . .

In order to be comprehensive and to properly represent the extent of environmental impact, the final environmental statement should include the following:

- A discussion of the probability that radioactive material will be accidentally released to the environment due to on-site mishaps, particularly fires. In addition, the possible adverse environmental effects of such releases should be addressed.

- A description of the procedures to be employed to maintain the contamination control envelope and containment building as barriers to the release of radioactive dust arising during dismantling.
- Details of the methods of treatment and disposal of radioactive liquid wastes. Also, alternatives to the release of treated wastes that have been considered should be discussed and evaluated.
- A discussion of the modifications to the existing environmental surveillance program that will be necessary in order to adequately monitor the various aspects of the dismantling operation.
- A full environmental evaluation of the method to be employed to dispose of all contaminated solid waste including an assessment of the effects of possible transportation accidents.
- An expanded discussion of the various alternatives considered. This should include an evaluation, in reasonable detail, of the environmental consequences of each alternative.

Potential Release of Radioactivity to the Environment

Airborne radioactive dust may be generated during dismantling of the pressure vessel and biological shield. The first barrier to prevent release of this dust to the environment will be a contamination control envelope. This envelope will be equipped with air particulate filters to prevent the dust from entering the containment building. To more fully evaluate the effectiveness of this barrier, the final statement should include the following:

- (1) Estimates of the specific activity of the materials forming the biological shield.
- (2) Discussion of the final design of the envelope and filter system.
- (3) Discussion of the procedures and precautions to be employed in cleaning the filters while the envelope is still intact.

- (4) An analysis of the probability and potential consequences of a fire or other accident in or near the envelope.
- (5) Details of accident contingency plans.

The second barrier to leakage of radioactive dust to the environment is the containment building. Although it is mentioned that the access to the building will have inner and outer doors, it is not clear whether operating procedures will prevent both sets of doors to be opened simultaneously. This possibility, along with an identification of any other possible route for radioactive materials to escape, should be presented and discussed in the final impact statement.

The dismantling plan stated that radioactive liquids released to the environment will be kept as low as practicable and in no case will discharges exceed the limitations proposed in 10 CFR 50 Appendix I. The applicability of Appendix I to this project should be discussed.

The statement implies that all liquid wastes generated in cutting operations will be collected in the pressure vessel and, therefore, will be treated by a special filter system and by the radwaste system. It is not clear that this will, in fact, be the case since it may be possible for some waste to enter floor drains. If this can occur, the treatment and release procedures for such wastes should be described and alternative waste management methods evaluated in the final statement.

Environmental Surveillance

The present environmental monitoring program is a joint effort of the Rural Cooperative Power Association and the Minnesota Department of Health. The statement indicates that this program, which is designed for an operating reactor, will be continued and modified as appropriate during the Elk River Reactor dismantling operations. In our judgment, these modifications should include, considering the potential for release of

contaminated dust, the use of additional continuous-particulate samplers located at the site boundary. A discussion of the surveillance program modifications should be included in the final statement and cover the following points:

1. Description of the location, sensitivity, and sampling frequency of any additional samplers.
2. The types of radionuclide analyses to be performed.
3. The amounts and specific activity level of radioactive dust that could be released to the environment undetected.
4. Sampling procedures to determine deposition of radioactive dust on vegetation.

The survey following the completion of dismantling should demonstrate that all reactor originated radioactivity has been removed from the site. The AEC should make its final report describing the results of the survey available to EPA and other Federal and state agencies.

Transportation and Disposal of Solid Wastes

The draft environmental statement states that approximately 100 truckloads of radioactive solid wastes will be shipped from the site. In addition, approximately 200-300 truckloads of nonradioactive wastes are expected to be disposed of locally. It is further stated that the Department of Transportation and AEC regulations will be followed regarding the packaging and shipment of all hazardous materials. A more detailed analysis is necessary, however, of the potential environmental impact of a serious accident involving a shipment of radioactive solid waste. The results of such an analysis should be presented in the final statement and should include the following:

- (1) The maximum estimated dose to an individual and man-rem dose to the population (if possible) from direct radiation.
- (2) The maximum estimated dispersion of radioactive contamination in the environment.

Several references are made in the statement that radioactive materials will be shipped to an AEC approved burial ground and that nonradioactive materials will be buried in a local landfill. The statement, however, does not define what specific criteria would be used to classify materials as radioactive or nonradioactive. In this regard, the AEC has agreed to present EPA with information on techniques, equipment, and criteria that will be employed. This information should also be presented in the final statement.

Finally, the statement and the dismantling plan indicate that the disposal of nonradioactive solid wastes will be in a local landfill area or at the reactor site, but no specific details of the plans or procedures are given. The Atomic Energy Commission has agreed to supply EPA with additional information prior to issuance of the final environmental statement. It is important, however, that such information also be included in the final statement.

Alternatives

It is essential the final statement contain a complete description of all feasible alternatives to the proposed dismantling plan. This should be accompanied by a detailed discussion of the environmental, economic, and technical merits and deficiencies of each approach. This discussion should conclude with an indication as to the reason or reasons for selecting a given alternative, including contractual agreements.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. Sheldon Meyers, Director
Office of Federal Activities
Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Meyers:

Thank you for your review and comment on the draft environmental statement for the Elk River Reactor Dismantling. An Atomic Energy Commission Staff Report on the Environmental Protection Agency's comments is enclosed.

The draft environmental statement has been revised to reflect consideration of your comments, as well as those received from other review groups. A copy of the final environmental statement is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin".

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosures:

1. AEC Staff Report
2. Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

ATOMIC ENERGY COMMISSION STAFF REPORT
ON
ENVIRONMENTAL PROTECTION AGENCY COMMENTS
ON THE
DRAFT ENVIRONMENTAL STATEMENT
ELK RIVER REACTOR DISMANTLING (WASH-1516)

The AEC responses to comments received from the Environmental Protection Agency (EPA) in its transmittal of February 25, 1972, are presented herein.

1. Onsite Accidents

The dismantling operation will be closely supervised utilizing detailed work procedures and personnel skilled in working with radioactivity. Thus, the chance of an onsite mishap is considered to be much reduced from that typical of normal construction activities. Fire prevention measures which have been in practice at the site will be continued and augmented where needed to provide assurance that the possibility of fires is minimized. Where the potential for fires is expected to exist, such as in torch cutting operations, portable fire-fighting equipment will be readily available in proximity to the operational areas. As noted in response 7 which follows, local medical personnel and facilities, and the local fire department are trained in responding to and handling accidents and mishaps involving radioactivity.

2. Radioactivity Barriers

The necessity for maintaining confinement during dismantling operations has been recognized. The reactor building is penetrated by two airlocks, one freight door, and one newly installed access hatch sized to accommodate scrap resulting from dismantling operations. Each airlock and the access hatch have two sealed doors to prevent the release of radioactive contamination to the outside of the building. The two doors of each airlock and the access hatch are normally kept closed except during the transfer of personnel or materials and equipment. The freight door is sealed to prevent the release of radioactive contamination to the outside.

The access hatch and airlocks will be procedurally controlled so that both doors of each penetration will normally be closed when not in use. When any of these penetrations is being used, it will be standard practice to keep one of the two doors closed. In the event both doors of the newly installed access hatch must be opened during dismantling, the outside supply damper of the building ventilation system will be closed thereby directing all ventilation inlet air into the reactor building through the open access hatch.

Under these latter conditions, no operations will be permitted in the reactor building which could potentially generate airborne radioactive contaminants.

All material and equipment transferred through the access hatch from the reactor building will be surveyed prior to movement for surface radioactive contamination, and will be decontaminated if necessary. All material and equipment moved through the access hatch, therefore, will be free of detectable surface radioactive contamination. Before the inner door of the access hatch is opened, the adjacent area inside the building will be surveyed to insure that no detectable surface radioactive contamination is present.

The flow of airborne toxic and radioactive materials will be controlled primarily by the reactor building ventilation system. In addition, localized exhaust will be provided in those situations where toxic vapors and/or airborne radioactive contamination may be produced.

Respiratory protection will be worn when levels of toxic nonradioactive substances could exceed the threshold limit values specified by the American Conference of Governmental Industrial Hygienists. Supplied air respiratory protection will be specified when excess levels of airborne vapors and gases could be encountered. For airborne particulates, full face respirators with high efficiency filters will be worn.

For airborne particulate radioactive contamination, the following specifications will apply:

1. Less than 3×10^{-9} microcuries/cc beta-gamma -- no respiratory protection required.
2. Between 3×10^{-9} and 3×10^{-8} microcuries/cc beta/gamma -- full face respirators with high efficiency filters required.
3. Greater than 3×10^{-8} microcuries/cc beta-gamma -- supplied air respiratory protection required.

Supplied air respiratory protection will be provided when detectable gaseous radioactive contamination is present.

3. Liquid Radioactive Wastes

All liquid wastes generated at the ERR flow directly to two 3,000 gallon retention tanks, or through floor drains to a sump at the sub-basement level where the liquid is pumped to the retention tanks. Liquid waste collected in the retention tanks is released on a batch basis, each release amounting to approximately 3,000 gallons. Prior to release, the waste in a tank is circulated through filters and ion exchange resins. The waste is sampled and analyzed for total beta activity and specific gamma emitters, both before and after recirculation to determine the need for additional purification. Prior to

release to the Mississippi River, the radioactive concentration of the waste is further reduced by dilution with condenser cooling water from the turbine generator plant. After dilution, the waste is again sampled and analyzed to confirm concentration and total radioactivity predictions.

Various alternatives are theoretically possible for the handling of liquid radioactive wastes. These include collection and concentration followed by offsite disposal either as a liquid or solid, collection without concentration followed by offsite disposal, installation of additional equipment to extend the radwaste clean-up capability, and use of the presently installed equipment. All approaches except the last would involve more handling of the liquid waste or impose delays and costs which cannot be justified, since the use of the existing equipment assures that any releases will be below applicable regulatory limits.

4. Environmental Surveillance

The environmental surveillance program at the ERR has been in operation since 1959 and has been modified from time to time to reflect changing operations and improvements in technology. The latest modifications, completed in the fall of 1971 in anticipation of dismantling operations, consisted of the following additions:

- A. Effluent monitoring -- installation of an integrated particulate sampling device in the reactor building exhaust duct.
- B. Onsite Program:
 - 1. Installation of three air sampling stations as noted in Figure A.
 - 2. Collection of soil and vegetation samples monthly at four locations shown in Figure A.
 - 3. Collection of weekly ground water sample.
- C. Offsite Program
 - 1. Installation of five air sampling stations (two of which are operated by the Minnesota Department of Health) at the locations shown in Figure B.
 - 2. Installation of devices for measuring gamma radiation background at the nine stations shown in Figure B.

3. Collection of quarterly soil and vegetation samples at the above nine locations.
4. Routine collection of Mississippi River water samples at two additional locations (one sample collected by MDH). The water sampling locations are shown in Figure C.

5. Solid Waste Disposal

The Final Environmental Statement has been revised to discuss more fully the disposal of solid wastes and the consequences of possible transportation accidents. In this regard, it should be noted that all solid waste shipments will comply with the applicable DOT regulations and that the solid wastes so shipped will not involve fission products, but rather fixed contamination resulting from activation. Further, based on the radioactive inventory (Table III of the Environmental Statement) the preponderance of the radioactivity will be present as irradiated metal, and will not be subject to spillage or dispersion in the unlikely event that a transportation accident did occur.

6. Alternatives

The alternatives section of the Final Environmental Statement has been expanded to provide greater detail for the applicable alternatives. It should be noted that as a practical matter, the contractual arrangements for the ERR essentially reduced the alternatives to only two -- complete removal of the facility, or removal of the facility to the extent that detectable reactor originated radioactivity would not remain. These two also result in the least environmental impact.

7. Airborne Radioactive Dust and Potential Release Pathways

The maximum anticipated biological shield specific activity is 0.6 uci/gm. Of this, 53 percent is expected to be Co⁶⁰, 44 percent Eu¹⁵², two percent Na²², and one percent Fe⁵⁹.

The cavity contamination control envelope will be fabricated from steel angle-iron and sheet metal. Plexiglass windows and an access door will be included. The envelope will be gasketed to prevent leakage. An inlet prefilter and an absolute filter will process incoming air. The envelope exhaust will also include a prefilter and an absolute filter, and a 1,000 cfm blower exhausting to the containment building. Figure D attached, provides additional information.

With regard to filter handling procedures, prior to changeout all cavity work will be stopped and personnel will vacate the cavity and the vicinity of the filters. The cavity exhaust blower will be stopped. Personnel involved in the changeout will wear anti-contamination

clothing and respirators. The spent filters will be manually removed, promptly bagged in plastic, and sealed. While awaiting shipment for offsite burial, the bagged filters will be stored in an appropriate container in approved storage areas. New filters will be installed manually and tested for efficiency and proper installation prior to occupancy of the control envelope and resumption of cutting operations. These operations will all be conducted in accordance with approved radiation work permits and under the direct surveillance of Health Physics Department personnel.

As noted above, the control envelope will be constructed of noncombustible material. All materials within the control envelope will also be noncombustible or consist of fire retardant material. Type ABC fire extinguishers will be located in the immediate work area with a fire watchman on duty when cutting with an open flame is taking place. Other fire prevention practices which are common to industrial operations are in effect and will be continued. Communication will be available at all times between personnel in the control envelope and support personnel outside of the structure. A basket stretcher will be available for retrieval of incapacitated personnel should the need arise.

The probability of an accident occurring in or near the control envelope should be comparable to or less than that of any other construction activity because of the detailed advance preparations made and the close supervision which will be given to the entire dismantling operation. In the event of an accident, RCPA Health Physics and other staff personnel have been trained to provide industrial first-aid treatment. Local medical personnel and facilities are experienced in providing prompt responses in the event of an accident, and trained to treat those involving radiation exposure and contamination. The local fire department personnel are also trained in emergency first-aid and in procedures for handling situations where radioactivity is involved.

The principal safeguards against the occurrence of accidents include detailed planning and documentation of procedures for the dismantling operations, continuing close supervision of all operations, and the use of highly trained and skilled personnel. Industrial and radiological safety practices which have been implemented since the inception of the ERR project will be continued and augmented where needed. As noted above, additional precautions have been taken and safeguards are available should an accident occur. As indicated in response 2 above, confinement capability and procedures will be utilized to assure that the environment is protected against accidental release of detectable reactor-originated radioactivity during the dismantling operations.

8. Applicability of 10 CFR 50, Appendix I.

Appendix I is a proposed amendment to 10 CFR 50, "Licensing of Production and Utilization Facilities." Its numerical guidelines will be applied in this case to the effluent releases as upper limits to provide conservatism since these provisions are more restrictive than other Federal regulations. Consistent with the operations, equipment and other factors, the releases and exposures, however, are expected to be substantially below these limits. Throughout the dismantling operations, releases and personnel exposures will be kept to levels which pose no undue risk to the workers or the public.

9. Liquid Wastes from Cutting Operations

Contaminated water will be generated during cutting operations to be performed in both the pressure vessel and fuel storage pool. This water will be filtered by a modified water purification system to maintain water clarity during cutting and to reduce contamination levels in the liquid waste system prior to final draining of the vessel and pool. The vessel and pool water is drained directly to the liquid waste system and is treated for disposal in the same manner as all liquid wastes as described in response 3 above.

Liquid wastes generated during clean concrete cutting operations will be filtered and reused where practical. This filtered water will ultimately pass to the floor drains which lead to the liquid radwaste retention tanks. The liquid waste can then be treated for disposal as described previously. When the dismantling proceeds to the point where floor drains are no longer in service and floor removal operations are undertaken, a fracturing of the concrete (rather than cutting) approach is planned which will not require water cooling of the equipment. If, however, cutting is required, methods will be developed and applied to ensure that all liquid radwastes so generated are collected. These wastes will be routed to the liquid radwaste system, or collected and disposed of offsite in accordance with applicable regulations. The floor drains will be disposed of according to their radioactive content as determined by a radiation survey as described later.

10. Environmental Monitoring Program

The Environmental Statement, Section IV C, has been revised in accordance with this comment.

11. Site Survey

After dismantling is completed, a site survey will be performed prior to termination of the AEC-lease to confirm that all detectable reactor-originated radioactivity has been removed from the site. The final report describing the results of the survey will be a public document and available to EPA, Federal and State agencies, and other parties without restrictions.

12. Offsite Shipments of Solid Wastes

As indicated in Table III of the environmental statement, the preponderance of the activated material to be shipped offsite will consist of metal components and equipment from the ERR. Such wastes will not be subject to leakage or dispersion should an accident occur. The quantity of radioactivity in any shipment of the concrete waste will be very small because of the numbers of shipments contemplated and their low specific activity. The Final Environmental Statement has been revised to expand those portions dealing with offsite shipments to include potential effects of an accident.

13. Identification of Solid Waste Materials

During dismantling, the radiation survey of the material to be removed will be performed with equipment which is capable of measuring radiation levels below natural background. The natural background of structural material at the site which is known to be free of reactor-originated radioactivity will be determined by gross beta-gamma measurements in situ. The specific components of background will be determined by spectrometric analyses of representative material samples. Using these data as references, the presence of detectable reactor-originated radioactivity in building structural materials will be determined.

14. Non-Radioactive Solid Waste Disposal

There is agreement with RCPA that rubble which does not contain detectable reactor-originated radioactivity and which is free of wood, piping and combustible materials can be used as fill for the onsite cavities remaining after the removal of the ERR. Other clean rubble which cannot be accommodated onsite will be buried offsite. The burial contractor, Big Lake Sand and Gravel Company, conducts a land-fill operation near Elk River, Minnesota, which will accommodate this latter material as replacement for gravel presently being extracted.

FIGURE A

FIGURE B

FIGURE C

FIGURE D

— CONTAMINATION CONTROL ENVELOPE AND REACTOR
CAVITY EXHAUST AND VENTILATION SYSTEM

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

FEB 25 1972

Dear Mr. Rubin:

This is in response to your letter of December 27, 1971, requesting our comments on the Atomic Energy Commission's draft environmental statement on the Elk River Reactor Dismantling, Elk River, Minnesota.

We believe that the statement adequately describes the impact of the dismantling work on the environment except for the method of transportation to and location of the burial grounds for radioacted materials resulting from the dismantling. It is stated on page 1 that the burial grounds are outside the State of Minnesota. This statement alone is inadequate.

Based on the description of the procedures to be used, significant adverse impacts of the dismantling operation on the environment due to geologic or hydrologic conditions are not likely to occur.

Since the project is located on a portion of a larger generating site, the esthetics of the area would not be significantly altered by the proposed action.

Insignificant recreational and fish and wildlife resources would be affected. The continuing monitoring program, described on page 32, will provide for adequate surveillance of the environmental effects during the dismantling process. It appears that the reactor dismantling program has been thoroughly planned.

We hope these comments will be useful to you in the preparation of the final environmental statement.

Sincerely yours,

Deputy Assistant Secretary of the Interior

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
U. S. Atomic Energy Commission
Washington, D. C. 20545

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Mr. William W. Lyons
Deputy Assistant Secretary
for Program Policy
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Lyons:

Thank you for your review of the draft environmental statement on the Elk River Reactor Dismantling. Your comments, and comments received from other sources have been considered in the preparation of the final environmental statement, a copy of which is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin", is positioned above the typed name.

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON, D.C. 20201

OFFICE OF THE SECRETARY

FEB 28 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

This is in response to your letter of December 27, 1971, wherein you requested comments on the draft environmental impact statement for Elk River Reactor Dismantling, Elk River, Minnesota.

This Department has reviewed the health aspects of the above project as presented in the documents submitted. This project does not appear to represent a hazard to public health and safety.

The opportunity to review this draft environmental impact statement is appreciated.

Sincerely yours,

Merlin K. DuVal, M.D.
Assistant Secretary for
Health and Scientific Affairs

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 5 1972

Dr. Merlin K. DuVal
Assistant Secretary for
Health and Scientific Affairs
U.S. Department of Health, Education,
and Welfare
Washington, D.C. 20201

Dear Dr. DuVal:

Thank you for your review of the draft environmental statement for the Elk River Reactor Dismantling. This statement has been revised and a copy of the final environmental statement is enclosed for your information.

Sincerely,

A handwritten signature in cursive script, reading "Julius H. Rubin", is positioned above the typed name.

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement -
Elk River Reactor Dismantling,
Elk River, Minnesota (WASH-1516)