NUREG-0686

Final Environmental Statement

related to Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station, Unit No. 1

Docket No. 50-10

Commonwealth Edison Company

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

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ABSTRACT

The staff has considered the environmental impact and economic costs of the proposed chemical decontamination of the primary cooling system at Dresden Nuclear Power Station, Unit No. 1. This statement focuses on the occupational radiation exposure associated with the proposed decontamination program, on alternatives to chemical decontamination, and on the environmental impact of the disposal of the solid radioactive waste generated by this decontamination. The staff has concluded that the proposed decontamination will not significantly affect the quality of the human environment. Further, any impacts from the decontamination program are outweighed by its benefits.

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PREFACE

This Final Environmental Statement was prepared by the U. S. Nuclear Regulatory Commission (NRC) staff. It addresses the potential environmental impact of a request by Commonwealth Edison Company to NRC for approval to chemically decontaminate the primary cooling system of the Dresden Nuclear Power Station, Unit No. 1.

For further information regarding this environmental review, contact:

Paul W. O'Connor, Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555
(301) 492-7215

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EXECUTIVE SUMMARY

By a letter dated December 19, 1974, Commonwealth Edison Company (CECo) proposed a program for the chemical decontamination of the primary cooling system of the Dresden Nuclear Power Station, Unit No. 1. The NRC staff issued a Safety Evaluation and conditional authorization to initiate the proposed chemical decontamination by a letter dated December 9, 1975.

Three petitions regarding the proposed program have been received. Two of these--one from Ms. Kay Drey and one from Citizens for a Better Environment--asked for the preparation of an Environmental Impact Statement (EIS). The third petition--from the Illinois Safety Energy Alliance (ISEA)--requested an EIS and, in anticipation of an NRC denial of requests for an EIS, asked for a public hearing. The petitions for an EIS were granted by the Director of Nuclear Reactor Regulation and a Draft Environmental Impact Statement (NUREG-0686) was published on May 30, 1980.

This Final Environmental Statement (FES) addresses comments received from Federal and State agencies and individuals on the Draft Environmental Statement.

The major issues addressed in this environmental review are the occupational radiation exposure associated with the proposed decontamination and the environmental impact of the disposal of the radioactive waste generated by the decontamination.

The staff evaluated the environmental impacts of the proposed decontamination program and the following alternatives to an immediate chemical decontamination program:

- Continue reactor operation without decontamination.
- Permanently shut down the reactor.
- Use a different method of decontamination.
- Delay the decontamination for 5 years.

The staff found none of the alternatives to be obviously superior to the program proposed by CECo. Moreover, the staff has concluded that the proposed program will not significantly affect the quality of the human environment. The staff has also concluded that any impacts from the proposed decontamination program are outweighed by its benefits (Sections 4-6).

This FES addresses only the environmental aspects of this proposed action. The staff has also completed an extensive evaluation of the reactor safety considerations of this proposed action. This review is summarized in a staff Safety Evaluation that will be issued in support of the staff's authorization of the action. The staff will act on the amendment when the National Environmental Policy Act (NEPA)-related requirements associated with this FES are completed and the Commission resolves the requests for public hearings on the proposed action.

1.0 PURPOSE

This Final Environmental Statement (FES) evaluates the environmental impact of the method proposed by the Commonwealth Edison Company (CECo) to decontaminate the primary cooling system of the Dresden Nuclear Power Station, Unit No. 1. It also evaluates alternatives to chemical decontamination of the system which CECo has considered.

It has been prepared in response to expressions of public interest in the decontamination of Dresden Unit 1, and is in accordance with the statement of general policy and procedures on implementing the National Environmental Policy Act of 1969.

2.0 BACKGROUND

2.1 PROPOSED ACTION

CECo, which is the licensee for the Dresden Station. has proposed to decontaminate the primary cooling system of Dresden Unit 1 by circulating and subsequently flushing a decontamination solution through the system (References 1 and 2). This procedure would dissolve a thin layer of radioactive corrosion products which have accumulated during the 20-year operation of the plant.

CECo originally proposed the decontamination by a letter dated December 19, 1974. On December 9, 1975, NRC authorized CECo to begin preparation for the decontamination (Reference 3); however, three open items had to be completed before the NRC approval was final. These items were:

(1) CECo had to complete a testing program and submit the results to NRC for review and approval before the proposed chemical cleaning could begin.

(2) CECo had to formulate and submit to the NRC for review and approval a pre-service program for inspecting the primary coolant boundary before the reactor is returned to service.

(3) CECo had to formulate and submit to the NRC for review and approval a post-cleaning surveillance program which includes additional surveillance specimens and a specimen withdrawal and examination schedule to be performed before the reactor is returned to service.

Since NRC granted the preliminary authorization in 1975, CECo has completed construction of all of the support facilities needed to carry out the decontamination and has submitted to NRC all of the information required to satisfy these three open items (References 4, 5, and 6).

2.2 DESCRIPTION OF THE DRESDEN FACILITY

Dresden 1 is a dual-cycle boiling water reactor manufactured by General Electric. It is located near Morris, in Grundy County, Illinois. Dresden 1 is the world's first privately financed, full-scale, commercial nuclear power reactor. The facility began commercial operation in 1960 and has produced 16.8 billion kilowatt hours of electrical energy since that date.

2.3 NEED FOR DECONTAMINATION

As a result of corrosion during the 20 years that Dresden 1 has been operating, traces of the materials used in piping and components in contact with the primary coolant have become entrained in the circulating primary coolant.

Circulating through the reactor core, these trace quantities of metals have become radioactive through neutron activation. Small quantities of metals have subsequently plated out on the inner surfaces of pipes, valves, and pumps in a thin layer of tightly adherent oxide. The radioisotope of most particular concern in this process is Cobalt-60 (Co-60). This radioisotope is produced by neutron activation of stable cobalt that is present in trace quantities in the large amount of stainless steel used in the reactor primary cooling system. Table 2.1 lists the predominant radionuclides present in the oxide layer at Dresden 1, along with the initial esitmate (1972) and most recent estimate (1979) of the number of Curies (Ci) of each nuclide present (Reference 7).

This estimate was made by measuring the radioactivity in the oxide layer removed from a known area of a steam generator tube and extrapolating to the total system activity in proportion to the areas of the systems involved.

This buildup of radioactive corrosion products inside the piping and other components of the primary cooling system causes increased occupational exposure for those who have to work on or adjacent to these components.

The occupational exposure at Dresden and the average occupational exposure at all boiling water reactors (BWRs) and all light water reactors (LWRs) are shown in Figure 2.1, and the individual man-rem occupational exposures at all BWRs for 1973-1977 are shown in Table 2.2 (Reference 8).

The trend and absolute value of the exposures at Dresden are similar to those at other reactors. However, Dresden 1 does have a somewhat more difficult occupational radiation exposure problem. Unit 1 was built prior to the development of some of the remote inservice inspection techniques currently used at newer reactors. Because these remote techniques cannot be used at Dresden 1, a significant radiation exposure is accumulated by technicians carrying out the inservice inspections which are required to ensure the integrity of the primary cooling system boundary. Because of the high occupational exposures that had been experienced in the past, in 1973 CECO requested and NRC granted relief from some inservice inspection requirements. However, in 1974, NRC informed CECo that the relief would not be granted indefinitely and that the company must develop a plan to carry out all required inspections.

Because of increased exposure rates and the need to modify the plant to meet NRC inspection requirements, CECo determined that chemical decontamination of the primary cooling system was the best approach to complete the required inspections while attempting to maintain occupational exposure to its personnel as low as reasonably achievable (ALARA).

The decontamination effort will facilitate implementation of other actions ordered by the Commission, such as the installation of a new high-pressure coolant injection system, inservice inspection, and modifications to the reactor protection system.

TABLE 2.1

Predominant Radionuclides in Oxide Layer at Dresden 1 and Estimates of the Number of Curies Present

Nuclide	Half Life	Estimated Curies (1972)	Estimated Curies (1979)
$^{144}Ce-^{144}Pr$	284 days	117	11.9
^{141}Ce	33 days	15	$< 9 \times 10^{-3}$
^{57}Co	270 days	15	$< 9 \times 10^{-3}$
^{58}Co	71 days	630	18.5
^{60}Co	5.3 years	2160	502.2
^{154}Eu	16 years	*	$< 1 \times 10^{-3}$
^{59}Fe	45 days	*	$< 2 \times 10^{-3}$
^{55}Fe	2.6 years	*	70.1**
^{54}Mn	303 days	30	6.6
^{63}Ni	92 years	*	26.4**
^{103}Ru	40 days	9	0.3
$^{106}Ru-^{106}Rh$	1 year	*	22.5
^{124}Sb	60 days	*	$< 5 \times 10^{-2}$
^{125}Sb	2.7 years	*	$< 5 \times 10^{-2}$
$^{95}Zr-^{95}Nb$	65 days	21	4.0
$^{239}Pu-^{240}Pu$	2.44×10^{4} years-6540 years	*	0.2
^{238}Pu	87.8 years	*	0.3
^{241}Cm	36 days	*	0.1
$^{242}Cm-^{243}Cm$	163 days - 28 years	*	0.3
^{244}Cm	17.9 years	*	0.10
		3 (MFP)	-
	Total Esitmated Curies	3000	663.6

* not designated in 1972 estimate.

** Only β emitters, no γ.

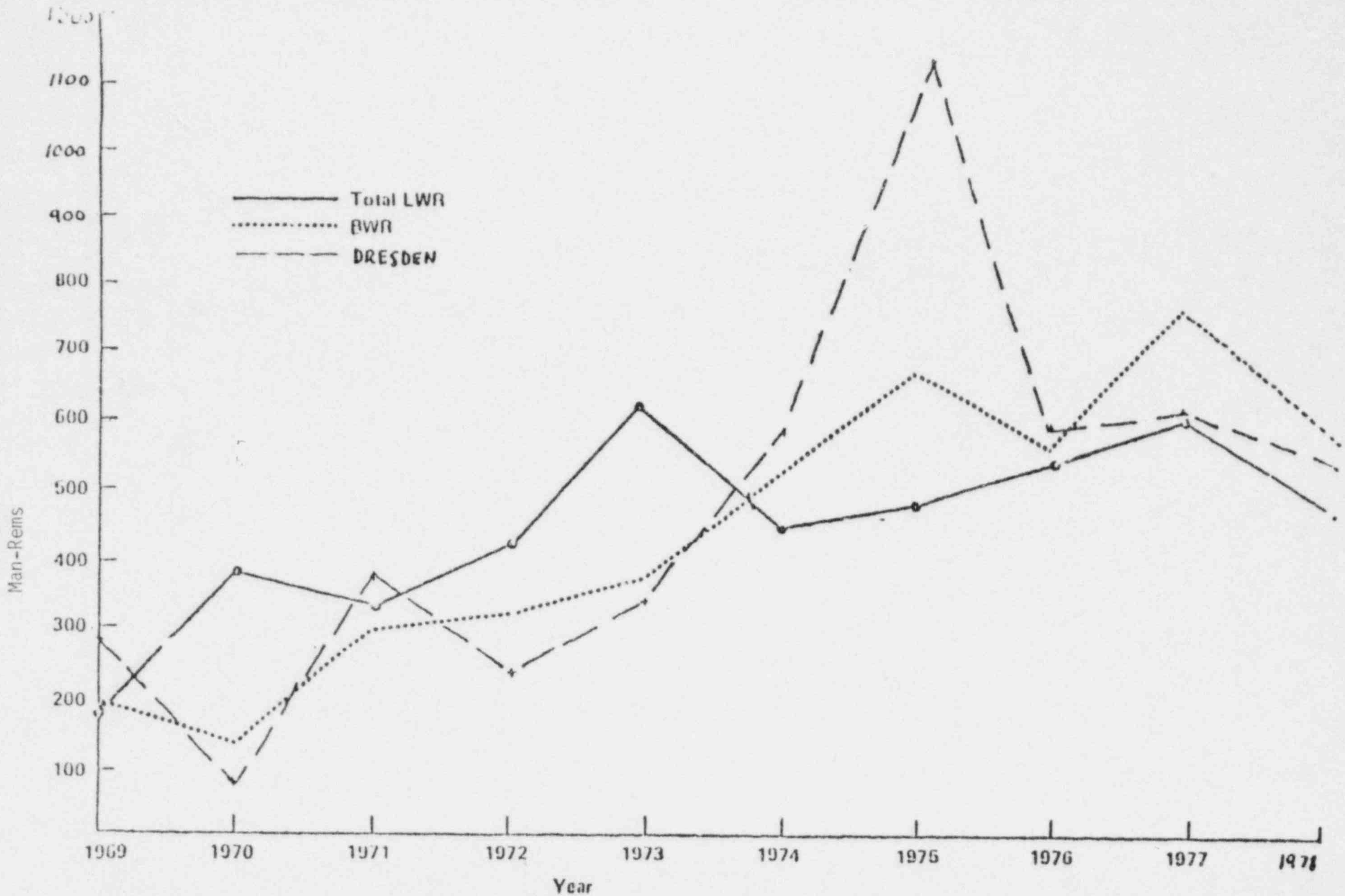


Figure 2.1 Average Exposures in Man-Rems Per Year.

TABLE 2.2

Man-Rem Exposures at Boiling Water Reactors, 1973-1977

BWR AVG

1973

Site Name	[1]Man Rems per Site	Dose per Worker (Rems)	Man Rems per MW Yr
Vermont Yankee	85	0.34	0.38
Pilgrim	126	0.54	0.26
Monticello	176	0.43	0.52
La Crosse	221	1.40	9.21
Humboldt Bay	266	1.26	5.32
Big Rock Point	285	1.18	5.56
Dresden 1,2&3	939	0.70	0.84
Nine Mile Point	567	1.03	1.38
Millstone Point 1	663	0.56	2.95
Oyster Creek	1236	1.58	2.91
Averages per Reactor	380	0.85	1.36

1974

Site Name	[1]Man Rems per Site	Dose per Worker (Rems)	Man Rems per MW Yr
La Crosse	139	1.21	3.66
Vermont Yankee	216	0.61	0.71
Quad Cities 1&2	482	0.71	0.50
Big Rock Point	276	0.98	6.73
Humboldt Bay	318	1.07	7.39
Monticello	349	0.41	1.00
Pilgrim 1	415	0.90	3.77
Dresden 1,2,3	1662	1.04	1.90
Nine Mile Point	874	1.11	2.[illegible]
Oyster Creek	984	1.05	2.27
Millstone Point 1	1430	0.55	3.33
Averages per Reactor	507	0.81	1.76

1975

Site Name	[1]Man Rems per Site	Dose per Worker (Rems)	Man Rems per MW Yr
Peach Bottom 2&3	228	0.23	0.19
Cooper Station	117	0.20	0.26
Vermont Yankee	153	[illegible]	0.36
Big Rock Point	180	0.60	5.15
La Crosse	234	1.42	7.31
Browns Ferry 1	325	0.14	2.01
Humboldt Bay	339	1.28	7.53
Nine Mile Point	681	1.05	1.90
Pilgrim 1	798	1.69	2.59
Quad Cities 1&2	1618	1.45	1.55
Oyster Creek	1.40	0.94	3.05
Dresden 1,2&3	3422	1.48	4.83
Monticello	1353	1.00	3.92
Millstone Point 1	2022	0.78	4.35
Averages per Reactor	701	0.86	2.18

1976

Site Name	[1]Man Rems per Site	Dose per Worker (Rems)	Man Rems per MW Yr.
Duane Arnold	105	0.30	0.35
La Crosse	110	0.93	5.23
Brown Ferry 1&2	234	0.11	0.69
Hatch	134	0.21	0.27
Fitzpatrick	207	0.34	0.41
Monticello	263	0.81	0.55
Big Rock Point	289	0.59	9.97
Brunswick 2	326	0.26	1.10
Cooper Station	350	0.46	0.81
Vermont Yankee	411	0.50	1.06
Peach Bottom 2&3	840	0.39	0.61
Nine Mile Point	428	1.09	0.89
Dresden 1,2&3	1688	0.96	3.95
Humboldt Bay	683	1.31	29.78
Quad Cities 1&2	1651	1.35	1.74
Oyster Creek	1078	0.68	2.37
Millstone 1	1194	0.87	2.66
Pilgrim 1	2468	2.01	9.23
Averages per Reactor	547	0.71	1.82

1977

Site Name	[1]Man Rems per Site	Dose per Worker (Rems)	Man Rems per MW Yr.
Cooper Station	198	0.83	5.33
La Crosse	225	1.59	20.36
Vermont Yankee	258	0.40	0.61
Duane Arnold	299	0.58	0.84
Big Rock Point	334	0.72	7.59
Millstone Point 1	394	0.37	0.68
Browns Ferry 1&2	863	0.48	0.65
Hatch 1	465	0.36	1.84
Quad Cities 1&2	1031	1.14	1.06
Dresden 1,2&3	1694	0.91	1.50
Monticello	1000	1.16	2.34
Peach Bottom 2&3	2937	0.72	1.94
Fitzpatrick	1090	0.70	2.34
Brunswick 2	1128	0.74	3.86
Nine Mile Point	1383	1.27	3.99
Oyster Creek	1614	0.96	4.18
Humboldt Bay	1905	1.75	[illegible]
Pilgrim 1	3142	1.67	9.91
Averages per Reactor	828	0.89	2.1

[1] For Those Sites With More Than One Operating Reactor, the Numbers of Man-rems per Reactor is Obtained by Dividing the Number of Man-rems Repeated by the Site by the Number of Reactors

2.4 ALTERNATIVE METHODS CONSIDERED

CECo considered various methods to decontaminate or reduce the radiation levels at Dresden 1. These methods were grouped into four general categories:

(1) mechanical cleaning

(2) water flushing

(3) operational techniques

(4) chemical cleaning

CECo selected the Dow Chemical Company as its prime contractor for the project. CECo and Dow evaluated each possible decontamination technique against the following goals:

- Reduce radiation levels so that plant accessibility is improved.
- Ensure that the future operation at Dresden 1 is safe and efficient.
- Develop and prove the reliability of techniques which can subsequently be used on other reactors.
- Encourage vendors, manufacturers, and consultants to take part in the decontamination program.

The results of this evaluation are shown in Table 2.3.

Based upon its assessment of decontamination alternatives, CECo selected chemical cleaning as the method for reducing the primary system radiation levels. The next step was the selection of the chemical agent to use for the decontamination. Tables 2.4 and 2.5 list a number of decontamination chemicals tested by CECo on radioactive components removed from the Dresden 1 primary cooling system.

CECo used the following criteria in evaluating the results of the tests of the decontamination chemicals:

- Provide the greatest possible reduction in radiation levels.
- Completely dissolve the film.
- Do not cause reprecipitation and redeposition of materials.
- Have low corrosion rates.
- Provide treatment with one solution.

On the basis of these criteria and the preliminary feasibility tests carried out by CECo and its contractors, CECo decided to use Dow Chemical's proprietary solvent NS-1 for the decontamination of Dresden 1.

It might be noted that in 1976 CECo successfully demonstrated the effectiveness of reducing radiation levels by the proposed chemical decontamination operation when a primary system test loop at Dresden 1 was chemically cleaned by this method.

TABLE 2.3

Evaluation of Alternative Methods for Reducing Radiation Levels at Dresden 1

Method	Advantages	Disadvantages	Evaluation
Mechanical cleaning			
Brushing, wiping, scrubbing and scouring	Simple, no chemical waste, filtration disposal.	Not highly effective, access is not possible in many areas, personnel exposure is high.	Is not a solution to total problem.
Poly-pig (pumped scouring projectile)	Waste handling eased, technique available.	Applies only to piping, radiation exposure is high, access is not possible in many areas.	Does not meet program goals for reduction of radiation levels.
Ultrasonic cleaning	No system modifications required, waste handling eased.	Radiation exposure is high, access is not possible in many areas, gives only localized effect.	Does not meet program goals for reduction of radiation levels.
Component replacement	Achieves minimum radiation level.	Expensive, radiation exposure is high, provides partial solution only, waste disposal is difficult.	Is not a solution to the total problem. Can be considered for supplemental use in certain problem areas.

TABLE 2.3 (Continued)

Method	Advantages	Disadvantages	Evaluation
Water flushing			
Fill and drain	Simple, no significant additional equipment needed.	Ineffective on scale and crud traps.	Does not meet program goals for reduction of radiation levels.
High-pressure jetting	Waste handling eased.	Piping access is difficult or impossible without major changes, not effective without addition of chemicals, airborne contamination problems result.	Does not meet program goals for reduction of radiation levels. Requires extensive pressure boundary disturbance.
Operational Techniques			
Online chemical addition (transport deposit to cleanup system)	No or minimum outage, provides ongoing solution for future.	Proven or even promising method unknown at this time, licensing/safety questions are difficult to answer.	Not feasible at this time.
Improve feedwater	Minimizes future buildup.	Long response time, does not remove scale or crud trap material, does not affect corrosion products generated in the primary system.	Does not meet program goals for reduction of radiation levels.

TABLE 2.3 (Continued)

Method	Advantages	Disadvantages	Evaluation
Chemical Cleaning			
Flushing with existing solvents shown below: (See Tables 2.4 and 2.5)	Technique is well known, treats total system, no substantial system modification required.	Extensive corrosion testing required, large waste disposal problem created, decontamination factors are low, solubility is lower than desired.	Does not meet goals for reduction of radiation levels.
Flushing with new new solvent (NUTEK-L106)	Technique is well known, treats total system, no substantial modification required.	Extensive corrosion testing required, large waste disposal problem created (demin resins), decontamination factors are low, solubility is lower than desired.	Effectiveness is questioned, test results are not available, cannot be considered at this time.
Flushing with new solvent (Dow Solvent NS-1)	Same as above, plus it is a single-phase system with close to 100% solubility, decontamination factors are high, liquid waste problem is reduced by a factor of 2 to 3 over "known" solvents.	Extensive corrosion testing required, waste processing required.	Appears to be the best alternative to achieve program goals.

TABLE 2.4

Evaluation of Decontamination Solvents
With a Dresden 1 Specimen

Code Name	Chemical Formula	g/l	Conditions of Use	Decontamination Factor for Cobalt 60
APAC (Shippingport 1964)				
(AP)	$KMnO_4$	13	24 hrs, 121°C	1
	NaOH	100		
(AC)	$(NH_4)_2HC_6H_5O_7$	13	28 hrs, 121°C	1.15
AP-Citrox (PRTR 1965)				
(AP)	$KMnO_4$	30	2 hrs, 105°C	1
	NaOH	100		
(Citrox)	$H_2C_2O_4$	25		
	$(NH_4)_2HC_6H_5O_7$	50	3 hrs, 81°C	1.15
	$Fe_2(SO_4)_3$	2		
	diethyl thiourea	1		
60% H_4PO_4 (Dresden 1968)	H_3PO_4	600	4 hrs, 121°C	2.0
NS-1	proprietary formula	--	100 hrs, 121°C	114 - 936 (Dow dynamic test loop) 4 - 732 (Dresden 1 test loop)

TABLE 2.5

Evaluation of "Known" Decontamination Solvents Under Differing Conditions

Code Name	Chemical Formula	g/l	Conditions of Use	Decontamination Factor for Cobalt 60	Reason For Rejection
AP	NaOH $KMNO_4$	10 30	12 hrs, 97°C	1	Low DF
ACE	$(NH_4)_2HC_6H_5O_7$ EDTA+NH_4OH inhibitor	100 0.4	pH 5 100 hrs, 130°C	450	Insuffcient removal of fission product and sloughing
Citrox	$H_2C_2O_4$ $(NH_4)_2HC_6H_5O_7$ $Fe(NO_3)_3 \cdot 9H_2O$ inhibitor	24 50 2	pH 2.4 100 hrs, 130°C	780	Corrosion
AC	$(NH_4)_2HC_6H_5O_7$ inhibitor	100	100 hrs, 130°C	45	Sloughing and low DF
Sulfox	H_2SO_4 $H_2C_2O_4$ inhibitor	30 9	100 hrs, 130°C	928	Corrosion
(AP)	Each used in sequence; formulated etc, as AP and AC above			547	2-stage system and sludging
(AP) (ACE)	Each used in sequence; formulated etc, as AP and ACE above			230	2-stage system and sludging
(AP) (Citrox)	Each used in sequence; formulated etc, as AP and CITROX above			1350	2-stage system and sludging
NS-1	Proprietary		100 hrs, 121°C	100-1000	Selected for use

3.0 DESCRIPTION OF THE PROPOSED CHEMICAL DECONTAMINATION OF THE PRIMARY COOLING SYSTEM

The decontamination will involve the circulation of the cleaning solvent, Dow NS-1, through the primary cooling system. The primary cooling system is shown in Figure 3.1.

After the uranium fuel is removed, the solvent will be circulated through the primary coolant system for approximately 100 hours at about 121°C. Then the solvent and the dissolved oxides will be drained from the reactor to a waste-treatment facility adjacent to the reactor. Any remaining solvent will be flushed from the reactor with demineralized water. This flushing water and solvent will be stored in the waste-treatment-facility storage tanks until they are processed to concentrate and solidify the solvent and dissolved radioactive corrosion products. A detailed description of the waste-treatment facility and the cleaning processes appears in Reference 9.

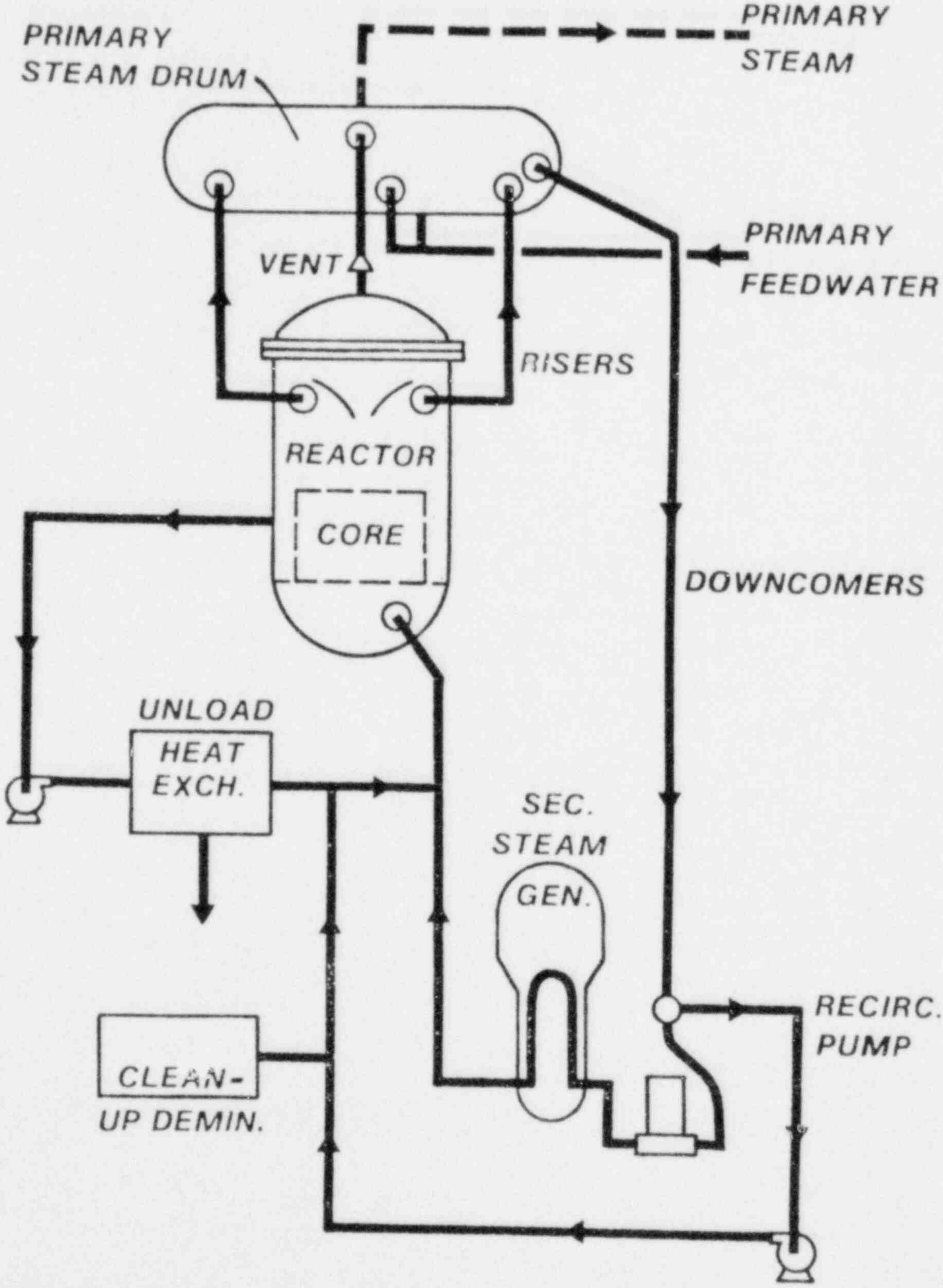
The concentrated waste solution will be solidified in 55-gallon drums using a process developed by the Dow Chemical Company for the solidification of low-level radioactive wastes (Reference 10). This process consists of mixing the waste liquid with a polymeric binder material, vinyl ester styrene. Following the addition of a catalyst and a promoter, the mixture cures into a solid monolith. The catalyst is a 40% benzoyl peroxide emulsion (trade name Cadox 40E). The promoter is a tertiary amine, N.N.-Dimethyl-p-Toluidine. This solidification process has been tested on the NS-1 solvent and produced a solid waste form that contained no free liquids (References 11 and 12). The waste solidification procedures include a quality control process test on each barrel of waste to provide additional assurance that the liquid waste has been properly solidified. It is estimated that as many as 1200 55-gallon drums of solidified radioactive waste will be generated. The radioactivity will consist mainly of activated corrosion products (more than 95% consists of Cobalt (Co)-58 and Co-60).

After solidification, all decontamination waste will be shipped to a commercial low-level waste disposal site at an arid environment such as Hanford, Washington or Beatty, Nevada. The waste will be packaged and transported in accordance with all applicable NRC and Department of Transportation regulations and will be disposed of in accordance with the conditions of the state licenses governing operation of the disposal sites. At the disposal sites, all chelated decontamination waste will be segregated from all other waste.

The decontamination will be carried out entirely within a closed system inside the containment building, and all waste processing will be done within a building designed to meet seismic standards.

Figure 3.1

PRIMARY COOLING SYSTEM



After the decontamination has been completed, the temporary piping connections and decontamination-related components not needed during reactor operation will be removed. These components are not expected to be highly contaminated because the contaminants which they contain are highly soluable. The components will either be disposed of as solid waste or cleaned and stored for possible future use.

Details of the facility are shown in Figures B.1 through B.10 of Appendix B, while the procedure itself is outlined in Figures B.11 and B.12.

4.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED DECONTAMINATION

4.1 ASSESSMENT OF NONRADIOLOGICAL IMPACTS OF CHEMICAL DECONTAMINATION

All of the structures, procedures, and components associated with the decontamination project have been designed and prepared to preclude the release of chemical effluents to the environment. All of the chemicals that are involved in the cleaning will be contained within the closed decontamination system and solidified along with the radioactive corrosion products. After solidification the waste will be shipped to a licensed commercial waste burial site.

The decontamination will not cause any increase in the amount of waste heat emitted from Dresden 1. Therefore, the proposed decontamination project will not cause a significant nonradiological impact at the Dresden site.

4.2 ASSESSMENT OF RADIOLOGICAL IMPACTS OF CHEMICAL DECONTAMINATION

4.2.1 Occupational Radiation Exposure

4.2.1.1 Radiation Exposure During the Decontamination Procedure

As one of the initial steps in the decontamination procedure, several modifications to the existing facility had to be made which involved occupational radiation exposure. This exposure came during the installation of decontamination and radwaste treatment system interface piping to the reactor primary system and the installation of instrumentation and electrical equipment in the containment because this work had to be done in existing radiation areas inside the containment.

CECo has an extensive program for keeping occupational exposures as low as reasonably achievable (ALARA). This program consists of pre-operational testing, monitoring, and training. Temporary shielding was used where it could be expected to provide a significant reduction in exposure. The primary system was drained and flushed before the interface piping and instrumentation were installed. Portions of the primary system were backfilled with water to provide additional self-shielding. Primarily because of these precautions, with more than 90% of the pre-decontamination installation completed, the occupational radiation exposure has been kept to about 200 man-rems, plus 84 man-rems from jobs not included in the decontamination planning and not included in CECo's original dose estimates. This compares with CECo's original estimate of about 400 man-rems for 90% completion of the pre-decontamination installation work.

Following the installation, but before the actual decontamination, the licensee plans an operational test with clean water. The actual cleaning will follow this test. Most of the cleaning operations will be done remotely, from the control panel area where the design radiation level is less than 1 millirem/hr (mrem/hr). However, some valve lineups will have to be done manually before the start of the decontamination and will result in some exposure. CECo has estimated that a dose of 8 man-rems will be accumulated during the test, and a dose of 15 man-rems will be accumulated during the actual cleaning.

As described above (Section 3), the decontamination solution and rinses are to be stored in tanks and processed through the special radwaste system. The processing includes evaporation of the spent decontamination solution and solidification of the evaporator concentrate. The radwaste facility constructed specifically for this process has been designed for remote operation of all phases, including filling, capping, and storage of the waste drums. These processes will be directed from the control panels in the chemical cleaning building where radiation levels are designed to be less than 1 mrem/hr.

CECo has estimated that 6 man-rems will be accumulated during the evaporation (including the solidification of concentrate of the radioactive waste solutions). CECo also estimates that another 4 man-rems will be expended transportating the solidified waste to a licensed burial facility. Operation of the demineralizer system (which will clean distillate from the evaporator) will produce an estimated dose of 10 man-rems.

Preparation of the reactor for return to service also will entail modifying piping, instrumentation, and electrical equipment. However because these activities will follow the decontamination, the areas in which they will be performed will have lower radiation levels. CECo estimates an occupational radiation exposure of 20 man-rems for preparing the reactor for return to service. Finally, dismantling equipment used in the decontamination and cleanup of the unit will result in an occupational radiation exposure of 25 man-rems.

On the basis of the man-rems expended to complete 90% of the pre-decontamination installation work, the estimated total occupational dose for the entire decontamination procedure now is about 400 man-rems. (See Table 4.1 for a summary of doses estimated by CECo and NRC.) The estimates cited include only those operations associated with the decontamination operation. Normal work items such as removal of control rod drives and other normal reactor outage maintenance not associated with the decontamination are not included.

The NRC staff has reviewed CECo's methods of estimating occupational exposure expected during this project. The staff has concluded that these methods are conservative and that the estimates realistically bound the anticipated dose.

4.2.1.2 Radiation Exposure After the Decontamination Procedure

CECo has estimated that a total of 10,000 to 15,000 man-rems will be saved by the decontamination of the primary cooling system. This estimate is based on an immediate savings of 5000 to 10,000 man-rems during the current outage (related to modifications and inservice inspections), plus an average savings of 500 man-rems/yr for the next 10 years of plant operation.

TABLE 4.1

Estimates of Occupational Radiation Exposure
that Would Result from the Chemical Cleaning of Dresden 1

Procedure		CECo estimate, man-rems	NRC estimate, man-rems
Installation			
Piping		383	---
Instrumentation		55	---
Electrical		15	---
	Sub-total, man-rems: Installation	453	225
Hydro test		8	10
Decontamination operation (Extrapolated from prototype loop test)		15	15
Return to service			
Piping		19	20
Instrumentation		1	1
Electrical		0.4	1
Evaporation and solidification		6	10
Demineralizer system operation		10	10
Transportation		4	5
Dismantling (Extrapolated from prototype loop test)		25.0	25.0
	Sub-total, man-rems: Hydro test through dismantling	88.4	97.0
Additional unplanned man-rems		----	84
	Total man-rems	541.4	406

CECo's estimate is based on current normal operating procedures. CECo has noted that in the future NRC might require special activities which, without decontamination, could cause the expected occupational radiation dose to increase. If the decontamination takes place, these increases in exposure will not occur. Hence, there is a potential for an even greater man-rem savings.

It might be noted that following a return to power, after the Dresden 1 pilot loop decontamination, the decontaminated surfaces of the primary cooling system became recontaminated by radioactive material that remained in the uncleaned portions of the system. However, because the proposed decontamination project will clean the entire primary cooling system, this type of recontamination is not expected to be a problem.

At this time neither Commonwealth Edison nor NRC has identified any requirement for an additional decontamination in the future; however, if plant specific modifications or safety related inspections are required, decontamination is one of the techniques that could be used to carry out these tasks while maintaining the occupational exposures ALARA.

The NRC has reviewed CECo's estimates and has found the estimates adequately conservative (based on a detailed review of the radiation levels and anticipated working times expected during the present outage). Because of uncertainties related to future radiation levels and the extent of future inspections and modifications, the staff has extrapolated the occupational exposure savings for only 5 years and estimates a probable saving of 2500 man-rems. The staff, therefore, has concluded that the decontamination will result in a total savings of approximately 7500 to 12,500 man-rems over the next 5 years of operation.

Moreover, as described in Section 2.3, at present CECo has been permitted to forego certain mandatory inservice inspections. An estimated 40 to 50 welds are not being inspected because they are considered to be inaccessible as a result of the high radiation levels. After decontamination, these welds should be able to be inspected, which will significantly increase the safety of future plant operation.

4.2.1.3 Summary of Occupational Radiation Exposure Projections

The estimated occupational exposure savings as result of the decontamination is 7500 to 12,500 man-rems. The estimated total exposure of the decontamination operation itself is 400 man-rems, and it would result in a significant net reduction of exposure over the remaining years of plant operation. The decontamination operation itself, therefore, can be an effective method of maintaining the long-term overall occupational exposure ALARA.

For the decontamination operat on, the estimated radiation exposure of 400 man-rems represents a predicted increased risk of premature fatal cancer induction of less than e-tenth of one event (e.g., 0.04 event-risk estimation from data fo. the population as a whole, as given in the November 1972 report of the National Academy of Science, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation"). The increased risk of this exposure on generic effects to the ensuing five generations is also predicted to be about 1/10 th of one event (risk estimation from data for the population as a whole, as given in the same National Academy of Sciences report). For a selected population--such as is likely for the exposed workers involved in the decontamination program, which population would consist principally of adult males--these risks would tend to be even less. These risks are incremental risks, that is, risks in addition to the normal risks of cancer deaths and genetic effects which all persons continuously face. To put the risk into perspective, for a population of 350 (corresponding to the approximate number of workers that will be involved in the various phases of operation), these normal risks from all factors (genetic or environmental) would would result in roughly 40 to 60 cancer deaths and 15 to 20 genetic effects

Another view of assessing the occupational exposure impact is a comparison with variations in natural background radiation. The average annual dose to an individual as a result c natural background raidation is about 0.1 rem. However, a number of factors, such as altitude above sea level and local geological formations, cause average background levels to vary. For example, because of the higher altitude, the average background dose in Denver, Colorado is roughly 0.08 rem per year higher than that in Washington, D. C. Over an average lifespan, an individual residing in Denver would receive 4 rems more than the same individual would by living in Washington. The estimated dose of the decontamination project of 400 man-rems will be spread over about 350 workers over at least a 1-year period. Therefore, the average dose to a worker for this operation will be roughly 1 man-rem, or 1/4th of the variation in natural background radiation between Denver and Washington that an individual could experience in a lifetime. It is not evident such a variation in natural background would be a significant factor in influencing any decision on an individual's activities (for example, moving from Denver to other locations which have lower background radiation levels). Therefore, the radiation exposure increase resulting from the decontamination operation, which is a fraction of the variation in natural background radiation, seems to represent an insignificant and acceptable impact. In no event will any individual be permitted to receive more than 3 rems per calender quarter as a result of direct external whole body radiation from this project.

4.2.2 Radioactive Waste

The decontamination operation is not expected to result in the release of liquid or gaseous radioactive material to the environment in any significant quantities.

4.2.2.1 Radioactive Liquid Waste

A total of approximately 664 Curies (Ci) of radioactivity is expected to be present in the decontamination solvent and subsequent rinses. About 92% of the gamma emitters are expected to be in the form of cobalt isotopes. More than 99% of the radioactivity will be in the decontamination solvent and the first rinse, which will contain about 200,000 gallons of liquid. As described above (Section 3), this liquid will be processed through an evaporator. The concentrated waste--about 20,000 gallons of evaporator bottoms--will be solidified for offsite burial. The remaining 180,000 gallons of waste--distillate from the evaporator--will be sampled and sent to the existing plant holdup system or will be polished through the demineralizer before being stored for plant re-use. Water from any subsequent rinses will be sampled and processed through the demineralizer and/or the evaporator. The processed water will also be recycled into plant holdup systems for re-use. It is expected that no liquid radioactive effluents will result from the decontamination operation.

4.2.2.2 Gaseous Radioactive Waste

No significant gaseous radioactive effluents are anticipated. The NS-1 for the decontamination is nonvolatile. All radioactive iodine isotopes have been decayed to insignificant levels. The only expected source of gaseous radioactivity effluents during the decontamination operation is the venting of the noncondensable gases from the evaporator distillate. However, a number of partition and decontamination factors during the evaporation, condensation, and filtration processes will reduce this source to a small quantity estimated to be less than 1 uCi (Reference 5).

Effluents from the chemical cleaning facility will be continuously monitored. Therefore, unplanned releases as the result of leaks or spills can be quickly detected and remedial action taken. Technical Specifications limiting release rates during normal plant operation will also be in effect during the decontamination operation. Consequently, the environmental impact from airborne radioactive effluents should not be greater than those described in the Final Environmental Statement (FES) for Dresden Unit 1, dated November 1973. (The FES for Dresden Units 2 and 3 also addresses the radiological impact of releases from the site, including Dresden Unit 1.)

The nitrogen cover gas blanketing the primary cooling system during the cleaning will be vented to the atmosphere through the existing Dresden 1 containment ventilation system. Approximately 120,000 ft^3 of nitrogen will be vented during the testing, cleaning, and the three rinses that will follow the cleaning. No airborne radioactive material is expected to be released during this phase of the cleaning.

4.2.2.3 Solidified Radioactive Waste

About 1200 55-gallon drums (9000 ft^3) of solidified radioactive waste (containing approximately 664 Ci of radioactivity) generated by the cleaning will be shipped offsite for burial. (During 1979, 36,900 ft^3 and 844 Ci of radioactive waste was generated by routine operations and shipped from the Dresden site). When the process was tested (see Section 2.4), the decontamination solvent was then soldiified using the Dow system. Samples of this solidified waste indicated no free-standing liquid. Leach tests on samples indicated that the Dow solidification process is equivalent to or better than other solidification methods being routinely employed at nuclear power plants (References 10, 13, and 16).

The estimate of 1200 55-gallon drums used above is a maximum, based on an unlikely situation in which two cleaning cycles using a total of 225,000 gallons of solvent and an approximate evaporation ratio of 7:1 would be necessary. This would result in a maximum of 36,000 gallons of concentrated waste. Approxmiately 30 gallons of waste would be solidified per drum, for a total of 1200 drums. The actual number of drums of solidified radwaste is expected to be considerably less (400 to 600 drums), based on lower "crud" inventory and increased ratios of evaporation.

For the solidification of the spent decontamination waste, controls will be implemented to ensure a completely solidified waste with no free-standing liquid. As a part of the initial startup testing for the project, before the solidification of any radioactive waste, a nonradioactive batch simulating the chemical properties of the waste was solidified and destructively tested to establish the acceptability of the process as it is actually installed (Reference 12). The simulated solidified waste drum was sectioned. The waste form was a solid monolith with a no free standing liquid. The ratio of waste to binder used in the full-scale test was 1.5:1 by volume.

To ensure that a properly solidified material is consistently produced, a process control program will be used. Prior to solidifying each batch of waste solution, a small sample of the actual waste will be solidified in a laboratory hood to verify that the proper amounts of solidification binder, promoter, and catalyst will produce an acceptable product. For each drum of solidified waste, a rod containing a thermocouple will be brought in contact with top surface of the solid material to measure its temperature to verify the occurrence of polymerization. This same rod, by making contact and measuring resistance of penetration of the solid mass, will verify the solidification. Television cameras aimed at the top of the waste drum will allow this activity to be observed.

The amount of radioactivity of the solidified radwaste amounts to less than 0.01% of the 5.8×10^6 Ci of total radioactivity shipped to commercial burial sites as of 1979. The volume of solidified radwaste expected to be generated by the Dresden 1 decontamination operation amounts to less than 0.04% of the 2.4×10^7 ft^3 of total radwaste shipped to commercial burial sites as of 1979. These wastes, however, contain a significant quantity of chelating agents which require more restrictive disposal criteria than is applied to routinely generated low-level wastes. Specifically, these decontamination wastes will require disposal at an arid site and segregation from other wastes.

The licensee has committed to meet all the applicable NRC and Department of Transportation regulations regarding packaging of the radwaste for shipment. Therefore, the environmental impact enroute to the burial site (e.g., direct radiation, accident considerations) is not significantly different from those already analyzed in the FES for Dresden Unit 1.

On the basis of the material discussed above the staff has determined that there will be no significant environmental consequences resulting from the liquid, gaseous, and solid radioactive wastes generated from the decontamination operation. Further, the staff has determined that the radioactive wastes will not significantly affect the quality of human environment, according to the requirements set forth in the 10 CFR Part 51 and the Council on Environmental Quality's Guidelines, 40 CFR 1500.6.

4.2.3 Disposal of Radioactive Waste

The radioactive waste from the Dresden Unit 1 decontamination will be solidified prior to shipment to a commercial low-level waste burial site. Solidification will be performed using the Dow vinyl-ester-styrene solidification system (which is discussed in Section 4.2.2).

Laboratory tests by an NRC contractor (Reference 11), Brookhaven National Laboratories (BNL), confirm that wide variations ($\pm$20%) in the chemical components used in the Dow system do not produce free-standing liquid. The Dow process parameters used to solidify the Dresden waste will be controlled within $\pm$10% of the solidification parameters maintained in the inprocess sample solidification tests. Further assurances that the final product will not contain free-standing liquid will be provided by system design and quality control checks which are part of the Dow solidification system. This includes mixing sequence interlocks, quality control checks (Reference 10) on each barrel of solidified waste (e.g., visual monitoring, temperature monitoring, and resistence to penetration testing) and inprocess sample verification during the production runs. In addition, full-scale qualification tests using simulated wastes have been conducted under NRC observation prior to startup of actual solidification operations. The waste from the qualification test was destructively examined. The waste product was found to be a solid monolith with no free-standing liquid (Reference 12).

Standard mild steel 55-gallon drums (DOT-approved) have been proposed for use by CECo. To confirm that these containers are adequate for use with waste solidified with the Dow vinyl-ester-styrene process, BNL performed corrosion tests on container-metal specimens. BNL measured the corrosion rate for an unlikely bounding case in which a layer of liquid waste was in contact with the drum steel to simulate the worst case for condensate in the drum. Such a layer of liquid waste has not been observed in wastes solidified by Dow when wastes were solidified in accordance with the procedure specified by Dow. The results of this test show that the drum could be expected to last 1 or 2 years. This indicates that if the above is assumed as a trial worst case, a container would not corrode through during handling and storage, if it is buried within a few months of solidification. Even for this unlikely case, container corroding through after burial would not present a problem since the majority of the waste is a solid, and the small quantity of condensate that could leak from the drum would be easily absorbed in the unsaturated soils at an arid disposal site. Corrosion tests conducted under expected conditions show that after 4 weeks of exposure no significant corrosion occurs to the drum steel in contact with solidified waste or vapor from liquid waste. The corrosion rate in contact with solidified waste was 0.01 mils/day. At this corrosion rate the drum would last for approximately 25 years (Reference 11).

The solidified radioactive waste from the Dresden 1 decontamination will be shipped to a commercial low-level waste-burial site such as Beatty, Nevada or Hanford, Washington. These sites have been chosen as waste-burial locations because of their favorable geologic, hydrologic, and meteorologic features. The annual rate of precipitation at both sites is very low, and the water table is very deep. The mean annual precipitation rate for the Beatty site is less than 5 in./yr (Reference 14). For the Hanford site, the mean annual precipitation rate is 6.25 in./yr (References 15, 17). The depth to the nearest aquifer at both Beatty and Hanford is about 100 meters (References 14, 15 and 17).

These features, combined with the remote location of these burial sites, provide assurance that the waste can remain isolated from the human environment long enough to allow the principal radionuclides to decay to insignificant levels.

Because of the presence of a large quantity of chelates, the concentrated NS-1 decontamination solvent from Dresden 1 which will be solidified using the Dow solidification process, would receive special handling at the Hanford site. Criteria at that site require that the solidified waste be segregated from other waste by a minimum of 10 ft. of soil. The segregation of chelating chemical wastes is consistent with the Hanford disposal site license (WN-I019-2, revised January 24, 1980). License conditions similar to Hanford's will be imposed at Beatty if the decontamination wastes are disposed of at Beatty.

With regard to disposal of this waste, the solidified waste form and container, disposed of in an arid environment where there is minimal potential for actual contact of the waste with water, and with the waste segregated from other wastes (minimum of 10 ft. separation) provides an acceptable approach for disposal of this waste.

4.3 ASSESSMENT OF IMPACTS OF POSTULATED ACCIDENTS

The decontamination of the Dresden 1 primary cooling system takes place entirely within a closed system that is contained inside of low-leakage structures. No releases from the primary cooling system or from the waste-treatment facility are planned or expected.

In the event of leakage within the reactor containment building or the waste-treatment facility, all gaseous releases must pass through a pathway monitored for radioactivity that will be isolated if the Technical Specification setpoint is exceeded.

In the event that the waste storage tanks fail within the waste-treatment facility, all leakage will be contained within the "bathtub" portion of the facility. This "bathtub" is the portion of the waste-treatment facility that surrounds the waste storage tanks. It is a leakproof structure designed with all penetrations located above the height necessary to contain all 300,000 gallons of liquid waste that could leak out of the high-level storage tanks.

Therefore, the decontamination process and the associated facilities built to solidify the radioactive waste will not be subject to any accidents more severe than those previously considered for the Dresden site and will not result in any hazards not previously considered.

CECo has developed a site emergency plan for the entire Dresden Station. This plan, which has been reviewed and approved by the NRC, was developed with extensive input from the State of Illinois to ensure that State emergency organizations which must respond to nuclear emergencies would be able to interface effectively with the Commonwealth Edison organization.

In particular, the Illinois Emergency Services and Disaster Agency (ESDA) and the Illinois Department of Public Health (IDPH), under the overall offsite command authority of the Governor, are responsible for major aspects of the State's support in the event of a nuclear emergency. ESDA exercises command and coordination and has programmatic responsibility for the implementation of protective actions as recommended for the public by the IDPH and the Governor. The IDPH Division of Nuclear Safety has both the command authority for radiological aspects of a nuclear accident and the responsibility for performing various radiological functions. During an accident situation, the IDPH will make protective-action recommendations to the Governor and the ESDA.

The emergency plan is designed to deal with 5 classes of emergency. These levels are:

- transportation accidents
- an unusual event
- an alert
- a site emergency
- a general emergency

Each of these classes of emergency is associated with a progressively greater potential for the release of radioactive material from the site, and each class of emergency causes a graded response involving the licensee, the State of Illinois, and the NRC to be placed into effect. Appendix C of this FES defines each of the five classes of emergency, identifies the release potential associated with each class of emergency, and identifies the type of accident that could initiate each class of emergency.

In the event of an emergency at the site which involves the release of radioactive materials, the following equipment is available to assess the magnitude and location of the release:

(1) Onsite meteorological monitoring instrumentation

  (a) Wind direction
  (b) Wind speed
  (c) Air temperature
  (d) Dewpoint temperature

(2) Onsite radiological monitoring equipment

  (a) Process monitoring and sampling system
  (b) Effluent radiological monitoring and sampling system
  (c) Airborne radioactive monitoring system
  (d) Area radiation monitoring system
  (e) Portable survey and counting equipment

(3) Offsite monitoring facilities and equipment

  (a) Geiger-Mueller counters
  (b) Ionization chamber monitors
  (c) Pocket dosimeters
  (d) Air samplers
  (e) Continuous air and thermoluminescent dosimeters in place and in operation at the 17 locations indicated on Figure 4.1

FIGURE 4.1

LOCATIONS OF FIXED ENVIRONMENTAL RADIOLOGICAL MONITORING STATIONS

<u>Air Samplers</u>

1 - Onsite Station 1

2 - Onsite Station 2

3 - Onsite Station 3

4 - Collins Road

5 - Bennitt Farm

6 - Pheasant Trail

7 - Clay Products

8 - Prairie Park

9 - Coal City

10 - Goose Lake Village

11 - Morris

12 - Lisbon

13 - Minooka

14 - Channahon

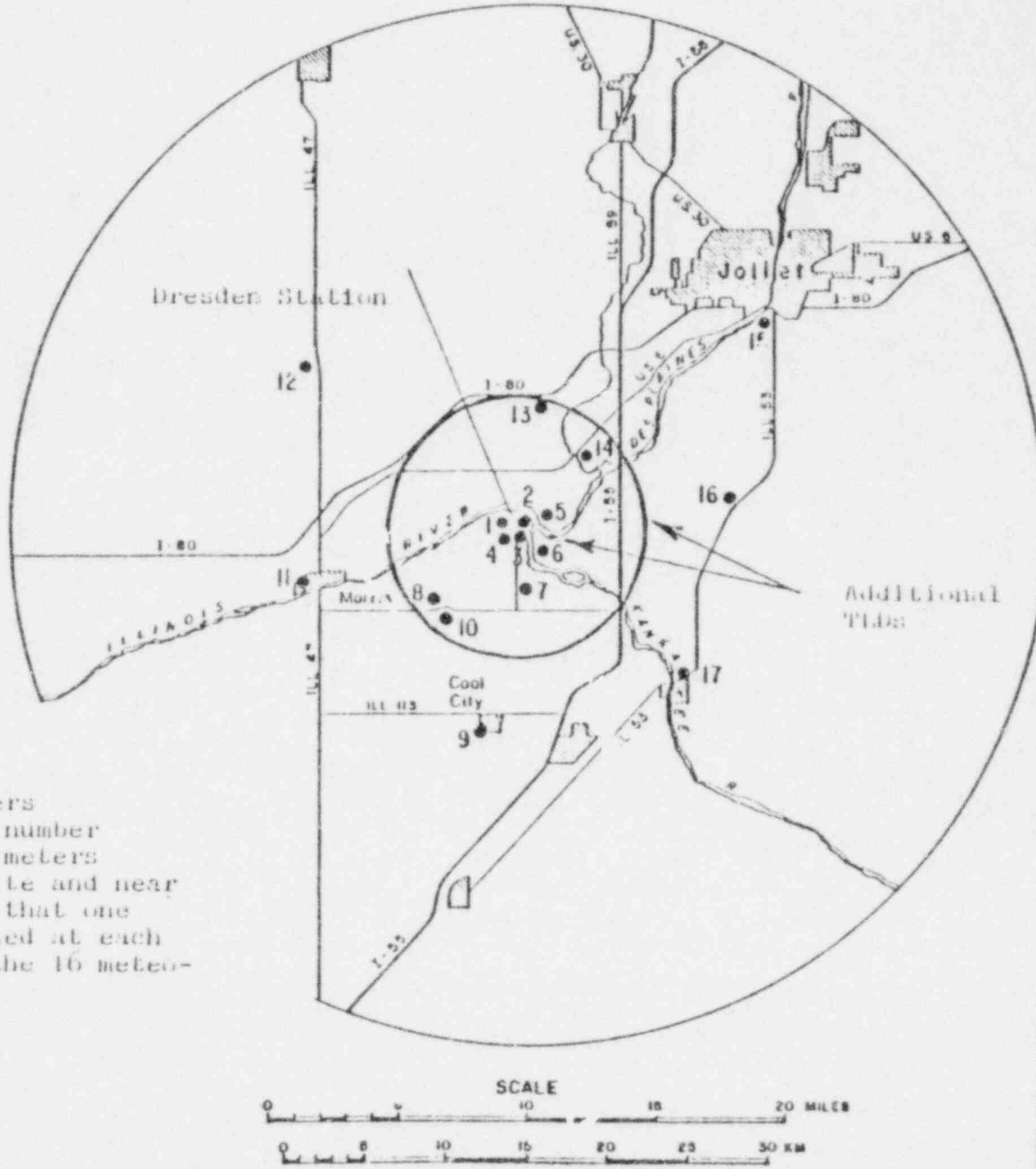
15 - Joliet

16 - Elwood

17 - Wilmington

<u>TLD</u>

Same as air samplers plus a sufficient number of additional dosimeters placed near the site and near 5 miles to assure that one dosimeter is located at each range in each of the 16 meteorological sectors



5.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES TO CHEMICAL DECONTAMINATION OF THE PRIMARY COOLING SYSTEM

Several alternatives to the chemical decontamination of Dresden Unit 1 have been evaluated to determine their potential environmental impact. These alternatives are (1) continue reactor operation without decontamination, (2) permanently shut down the reactor, and (3) use alternative methods of decontamination. CECo evaluated these alternatives and concluded that the chemical decontamination of the facility is the best choice. The NRC reviewed these alternatives as well as the alternative of delaying the decontamination for 5 years. Each of these alternatives is discussed below.

5.1 CONTINUE REACTOR OPERATION WITHOUT DECONTAMINATION

CECo must carry out five major modification and inspection projects before Dresden 1 can be returned to service. These projects are:

(1) Install high-pressure cooling system (by Commission order).

(2) Implement an inservice inspection program (required by 10 CFR 50.55).

(3) Replace the unloading heat exchanger.

(4) Inspect piping system to satisfy NRC Office of Inspection and Enforcement Bulletins.

(5) Modify the reactor protection system (by Commission order).

Carrying out these programs will require personnel to work extensively in areas in which the radiation exposure levels range from 1 to 30 rems/hr and will result in unacceptably large occupational exposures to the workers. CECo has estimated that without decontamination these operations could result in total occupational exposures to the work force of 5000 to 10,000 man-rems. Occupational exposures of this magnitude are clearly unacceptable to the utility and to the NRC staff if they can be prevented by readily available techniques.

CECo has evaluated the possibility of utilizing local shielding to reduce the occupational exposure that would be received if the "no-decontamination" option were adopted. However, it is not practical to shield the workers from the source of radiation in this case because the major source is on the inside surfaces of the component. In addition, the design of the Dresden facility is such that physical access to the components is severely limited and there is not enough space available so that the the necessary shielding could be constructed.

Another method that has been considered to permit the continued operation of the facility is to carry out the required safety inspections and modifications remotely. CECo is planning to utilize remote inservice inspection techniques to examine some of the inaccessible beltline welds on the reactor vessel. However, these remote methods cannot be used for the inspection of pipe welds, nozzles, and other primary cooling system components unless a significant amount of work is done to install the remote equipment and prepare the components for remote inspection. Without decontamination, higher doses would be received during these preparatory activities than would be received during the manual inspections.

The NRC staff has reviewed the potential for carrying out these necessary safety inspections remotely and concludes (1) that CECo cannot remotely inspect these components as they are presently designed and (2) that it is not practical for CECo to install the remote inspection equipment in the currently existing high-radiation fields.

CECo has further estimated that, without decontamination, in the future approximately 500 man-rems will be received each year. This annual increase in occupational exposure projects to a total occupational exposure increase of 2500 man-rems over the next 5 years of Dresden 1 operation. In addition to this directly measurable increase in occupational exposures, it is estimated that failure to decontaminate will cause future outages to last longer than necessary because of the extensive radiological safety precautions that will have to be employed.

Based upon the projected increase of occupational exposure, which the NRC Staff estimates will be in excess of 5000 man-rems, the staff has concluded that (1) the occupational exposure at Dresden 1 will be increased significantly without the proposed chemical decontamination, (2) a long-term dose increase of more than 2500 man-rem be received without the decontamination, and (3) the occupational exposure that would result from inspection and modifications without decontamination would be unacceptable under the principal of maintaining occupational exposures as low as reasonably achievable. Therefore, the staff has concluded that the alternative of continuing reactor operation without decontamination is undesirable and would result in environmental impacts that can be avoided by decontamination.

5.2 PERMANENTLY SHUT DOWN THE REACTOR

The cost of purchasing replacement power for Dresden 1 is estimated to be $100,000 per day. Assuming a 60% capacity factor over the approximately 15 years that will remain before the expiration of the Dresden 1 Operating License, approximately $300 million would be required to purchase power to replace the Dresden 1 generating capacity.

The cost of the decontamination of the facility, including solvent research and development, solvent compatibility testing, construction of the decontamination facility, and the operational cost of the decontamination, total $37.5 million.

Because the $300 million cost of replacement power is significantly more than the $37.5 million needed to carry out the decontamination and is not justified by any improvement in the quality of the human environment, the immediate-shutdown alternative is less favorable than decontamination.

5.3 USE ALTERNATIVE METHODS OF DECONTAMINATION

CECo evaluated a number of alternative methods for decontaminating the reactor primary cooling system (discussed in Section 2.4), and subsequently decided to use chemical cleaning and Dow Chemical's NS-1 solvent. The NRC staff has reviewed CECo's decision (and the material in Tables 2.3, 2.4, and 2.5) and concurs that the use of NS-1 solvent will not result in excessive corrosion of the materials of construction. Moreover, it will result in the most effective reduction of radiation levels of all of the alternatives considered. On the basis of a review of the corrosion properties of the solvent and the proposed methods of solidification and disposal, the staff finds the use of NS-1 solvent acceptable.

5.4 DELAY DECONTAMINATION FOR 5 YEARS

Commonwealth Edison has informed NRC that it has decided to postpone the scheduled return to service of Dresden 1 until 1986 so that it can concentrate its financial resources on bringing its LaSalle Station on line.

Because of the CECo decision to delay the return to service of Unit 1 for 5 years, NRC evaluated an additional option, that of delaying the decontamination for 5 years and then decontaminating the reactor.

During a 5-year delay, the gamma-emitting isotope present that contributes to the major portion of the occupational exposure is Cobalt-60. This isotope has a half life of 5.3 years, so that during the extra 5 years of delay the major contributers to the occupational exposure will decay from 500 Ci to about 250 Ci. During this same period of decay, all of the other gamma-emitting isotopes (see Table 2.1) will have decayed to less than 1 Ci each. Because of this decay, the occupational exposure associated with the remainder of the decontamination will be reduced by at least 50%. However, the greater portion of the man-rem exposure for the decontamination project has already been received. Using the data in Table 4.1, it is evident that only 150 to 200 man-rems will be received during the remainder of the operation. Therefore, the maximum possible man-rem saving that could be achieved by delaying the decontamination would be in the range of 75 to 100 man-rems.

In reality, the entire 75 to 100 man-rems would not be saved because CECo personnel would receive an additional occupational exposure as they perform routine non-decontamination-related functions required by the Unit 1 License even though the reactor is shut down. Although the exact magnitude of this exposure cannot be predicted, CECo has reported that 84 man-rems have been received since shutdown as a result of nondecontamination-related routine work. This type of work must continue whether or not the primary system is cleaned, and the dose received will easily negate the potential man-rem savings that might be realized if decontamination were delayed for 5 years.

The are significant costs associated with delaying decontamination. CECo ha identified a cost of $360,000 to delay the decontamination until October 1, 198, as well as an additional cost of $110,000 per month thereafter. This cost is associated with maintaining the capability to decontaminate on a 1-month lead time. This capability requires that the licensee retain approximately 25 contractor personnel who would be available to decontaminate within a week of an NRC authorization.

A delay of 5 years in decontaminating the primary system would involve a significant cost to the utility and would result in, at best, a small savings in man-rems. It might even result in a higher man-rem expenditure than the immediate decontamination option.

6.0 CONCLUSIONS

After reviewing the proposed primary cooling system decontamination, the staff has reached the following conclusions:

(1) The occupational exposure associated with the chemical decontamination program will be approximately 400 man-rems. The occupational exposure aspect of this program has been carefully planned by the licensee, and the estimated exposures appear to be as low as reasonably achievable.

(2) The decontamination will result in the saving of more than 5000 man-rems over the remaining life of the facility. The radiological benefit of decontamination outweighs the occupational exposure that will be received in carrying out the decontamination.

(3) There will be no significant increase in radiological effluents from the facility as a result of the decontamination procedures.

(4) The radioactive wastes created by this decontamination will be similar in radioactive characteristics and quantity to those which have been produced by the facility in the past.

(5) The offsite transportation and disposal of the radioactive waste generated by the decontamination will be in accordance with all applicable NRC, Department of Transportation, and Agreement State Rules and Licenses and will not result in any unacceptable risk to the public.

(6) The radioactive wastes generated by the proposed decontamination will contain a large quantity of chelating agents which require more restrictive disposal criteria than are applicable to routinely generated low-level wastes. These wastes will be disposed of at an arid low-level waste disposal site and will be segregated from other wastes by at least 10 ft of soil.

(7) The alternatives of (1) continuing operation without decontamination, (2) shutting down the reactor permanently, (3) alternative methods of decontamination, and (4) delaying the decontamination for 5 years were considered, and none were found superior to the proposed action.

Therefore, the staff finds that the benefits of this action outweigh any associated impacts and that the proposed decontamination will not significantly affect the quality of the human environment.

7.0 FEDERAL, STATE AND LOCAL AGENCIES AND INDIVIDUALS TO WHOM THIS FINAL ENVIRONMENTAL STATEMENT WILL BE SENT

This Final Environmental Statement will be sent to the following:

U.S. Advisory Council on Historic Preservation
U.S. Department of Agriculture
U.S. Department of the Army, Corps of Engineers
U.S. Department of Commerce
U.S. Department of Energy
U.S. Department of Health and Human Services
U.S. Department of Housing and Urban Development
U.S. Department of the Interior
U.S. Department of Transportation
U.S. Environmental Protection Agency
U.S. Federal Energy Regulatory Commission
State of Nevada
State of Illinois Attorney General
State of Washington
State of Illinois Department of Public Health
Grundy County
Citizens for a Better Environment
Illinois Safe Energy Alliance
Ms. Kay Drey
Brigid K. McCauley
Randall L. Plant
Marvin I. Lewis
Princeton University
Washington University in St. Louis
Paula J. Ayers
Northern Illinois University
Ben Ruekberg
RPF Ecological Associates
Pollution and Environmental Problems, Inc.
Edwin R. McCullough
Cecile Meyer
The Sassafras Audubon Society
National Campaign for Radioactive Waste Safety
Commonwealth Edison Company
Rose Levering
Citizens Against Nuclear Power
Robert Goldsmith
Catherine Quigg
Edward Gogol
Marilyn Schineflug

8.0 STAFF RESPONSE TO COMMENTS

Pursuant to 10 CFR 51.25, the Draft Environmental Statement was transmitted to the following, along with a request for comments:

U.S. Advisory Council on Historic Preservation
U.S. Department of Agriculture
U.S. Department of the Army, Corps of Engineers
U.S. Department of Commerce
U.S. Department of Energy
U.S. Department of Health and Human Services (formerly Health, Education, and Welfare)
U.S. Department of Housing and Urban Development
U.S. Department of the Interior
U.S. Department of Transportation
U.S. Environmental Protection Agency
State of Illinois
Grundy County
Citizens for a Better Environment
Illinois Safe Energy Alliance
Ms. Kay Drey

Responses were received from:

U.S. Department of the Army	Undated
U.S. Department of Agriculture (Economics, Statistics, and Cooperative Service)	June 10, 1980
U.S. Federal Energy Regulatory Commission	June 12, 1980
Brigid K. McCauley	June 17, 1980
U.S. Department of Housing and Urban Development	June 18, 1980
U.S. Department of Agriculture (Soil Conservation Service)	June 24, 1980
Randall L. Plant	June 27, 1980
Marvin I. Lewis	June 28, 1980
U.S. Department of Health, Education & Welfare (Food and Drug Administration)	June 30, 1980
Princeton University	July 1, 1980
Washington University in St. Louis	July 1, 1980
Paula J. Ayers	July 8, 1980
Kay Drey	July 16, 1980
Northern Illinois University	July 16, 1980
Ben Ruekberg	July 16, 1980
RPF Ecological Associates	July 17, 1980
Citizens for a Better Environment	July 18, 1980
Pollution and Environmental Problems, Inc.	July 18, 1980
State of Illinois Attorney General	July 18, 1980
Illinois Safe Energy Alliance	July 18, 1980
Edwin R. McCullough	July 18, 1980
Cecile Meyer	July 19, 1980
The Sassafras Audubon Society	July 19, 1980
National Campaign for Radioactive Waste Safety	July 20, 1980
State of Illinois, Department of Public Health	July 21, 1980
Commonwealth Edison Company	July 21, 1980
Rose Levering	Undated, rec'd July 22, 1980
Citizens Against Nuclear Power	July 23, 1980
U.S. Department of Agriculture	July 23, 1980
U.S. Environmental Protection Agency	July 25, 1980

The responses are reproduced in their entirety in Appendix A to this FES.

The responses from the Department of the Army, the Department of Agriculture (Economics, Statistics, and Cooperatives Service), the Federal Energy Regulatory Commission, the Department of Housing and Urban Development, the Department of Agriculture (Soil Conservation Service), and the Department of Agriculture (Forest Service) did not provide any significant comments, and, therefore, no changes were made to accomodate these comments.

Brigid K. McCauley of University City, Missouri responded (A-4) with three comments summarized below:

1. McCauley Comment (A-4):

Can you explain how this migration of radionuclides can be going on at Hanford (and probably at Beatty, since the two sites are, according to the NRC, so very similar) if, as your report repeatedly assures us, "the geological and hydrologic features of the burial site" make it impossible?

NRC Response:

The migration of radionuclides from radioactive waste disposal sites has been associated with the disposal of intermediate and high-level liquid radioactive wastes that have either leaked from long-term storage tanks or have been discharged into the soil. Such liquid discharges are no longer used to dispose of radioactive waste. Migration of radionuclides has taken place because the wastes were in a liquid form and not solidified as the Dresden decontamination wastes will be.

2. McCauley Comment (A-5):

Ms. McCauley discussed various experiments relative to the increased uptake of heavy metals in plants when chelating agents are used in commercial fertilizers. She asked, "How can you rule out plants as a pathway for the chelated radionuclides into the environment?"

NRC Response:

The impacts of the disposal of wastes containing cobalt-60, iron-55, nickel-59, and nickel-63 were evaluated for an arid disposal site using the methodology presented in NUREG-0456, "A Classification System for Radioactive Waste Disposal--What Waste Goes Where?," and in NUREG/CR-1005, "A Radioactive Waste Disposal Classfication System." The evaluation included the effect of chelating agents. The limiting pathway was found to be that of a reclaimer growing and consuming food grown on the disposal site following loss of institutional control. The maximum allowable concentrations for cobalt-60, iron-55, nickel-59 and nickel-63 were determined.

The values indicate that the Dresden wastes containing cobalt-60, iron-55, nickel-59, and nickel-63 complexed in chelating agents will be acceptable for shallow-land burial at an arid disposal site.

3. McCauley Comment (A-5):

Is it not possible that some of the principal crud radionuclides to be shipped for burial will be longer-lived than the cobalt-60 isotope you mention?

NRC Response:

There are longer-lived radionuclides than cobalt-60 present in the radioactive waste to be buried. These nuclides are present in far less significant quantities than the cobalt-60 which is the principal radionuclide present from the standpoint of total Curie level and penetration characteristics of the radiation emitted. Table 2.1 of the Final Environmental Statement has been revised to identify radionuclides found to be present in significant quantities in the oxide layer at Dresden 1. Other nuclides may be present in trace amounts that are below the detection sensitivity of the analysis used to identify the nuclides present.

4. McCauley Comment (A-6):

"...how can we have any confidence in the NRC evaluation of the safety-guaranteeing conditions at Beatty (near centers of earthquake activity and the underground atom bomb testing grounds) and Hanford (150 miles east of Mt. St. Helens, with volcanic activity now being predicted for the whole Cascade Range)--particularly when radionuclide migration has already been documented at Hanford?"

NRC Response:

The NRC staff has been monitoring the volcanic activity at Mt. St. Helens. We have not discovered any effect of this eruption that adversely affects the suitability of the Hanford, Washington or the Beatty, Nevada low-level waste disposal sites.

The Beatty site is in a seismically active region. However, the site is not on an active fault zone. The only important effects of earthquakes on the water contamination aspects of the Beatty site would be from surface fissures. These fissures, if not backfilled, could permit the inflow of rainfall and runoff. However, the possibility of an earthquake of sufficiently high magnitude to form open fractures appears to be remote (Reference 14).

There have been no observed effects on the Beatty site from weapons testing at the Nevada Test Site.

Randall L. Plant of Urbana, Illinois commented (A-10) that:

1. Plant Comment (A-10):

"...It is therefore highly inaccurate to say the cost of replacement power will be $300 million. There may very well be no additional cost at all.

2) The cost of replacement power, if any, should not be compared to only the $39 million cost of the decontamination, but rather to the total cost

of producing this equivalent energy. These costs would include fuel, operations, and maintenance cost for the Dresden unit over its expected 15 year lifetime.

3) It is highly unlikely that Dresden I will continue to operate for an additional fifteen years. As concern for safety of nuclear power plants increases, it is very likely that the oldest reactors will be shut down first. It is also very unlikely that Dresden I will operate at a 60% capacity factor for the next fifteen years (The report states '60% availability.' I assume this is an error, and that the authors meant to say 'capacity factor'). Between 1960 and 1980, Dresden I had a capacity factor, on the average, of 46%. Even if one takes into account the past five years of down-time, the total is still barely over 61%. The future capacity factor of the plant is, at best, likely to be little more than the historic average of about 45%."

NRC Response:

There would be some fixed cost associated with the plant, even though it was not operating, which will be borne by the ratepayers in one form or another. These costs are related to the fixed cost of the investment (i.e., taxes, insurance, depreciation, return on investment, etc.) and the fixed cost of operation and maintenance. The fixed cost on investment could range from about 2% of investment for taxes and insurance to about 20% if the unit has not been depreciated and the original investment recovered. The investment in the unit is about $34 million in 1960 dollars; thus, the annual cost on investment could range from about $1 million to about $7 million. The fixed cost for operation and maintenance could amount to $1 million to $4 million per year.

The replacement power cost during the downtime would be the greatest cost. This cost will depend on the type of fuel used to generate the replacement power. Since nuclear generating units have lower fuel costs than coal- or oil-fired units, the replacement power cost will result in an increase in the cost of electricity to Commonwealth Edison's ratepayers. Assuming the replacement power is generated by Commonwealth Edison, the increased cost would be the cost of coal or oil fuel less the cost of nuclear fuel. The cost of fuel on the Commonwealth Edison System in 1979 was about $39/ton for coal and $26/barrel for oil. These costs translate into about 18 mills/kWh for coal and about 42 mills/kWh for oil. The nuclear fuel cost is about 8 mills/kWh. Thus, for the 200-MWe Dresden unit the increased cost would be about $48,000 per day -- (18-8 mills/kWh) (200,000 kW x 24 hr/day x 1/1000 mills/kWh) -- for coal and about $160,000 per day for oil at a 100% capacity factor. Assuming the replacement power cost would be split between coal and oil, the cost would be about $100,000 per day. Assuming a 60% capacity factor, the annual cost would be about $22 million. Thus, the additional cost to the ratepayers is about $22 million for each year the Dresden unit is out of service.

Another perspective is to calculate how much one could spend to renovate Dresden and break even with the cost of generation for a nuclear unit coming on line in 1980. The cost of generation for such a unit is about 30 mills/kWh. Subtracting the cost of fuel and O&M of about 8.2 mills/kWh and 1.8 mills/kWh respectively leaves about 20 mills/kWh for fixed cost. Assuming a fixed charge rate of 20 mills/kWh for a 15-year life, the break even renovation cost would be about $\$105 \times 10^6$ (20\$/MWh x 200 MWe x 8760 h/yr x 0.6 capacity factor/0.20). Thus one could afford to spend up to about \$105 million to renovate Dresden for 15 years of operation and break even with the cost of a new plant coming on line in 1980.

As suggested we have replaced the term availability with the term capacity factor. Our projection of 15 years additional operation was used for purposes of estimating the cost of an immediate shutdown since it approximates the period remaining in the Dresden 1 operating license.

2. Plant Comment (A-11):

"Throughout the report, the authors refer to tests that have been made on the proposed process. In every case, these tests were made by Dow or CECo. One can justifiably be very skeptical of the validity of any test made by an industry on a product it is trying to sell or promote. It is imperative that the NRC obtain independent analyses of the processes involved here.

I would therefore recommend that the NRC:

1) Appoint at least one, and possibly more, ad hoc commissions to fully examine the decontamination process. This commission should be comprised of qualified individuals who have no ties with the nuclear industry and who have previously expressed skepticism of aspects of the nuclear industry. They should be awarded full access to all relevant data, and their final report should serve as addressing the "other side" of the decontamination process (now only addressed by the industry/utility reports). A good example of this mechanism is the recent study by the Union of Concerned Scientists with regard to the venting of gases at Three Mile Island.

2) Upon completion of the report, a public hearing should be held to discuss findings by this ad hoc group, as well as the literature provided by Dow and CECo. This hearing would lead to a complete airing of all opinions on the matter, and would mitigate concerns about improper decisions."

NRC Response:

It is the responsibility of the NRC to review the proposed Dresden Decontamination Project. In carrying out this responsibility, we make use of consultants in specific areas of expertise as needed.

The matter of a public hearing on this proceeding will be resolved in a separate action in response to the petition filed on July 8, 1980 in behalf of Citizens for a Better Environment, Prairie Alliance, Kay Drey, Briget Rorem, Illinois Safe Energy Alliance, and Marilyn Schineflug, by their attorney, Robert Goldsmith.

Marvin I. Lewis of Philadelphia, Pennsylvania (A-12) commented as summarized below:

1. Lewis Comment (A-12):

The review should consider problems found in the cleaning of nonnuclear power plants.

NRC Response:

The Commonwealth Edison Company and its prime contractor, Dow Chemical Company, have an extensive background in the field of operating and cleaning of non-nuclear plants through past experience in that area. Section 2.4.1 of Reference 20 discusses some considerations related to chemical cleaning of conventional fossil fuel heated utility boilers. That was a part of the initial planning for this project.

The U.S. Department of Health and Human Services (formerly the Department of Health, Education and Welfare), Bureau of Radiological Health (A-13) commented:

1. HEW Comment (A-13):

Our assessment of the proposed decontamination operation indicates that the planning, system testing, and training of personnel provides adequate assurance that the occupational radiation exposure will be maintained as low as reasonably achievable (ALARA).

NRC Response:

Our continuing review of the conduct of these operations by Commonwealth Edison confirms our previous conclusion relating to the efficacy of the radiation protection program for the decontamination program. We concur with the comments by the Bureau of Radiological Health.

2. HEW Comment (A-13):

It would be appropriate for the Draft Environmental Impact Statement to contain a discussion of the need for repeat decontamination operations. It is noted that the staff analysis of future occupational exposure savings is based on a five-year period of operation.

NRC Response:

We have added a discussion of the possible need for future decontamination to Section 4.2.1.2.

3. HEW Comment (A-14):

"...It would be appropriate to expand this section (Section 4.3) to include a statement that coordination with the State of Illinois has taken place."

NRC Response:

We have expanded Section 4.3 to describe the extensive involvement of the State of Illinois in the emergency plans for Dresden Station.

4. HEW Comment (A-14):

The statement does not contain any information on the monitoring program at the Dresden Nuclear Power Station. It would be helpful to expand the statement by adding a section on environmental monitoring which could specify the adequacy of the existing program to monitor any accidental releases.

NRC Response:

We have modified Section 4.3 to describe the environmental monitoring program at Dresden Station that would be used to monitor any accidental releases.

David A. Crerar of Princeton University (A-15) states:

1. Crerar Comment (A-15):

"...However, I am surprised that the alternative of physically or chemically degrading chelating agents after reactor decontamination and prior to disposal is treated in only the most cursory fashion in this report (as a brief response to question 4d, Appendix A, pg. 12, and not even mentioned in Section 2.4 which evaluates alternatives)."

NRC Response:

The Brookhaven National Laboratory has surveyed potential processes for degradation of chelating agents (Reference 11). This report indicates that there are no satisfactory methods for the degradation of chelating agents, such as EDTA, DTPA, and NTA. There are, however, some methods which might, following further development, provide feasible degradation processes.

2. Crerar Comment (A-16):

"...I also find it unfortunate that in this report the NRC should have consistently deemphasized the significance of chelating and other strong complexing agents in the migration of radioactive wastes. It is the very presence of large quantities of such compounds to be contained in the waste generated from decontamination operations that has created much of the present public concern."

NRC Response:

Based upon the conservatism assured by the solidification of the wastes, the selection of an arid disposal site and the segregation of the decontamination wastes from other wastes, the deactivation of the chelates, even if this were feasible, would provide little additional protection to the health and safety of the public.

Leonard J. Banaszak, Washington University in St. Louis, Missouri (A-17) commented:

1. Banaszak Comment (A-17):

The report seems to totally overlook other possibilities for disposing of the chelated radionuclides which will be obtained from the wash of the cooling system. The major environmental importance and the major reason for this operation coming under the criticism of people who are aware of the dangers of radioactivity stem from the fact that the products are in a highly mobile form. The mobility of the radioactive waste is due entirely to the presence of the chelating agent(s) and not a single new possibility has been described for removing or destroying the chelated form of these products prior to burial.

NRC Response:

The product is not in a highly mobile form. The product is immobilized in solid form and will be disposed of in a dry arid location where the opportunity for leaching is minimized. (Also see the NRC Response to Crerar's Comment 2.)

2. Banaszak Comment (A-18):

The proposed decontamination of the cooling system involves the removal and disposal of a large amount of highly radioactive substances. In communications from the NRC, the amount has been estimated to be 3,000 plus or minus 1,000 curies. The large indicated error in this estimate suggests that it was obtained by inadequate experimmental procedures and further studies should be made to obtain a more precise value. Any environmental impact of the decontamination procedure will be directly related to the total amount of dangerous radionuclides removed during the decontamination, and present estimates of the amount are not satisfactory.

NRC Response:

The factor of plus or minus 1000 that is applied to the 3000 Curies is not an error but represents a factor of conservatism applied to assure that the shielding design is adequate. More recent measurements of the radionuclide activity actually present in the primary cooling system indicate that the actual quantities of radioactive materials removed in the decontamination will be significantly less than the design value of 3000 Curies. (See new Table 2.1.)

3. Banaszak Comment (A-18):

In addition, on page 2-2 of the draft statement, no measurements of 59 iron, 51 chromium, or 63 nickel are found. This suggests that either they were not measured in the test samples or they are not present. It would be astounding if no iron, chromium or nickel were found in this crud which is being generated by the materials in the cooling system and which contain a large amount of steel.

NRC Response:

In response to your comments and other similar comments, we have revised Table 2.1 to include all nuclides actually found to be present in the Dresden 1 crud. This revision is based on more recent analyses carried out for Commonwealth Edison and submitted to NRC for our review by CECo in a letter dated September 4, 1980.

4. Banaszak Comment (A-18):

Initial plans for removing the waste from Dresden to some storage site involve the polymerization within steel barrels. It seems certain that after polymerization the possibility exists that small pockets of free chelating agent will remain in these transportation drums. These small pockets of chelating agents are highly corrosive toward the mild steel to be used for transport. In fact, adequate data from the Brookhaven National Laboratory (BNL) support the corrosiveness of this cleaning material. Data which I have read from the BNL indicate that an uncoated container will be reduced to about 25 mils thickness after 3 months. Such corrosiveness means that in a few instances pitting will occur, resulting in leakage from the barrels after a relatively short time.

NRC Response:

See FES Sections 4.2.2 and 4.2.3.

5. Banaszak Comment (A-19):

Should an accident occur during the cleanup operations, procedures for the protection of the workers and the nearby environment should be developed prior to the undertaking of the decontamination operation. Such an accident, however unlikely, could have disastrous results for the population and the watershed near to the plant. This danger arises once again because of the highly mobile nature of the chelated forms of these radionuclides. The draft statement contains little evidence of precautions to be used in case of a mishap.

NRC Response:

The current requirements for emergency preparedness are contained in Appendix E to 10 CFR Part 50, "Emergency Plans for Production and Utilization Facilities," which was published in December 1970 and amended in January 1973. In conjunction with this rule, the Commission developed a document entitled "Guide to the Preparation of Emergency Plans for Production and Utlization Facilities" to help applicants establish adequate emergency plans. More complete guidance for an acceptable method for complying with this regulation, including general guidance for emergency facilities, is contained in Revision 1 of Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," published in March 1977.

The Commonwealth Edison Emergency Plan, called the Generating Stations Emergency Plan (GSEP), was originally submitted on February 18, 1975 and approved by NRC on May 23, 1975.

The investigation of the accident at the Three Mile Island Nuclear Power Plant Unit 2 identified the need for extensive improvements in emergency preparedness at nuclear power plants. The NRC and the Federal Emergency Management Agency (FEMA) have jointly prepared NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants."

In response to NRC requirements, CECo has submitted a completely revised GSEP on April 24, 1980. This plan incorporates new regulatory requirements resulting from the staff's review of the Three Mile Island accident. The NRC staff has completed its review of this revised Emergency Plan and has found it acceptable for implementation. NRC has identified additional changes that should also be implemented to assure that the plan will meet evolving NRC requirements.

We have expanded Section 4.3 of the FES to describe the Dresden Emergency Plan that would be put into effect in the event of an accident involving the relase of radioactive material from the reactor.

6. Banaszak Comment (A-19):

While it is true that leakage would be greately reduced at a drier disposal site, dilution factors would also be reduced. An environmental study of the potential dangers of pulses of high concentration of chelated radionuclides leaked from a storage site should be considered. In addition, one is uncertain about how dry this disposal site will remain. Recent volcanic activity in an area immediately adjacent to the disposal area could alter rainfall patterns.

NRC Response:

Based on the conservatism assured by the solidification of the wastes, the selection of an arid diposal site, and the segregation of the decontamination wastes from other wastes, the proposed disposal approach provides adequate protection for public health and safety.

The weather patterns in the arid regions east of the range of mountains extending from California (Sierras) to Washington are the result of a rain shadow effect. The prevailing westerly winds caused by the earth's rotation contain moisture which falls as rain when the winds reach the western side of the mountain range. The region to the east of the mountains remains arid since the moisture carried by the westerlies has been removed. Therefore, any significant change in the weather patterns in the arid region would have to be caused by a change in the prevailing winds. Mt. St. Helen's volcano would not, therefore, be expected to significantly alter the prevailing winds. In fact, previous eruptions in the area or elsewhere in the world have not produced significant long-term climatic changes.

Glaciation in North America occurs in cycles generally over periods of about 100,000 years. Some glacial cycles have occurred over periods of 10,000 years. Glacial periods would be the only cause of significant climatic changes, although it is uncertain if even these events could alter the present arid environment into a humid or tropical zone.

7. Banaszak Comment (A-19):

NRC should view the Commonwealth Edison request not as a matter of urgency.

NRC Response:

The NRC review of this action was begun in 1974 and has continued for more than 5 years. Our review has examined all aspects of the project including reactor safety for continued operation, occupational radiological safety and environmental impacts. Authorization for the actual decontamination will not be given until all legal requirements are met and the staff publicly concludes that the environment will be protected and there is no undue risk to the public health and safety.

Paul J. Ayres of St. Louis, Missouri comments (A-21):

1. Ayres Comment (A-21):

Because of the admittedly temporary nature of the barrels you suggest for containing the solidified wastes (1-10 years), the only realistic long-term containment of the wastes you present is the polymer they will be trapped in and the ground.

NRC Response:

See FES Section 4.2.3 and Banaszak's Comment 6.

2. Ayres Comment (A-21):

The set polymer is porous; you do not know the leach rates. The slightly better leach rates with the Dow polymer shown in Dow's own tests doesn't seem to be sufficient assurance when the polymer and the ground are the only containment for these dangerous wastes.

NRC Response:

BNL has performed limited leach tests using NS-1 as the waste liquid. For a sample product similar to what will be generated in solidifying the Dresden waste, the fractional release of iron was 2.0 percent over the 37-day test period. Over the same test period, the fractional release of nickel was less than 0.3 percent. These leach tests were conducted with the solidified sample totally immersed in water, a condition which is not likely to occur at an arid disposal site. (Reference 13)

The greater surface-to-volume ratio of the waste in 55-gallon-sized monoliths as compared to beaker-sized laboratory samples will further reduce the leach rate. In any case, these leach rates are conservative when related to the actual disposal conditions at arid sites such as Hanford or Beatty, where contact with water is unlikely because of the meteorological and hydrological conditions at the site (Also see Banaszak's Comment 6.)

3. Ayres Comment (A-21):

Your response to problems of leaching to the water table by burying it in "dry" areas is not very reassuring. Recent flash floods in Pheonix and the possible climatic impact of the eruption of Mt. St. Helens point up the unpredictability of long-term climatic forecasts. It doesn't seem safe or thorough to use containment methods that only work in proper weather.

NRC Response:

See NRC response to Banaszak's Comment 6 regarding Mt. St. Helens' possible impact on regional weather patterns.

4. Ayres Comment (A-21):

"...I find it difficult to believe or understand why radioactive elements other than Cobalt-60, such as radioactive Iron-59 and Nickel-63 are of no concern to you. I understand they have half-lives considerably longer than Cobalt-60 and would be dangerous much longer than the 50 years the polymer is hoped to last."

NRC Response:

We have revised our listing of radionuclides present in the Dresden waste (see Table 2.1). See also NRC response to McCauley's Comment 2 and to Banaszak's Comment 3.

Kay Drey of University City, Missouri commented (A-23 through A-31):

1. Drey Comment A-23:

How can anyone be sure an accident will not occur during the decontamination and what will be the effect on workers and the public?

NRC Response:

There is no absolute assurance that "an accident" will not occur during the decontamination. However, in Section 4.3 the NRC Final Environmental Statement provides an evaluation of the impact of accidents should they occur. (See also NRC Response to Banaszak's Comment 5.

2. Drey Comment (A-24):

What radioactive wastes and other toxic chemicals are apt to be released to the atmosphere during the evaporation, and in what quantities?

NRC Response:

This comment is discussed in Section 4.2 of the Final Environmental Statement.

3. Drey Comment (A-24):

Does anyone really know what is inside the primary cooling system that you want to let out? Is this perhaps the ultimate Pandora's box? What is the composition of the crud?

NRC Response:

See NRC Response to McCauley's Comment 3.

4. Drey Comment (A-28):

Is it really a good idea to bond chelates to the Dresden crud--even if the pipe interiors get cleaner?

NRC Response:

See NRC Response to Crerar's Comments 1 and 2.

4. Drey Comment (A-30):

Does anyone know for how long Dow's solidifying plastic resins will be able to keep chelated radioactive wastes "solidified?"

NRC Response:

The long-term stability of the solidified product was evaluated with respect to its potential for release of radionuclides into the environment and nearby aquifers. The Dow Topical Report indicates that no signicant physical or mechanical changes occurred in the waste product when it was subjected to gamma exposures in excess of 10^8 rads. This is equivalent to the lifetime dose due to a 15 Curies/ft^3 concentration of cobalt-60. The cobalt-60 concentration in the Dresden decontamination wastes will be less than about 1 Curie/ft^3.

Since the Dresden waste will be segregated from other wastes, the potential for interaction with other wastes will be minimized.

The Dresden waste will be disposed of at an arid site. Therefore, the arid site conditions will minimize any potential for release of activity due to leaching.

The above characteristics of the waste form and the site provide assurance that the stability of the waste form will be adequate over the hazardous lifetime of the wastes (about 50 years for cobalt-60).

5. Drey Comment (A-31):

Can anyone be sure the Washington and Nevada sites will remain dry?

NRC Response:

See response to Banaszak's Comment 6.

Bruce Von Zellen, Northern Illinois University, De Kalb, Illinois comments.

1. Von Zellen Comment (A-32):

What leachate was used by Dow for testing chelated samples solidified by the Dow method? How close in composition was the test leachate to that anticipated at the disposal site? pH?

NRC Response:

The tests conducted by Dow Chemical Company and Brookhaven National Laboratory utilized demineralized water as the solution used for leach tests. (See Ayres' Comment 2 and Banaszak's Comment 6.)

2. Von Zellen Comment (A-33):

In the past year or so, both sites denied burial of low-level radwaste from Commonwealth Edison Company. What assurance is there the Dresden waste will be accepted now?

NRC Response:

Commonwealth Edison has a contract with Nuclear Engineering Corporation to dispose of solid radioactive waste. The Dresden 1 decontamination waste will be in a form that is acceptable under the State-issued licenses for the Hanford, Washington and Beatty, Nevada burial sites.

The NRC has evaluated the Dresden decontamination proposal on the facts as they currently exist. If any of these sites close in the future, we will reevaluate the disposal of the wastes on the basis of waste-burial-site availability at that time.

3. Von Zellen Comment (A-34):

A generating reserve of 38%, substantially above the 14% level of reserve deemed adequate by the company, together with the addition of four new nuclear units within the next year or so, provides sufficient reserve to permit the shutdown of Dresden without the purchase of replacement power.

NRC Response:

See NRC response to Plant's Comment 1.

4. Von Zellen Comment (A-34):

The actual migration of plutonium from the Hanford, Washington waste disposal site has been reported (Transuranium Nuclides in the Environment, Price & Ames, EC, 1976).

Recognition of the demonstrated migration of radwaste at sites across the nation and in Canada requires data be generated on the migration potential of radwaste associated with NS-1.

In addition to Oak Ridge, Menas et al. (ibid.) mention the migration of waste at six sites in this country and Canada. What relationship exists among the parameters of average precipitation, liquid waste, complexing agents, and geology at the six sites?

NRC Response:

These reported instances of waste migiration have involved liquid radioactive waste disposal operations. These cases are not relevant to the disposal of a solid waste form in an arid site. (See NRC response to Brigid McCauley's Comment 1.)

5. Von Zellen Comment (A-35):

"...The NRC response that decontamination wastes from Dresden 1 will be buried in 'dry' areas is not adequate in light of man's inability to predict climatic conditions over the long time spans this waste remains dangers to life."

NRC Response:

See NRC response to Banaszak's Comment 6.

6. Von Zellen Comment (A-35):

"...consideration has not been given to the fact that organic solvents present in much radioactive waste can dissolve the Dow solidification agent."

NRC Response:

The Dresden decontamination wastes will be segregated from all other wastes. (See FES Section 4.2.3.)

7. Von Zellen Comment (A-35):

"...if not an experiment, then why the paucity of data on the quality and quantity of mixed fission products and actinides, frequency of decontamination procedures over the remaining 15 years of the operating license, and the rate of leaching under field and laboratory conditions?"

NRC Response:

The quantity of radioactive material that will be removed from the Dresden primary cooling system was estimated for the purpose of shielding needed for the radioactive-waste-storage and solidification facilities. For that purpose, a conservatively high estimate of 3000 ± 1000 Curies was assumed present to assure the adequacy of the shielding. The actual quantity of radioactive material present is expected to be significantly less than 3000 Curies because of the conservatism of the earlier estimate and decay that has taken place since the reactor shut down in 1978. Table 2.1 has been revised to provide our latest estimate of the quantities of the specific nuclides that have actually been detected in the Dresden corrosion layer.

CECo opted for decontamination specifically to allow access to carry out inservice inspections and plant modifications that were impractical in the presence of the existing high radiation fields in the vicinity of the primary system. At this time, no additional modifications have been identified that will require such access after operation is resumed. Accordingly, no request for future decontaminations have been received from CECo. No need for future decontamination has been identified at Dresden at this time.

8. Von Zellen Comment (A-35):

"I recommend comparative data on leach rates, solidifcation, and leachates between Brookhaven National Laboratories and Dow be shown in tabular form. The information is currently unclear.

"In view of the possible calamities that may occur over the period of a hundred or more years, it is imperative field tests be undertaken to quantify the migration potential of radionuclides complexed with Dow's NS-1."

NRC Response:

Leach tests performed by Dow (Reference 16) indicate that the cobalt-60 release is less than 1 percent in 70 days. These tests were performed on actual samples of NS-1 solution from the Dresden test loop decontamination, solidified with the Dow polymer. The modified IAEA test procedure was used with deionized water. (See NRC response to Banaszak's Comment 6 and Ayres' Comment 2.)

9. Von Zellen Comment (A-35):

"The chelating agent can be 'deactivated' (reduced to simple molecules) thermally or chemically. However, this process has not been chosen by the licensee because: (1) the leach rate with chelating agent is testing to be less than those of solidified radioactivity without the chelating agent and (2) the additional process of 'deactivation' adds complication to radwaste handling and may also result in additional equipment maintenance and personnel radiation exposure."

These reasons are not supported by convincing evidence. Dow appears to have used distilled water alone as a leachate for the polymer and chelated radwaste, and nowhere in the (draft) EIS is it demonstrated that reason (2) is true.

NRC Response:

See NRC response to Crerar's Comment 1.

10. Von Zellen Comment (A-36):

"In fact, rather than using stronger chelated agents at Dresden Unit 1 in the future, it is quite possible that, following the strong decontamination solution, the utility may elect to use a weaker but more frequent decontamination on line process than is currently being developed, under EPRI (Electric Power Research Institute) sponsorship by Battelle Northwest.

"The experimental overtone to this statement suggests ever-increasing amounts of complexing agents being added to the environment from this and other future decontaminations."

NRC Response:

See NRC response to Comment 2 from the U.S. Department of Health, Education, and Welfare (now the Department of Health and Human Services).

Ben Ruekberg of Chicago commented (A-37):

1. Ruekberg Comment (A-37):

"For example, the annual man-rem exposure from Dresden I is not given, but rather the average from the three Dresden reactors (1973-1977). What is that supposed to mean? Don't you know or aren't you telling the exposures from Dresden I? If not, why not?"

NRC Response:

At Dresden Station, as well as at other multi-unit sites, some employees work interchangeably among the units. For this reason, the radiation exposures are recorded by site, not by unit. Therefore, no breakdown on a per-unit basis is available.

2. Ruekberg Comment (A-37):

"Where did you get your estimated savings in exposure of 7,500 to 12,500 man-rems?"

NRC Response:

The licensee has estimated that the decontamination of the primary system will result in an immediate savings of 5,000 to 10,000 man-rems during the current outage related to modifications and inservice inspections. In addition, the licensee has estimated that the decontamination will save 500 man-rems/yr for the next 10 years of operation. However, because of the uncertainties related to future radiation levels and the extent of future inspections and modifications, the staff has extrapolated the 500 man-rem/yr savings for only the first 5 years after resumption of operation, or 2500 man-rems. Thus, the chemical decontamination will result in a total savings of 7,500 to 12,500 man-rems.

3. Ruekberg Comment (A-38):

"...There yet remain a number of unanswered questions. If the deposits in the pipes are 'trace quantities of metals (that) have become neutron activated,' what fraction of the deposits are radioactive? If the fraction is small enough, then the solvent may become saturated long before the radiation has been reduced. A much larger volume of solvent (and solidifed) waste) will be necessary to accomplish the described goal. The task will take longer and involve more exposure time to workers and more corrosion of the pipes by the solvent. A higher than anticipated ion content may adversely affect the ability of the solvent and resin to hold the radionuclides."

NRC Response:

The solvent has been tested fully in the laboratory and has been in full-scale cleaning operations at Peach Bottom Nuclear Power Station and on the test loop at Dresden 1. The effectiveness of the solvent and the parameters associated with its use to achieve optimum results are well known and understood.

4. Ruekberg Comment (A-39):

Even if an accidental spill is "kept" in the containment, it might seriously increase worker exposure. Eight workers at the licensee's facility at Zion were splattered on May 12, 1980 in a mishap during a routine operation.

NRC Response:

The radwaste facility is specifically designed for remote filling, capping, and storage of the waste drums. Since the wastes from decontamination will be disposed of in approximately 600-1200 drums, the radiation level from any 1 drum will be approximately 10 rems. In the event of a spill during drum filling, the liquid wastes in the radwaste system can be backflushed to waste tanks to reduce the radiation levels in the radwaste drum-filling area. This will permit cleanup of the spill with a minimum of personnel exposure. The radwaste system can be backflushed in a similar manner to permit maintenance work on the system during breakdowns.

In the event of a spill from the primary system during decontamination, the decontamination solution in the system can be pumped back to holding tanks. This will prevent further leakage and will facilitate cleanup of the spill in a lower dose rate environment. Because the 664 Curies of crud will be diluted in approximately 100,000 gallons of decon solution, cleanup of any spills will not result in any serious worker exposure. In the event airborne radioactive releases exceed Technical Specification limits, the containment atmosphere will be isolated from the outside atmosphere so there will be no threat to the public nearby. Since the NS-1 solvent is not volatile, there little possibility of gaseous releases from liquid leakage.

Robert W. Guth of Evanston, Illinois commented (A-41):

1. Guth Comment (A-41):

"I could not find an evaluation of occupational or public radiation exposure that might result from a serious vehicle accident during transportation of the solidified waste to a licensed burial facility. What is the probability factor of such an accident? If barrels were broken and solidified waste were spread onto a highway in a worst-case accident, what would be the level of public radiation exposure? Certainly the risks involved of such an accident should be evaluated as part of potential, although unlikely, radiation exposure."

NRC Response:

The solidified waste will be packaged and shipped in accordance with the requirements of NRC and Department of Transportation regulations. We believe that burning of the waste due to a transportation accident is the most credible means of dispersal of radioactive material. In our review of the topical report (Reference 10) describing the solidification system we concluded that the burning of a 55-gallon drum containing 200 Curies of radioactive material would result in a radiation dose that is a small fraction of the exposure guideline values in 10 CFR Part 100.

2. Guth Comment (A-41):

"On page 15 of Appendix A, it is stated that decontaminations of Canadian and British reactors indicate no evidence for an accelerated recontamination or crud deposition rate. Were these reactors decontaminated with Dow NS-1? How many years of reactor operation have passed since decontamination of those reactors? Were these contaminations on primary cooling sytems? Have these reactors been free of pipe structural problems years later?"

NRC Response:

The dates of the Canadian decontamination are listed below. The reactors have operated since the decontamination without any evidence of pipe structural problems attributable to the decontamination. These decontaminations did not use NS-1.

SIGNIFICANT DECONTAMINATION EXPERIENCE

Plutonium Recycle Test Reactors	1962
Shippingport PWR	1964
Plutonium Recycle Test Reactor	1965
Hanford Reactor, 15 major decontaminations	1964 to present
SENA Power Plant, Chooz, France	1967
Rheinsberg PWR, Rheinsberg, Germany	1968
Douglas Point, Canada	1970
NPD, Canada	1973
Gentilly, Canada	1973
Douglas Point, Canada	1975
Dresden Unit 1, test loop using Dow NS-1 solvent	1976
Peach Bottom, regenerative heat exchanger using Dow NS-1	1977
Vermont Yankee, reactor water cleanup system	1979
Brunswick 2, reactor water cleanup system	1980

3. Guth Comment (A-41):

"In the evaluation of the Impact of Alternatives, the option to shut down the reactor permanently seems to be inadequately considered. Will the reactor really be available as much as 60% over the next 15 years? What is the basis for computing a cost of $100,000 per day for purchasing replacement power? Is this the going purchase price? Would electrical generation by coal, by oil, or by gas result in a cheaper power alternative? If even 20 million dollars would be spent to encourage electrical conservatism, would there be a need to replace the power at all?"

NRC Response:

See NRC response to Plant's Comment 1.

Citizens For a Better Environment of Chicago, Illinois commented (A-42 - A-67):

1. CBE Comment (A-44):

"The Draft EIS under consideration is not only inadequate insofar as the Dresden 1 decontamination goes, but it is also deficient in that it fails to consider the disposal and transportation of all the waste generated in like decontaminations as well as other generic issues raised in these comments. Hence, to fulfill the mandate of the National Environmental Policy Act (NEPA) the NRC must prepare and circulate an EIS related to the chemical decontaminations of light water, commercial power, nuclear plants."

NRC Response:

There are no requests pending before the NRC for the use of Dow NS-1 for the decontamination of the primary cooling system of any reactor. The decontamination of Dresden 1 has been proposed to accommodate a specific situation that exists at Dresden 1 as a result of the very difficult physical access afforded by the Dresden 1 design for inservice inspection and plant specific modifications. At present no other reactors have encountered problems with inservice inspection caused by radiation levels that might require decontamination to permit access.

As a part of the development of a new regulation for low-level waste management, 10 CFR 61, NRC will be proposing requirements on waste form which would apply to wastes from decontamination operations as well as other fuel- and nonfuel-cycle wastes. 10 CFR 61 is scheduled to be published as a proposed rule in mid-1981. The Draft EIS is also scheduled for completion in mid-1981.

2. CBE Comment (A-45):

"The overall organization and analysis of this Draft EIS are deplorable. Many pages are not even numbered. Several tables and charts are direct transfers from other documents. Much of the text is verbatim from previous memoranda or submittals. All of which evinces a failure to undertake a serious, independent, systematic analysis of the proposed decontamination. This certainly violates the spirit of NEPA and in many instances the letter."

NRC Response:

The editorial changes suggested in your comments on the draft of NUREG-0686 have been included in the Final Environmental Statement.

With regard to the commenter's observations relative to the consistancy between previous NRC documents and the Draft EIS, this consistency is to be expected, and is, in fact, required, since our earlier conclusions were based on the staff's detailed environmental review, and no new considerations have been identified that change those conclusions.

3. CBE Comment (A-47):

"The initial step in analyzing the problem of radioactive deposits on reactor cooling pipes is to accurately identify the nature of the deposits. The NRC has apparently failed to accomplish this task. The value for the total amount of radiation, as reported by the NRC to Prof. Banaszak on 9/7/79, has a very large error (3000 ± 1000 Curies). The total amount of radiation to be removed has an impact on several areas of the project, especially radiation exposure and waste disposal."

NRC Response:

See NRC response to McCauley's Comment 3.

4. CBE Comment (A-49):

"One of the primary concerns of the NRC should be some assurance that the decontamination does not degrade the integrity of the primary coolant system boundary. Unfortunately the Draft EIS addresses this problem most perfunctorily. One of the bases of public concern over the decontamination has been the possibility of damaging the reactor and thus precipitating a major accident in the future. The NRC has ignored the concerns of the public as well as of government scientists. In particular, a memo from John Weeks (4/16/79) at Brookhaven National Laboratories (BNL) expressed concern that significant amounts of NS-1 solvent might be trapped in creviced areas around bolts or in creviced pockets formed by galvanic corrosion near defects of the vessel clad. The water rinse cycles could easily fail to remove such trapped solvents. The longer the solvent remains, the more corrosion becomes significant."

NRC Response:

Commonwealth Edison has provided additional information in its submittals of March 10 and March 27, 1980 that were not available to Dr. Weeks at the time of his April 16 memo. These were reviewed by Dr. Weeks in a letter transmitted to NRC on May 5, 1980. In the conclusion section beginning on the bottom of page 2, Dr. Weeks made several suggestions of acceptable ways of handling the removal of residual NS-1. The copper rinse following the cleaning part of the cycle will use a solution of relatively high pH (9.5) for a period up to 6 hours. This should satisfactorily neutralize any residual acids in crevices in the system. It will be followed by up to three demineralized water rinses. We conclude that this is a satisfactory rinsing/decomp ition technique.

5. CBE Comment (A-50):

"Since the decontamination solvent is not described in detail because of proprietary rights, several questions arise concerning the nature of the radionuclide-chelate complex. Since such complexes and the uncomplexed chelates are known to be highly mobile in the environment (see Crerar et. al. article referred to in Appendix A of the Draft EIS) and the food chain, there is great concern over any possible release of these materials."

NRC Response:

Dow conducted extensive pilot evaporator tests to examine the physical properties of NS-1 solvent during the evaporation portion of the decontamination. The results are published in Dow report No. DNS-D1-016, titled "Technical Study for the Chemical Cleaning of Dresden-1." Evaporation decontamination factors based on sodium ion concentrations were at least 10^5. Concentrations of volatile species in the NS-1 distillate were reduced to a few ppm in ammonia and inorganic carbon by treatment with the hydrogen form of a strong acid ion exchange resin. Filtration through activated charcoal reduced levels of organic constituents in the overhead to 50 ppm. Tests also showed that at 275°F, 99.85% of the dissolved metals will remain in the liquid phase, 0.12% are carried with the steam, and 0.03% are in an aerosol form.

These tests provide evidence that there will be no danger of significant amounts of chelate-bound radioactivity being released to the Illinois River.

6. CBE Comment (A-51):

"The Draft EIS states that the concentrated waste will be solidified with a vinly ester-styrene polymer in 55-gallon steel drums. In the process of describing the procedure (Draft EIS, Section 4.2.3) the NRC shrugs off concerns about (1) the lifetime of the steel drums and whether they will remain intact long enough to be buried, (2) that the polymer matrix and steel drums will not prevent significant leaching, even at the "drier" disposal sites, and (3) what will happen if the waste has radiation levels greater than 10 nanocuries/gram and cannot be disposed of in a low level waste depository."

NRC Response:

With regard to comments (1) and (2) above see NRC response to Banaszak's Comments 4 and 6 and Ayres' Comment 2. The transuranic content of the waste has been measured again by the licensee and the results are shown in the revised Table 2.1 of the FES. This quantity of transuranic nuclides will result in a concentration of less than 10 nanocuries per gram when solidified according to the procedures specified by CECo.

7. CBE Comment (A-53):

"The Draft EIS does not mention or even appear to have thought about the problem of transporting the waste from Illinois to Washington State. We have already described the possibility of pin hole leaks developing in the drums. There is also a real possibility of a highway accident and resulting spills. The letter is even more serious since the NRC estimates from 10 to 100 trucks for transporting these wastes which must be multiplied for future decontaminations the NRC is planning. A spill from one of these trucks could cause severe long term harm. There is no mention in the Draft EIS of special precautions that will be necessary in the case of an accidental spill."

NRC Response:

Waste shipments will be made in accordance with NRC and Department of Transportation (DOT) regulations. Because this waste has activities similar to those of wastes currently being shipped, no adverse environmental impacts from shipping Dresden contamination wastes is expected. (Also see NRC response to Guth's Comment 1.)

8. CBE Comment (A-55):

"The alternative of shutting the reactor down permanently is given short shrift. Three short paragraphs are devoted to the topic and no detail or supporting data are given. The conclusion that $300 million could be saved over 15 years is unsupported. A 60% "availability factor" is assumed and yet a capacity factor is required to determine the accuracy of the $300 million. No cost per kilowatt hour (kWh) for the replacement power nor for Dresden 1 to operate for the next 15 years is given, eliminating the possibility of auditing the $300 million. The analysis is thus made up of conclusory statements and violates section 102(2)(C)(iii) of NEPA, as well as CEQ regulation, 10 CFR 1502.14."

NRC Response:

See NRC response to Plant's Comment 1.

9. <u>CBE Comment (A-58)</u>:

"CECo's proposed decontamination of Dresden 1 will be the first large-scale commercial reactor system decontamination in the United States. This decontamination experiment is expected to provide experience and background for future decontaminations at other nuclear reactors under NRC regulation. CBE, therefore, formally requests that a programmatic EIS be written relating to future decontaminations of commercial nuclear reactors."

<u>NRC Response</u>:

The decontamination of the Dresden Unit 1 primary cooling system is a plant-specific licensing action. It is not linked in any way to plans to decontaminate any other reactor. The decontamination of Dresden 1 will not compel or assure the NRC approval of any other decontamination, and at this time no other utilities have requested authorization to decontaminate the primary cooling system of a reactor. (Also see response to CBE Comment 1.)

Catherine Quigg of Palatine, Illinois commented:

1. <u>Quigg Comment (A-68)</u>:

"The NRC should be obliged to disclose the chemical composition of NS-1 to the public."

<u>NRC Response</u>:

The U.S. Code of Federal Regulations provides for the protection of trade secrets in Section 2.790, "Public Inspections, Exemptions, Requirements for Withholding." Commonwealth Edison and the Dow Chemical Company have provided the required documentation to the NRC requesting such withholding of the formulation of the cleaning solvent NS-1 from the public by letters dated March 14, 1975 and February 21, 1978. By our letters dated April 30, 1975 and June 16, 1978, the NRC staff determined (1) that the composition of Dow NS-1 is such a trade secret and granted withholding from public disclosure and (2) that the right of the public to be fully apprised as to the basis for and effects of our proposed action did not outweigh Dow Chemical Company's right to protect its competitive position as allowed by the law. The NRC staff and our consultants have had full access to the chemical formulation of Dow NS-1 and the results of the testing of NS-1 have been fully documented in the public record.

The NRC staff has the responsibility to determine the safety of proposed actions under its review. In the case of the Dresden decontamination, the public record contains extensive documentation confirming the acceptability of NS-1 for decontaminating the primary cooling system without adversely affecting the materials of construction. The formulation has also been made available to the Environmental Protection Agency for its review and comment as part of this EIS review. EPA's comments are contained in Appendix A.

2. <u>Quigg Comment (A-68)</u>:

"The NRC's entire premise of safe burial of NS-1 contaminated wastes from the Dresden cleanup is based on the supposition that Hanford and Beatty are arid lands where the potential for transport of radionuclides is virtually nonexistent. The NRC has not provided the public with specific factual data on the geohydrology of the Hanford and Beatty sites to back up its contentions that these sites are safe for the burial of radioactive wastes containing NS-1 which, most likely, contains EDTA -- a chelating agent known to speed the migration of radionuclides through the soil and groundwater."

NRC Response:

See the NRC response to McCauley's Comment 3 and Crerar's Comments 2 and 3. Section 4.2.3 of the FES has been expanded to include geohydrologic data describing the burial sites.

The State of Illinois (Attorney General) comments:

1. Illinois Comment (A-70):

The choice of NS-1 may be justified but the Draft Environmental Statement does not indicate why. One reason is that NS-1 is not listed in Tables (2.4 and 2.5), so its effectiveness compared to the others cannot be readily discerned by the reader.

Thus, the Draft Environmental Statement does not justify the use of NS-1 since its selection process, formulation, and capabilities are not adequately revealed in the document.

NRC Response:

Table 2.5 has been modified to include NS-1, and Section 2.4 has been modified to identify the basis for the selection of NS-1 for the Dresden decontamination.

2. Illinois Comment (A-70):

"The Environmental Statement fails to document the specific criteria for the decontamination process and results. For example, what is considered an acceptable corrosion rate; What is the solvent selection criteria for radiation reduction; What final radiation levels are required for safe operation and inspection?"

NRC Response:

The corrosion rates determined in the Dow NS-1 material test program have been determined to be of the order of 0.1 mils/yr for stainless steel and 1.0 mils/yr for carbon steels for an exposure of 100 hrs at 121°C. This rate approximates the corrosion rate of demineralized water on these materials and is acceptable to the NRC staff. The exposure to NS-1 has also been determined not to cause localized pitting or accelerated intergranular stress corrosion cracking in the reactor materials.

The decontamination factors (DF) achieved in laboratory specimens ranged up to 1000, and pilot-scale DFs were in the range of 10 to 100 for the various geometries cleaned. Compared with the alternative solution tested, NS-1 is the only chemical that reduces the exposure rates by factors of 100 with acceptable corrosion rates and meets CECo's other acceptance criteria listed in Section 2.4.

Final radiation levels in the range of 100 mrem/hr will permit personnel to work for up to 30 hrs without exceeding 3000-mrem whole-body limit generally applied to radiation workers in a calendar quarter. Work can be safely carried out in areas with higher radiation levels but shortened working times or shielding may be required so that the task can be accomplished within regulatory limits.

3. Illinois Comment (A-71):

There is very little information provided on the plans for the inspection and testing after the decontamination and system modifications are completed. The plans and suitable acceptance criteria for this review should be documented and should be part of the basis for the Environmental Statement.

NRC Response:

The inspection and testing procedures required in assuring the integrity of the primary cooling system of nuclear reactors is contained in Section 11 of the Pressure Vessel and Boiler Code published by the American Society of Mechanical Engineers (ASME Code). Conformance to this code is required by Section 50.55 of the Code of Federal Regulations. These codes are a matter of public record and are required by the Dresden Technical Specifications. No further documentation of these codes is necessary or is provided; the purpose and result of the decontamination is to allow these necessary and required tests and inspections to take place safely.

4. Illinois Comment (A-72):

"In the discussion of barrel corrosion rates, the staff quotes worst-case corrosion rates where the barrels would corrode through in less than a year and other environments where they may last 10 years but there is little or no evidence provided that the barrels will remain intact for the 50-100 years needed for decay of Co-60 (half-life 5.3 years). In addition, the staff says the leach rate for Co-60 is higher in the Dow solidifying agent than in concrete. Thus, the proposed waste storage process seems exceedingly dependent upon the arid climate of the storage site for its acceptability."

NRC Response:

Disposal site license conditions do not require that the barrels remain intact for the hazardous life of the material. (Refer to FES Section 4.2.3 for a more detailed discussion pertaining to this issue.)

5. Illinois Comment (A-73):

"The Environmental Statement is too brief and contains little hard data. The responses to questions raised by individuals reflect an after-the-fact analysis which tends to justify a decision already reached rather than openly consider the issue raised."

"Thus, there is not enough information or serious analysis in the Draft Environmental Statement to justify the Staff's conclusion that '...the benefits of this action outweigh the impacts associated therewith and the proposed decontamination will not significantly affect the quality of the human environment.'"

NRC Response:

The Environmental Statement has been prepared in accordance with NRC procedures conforming to guidelines promulgated by the Council on Environmental Quality. This statement adequately analyzes the impact of this action and supports the conclusion reached that the decontamination will not significantly affect the quality of the human environment.

The Illinois Safe Energy Alliance comments:

1. ISEA Comment (A-74):

Nowhere in the draft environmental statement are the implications for reactor safety of an extended wet lay-up period raised. According to a Brookhaven National Laboratory Memorandum dated April 16, 1979 from John Weeks to Frank Almeter:

NRC Response:

Reactor safety considerations are contained in the safety evaluation prepared for this action rather than in the Environmental Impact Statement. This safety evaluation will be published prior to decontamination. Dr. Weeks is a major contributor to the corrosion-related aspects of the safety evaluation. By letter dated September 3, 1980, Dr. Weeks has reevaluated his previous concerns about "wet layup" and has concluded that his previous concern has been substantially reduced by receipt of additional information.

2. ISEA Comment (A-75):

Since the NRC itself states in its news announcement dated June 3, 1980 that one of the "major" issues in the environmental review is "the occupational radiation exposures associated with the proposed decontamination...," it seems negligent to omit from the draft environmental statement the licensee's methods of estimating occupational exposures expected during this project. While the NRC concludes "that these methods are conservative and that the estimates realistically bound the anticipate dose and are acceptable to the staff," the methods are not presented in the environmental statement for public scrutiny. How can the public adequately judge the correctness of the NRC's conclusion when the basic data is not included?

NRC Response:

The licensee's detailed methods of estimating occupational exposure were submitted to the NRC staff by a letter dated May 19, 1978. This letter responded to an NRC request for additional information needed to complete our detailed evaluation of the safety and environmental impacts of this action. This document and all others used as a basis for our evaluation are a matter of public record and are available to the public at the NRC Local Public Document Room in Morris, Illinois.

3. ISEA Comment (A-75):

Sec. 4.2.1.C Conclusion from Occupation Exposure Review

Based on the estimated occupational exposure savings of 7,500 to 12,500 man-rems because of the decontamination operation, we conclude that the expenditure of the estimated total exposure of 300 man-rems for the decontamination operation would result in a significant net reduction of exposure over the remaining years of plant operation. The decontamination operation itself, therefore, can be an effective method of maintaining the long-term overall occupational exposure to ALARA.

"The logic of this conclusion is devastated by the fact that electricity from the Dresden I reactor is not needed. The attached chart demonstrates Edison has large reserve margins which would not be significantly reduced by continued removal of the relatively small Dresden I from the company's generating capacity."

NRC Response:

See NRC comments to Plant's Comment 1 and Ruekberg's Comment 2.

4. ISEA Comment (A-76):

NRC's predictions of an increased risk of fatal cancer induction are questionable.

NRC Response:

NRC used the risk estimators of the BEIR Report (1972). The BEIR Report presents risk estimators developed by the Advisory Committee on the Biological Effects of Ionizing Radiation of the National Academy of Sciences and the National Research Council. Recently (July 1980) the 1972 BEIR has been updated (BEIR III). The risk estimators in this latest report are approximately two times smaller than of the 1972 BEIR Report. Since the Dresden Draft Environmental Impact Statement was based on the earlier report, the risk estimates in it are conservative (over-estimates) by about a factor of 2.

The earlier of the BEIR Report (1972 BEIR Committee Report, p. 88) noted that "...Expectations based on linear extrapolation from the known effects in man or larger doses delivered at high dose rates in the range of rising dose-incidence relationship may well overestimate the risks of low-LET radiation at low dose rates and may, therefore, be regarded as upper limits of risk for low-level low-LET irradiation. The lower limit, depending on the shape of the dose-incidence curve for low-LET radiation and the efficiency of repair processes in counteracting carcinogenic effects, could be appreciably smaller (the possibility of zero is not excluded by the data). On the other hand, because there is greater killing of susceptible cells at high doses and high dose rates, extrapolation based on effects observed under these exposure conditions may be postulated to underestimate the risks of irradiation at low doses and low dose rates."

There are a few recent studies that suggest that the risks of low-level ionizing radiation might be greater than predicted from linear extrapolation from high doses. However, the results of these studies have not been generally accepted by the scientific community. It is important to consider both studies that present higher risk estimates and studies that present lower risk estimates, together with the complete body of scientific literature on the effects of ionizing radiation rather than relying on the results of a single or even a few studies. Such an approach has been used by the National Academy of Sciences' BEIR Committee.

5. ISEA Comment (A-76):

The comparison of projected exposures from the Dresden decontamination to variations in background radiation is unwarranted and misleading. Some persons may interpret this comparison to mean exposure to background radiation is safe. However, exposure to even small amounts of radiation from any source including background radiation increases one's risk of sustaining cell damage the effects of which are cumulative. Also, exposure to background radiation is unavoidable while exposure to radiation from the decontamination project is avoidable.

NRC Response:

The table below indicates the levels of natural background radiation for different parts of the country. The range of variation over the United States is 70 to 310 mrem/yr. One approach of assuring safe radiation levels is to limit the dose to a fraction of natural background radiation. This has its basis in the fact that the human population has evolved in the presence of natural background radiation, and that there is no strong evidence that natural background radiation is linked to human mortality. Along those lines, the National Council on Radiation Protection and Measurements stated: "It is unwarranted to urge people to remove themselves from areas where exposure to natural sources of radiation are of this magnitude (400 mrem/yr) This degree of exposure is not regarded currently as of sufficient magnitude to require separate consideration in the determination and control of an individual's medical or occupational exposure. There is no validated deleterious effect from natural background radiation in the portion of the population receiving the higher ranges of natural radiation, but it must be recognized that satisfactory epidemiological studies to determine such effects are probably impracticable." Comparison of dose estimates to background can serve as a useful means of evaluating the significance of various dose levels.

TABLE 8.1

ESTIMATES OF NATURAL "BACKGROUND" RADIATION LEVELS

IN THE UNITED STATES

(References 18 and 19)

Location	Annual Dose Rate (mrem/year) Cosmic Radiation	Terrestrial Radiation	Internal Radiation	Total
Atlanta, Georgia	44.7	57.2	28	130
Denver, Colorado	74.9	89.7	28	193
Harrisburg, Pennsylvania	42.0	45.6	28	116
Las Vegas, Nevada	49.6	19.9	28	98
New York, New York	41.0	45.6	28	115
Pennsylvania	42.6	36.2	28	107
Washington, DC	41.3	35.4	28	105
United States	40-160	0-120	28	70-310

6. ISEA Comment (A-76):

The solution of burial in dry commercial sites (or a federally owned site, as suggested in response to Question 3, ISEA, in the Appendix if transuranics appear in unexpectedly high concentrations) remains inadequate in light of man's inability to predict climatic conditions over the long time spans this waste remains dangerous to life. Recent volcanic activity and possible changing weather patterns already challenge the acceptability of both the federally owned and commercial sites in Washington. Public pressure and/or state actions may force closure of the Nevada and Washington sites. With no other dry sites available in the country, the ISEA's concern that the chelated wastes may stay in Illinois remains valid.

Disagreement still exists regarding the "principal" radionuclides which may appear in the chelated waste and thus the length of time required for waste isolation. The table presented in Response 3 to Question 3, Drey, excludes nickel 63 which has a half-life of 92 years. However, because Dresden I feed-water tubing was 70-30 copper-nickel and originally had admiralty condenser tubing, could not significant concentrations of nickel isotopes appear in the crud? (See p. 11, 24, 25 from "Primary System Shutdown Radiation Levels at Nuclear Power Generating Stations, PP 251-343--attached.)

NRC Response

If the Hanford and Beatty disposals sites are closed for any reason, the wastes would have to be stored until alternative arrangements could be made (i.e. at a DOE arid disposal site). Other comments restate positions addressed by other commenters. See NRC response to McCauley's Comments 2, 3, and 4; Banaszak's Comment 6; and Citizens for a Better Environment's Comment 5.

7. ISEA Comment (A-77):

While segregation of chelated wastes is proposed, why isn't separation from toluene and xylene or other organic material required? Aren't these chemicals capable of dissolving polymers?

NRC Response:

The chelating agent wastes will be segregated from all other wastes including toluene and xylene.

8. ISEA Comment (A-77):

This section does not fully describe possible accidents nor the exact procedures to cope with them. If specific postulated accident scenarios are not presented, how can their environmental impacts be adequately assessed by the public?

NRC Response:

The Dresden Station emergency plan has been developed to respond to a broad spectrum of accidents and situations that could occur or have been postulated as an upper bound of possible events, to scope out the extent of resources needed to cope with potential accidents involving operating reactors.

This plan, which has been the subject of public meetings in the Morris area, addresses situations involving releases of radioactive materials onsite and offsite that exceed the total quantity of activity to be removed in the decontamination operation.

9. ISEA Comment (A-78):

Justification for the choice of decontamination over reactor shutdown is based on the assumption that electricity from the plant is needed. What demand projections are being used as a basis of the claim that "300 million dollars worth of replacement power over the remaining 15 years..." will be needed? Edison's large present and future reserve generating capacities (see chart from Chicago Sun-Times, June 8, 1980, attached), the lower than expected growth rates in peak demand and the untapped potential of conservation incentives combine to show that electricity from Dresden I simply is not needed.

NRC Response:

See the NRC response to a similar comment, Plant's Comment 1.

Edwin McCullough of Chicago, Illinois comments (A-89):

1. McCullough Comment (A-87):

The Denton memo later adds "Because of ACRS and staff concerns related to the potential for causing pipe cracks and some previous decontamination project misfortunes, we informed CECO that we wished to be kept closely informed about the progress of the decontamination program." (p.3) My letter of April 9, 1980 asked about previous decontamination projects, pointing out the Dresden I project is the first of scores of future projects. These questions are still unanswered. Surely, information about "previous decontamination project misfortunes" is relevant, yet there is only scant mention of previous decontamination projects. (<2.4) As to potential pipe cracking, the statement indicates that 40 to 50 welds are considered to be inaccessible because of the existing high radiation levels. However, it does not state the present condition of these welds and what the impact of the NS-1 solvent will be on these welds. Obviously, this deficiency must be corrected in a final statement.

NRC Response:

Previous reactor decontaminations have caused excessive corrosion in piping systems and have caused crud to be removed from one portion of a system and redeposited in other areas without removal from the system.

Some of these deficiencies are identified in Tables 3, 4, and 5 of the DES and were the reason that an extensive research program was undertaken by CECo and Dow to develop a new solvent for reactor decontamination. The new solvent has been tested in the laboratory, utilized in full-scale pilot operations on nuclear reactor systems, and it has been found to overcome these previous difficulties while achieving a high level of removal of radioactive deposits.

The present condition of the "welds that are inaccessible because of the existing high levels of radiation" cannot be assessed until the radiation levels are reduced. That reduction is the purpose of the decontamination. The inspection of the welds will provide added assurance of the continued safe operation of the reactor, and it is in the public interest to assure that these inspections are carried out.

2. McCullough Comment (A-87):

One other procedural issue needs to be discussed. The statement and previous NRC communications refer to tests that have been made on the project. As I stated in my April 9, 1980 letter, the NRC has not conducted any independent tests of the process. All of said tests were conducted by Dow (owner of the proprietary solvent NS-1), Commonwealth Edison (licensee), or General Electric (manufacturer of BWR). The public has little reason for confidence when all of the parties conducting tests have a vested interest in favorable results. Clearly, with decontamination looming large in the future, we are entitled to independent testing and analysis before the first decontamination proceeds.

NRC Response

The NRC staff has been reviewing the results of the testing program carried out by the licensee and their representatives since 1974. Our staff is composed of qualified scientists and engineers whose responsibility is the review and critical evaluation of licensee proposals such as the Dresden decontamination. During our review, we have made use of outside consultants such as Brookhaven National Laboratories (BNL) in areas where special expertise from their area of concentration was called for. Independent confirmatory testing has been performed by BNL (see FES Section 4.2.3).

3. McCullough Comment (A-87):

Section 4.3 discussed leakage within the waste treatment facility, stating that all leakage will be contained within the "bathtub" portion of the facility. What happens after that? How are workers protected? What is then done with the leaked liquids? These and other questions are particularly relevant in light of continuing safety violations at Dresden I. (See attached Notice of Violation.) A thoughtful accident plan should consider all possible contingencies and steps that will be taken to protect the environment.

NRC Response:

The radwaste facility is specifically designed for remote filling, capping, and storage of the waste drums. In the event of a spill during drum filling, the liquid wastes in the radwaste system can be backflushed to waste tanks to reduce the radiation levels in the radwaste drumming area. This will permit cleanup of the spill with a minimum of personnel exposure. The radwaste system can be backflushed in a similar manner to permit maintenance work on the system during breakdowns.

In the event of a spill from the primary system during the decontamination process, the decontamination solution in the system can be pumped back to holding tanks. This will prevent further leakage and will facilitate cleanup of the spill in a lower dose rate environment. Areas contaminated by spills will be flushed and cleaned up in a manner that will minimize personnel exposure. In the event airborne radioactive releases exceed Technical Specification limits, the containment atmosphere will be isolated from the outside atmosphere so there will be no threat to the public nearby. Since the NS-1 solvent is not volatile, there is little possibility of gaseous releases from liquid leakage.

4. McCullough Comment A-87):

Insufficient information on leaching of chelated radionuclides from the solid waste. The statement admits that the NRC does not know the leach rate of Dow polymer under burial conditions (Appendix A, p. 5). I raised the question of the wastes entering into the environment and the food chain in my letter of April 9, 1980. It seems to me that the assurance of safe disposal of the waste is a basic issue that must be resolved before decontamination proceeds. I do not see a meaningful discussion or any alternative modes of disposal or a satisfactory justification for the proposed method. Americans have suffered through enough unplanned environmental disasters, such as DDT and the current discoveries of illegal hazardous waste dumps. Surely, we are entitled to thoughtful planning here.

NRC Response

These comments restate comments previously made by other commenters. See NRC responses to Banaszak's Comment 6 and Crerar's Comment 1.

Cecile Meyer of KeKalb, Illinois comments (A-94):

1. Meyer Comment (A-94):

An outstanding example is the repeated assurances that the waste from the so-called decontamination process would be safely buried at Hanford, Washington or Beatty, Nevada. Since both states in the recent past have refused to accept radioactive wastes from Commonwealth Edison because of its poor safety record in shipping, how can NRC be so sure they will accept these wastes? And if not, what then?

NRC Response

Refer to NRC responses to Von Zellen's Comment 2 and ISEA's Comment 6.

2. Meyer Comment (A-94):

On page 2 of Appendix A, a statement is made that no migration of radionuclides had been observed at either Beatty or Hanford. Has not migration of plutonium been reported from the Hanford site, causing concern about pollution of the Columbia River?

NRC Response

The migration referred to did not involve solid radioactive waste buried in a low-level waste site. It involved high-level liquid waste from the defense program stored in tanks. Leakage from these tanks has occurred in the past but is no way comparable to the situation we are addressing. The Dresden waste is low-level waste, it is not a liquid, and it contains less than 10 nanocuries per gram of transuranic isotopes.

3. Meyer Comment (A-94):

The details of the extremely hazardous waste disposal methods which were permitted at Oak Ridge do not impart a feeling of confidence in the regulating agencies. As a former resident of Oak Ridge, I am appalled at what was allowed to occur in that beautiful part of our country by such sloppy disposal of radioactive materials. Much may be learned afterwards by such disasters about precautions which should have been taken. It is time we stopped proceeding to inject this dangerous material into the environment until we have proven evidence that it can be safely contained over the long periods that it remains a threat.

NRC Response

Refer to the NRC response to Banaszak's Comment 6.

4. Meyer Comment (A-94)

Your assumption on page 4-5 that the additional radiation exposure to workers involved in the decontamination process is negligible is based on a 1974 study. Should you not at least acknowledge several later studies (such as that by Mancuso) that any additional amount of radiation is harmful to human health?

Highly questionable is the EIS assumption that closing Dresden I would necessitate a $300 million expense for purchase of replacement fuel over a 15-year-period. Such a conclusion ignores the excess generating capacity of ConEd which renders replacement of Dresden I output unnecessary.

NRC Response

These comments have been answered in our response to the Illinois Safe Energy Alliance's Comment 4 and Plant's Comment 1.

The Sassafras Audubon Society of Lawrence, Greene Monroe, Brown, Morgan, and Owen Counties commented (A-91):

1. Audubon Comment (A-95):

Can it be said with certainty that one flushing (of approximately 100 hours) will do the job?

Or how long occupational exposure levels may be reduced to "acceptable" levels?

Or that the integrity of the primary cooling system will not be affected?

NRC Response

The testing carried out by Dow and CECo has determined that the cleaning parameters chosen by Dow will be adequate to remove the layer of corrosion products. The NRC staff has reviewed these tests and is satisfied that the tests support CECo's position that 100 hours exposure at 121°C will not cause unacceptable corrosion or cracking in the primary cooling system.

The occupational exposure levels will be reduced for a period long enough to permit the necessary safety inspections and modifications to take place. Recontamination of this system is expected to occur after return to service; however, because the entire system will start from a clean condition, the radiation levels are not expected to return to the precleaning levels immediately after return to service.

2. Audubon Comment (A-96):

Chelates have the capacity to form strong complexes with radionuclides and to reduce markedly the adsorption capacity of soil and rock for liquid radionuclides; to accelerate aqueous transport of radionuclides in the ground; and are extremely persistent in the natural environment. The migration potential of chelated radionuclides may be decreased when placed in a solid waste matrix and disposed of in a semi-arid disposal site but the fact remains that it is a dangerous if not unacceptable practice to bury radioactive wastes bound to chelates that are not biodegradable.

NRC Response

See response to Banaszak's Comment 6 and FES Section 4.2.3.

3. Audubon Comment (A-96):

Has either Beatty, Nevada or Hanford, Washington accepted responsibility for the disposal of the Dresden 1 decontamination wastes? Why was this not finalized before issuance of the DES?

NRC Response

See response to Von Zellen's Comment 2, and ISEA's Comment 6.

4. Audubon Comment (A-96):

There is a question of geologic instability at both the Beatty and Hanford sites. Hanford is about 120 miles from Mt. St. Helens and considerable movement of the earth's crust as evidenced in earthquakes and volcanic eruptions. The Hanford site has also been subject to considerable disturbance from the practice of "water mounding" which added to the problem of the "escape" of large quantities of liquid radioactive wastes into the ground, particularly since Plutonium had been complexed with a wetting agent in some instances which promotes its movement through the soil.

NRC Response

See response to McCauley's Comments 1 and 4 and Banaszak's Comment 6.

5. Audubon Comment (A-96):

Dresden 1 was not designed to limit normal occupational exposure of workers to what is termed ALARA, e.g., for required inservice inspections as radiation levels rose and the plant aged. It is a poor candidate for a decontamination experiment with the many uncertainties surrounding its clean-up.

NRC Response:

See USPHS evaluation of ALARA considerations (A-13) and NRC response to Plant's Comment 1.

6. Audubon Comment (A-97):

The DES does not address sufficiently alternatives to the decontamination which would enable Com Ed to shut down and decommission Dresden 1 immediately. We ask that this be done in the Final EIS with a discussion of Com Ed facilities, both nuclear and others (coal, oil, natural gas, etc) and how they can be used effectively to compensate for the decommissioning of Dresden 1. Natural gas seems to offer an exceptional low-risk alternative to nuclear power at this time and far into the future while soft energy alternatives are being developed.

NRC Response:

Under NEPA the permitting agency is not required to exhaustively identify alternatives that could or may be taken when the impact of the alternative chosen has been shown to be insignificant. In the case at hand, the impact of not decontaminating has been clearly shown to be not superior and the decontamination option has been clearly shown to be acceptable because it will not cause significant environmental impact.

Peter Montague of Lawrenceville, New Jersey comments (A-99):

1. Montague Comment (A-100):

Either (a) Dresden doesn't need decontamination [or] (b) all BWRs need decontamination.

NRC Response:

The need for decontamination for Dresden was clearly identified in the DES.

2. Montague Comment (A-101):

The DES states that NS-1 causes extensive corrosion.

NRC Response:

Because of a typographical error in Table 3, the phrase "extensive corrosion testing required" was segmented into two statements by the capitalization of the letter "T" in "testing." This error has been corrected in the Final EIS (see Table 2.3). The initial extensive testing program that was required was carried out under NRC review, and has provided adequate assurance that the use of NS-I will not corrode the primary cooling system.

3. Montague Comment (A-102):

The Council on Environmental Quality was identified as the Council of Environmental Quality.

NRC Response

This error has been corrected.

4. Montague Comment (A-103):

The commenter identified several gramatical errors throughout the EIS.

NRC Response

These errors have been corrected.

5. Montague Comment (A-105):

Organic solvents could degrade the Dow polymer.

NRC Response:

See NRC response to ISEA's Comment 7.

6. Montague Comment

On the following page, the last sentence in the first paragraph says that NRC will "destructively examine" the wastes from a "qualification test" of the Dresden decontamination wastes. The FEIS should present details, including test protocols and results of these tests.

NRC Response

The destructive examination consisted of sectioning the solidified product with a chain saw and examining for complete solidification, voids, and homogeneity. This examination is documented in a Trip Report by T. Johnson (Reference 12).

7. Montague Comment (A-106):

In Appendix A, the first unnumbered page, the response to Question 1 does not say whether 10 CFR Part 61 will be complied with. This issue should be addressed in the FEIS.

NRC Response:

The proposed action is consistent with the preliminary draft of 10 CFR 61.

8. Montague Comment (A-107):

Next page (marked "-5-"), top paragraph: "If more than 10 nCi/g of transuranics are discovered and the wastes cannot, then, be shipped to a shallow-trench burial ground, where will they go?"

NRC Response

See NRC response to Citizens for a Better Environment's Comment 5.

9. Montague Comment (A-109):

The FEIS should contain all the relevant test protocols and test data and conclusions for the reasons given above. Neither NRC nor Dow have credibility with the public and it is important that the public be able to analyze raw data and draw independent conclusions.

NRC Response

See response to McCullough's Comment 2.

10. Montague Comment (A-109):

On that same page, the response to question 3c says "We do not know the leach rate of Dow polymer under burial conditions." This should be known if safety analysis is to go forward. It would appear to be impossible to carry out a safety or risk analysis without this key piece of information. The next to last paragraph on that page describes, very briefly, some tests on a concrete matrix. This is very important information and should be amplified in detail for the FEIS.

NRC Response

See responses to Banaszak's Comment 6 and Ayres' Comment 2.

11. Montague Comment (A-110):

On the following page, in the response to Question 4, the statement is made that "most barrels remain resistant to corrosion...."

NRC Response

See FES Section 4.2.3.

12. Montague Comment (A-112):

This is an extremely important statement and the program for developing this process should definitely be described in this EIS. The decontamination proposed in this DEIS may lead to use of this other process and so the two are inextricably and intimately related; this impact statement should deal with the potential on-going decontamination process "...currently being developed under EPRI sponsorship by Battelle Northwest."

NRC Response:

See NRC response to Citizens for a Better Environment's Comment 8.

The Illinois Department of Health, William L. Kempiners, Director comments:

1. Illinois Comment (A-114):

For instance, the report indicates that field or laboratory test results which quantify the migration potential of radionuclides associated with the Dow solvent are not available. One must utilize other documentation to determine that test results are available but pertain to free ionic cobalt with no chelating agent.

NRC Response:

See NRC response to Banaszak's Comment 6 and Ayres' Comment 2.

2. Illinois Comment (A-114):

The environmental impact of disposal is not directly addressed. Rather, it is stated to be less than that already analyzed in the FES, November 1973.

NRC Response:

The 1973 Final Environmental Impact Statement is a major study which evaluates the environmental impact of the operation of Dresden Station. As such, it serves as a benchmark against which the NRC can compare proposed actions to determine whether they increase the environmental impact of the facility beyond that which has been previously evaluated and approved.

The reference to the previous FES was made to establish that the effluents and wastes previously considered at Dresden included chemical effluents such as decontamination wastes. A description of the solidification of decontamination wastes is included in Section 3.5.1. Some of the chemical decontamination solutions previously considered are listed in Table 3.11 of the 1973 FES.

3. Illinois Comment (A-115):

Data on burial sites presented is given in the answers to letters in Appendix A. Such data and more should be included in the body of the report.

NRC Response:

The burial site data has been enlarged and moved to Section 4.2 of the FES.

4. Comment (A-115):

It appears from reading various reports previously supplied by Dow, that the problems associated with recontamination have been ignored in the statement and understated in the answer to question 6a of Appendix A. Reference 1 indicates that recontamination occurs quickly, suggesting the need for frequent future decontaminations. This need, and its effect should be thoroughly addressed in the statement.

NRC Response:

As stated on page 15 of Appendix A of NUREG-0686, there is no evidence (based on decontaminations performed at Canadian and British reactors) to indicate that the rate of recontamination or the rate of crud deposition on the cleaned surfaces would be accelerated by the decontamination.

See NRC response to comment from U.S. Department of Health, Education, and Welfare relative to future decontaminations.

5. Illinois Comment (A-115):

There was no discussion of venting of the N_2 cover gas. However benign this may be, it should be noted in the statement.

NRC Response:

The nitrogen cover gas blanketing the primary cooling system during the cleaning will be vented to the atmosphere through the existing Dresden 1 containment ventilation system. Appriximately 120,000 ft^3 of nitrogen will be vented during the testing, cleaning, and the three demineralized water rinses that will follow the cleaning. No airborne radioactive material is expected to be released during the venting process. Section 4.2 of the FES has been expanded to discuss the venting of the nitrogen cover gas.

6. Illinois Comment (A-115):

A better technical description of the chemical interaction of the burial environment with chelated wastes should be provided in the statement itself.

NRC Response:

See response to Banaszak's Comment 6.

7. Illinois Comment (A-115):

The economic impact of alternatives does not include the effects of shutdown on the utility's reserve power status.

NRC Response:

The shutdown of Dresden 1 would not reduce the utility's reserve capacity below accepted criteria. However, such a shutdown would require the use of more expensive methods of generation which utilize fossil fuels.

8. Illinois Comment (A-115):

The arguments for utilizing the Hanford and Beatty sites need to be strengthened, perhaps with some statistical data on rainfall. The present statement remains somewhat unconvincing.

NRC Response:

We have enlarged our discussion of the hydrologic and geologic features of the Hanford and Beatty sites in Section 4.2.3.

9. Illinois Comment (A-115):

No discussion of single, highly exposed workers is discussed.

NRC Response:

Plant worker exposures during the Dresden decontamination will be governed by the provisions of 10 CFR Part 20.101. These provisions allow a worker to receive a quarterly total whole body occupational dose of 1-1/4 rems per quarter [or 3 rems per quarter if his prior dose history permits according to the 5 (N-18) rule]. ALARA practices will be in effect during all phases of the decontamination operation. Personnel will be closely monitored to ensure that their occupational dose does not exceed the permitted limits stated above.

A majority of the actual primary system decontamination will be performed remotely from the operating deck of the containment building. Surface dose rates on the primary system piping and components range from 1 to 10 rem/hr. This is due to the plated out crud on the inner walls of the piping and components. Circulation of the decontamination solution through the primary system will reduce primary system surface dose rates by removing the crud from the pipe and component walls and redistributing it throughout the entire volume of the pipe and components. This will help to reduce radiation fields and the exposure of personnel in the vicinity of the primary system. In addition, the maximum estimate of approximately 664 curies of crud will be diluted by approximately 100,000 gallons of decontamination solution.

The overall dose rates during decontamination will be less than those present during plant operation. Hot spots will be shielded. Any primary system spills or leaks during decontamination will flow to floor drains and will be processed as waste. Residual activity from leaks will be hosed down the drains to reduce the possibility of worker exposure. Any major spills will be dumped into the leakproof "bathtub" portion of the facility. Because of the dilution of the crud and material in the decontamination solution, personnel exposure from contact with leaking decontamination solution will not pose a serious exposure problem. Workers will wear protective clothing to minimize personnel contamination from spills or leaks.

10. Illinois Comment (A-115):

In the discussion of Radioactive Waste (Section 4.2.2), "significant quantities" needs to be defined. In comparing the amounts of decontamination wastes to total radwaste, a discussion of the comparison between the types of waste should be discussed.

NRC Response:

Section 4.2.2 has been revised to delete the reference to "Significant Quantities." The solidified decontamination wastes contain about five percent chelating agents. Wastes having these characteristics are not routinely generated and will require more restrictive disposal requirements. See FES Section 4.2.3.

In 1979 the Dresden Station shipped 20,500 ft^3 of solidified resins and evaporator concentrates. These wastes could be comparable to the decontamination wastes. A total of 16,400 ft^3 of dry trash wastes was also shipped for disposal in 1979.

11. Illinois Comment (A-115):

No discussion of the effects of a possible closing of the Hanford and Beatty sites is included. Because of this possibility, some discussion should be included for making the availability of a dry waste site a condition of approval.

NRC Response:

See NRC response to ISEA's Comment 6.

12. Illinois Comment

One disappointing aspect of the statement is that only one option, in reality, is considered viable. Rather than rating the options, all others are eliminated due to the disadvantages, leaving only NS-1 to choose from. One could hope for at least a back-up option to compare against.

NRC Response:

The NRC did evaluate the most obvious alternatives to decontamination. Those were the no-decontamination alternative and the reactor-shutdown alternative, as well as the alternative of delaying the decontamination for 5 years. None of these alternatives was found to be superior to the decontamination choice, and the environmental impact of the decontamination was found to be insignificant. Given these findings, there is no requirement to fabricate artificial alternatives merely for the purpose of comparison. No other alternatives are under consideration by the licensee, and the NRC has not identified any obviously superior alternatives. In light of the foregoing, we see no need to evaluate any other option.

13. Illinois Comment (A-116):

The Illinois Department of Public Health identifed additional information that supported the NRC position relating to the corrosivity of Dow NS-1.

NRC Response:

The NRC agrees with the State of Illinois' comments.

Comment from Rose Levering, St. Louis, Missouri (A-125):

1. Levering Comment (A-125):

This question is in reference to the Environmental Impact Statement on Dresden One. What are the relative possible positive and/or negative effects of using other decontaminating agents that might not contribute to increased radionuclide mobility?

How do strong acids, bases, oxidizing agents or citrates, tartrate, oxalate, gluconate, phosphate, bisulfate, and fluoride measure up to Dow's NS-1.

NRC Response:

Commercially available decontaminating agents contain chelating agents such as EDTA. Decontamination chemicals without chelating agents like EDTA have not been developed which provide decontamination factors equivalent to or better than NS-1. In addition, citrates and oxalates are also chelating agents, although they do not form as strong a complex as EDTA does. The criteria used were from Commonwealth Edison report (DNS-NS-D1-020, p. 16):

- Greatest possible reduction in radiation levels
- Complete dissolution of film
- No reprecipitation and deposition
- Low corrosion rate
- One-solution treatment

The evaluation of other decontaminating agents that were specifically considered for Dresden 1 is summarized in Tables 2.3, 2.4, and 2.5 of the FES. This evaluation shows that these other decontaminating agents did not meet the acceptance criteria.

The categories of other decontaminating agents specifically suggested in the comment are evaluated as follows:

Strong acids, bases, and fluorides would not be considered acceptable because of high corrosion rates. These agents may be considered only for decontamination as a precursor to plant decommissioning when high corrosion rates can be tolerated. Oxidizing agents, citrates, and phosphates result in low decontamination factors compared to NS-1 as seen in Table 2.4 of the FES. Oxidizing agents and citrates (APAC) also require a two-step decontamination process which does not meet the one-solution treatment criteria. The use of other agents (tartrate, oxalate, gluconate, and bisulfate) would not be expected to result in good decontamination factors.

See NRC response to McCauley's Comments 1, 2, 3, and 4.

Citizens Against Nuclear Power of Chicago, Illinois comments (A-126):

1. CANP Comment (A-128):

"Any evaluation of the public health and environmental consequences of the proposed Dresden One 'decrudding' must begin with an estimate of how much insoluble radioactivity there is on the surface interior to the primary coolant boundary, of what nuclides this material is composed, and in what proportions."

NRC Response:

See NRC response to McCauley's Comment 3 and Citizens for a Better Environment's Comment 5.

2. CANP Comment (A-129):

Concerning whether the radioactive waste produced by the "decrudding" will be sucessfully solidified and packaged.

NRC Response:

See Section 4.2.2 of the FES.

3. CANP Comment (A-131):

Concerning whether a place will be found to dispose of the barrels of decontamination waste, and whether the chelant-bound radionuclides in the decontamination waste will not leach out and become environmentally mobile.

NRC Response:

See NRC response to Ayres' Comment 2, Banaszak's Comment 6, and ISEA Comment 6.

6. CANP Comment:

Concerning whether the process will result in any radionuclides dissolved by the decontamination solvent being released to environments around Dresden.

NRC Response:

Dow conducted extensive pilot evaporator tests to examine the physical properties of NS-1 solvent during the evaporation portion of the decontamination. The results are published in Dow report No. DNS-D1-016, "Technical Study for the Chemical Cleaning of Dresden 1." Evaporation decontamination factors based on sodium ion concentrations were at least 10^5. Concentrations of volatile species in the NS-1 overhead were reduced to a few parts per million (ppm) in ammonia and inorganic carbon by treatment with the hydrogen form of a strong acid ion exchange resin. Filtration through activated charcoal reduced levels of organic constituents in the overhead to 50 ppm. Tests also showed that at 125°C, 99.85% of the dissolved metals will remain in the liquid phase, 0.12% are carried with the steam, and 0.03% are in an aerosol form.

These tests provide evidence that there will be no danger of significant amounts of chelant-bound radioactivity being released to the Illinois River.

5. CANP Comment:

Concerning whether the decontamination process will weaken or corrode critical plant components, leading to increased risk of dangerous nuclear accidents.

NRC Response:

Many documents have been submitted to the NRC for review and comment describing the test program on the materials identified. These are also available in the NRC Public Document Room. They include, among others, "Technical Study for the Chemical Cleaning of Dresden 1," report DNS-D1-016, dated June 15, 1977, with enclosures, including earlier work of Staehle and Agrawal at Ohio State.

Responses to NRC staff questions were submitted May 2, 1978 to Mr. Dennis Ziemann. Also submitted were a final report, "Supplemental Metallurgical Studies," performed by Dow dated January 24, 1979, (report No. DNS-D1-029), and a series of reports and progress reports from General Electric by W. L. Walker and co-workers, including NEDC-24143, September 1978 and others. All of these reports contain sufficient information to ensure that significant corrosion of the Dresden 1 materials will not occur during the decontamination; they form the basis for the staff's conclusion that this decontamination can be performed safely.

6. CANP Comment:

Concerning whether the proposed "decrudding" process is experimental.

NRC Response:

Dow NS-1 decontamination solvent has been used to decontaminate full-scale components and subsystems of operating nuclear power reactors. The NRC staff has reviewed these decontaminations and the laboratory and pilot scale tests submitted by Dow and CECo in support of the proposed cleaning and conclude that this decontamination process. See NRC response to Ben Ruekberg's Comment No. 3.

7. CANP Comment (A-134):

Concerning whether the occupational radiation exposure incurred by the "decrudding" has been and will be as low as claimed.

NRC Response:

See NRC response to Illinois Safe Energy Alliance's Comment 2.

8. CANP Comment (A-134):

The NRC has not considered "all possible alternatives."

NRC Response:

Under NEPA, the authorizing agency is not required to consider "all possible alternatives" to a proposed action when the environmental impact of the proposed action has been determined to be acceptable. The alternatives that have been considered are those which can reasonably be expected to be utilized instead of the proposed action. We have modified Section 5.0, "Impact of Alternatives," to discuss the impact of deferring the Dresden cleaning, based upon CECo's intention to wait until 1986 to return Dresden 1 to service.

The U.S. Environmental Protection Agency, Washington, DC, William J. Hedeman, Jr., Director of the Office of Environmental Review, has commented (A-138).

1. EPA Comment (A-139):

EPA recommends that NRC prepare a generic EIS discussing the options for waste treatment and disposal from all likely decontaminations of nuclear power reactors. EPA further proposes that this generic EIS address the cumulative environmental impacts of all decontaminations. Given the uncertainty concerning the continued availability of disposal facilities, EPA believes that this generic EIS should also discuss the availability of environmentally sound waste disposal facilities in the future.

NRC Response:

See NRC response tc CBE's Comment 1.

2. EPA Comment (A-139):

It would be helpful to both technical and non-technical readers if diagrams of the plant layout and process flow were included. The diagrams should show the design features that mitigate emissions to the air (Section 4.2.2.B.) and those that preclude releases to the Illinois River. Most chemical processing operations can be more easily understood with such diagrams. The FEIS should also address the cumulative impacts of the emissions added to those from the other Dresden units and compare them to EPA's Uranium Fuel Cycle Standard (40 CFR 190).

NRC Response:

We have added drawings of the plant layout and process flow. They are contained in Appendix B.

The existing Technical Specifications for the Dresden station are formulated from the standpoint of the three units operating together. They are designed to conservatively implement the dose limits of 10 CFR Part 20. In addition, the Commission has informed all licensees that they are obligated to stay within the requirements of 40 CFR Part 190.

3. EPA Comment (A-139):

Additional piping and equipment will be installed in order to decontaminate the piping of Unit No. 1. Once the decontamination is completed, these modifications may be removed. The FEIS should discuss whether this equipment will be contaminated and require special disposal and/or cleanup measures.

NRC Response:

Section 3.0 has been modified to discuss the disposal of decontamination equipment.

4. EPA Comment (A-139):

Section 4.3 contains a discussion of postulated accidents. This section should briefly discuss what contingency plans exist in the event of unplanned releases.

NRC Response:

Section 4.3 has been expanded to describe the Dresden Station Emergency Plan more fully. This plan provides a plan of action to deal with a spectrum of accidents which range from minor onsite spills to the design basis loss-of-coolant accident. The contingencies addressed in this plan bracket any potential accident that could occur during the decontamination.

5. EPA Comment (A-139):

The EIS makes it clear that no free liquids will be present in the decontamination waste; however, other waste buried in the same waste trench at the disposal site might contain toluene or xylene, which could dissolve the Dow vinyl-ester resin in which the radionuclides will be solidified. This problem should be addressed in the final EIS.

NRC Response:

See NRC response to ISEA's Comment 7.

6. EPA Comment (A-140):

Section 4.2.1 contains the discussion of occupational radiation exposure, yet does not clearly indicate how the exposures for the decontamination procedure were determined. We suggest 1) that a sample calculation be shown and 2) that the occupational exposures from the decontamination operation be summarized in a table in the final EIS. Section 4.2.1.C appears to contain an "additional" exposure of 100 rem which may or may not be an additional exposure over and above the 300 rem identified in Section 4.2.1.B. The final EIS should identify what the specific tasks are in the procedure that produce the highest individual occupational dose.

NRC Response:

The licensee's man-rem estimates are based on a detailed study of the number of workers, man-hours, and dose rates associated with the operations of decontamination, cleanup, waste disposal, and return to operation of Dresden 1. Using estimates based on actual construction practices, the licensee determined the number of man-hours required to perform each stage of a particular job. For example, the total man-hours required to install a particular pipe would be determined by summing the man-hours required for such tasks as scaffold installation, removal of insulation, pipe rigging, pipe connecting, pipe support installation, installation of insulation, quality assurance and quality control inspections, scaffold removal, cleanup, and supervisory support. The licensee used radiation survey data to determine the radiation fields associated with each of these operations. The product of the man-hours and dose rate gives the licensee's estimate of man-rems associated with each job.

A 1977 breakdown of the licensee's man-rem estimates for the entire Dresden decontamination process is presented in Table 4.1. This shows that the entire operation was estimated to require approximately 540 man-rems, with 450 of this amount associated with the pre-decontamination installation phase. With 90% of the pre-decontamination installation completed, the licensee reported that the occupational exposure expended that can be attributed to the original estimated jobs had been kept to approximately 200 man-rems (as compared to the original estimate of $0.90(450) \cong 400$ man-rems). The licensee expended an additional 84 man-rems during installation, which was not planned for and was not included in the original estimate of 450 man-rems. Extrapolating the dose of 200 man-rems already incurred for 90% completion of the pre-decontamination installation to 100% completion results in 225 man-rems. When this number is added to the 84 man-rems already incurred from non-planned work, and the 88 man-rems estimated in Table 4.1 for decontamination, return to service, and radwaste operations, the total estimated dose for the Dresden decontamination comes to approximately 400 man-rems (see Table 4.1).

7. Comment

Table 1 (page 2-2) should indicate that cobalt-58 has a half-life of 71 days and that manganese-54 has a half-life of 303 days. (The same corrections should be made to Table 1 in Appendix A on page 4.) [These tables should also list the estimated concentrations of long-lived corrosion products such as iron-55 (half-life of 2.6 years, nickel-63 (half-life of 92 years), and nickel-59 (half-life of 80,000 years).]

NRC Response:

The table (now Table 2.1) has been modified as recommended. No nickel-59 has been detected in any of the specimens taken from Dresden 1; therefore, it has not been included in the updated table.

8. EPA Comment (A-140):

The list in Table 4 (now 2.4) of decontamination factors for alternative cleaning solutions should include the decontamination factor for NS-1.

NRC Response:

Table 2.4 has been modified as suggested.

9. EPA Comment (A-140):

The response to question 3 of the ISEA petition incorrectly lists 10 nanocuries per gram as 10^{-9} Ci/gm. This should read 10^{-8} Ci/gm.

NRC Response:

We have corrected the error.

References

1. Letter from J.S. Abel, Commonwealth Edison Company, to E.G. Case NRC, "Dresden Station Unit 1 Chemical Cleaning Licensing Submittal," dated December 19, 1974.*

2. Letter from J.S. Abel, Commonwealth Edison Company, to B.C. Rusche, NRC, "Dresden Station Unit 1 Chemical Cleaning Licensing Submittal Supplement 1," dated April 16, 1975.*

3. Letter from K.R. Goller, NRC, to R.L. Bolger, Commonwealth Edison Company, "NRC Authorization to Initiate Chemical Decontamination," dated December 9, 1975.*

4. Letter from M.S. Turback, Commonwealth Edison Company, to D.L. Ziemann, NRC, "Dresden Station Unit 1 Response to Request for Additional Information Concerning Chemical Cleaning," dated May 19, 1978.*

5. Letter from M.S. Turback, Commonwealth Edison Company NRC, "Dresden Station Unit 1 Chemical Cleaning Response to NRC Request for Additional Information," dated December 27, 1978.*

6. Letter from R.F. Janecek, Commonwealth Edison Company, to D.L. Ziemann, NRC, "Dresden Station Unit 1 Response to Request for Additional Information Concerning Chemical Cleaning," dated February 5, 1979.*

7. Letter from R.F. Janecek, Commonwealth Edison Company, to P. O'Connor, NRC, "Additional Information Pertaining to Chemical Cleaning," dated September 4, 1980.*

8. U.S. Nuclear Regulatory Commission, "Occupational Radiation Exposure," USNRC Report NUREG-0463, dated October 1978.**

9. Letter from M.S. Turback, Commonwealth Edison Company, to P. O'Connor, NRC, "Dresden Station Unit 1 Chemical Cleaning," dated February 17, 1978.*

10. Dow Chemical Company, "Topical Report - The Dow System for Solidifcation of Low Level Radioactive Waste from Nuclear Power Plants," DNS-RSS 001, (NP).*

11. E. Premuzic and H. Manaktala, "Scoping Study of the Alternatives for Managing Waste Containing Chelating Decontamination Chemicals," Brookhaven National Laboratory, BNL-NUREG 28403, dated September 1980.*

12. Memorandum from T.C. Johnson, NRC, to R.D. Smith, "Trip Report Regarding Dresden Decontamination Solution Solidifcation," July 18, 1980.*

13. A. Weiss, et al, "Solidifcation and Leaching of Dow Vinyl-Ester-Styrene Waste Forms Containing NS-1 Decontamination Waste Concentrate," Brookhaven National Laboratory, dated May 19, 1980.*

14. Attachment F to Nuclear Engineering Corporation, Inc. Application for Renewal of License No. 13-11-0043-02, A. Clebsch, "Geology and Hydrology of a Proposed Site for Burial of Solid Radioactive Waste Southeast of Beatty, Nye County, Nevada," 1962.*

15. U.S. Nuclear Regulatory Commission, "Environmental Impact Appraisal for Renewal of the Special Nuclear Material Disposal License at the Nuclear Engineering Company's Hanford Facility," January 18, 1980.*

16. Letter from R.F. Janecek, Commonwealth Edison Company, to P. O'Connor, NRC, "Dresden Station Unit 1 Response to Request for Additional Information Concerning Chemical Cleaning," dated October 16, 1980.*

17. U.S. Energy Research and Development Administration, "Final Environmental Statement, Waste Management Operations at the Hanford Reservation, Richland, Washington," ERDA-1538, dated December 1975.*

18. D.T. Oakley, "Natural Radiation Exposure in the United States," EPA Report, ORP/SID 72-1, U.S. Environmental Protection Agency, 1972.*

19. National Council on Radiation Protection and Measurements, "Natural Background Radiation in the United States," NCRP Report No. 45, November 1975.*

20. Letter from M.S. Turbak, Commonwealth Edison Company, to D.K. Davis, NRC, "Dresden Station Unit 1 Chemical Cleaning NRC Docket No. 50-10," dated August 23, 1977 and the Dow Chemical report enclosed thereto entitled "Technical Study for the Chemical Cleaning of Dresden 1, DNS-D1-016, Volume I, dated June 15, 1977.*

* These references are available for inspection and copying for a fee in the NRC Public Document Room, 1717 H. Street, N.W., Washington, D.C. 20555.

**Available for purchase from NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 and the National Technical Information Service, Springfield, Virginia 22161.

APPENDIX A

COMMENTS ON DRAFT ENVIRONMENTAL STATEMENT

APPENDIX A

COMMENTS ON DRAFT ENVIRONMENTAL STATEMENT NUREG-0686

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In addition to the above writt comments, the NRC held a public meeting on August 14, 1980 in the Morris Illinois Holiday Inn. Statements and comments were received from the below listed individuals. A verbatum record of these comments and the NRC staff's responses is available in the Morris Illinois Public Document Room at the Morris Public Library, 604 Liberty Street, Morris, Illinois.

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REGULATORY DOCKET FILE COPY

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

NCRED-PB

Director
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

RE: Draft EIS for Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1

Dear Sir:

The referenced draft Environmental Impact Statement (EIS) was forwarded to us because the Dresden Power Station is now within the Rock Island District boundaries. We have reviewed the draft EIS and have no comment.

Sincerely,

DOYLE W. McCULLY, P.E.
Chief, Engineering Division

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U.S. DEPARTMENT OF AGRICULTURE
ECONOMICS, STATISTICS, and COOPERATIVES SERVICE
WASHINGTON, D.C. 20250

June 10, 1980

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Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Crutchfield:

Thank you for the Draft Environmental Statement relating to Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1 at the Commonwealth Edison Company.

We have reviewed Docket No. 50-10 on the above subject and have no comments at this time.

Melvin L. Cotner

MELVIN L. COTNER
Director, Natural Resource
Economics Division

C002
5,10

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

June 12, 1980

Mr. Dennis M. Crutchfield
Nuclear Regulatory Commission
Division of Licensing
Washington, D. C. 20555

Dear Mr. Crutchfield:

I am replying to your request of May 30, 1980 to the Federal Energy Regulatory Commission for comments on the Draft Environmental Impact Statement for the Dresden Nuclear Power Station, Unit No. 1. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

The staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Thank you for the opportunity to review this statement.

Sincerely,

Carl N. Shuster
for Jack M. Heinemann
Advisor on Environmental Quality

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6600 Pershing Ave.
University City, Mo. 63130
June 17, 1980

Director, Division of Licensing
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

I have read the Draft Environmental Statement related to Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1, Commonwealth Edison Company, May 1980, Docket No. 50-10, U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, and have the following questions:

1. In Appendix A to the Draft Environmental Statement (DES), in answer to Ms Drey's questions 2 and 4c, and to the ISEA's question 4, your staff assures us that, e.g., "Migration as observed at the Oak Ridge site would not occur at the Beatty, Nevada or Hanford, Washington commercial disposal sites...the climate, geology, and hydrologic conditions eliminate the possibility..." (p.9). The NRC's answers to all three questions are extensively based on the writings of Means, Crerar, and Duguid, 1976 and 1978. Perhaps you are unaware that, in this same 1978 article, Means, Crerar and Duguid reported that "Varying levels of radionuclide migration from original disposal sites have been observed at four of these waste burial sites other than Oak Ridge National Laboratory, including... the Hanford, Washington facilities..." (p. 1480, Science, vol. 200, 30 June 1978, pp. 1477-1481), citing Price and Ames in "Transuranium Nuclides in the Environment," International Atomic Energy Agency, Vienna 1976, p. 191.

Can you explain how this migration of radionuclides can be going on at Hanford (and probably at Beatty, since the two sites are, according to the NRC, so very similar) if, as your report repeatedly assures us, "the geological and hydrologic features of the burial site" make it impossible?

2. The Draft Environmental Statement says, in 4. 2. 3. Radioactive Waste Disposal, that the Beatty, Nevada and Hanford, Washington "sites have been chosen as waste burial locations because of their dry, arid environment and their favorable geologic, hydrologic, and meteorologic features. These two sites are located in dry desert locations where there is a very low annual rate of precipitation and a very deep water table. These two features combined with the remote location of these burial sites, provide assurance that the waste can remain isolated from the human environment for a period long enough to allow the principal radionuclides to decay to significant levels."

a. Even "dry, arid" and "remote" deserts support a large variety of life forms, both plant and animal, as anyone who has seen Walt Disney's "The Living Desert" knows.

(1.) Regarding plants: Chelating agents have been used for years in commercial fertilizers to increase enormously the absorption of nutrients, like trace metals, by plants. After experimenting with absorption of plutionium by plants, Lipton and Goldin

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(Health Physics 1976 vol. 31 pp. 425-430) report that "chelation had a dramatic effect on plutonium uptake...on the average, the effect of chelation was to increase uptake by a factor of 1.3 X 10^3", i.e., increased by 1300%. They conclude that this uptake by plants makes radionuclides at large in the environment "a long term hazard in the terrestrial food chain."

In a similar investigation, Arthur Wallace (Health Physics 1972, vol. 22 pp.539-562) says that the chelating agent studied, "one year after the original application of the radionuclide to the soil,...was still able to increase uptake of the Americium-241" by plants. The chelating agent "could extract 100% of the 241Am which had been applied to the soil" (p. 561). Thus, even if ground water can be neglected as a migration route out of the burial sites, if "the barrels were designed to meet the packaging requirements for transport of the solidified waste and are not designed to serve the purpose of remaining corrosion-resistant after burial" (NRC answer to Ms Drey in DES, Appendix A, p. 7), how can you rule out plants as a pathway for the chelated radionuclides into the environment?

(2.) Animals eat plants and other animals; this is what the "food chain" is all about. After chelated radionuclides are taken up and concentrated a thousand-fold or more by plants, it has been found that the chelating agents also "enhance the intestinal absorption of plutonium ingested by animals. Baxter and Sullivan found a 700-fold increase in gut absorption when the chelating agent was added to plutonium nitrate administered by gavage to rats" (Ballou, Price, et al., Health Physics vol. 34, 1978, pp. 445-450; Baxter and Sullivan, Health Physics vol. 22, 1972, p. 785). Similar absorption was found when rats were administered ground up tumbleweed which had taken up chelated 239Pu, 241Am, and 244Cm. The radionuclides were "almost quantitatively excreted in urine," but "almost quantitatively excreted" is not entirely excreted, and ingestion of any radioactive material which has become lodged in tissues, organs or other parts of an animal's body can cause continuing irradiation in the person who eats the contaminated meat. Some people out west do eat jack rabbit and mule deer meat, which could contain residual or trace amounts of the Dresden chelated radioactivity taken up from or near the burial pits by plants. Clearly this is another route into the human environment not considered in the DES.

b. Is it not possible that some of the principal crud radionuclides to be shipped for burial will be longer-lived than the cobalt-60 isotope you mention?

(1.) Apparently Dresden has experienced fuel rod cladding failures during its 19 or 20 year occupational history, making it likely that some of the fission products and transuranics thereby released from the cladding would have precipitated out and mingled with the corrosion or activation products accumulated on the piping interiors. Some common fission byproducts have notoriously long half-lives, such as plutoniun-239 (24,000 years) and technetium-99 (210,000 years).

(2.) Have you not overlooked some long-lived activation products which would most likely be present in the crud at Dresden, as at other reactors nickel-63 (92 years), iron-60 (300,000 years) and manganese-53 (200,000 years)? I might even add, what about one of the isotopes of the cladding used more recently at Dresden, zirconium? Zirconium-96 has a half-life of 3.6×10^{17}, or 360,000,000,-000,000,000 years!

Surely the presence of any one of these should cause questions about an environmental impact statement based on the premise that the longest half-life to be dealt with is 5.3 years. Can you really "provide assurance that the waste can remain isolated from the human environment long enough to allow the principal radionuclides to decay to significant levels?"

3. In the Draft Environmental Statement frequent reference is made to the "geologic, hydrologic, and meteorologic" aspects of the waste disposal sites. I find it interesting that in an affidavit submitted in April 1978, Richard B. McMullen, a geologist in the Geosciences Branch of the Office of Nuclear Reactor Regulation, USNRC, testified that "based on a study of the Cascade volcanoes," including Mt. St. Helens, "We believe that there will be no increase in activity based on the experience of the past 10,000 years" (p.7; this affidavit was submitted during the operating license amendment proceedings designed to permit Portland General Electric Company to increase the number of spent fuel rods allowed to be stored in the Trojan nuclear plant "swimming pool"). This was written just two years ago, and even such accessible and unesoteric journals as Time and Newsweek are able to tell us that "scientists had been predicting a new eruption for five years" (Newsweek, June 2, 1980, p. 25).

Moreover, not just any scientists, but Crandell and Mullineaux of U. S. Geological Survey, whom McMullen cites throughout, predicted in 1975 "that Mt. St. Helens was the Cascade volcano most likely to reawaken from dormancy. 'We had predicted Mt. St. Helens would erupt within 100 years,' said Crandell. 'But then we went out on a limb and said before the end of the century.'" (National Geographic News Service, "Why Volcanoes Erupt," in the St. Louis Post-Dispatch, June 14, 1980) And in Science, vol 208, June 27, 1980, p. 1446, Crandell and Mullineaux "found that Mount St. Helens has not behaved at all consistently" but has swung from relatively quiet lava flows to the most violent kind of explosive ash eruptions and back again many times."

Somehow McMullen can read all this to mean that a violent eruption "is considered to be very unlikely within the next few centuries (Crandell and Mullineaux, 1975). It would represent a complete change in activity from that demonstrated during the last 10,000 years" (p. 6).

As for "meteorologic" expertise at the NRC, the same affidavit tells us that the NRC staff has concluded that "the prevailing winds blow away from the [Trojan] plant toward the volcano [Mt. St. Helens] most of the time and apparently have done so for thousands of years" (p. 2), and "such an eruption at one of these volcanoes occurring simultaneously with the wind blowing toward the site is extremely remote" (p.6). And yet this very thing occurred only two years later, with volcanic ash falling on Portland, Oregon, farther west than Trojan, on May 25 and June 13.

With this kind of record, how can we have any confidence in the NRC's evaluation of the safety-guaranteeing conditions at Beatty (near centers of earthquake activity and the underground atom bomb testing grounds) and Hanford (150 miles east of Mt. St. Helens, with volcanic activity now being predicted for the whole Cascade Range)--particularly when radionuclide migration has already been documented at Hanford?

Sincerely,

Brigid K. McCauley

Brigid K. McCauley
(Mrs. Matthew P.)

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
1 NORTH DEARBORN STREET
CHICAGO, ILLINOIS 60602

REGION V
300 South Wacker Drive
Chicago, Illinois 60606

JUN 18 1980

IN REPLY REFER TO:
5.1SS(Vahl)

Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing
U.S. Nuclear Regulatory Commission

Dear Mr. Crutchfield:

Subject: Draft Environmental Impact Statement Related to: Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1

This office has reviewed the above referenced DEIS and in regards to the concerns of the Department has no comments.

Sincerely,

Elmer C. Binford
Area Manager

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United States Department of Agriculture
Soil Conservation Service
Springer Federal Building
301 N. Randolph Street
Champaign, IL 61820

June 24, 1980

Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing
US Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Crutchfield:

We have reviewed the Draft Environmental Statement relating to the primary cooling system chemical decontamination at Commonwealth Edison Company's Dresden Nuclear Power Station, Unit No. 1.

There appear to be no effects on prime farmland.

Sincerely,

Robert H. Eddleman, Acting
Warren J. Fitzgerald
State Conservationist

cc: Lett
Smith
Koontz
Chief, SCS, USDA, Washington, D.C. 20013

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RANDALL L. PLANT
401 South Busey
Urbana, IL 61801

Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

27 June, 1980

Re: N.R.C. Docket No. 50-10

Dear Sir or Madam:

This letter is written to serve as a comment on the Draft Environmental Impact Statement for the above docket (Preliminary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1).

A) Cost Comparison of Alternatives

On page 5-2 fo the Draft Evironmental Impact Statement (DEIS), a comparison is made between the cost of permanently shutting down the reactor versus the cost of the decontamination process. According to the text, the cost of replacement power is $100,000/day, and, if the plant were to operate at a 60% availability (sic) factor for 15 years, the total replacement cost would be $300 million. The report then compares this cost to the $39 million expected price tag for the decontamination , and states that the latter is certainly the better alternative. However, this comparison is faulty on several grounds:

1) Due to a large expansion program, Commonwealth Edison Company (CECo) is expected to have a reserve margin of nearly 50% in the mid 1980's. With this sort of excess capacity, it is highly unlikely that replacement power purchases will be as high as stated in the report. In fact, the excess capacity may exceed, by a wide margin, the entire capacity of Dresden I. It is therefore highly inaccurate to say the cost of replacement power will be $300 million. There may very well be no additional cost at all.

2) The cost of replacement power, if any, should not be compared to only the $39 million cost of the decontamination, but rather to the total cost of producing this equivalent energy. These costs would include fuel, operations, and maintenance cost for the Dresden unit over its expected 15 year lifetime.

3) It is highly unlikely that Dresden I will continue to operate for an additional fifteen years. As concern for safety of nuclear power plants increases, it is very likely that the oldest reactors will be shut down first. It is also very unlikely that Dresden I will operate at a 60% capacity factor for the next fifteen years (The report states "60% availability". I assume this is an error, and that the authors meant to say "capacity factor). Between 1960 and 1980, Dresden I had a capacity factor, on the average, of 46%. Even if one takes into account the past five years of down-time, the total is still barely over 61%. The future capacity factor of the plant is, at best, likely to be little more than the historic average of about 45%.

B) Lack of Independent Analysis

Throughout the report, the authors refer to tests that have been made on the proposed process. <u>In every case, these tests were made by</u>

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Dow or CECo. One can justifiably be very skeptical of the validity of any test made by an industry on a product it is trying to sell or promote. It is imperative that the NRC obtain independent analyses of the processes involved here.

I would therefore recommend that the NRC:

1) Appoint at least one, and possibly more, ad hoc commissions to fully examine the decontamination process. This commission should be comprised of qualified individuals who have no ties with the nuclear industry and who have previously expressed skepticism of aspects of the nuclear industry. They should be awarded full access to all relevant data, and their final report should serve as addressing the "other side" of the decontamination process (now only addressed by the industry/utility reports). A good example of this mechanism is the recent study by the Union of Concerned Scientists with regard to the venting of gases at Three Mile Island.

2) Upon completion of the report, a public hearing should be held to discuss findings by this ad hoc group, as well as the literature provided by D ow and CECo. This hearing would lead to a complete airing of all opinions on the matter, and would mitigate concerns about improper decisions.

Given that the decontamination process will most likely be repeated at many other stations in the future, this kind of detail and review is justified. I encourage you to implement it.

Sincerely,

Randall L. Plant

Mazvin I. Lewis
6504 Bradford Terrace
Phila. PA 19149
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Paul W. OConnor
Office NRR
U.S.N.R.C.
Washingtin D.C. 20555

Sir:

Please accept the following letter as my comments on NUREG 0686 Draft Environmental Statement PRIMATY COOLING SYSEM CHEMICAL DECONTAMINATION AT DRESDEEEN NUCLEAR POWER PLANT.

I saw this DEIS advertised for comment in the Federal Register. Since several nukes in the PA area will have to be similarly treated in the future , I ordered it for comment tosee what the industry has in store for this area.

I was not disappointed. It is a totally deficient document. Although there has been no similar treatments for nuclear power plants , there have been many similar cleanouts for non nuclear power plants.

This document does not reference any of the problems that have been faced in refurbishing non nuclear power plants for elongated operating times. These problems have been large and many. Occasionally , the problems in cleaning and refurbishing non nuclear power plants have been so great that the effort was suspended and the plant retired. The problems included major leaks when the crud was removed; difficulties in removing blockage; formation of blockage due to saturation of cleaning solution ; and many others that I cannot remember.

A good look at the problems involved in cleaning out a non nuclear power plant would probably turn the cost benefit equation around the other way. A poor cost/ benefit equation is indicated which would mean that closing down the facility is the best solution.

Marvin I. Lewis
6504 Bradford Terrace
Phila. PA 19149
215 CU 9 5964.

MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
FOOD AND DRUG ADMINISTRATION

TO Director
Division of Licensing
U.S. Nuclear Regulatory Commission

DATE: June 30 1980

FROM Consultant (HFX-4)
Bureau of Radiological Health

SUBJECT: Draft EIS - Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1

The Draft Environmental Impact Statement, NUREG-0686, May 1980, related to the Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station, Unit No. 1, Commonwealth Edison Company has been reviewed by the Bureau of Radiological Health, Food and Drug Administration. We have the following comments to offer.

1. Our assessment of the proposed decontamination operation indicates that the planning, system testing, and training of personnel provides adequate assurance that the occupational radiation exposure will be maintained As Low As Reasonably Achievable (ALARA).

2. The Atomic Industrial Formum in February 1980 published a document titled "An Assessment of Engineering Techniques for Reducing Occupational Radiation Exposure at Operating Nuclear Power Plants." Pages 23-24 contains a discussion of chemical decontamination as a means of reducing the primary source term. It states in connection with the estimated exposure reduction that, "the long term effectiveness of decontamination has not been established. Operating experience indicates that activity build-up of corrosion products show an increasing trend through at least five years of operation. Consequently, a system decontamination would not be effective over the long term and repeat decontamination would probably be required at least every five years to gain substantial reduction." It would be appropriate for the DEIS to contain a discussion of the need for repeat decontamination operations. It is noted that the staff analysis of future occupational exposure savings is based on a five year period of operation.

3. As an editorial comment the last sentence of the first paragraph under section 4.2.3, Radioactive Waste Disposal should read "... principal radionuclides to decay to <u>in</u>significant levels".

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4. The environmental impacts of postulated accidents are discussed in section 4.3. Even though accidental releases of radioactivity has a low probability of occurrence, it would be appropriate to expand this section to include a statement that coordination with the State of Illinois has taken place. This is particularly important at this time in view of the public and State agencies concerns about potential exposure to low levels of radiation.

5. The statement does not contain any information on the monitoring program at the Dresden Nuclear Power Station. It would be helpful to expand the statement by adding a section on environmental monitoring which could specify the adequacy of the existing program to monitor any accidental releases.

Thank you for the opportunity of reviewing this draft statement.

Charles L. Weaver

cc:
Office of Environmental Affairs, HHS
Mr. Kenneth Taylor, HFV-2

Princeton University DEPARTMENT OF GEOLOGICAL AND GEOPHYSICAL SCIENCES

GUYOT HALL, PRINCETON, NEW JERSEY 08544

PHONE: 609-452-4101

July 1, 1980

Director,
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

I wish to comment briefly on the draft environmental statement for decontamination of the Dresden nuclear power station, NRC report NUREG-0686, Docket No. 50-10, May 1980.

I have participated in several research projects relating to disposal of organically chelated radionuclides and disposal of chelating agents in general. As a result, I have become concerned about the prospect of burial of large quantities of chelating agents in low level radwaste repositories. This problem extends, of course, beyond Dresden Unit No. 1 to all decontamination operations, present and future.

I am encouraged by the recommendations made since initiation of this project that (1) all waste be disposed of in desert repositories with low precipitation, deep water tables, etc., and (2) all chelated waste be segregated physically by an effectively impermeable barrier from other radioactive wastes in the same repository. I urge that these points be adopted as firm requirements for this and all similar operations in the future.

However, I am surprised that the alternative of physically or chemically degrading chelating agents after reactor decontamination and prior to disposal is treated in only the most cursory fashion in this report (as a brief response to question 4d, Appendix A, pg. 12, and not even mentioned in Section 2.4 which evaluates alternatives). This recommendation has now been made quite strongly in print (Means et al. (1978) Sci., v. 200, pp. 1477-1481, and Means et al. (1980) Environ. Pollution, v. 1, Ser. B., pp. 45-60), in reports (Means and Alexander (1980) "The Chelate Problem" Battelle Columbus Lab. Rpt. BMI-X-701, DOE contract W-7405, ENG92, Task No. 119), and by letter to the NRC (letter from me to Dr. J.M. Hendrie dated June 25, 1979). I note, for example, that the NS-1 chelating agent decomposes at approximately 300°F (pg. 14, Appendix A), only 50°F above the proposed temperature of the decontamination procedure (pg. 3-1), and is also chemically degradable. Chelate degradation would obviate many objections raised regarding disposal of these and similar wastes, and should warrant much more rigorous consideration. Where data are unavailable programs should be undertaken to design and evaluate specific degradation procedures applicable to large-scale decontamination operations.

Director,
Division of Licensing

July 1, 1980

I also find it unfortunate that in this report the NRC should have consistently de-emphasized the significance of chelating and other strong complexing agents in the migration of radioactive wastes. It is the very presence of large quantities of such compounds to be contained in the waste generated from decontamination operations that has created much of the present public concern. Surely this issue should be addressed directly in your impact statement (where the word "chelating" is now mentioned only once in a passing reference to the Hanford disposal license, Sect. 4.2.3). The NRC response to several questions in the Appendix notes, quite rightly, that observed migration at ORNL is attributable to fracture flow and high precipitation, but tacitly de-emphasizes the parallel importance of organometallic complexing and chemical controls in general. Obviously the NRC is aware that waste migration is both a physical and chemical problem, yet this report suggests otherwise: the chemical problem is not fully acknowledged; pertinent fundamental properties of the solvent are not noted and discussed. These properties include biological, physical, and chemical degradability; complexity constants for selected radionuclides; aqueous solubility; uptake and metabolization by organisms; influence on distribution coefficients, K_d, for selected adsorbent substrates as a function of solvent concentration.

Finally, one purpose of reports such as this must be to communicate clearly with a concerned public. Unfortunately, the numerous grammatical errors in this report, repetition and scrambled pagination, and the incomplete responses to queries such as those noted above do not project an image befitting the NRC.

Sincerely,

David A. Crerar
Associate Professor, Geochemistry

DAC:jo
copy: Paul O'Connor
NRC, Washington, D.C.

WASHINGTON
UNIVERSITY
IN ST. LOUIS

Department of Biological Chemistry

July 1, 1980

Paul W. O'Connor, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. O'Connor:

Thank you for a copy of the Draft Environmental Statement related to the Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1.

I have read the report carefully and am rather disappointed by the fact that it essentially is a rehash of most of the items that were originally raised about the dangers accompanying this whole operation. It appears to contain practically nothing by way of new information related to the problem that the decontamination operation will create.

In the letter which follows I would like to once again point out some of the dangers that appear to be overlooked by the personnel involved in this procedure. My concerns will be listed in a series of items which I have written below.

1) The report seems to totally overlook other possibilities for disposing of the chelated radionuclides which will be obtained from the wash of the cooling system. The major environmental importance and the major reason for this operation coming under the criticism of people who are aware of the dangers of radioactivity stem from the fact that the products are in a highly mobile form. The mobility of the radioactive waste is due entirely to the presence of the chelating agent(s) and not a single new possibility has been described for removing or destroying the chelated form of these products prior to burial. Thus, all of the radioactivity which will be obtained by the cleanup procedure will remain in a form which is biologically highly mobile. It is this chelation process itself which represents the major danger both for this single washout procedure and others that may follow for similar reasons.

The Nuclear Regulatory Commission, if it is to truly be concerned with the dangers of this new procedure, should have taken into consideration the possibility for isotope migration which will result from this chemical chelation. The danger which arises from the fact that these chelated radionuclides can migrate into the environment has not really been dealt with in the draft report. The fact that they are being put into a solidified form does not change this fact. Data from studies reported from a variety of places indicate that leaching of the chelated radionuclides from the solidified storage material is possible. Indeed throughout the literature which I have read it is made very clear that the polymerization within the barrels is solely for the purpose of transportation. It will in no way prevent the eventual leaching of the chelated radioactive waste into the environment. C002 S 1/0

[Wa]shington University
[Sch]ool of Medicine
Box 8094
660 South Euclid Avenue
St. Louis, Missouri 63110
(314) 454-2422

2) The proposed decontamination of the cooling system involves the removal and disposal of a large amount of highly radioactive substances. In communications from the N.R.C. the amount has been estimated to be 3,000 plus or minus 1,000 curies. The large indicated error in this estimate suggests that it was obtained by inadequate experimental procedures and further studies should be made to obtain a more precise value. Any environmental impact of the decontamination procedure will be directly related to the total amount of dangerous radionuclides removed during the decontamination, and present estimates of the amount are not satisfactory.

3) In addition, on page 2-2 of the draft statement, no measurements of 59 iron, 51 chromium, or 63 nickel are found. This suggests that either they were not measured in the test samples or they are not present. It would be astounding if no iron, chromium or nickel were found in this crud which is being generated by the materials in the cooling system and which contain a large amount of steel. The estimates of the nuclides present in this crud (Table 1) to my mind would be expected to include iron, chromium and nickel since these are elements which are found in any stainless steel piping system. I realize that the data I have seen suggest that part of this cooling system is constructed of Monel. However I find it difficult to understand why stainless steel components which must certainly be part of this cooling system do not contribute measurable amounts of neutron activated forms of iron and other metals of this sort.

4) Initial plans for removing the waste from Dresden to some storage site involve the polymerization within steel barrels. It seems certain that after polymerization the possibility exists that small pockets of free chelating agent will remain in these transportation drums. These small pockets of chelating agents are highly corrosive toward the mild steel to be used for transport. In fact, adequate data from the Brookhaven National Laboratory support the corrosiveness of this cleaning material. Data which I have read from the B.N.L. indicate that an uncoated container will be reduced to about 25 mils thickness after 3 months. Such corrosiveness means that in a few instances pitting will occur, resulting in leakage from the barrels after a relatively short time. In fact, not knowing how long it will be between placing the chelated crud in the barrels and arrival at the burial site and assuming this to be weeks rather than days, it is almost certain that some pits will produce leaks in the barrels. Indeed, in a memorandum to Paul O'Connor, C. Bishop describing the dangers of the use of the mild steel barrels, Mr. Bishop notes, and I quote, "We recommend that a container which can withstand corrosion better than the 55 gallon mild steel drum be used at Dresden based on test results and assuming that the time from solidification in the drums to disposal may be longer than a few months."

Thus even the N.R.C. is unhappy with the use of these drums. Yet on p. 3-1 of the environmental impact statement and I quote, "After processing the concentrated waste solution will be solidified in 55 gallon drums using the process developed by the Dow Chemical Co. etc.".

Hence to the external viewer such as myself, it appears that the people who prepared the environmental impact statement have ignored the dangers which may arise from the use of these 55 gallon drums.

5) Should an accident occur during the cleanup operations, procedures for the protection of the workers and the nearby environment should be developed prior to the undertaking of the decontamination operation. Such an accident, however unlikely, could have disastrous results for the population and the watershed near to the plant. This danger arises once again because of the highly mobile nature of the chelated forms of these radionuclides. The draft statement contains little evidence of precautions to be used in case of a mishap.

6) Leaching of chelated radionuclides even when contained in a polymer matrix appears to occur at a measurably significant rate. Hence data provided to me suggested that the so-called solid polymer matrix containing chelated radionuclides when immersed in the water leaked about 1% in 60 days. Such amounts could be significant or insignificant depending on dilution factors accompanying leakage. While it is true leakage would be greatly reduced at a drier disposal site dilution factors would also be reduced. An environmental study of the potential dangers of pulses of high concentration of chelated radionuclides leaked from a storage site should be considered. In addition one is uncertain about how dry this disposal site will remain. Recent volcanic activity in an area immediately adjacent to the disposal area could alter rainfall patterns. The disposal site is within a few hundred miles of the highest rainfall area in the United States. One would not have to produce dramatic changes in this rainfall pattern to change significantly the rainfall in the Hanford area. In addition to the danger of radionuclides already disposed at this site, the chelated forms which will arrive there after the Dresden decontamination multiply this danger significantly, again because of the mobility of these chelated forms.

7) Last of all, perhaps the most worrisome factor in the decontamination problem is the element of timing. I recently saw a graph of the radioactivity buildup or crud buildup in the cooling system at Dresden. Since beginning operation in 1961, the amount of crud buildup has been nearly trebling every year. The buildup rate is linear and the graph makes it clear to even the most unacquainted observer that the buildup would rapidly reach dangerous levels. Studies of safe cleaning and disposal operations could have been done as far back as 1965. While the present dangers of this crud to plant workers is obvious, the urgency of the cleansing operation is unacceptable as a reason for continuing. The N.R.C. should view the Commonwealth Edison request as not a matter of urgency. The industry had better than fifteen years to deal with this matter in a careful scientific fashion. What have they produced? They are proposing to clean this and perhaps other systems with chelating agents. They will put these chelated nuclides into the ground. Albeit in the best way they know how. But fifteen years of idleness on their part in no way mitigates the danger of this now highly mobile form of radioactivity. If these materials must be removed and disposed of, the present solution does not appear to be an environmentally safe way.

It is with real apprehension that I hope the N.R.C. will temporarily prevent this approach and aid the nuclear industry in finding a new and hopefully a safe solution.

Sincerely yours,

Leon :d J. Banaszak

LJB:ss

POOR ORIGINAL

Paula J. Ayers
7036 Bruno Avenue
St. Louis, Mo. 63143
July 8, 1980

Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

I have read the draft environmental statement related to primary cooling system chemical decontamination at the Dresden Nuclear Power Station Unit No. one and the following comments:

1) Becauce of the admittedly temporary nature of the barrels you suggest for containing the solidified wastes (1-10 years) the only realistic long-term containment of the wastes you present is the polymer they will be trapped in and the ground.

2) The set polymer is porous, you do not know the leach rates. The slightly better leach rates with the Dow polymer shown in Dow's own tests doesn't seem to be sufficient assurance when the polymer and the ground are the only containment for these dangerous wastes.

3) Your response to problems of leaching to the water table by burying it in "dry" areas is not very reassuring. Recent flash floods in Pheonix and the possible climatic impact of the eruption of Mt. St. Helens point up the unpredictablity of long-term climatic forecasts. It doesn't seem safe or thorough to use containment methods that only work in proper weather.

4) I find it difficult to believe or understand why radioactive elements other than Cobalt-60, such as radioactive Iron-59 and Nickel-63 are of no concern to you. I understand they have half-lives considerably longer than Cobalt-60 and would be dangerous much longer than the 50 years the polymer is hoped to last.

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There appear to be many uncertainties and real dangers involved in this procedure that could have a tremendous effect on the people near the Dresden plant and all over the country as well as the children of the future who may well pay the price for your haste.

Sincerly yours,

Paula J. Ayers

515 West Point Avenue
University City, MO 63130
July 16, 1980

Director, Division of Licensing
U.S. Nuclear Regulatory Commission
Washirgton, D. C. 20555

Dear Sir:

Thank you for giving citizens the opportunity to comment on the proposed NRC/DOE/Dow/Commonwealth Edison chemical decontamination demonstration project at Dresden Unit One, as described in the Draft Environmental Statement (Draft EIS), NUREG-0686, issued in May 1980. However, I must protest once again that the public is being asked to forego answers to questions affecting health and safety because of Dow's proprietary rights. The only scientists who know the ingredients of Dow's Nuclear Solvent-1 are those employed by Dow Chemical, Commonwealth Edison, DOE or the NRC -- and these are the very scientists who have been committed to the Dresden project and NS-1 for at least several years. I continue to believe that scientists without a financial or emotional commitment to this project should be given ac[illegible] the data necessary to evaluate its potential impact.

My concerns about the Draft EIS and the proposed decontamination center around both facts that are known and those that are not.

A. How can anyone be sure an accident will not occur during the decontamination?

We know that, contrary to basic design and operating guidelines for nuclear power plants, some areas of the Dresden reactor coolant pressure boundary have not been inspected for seven years. Because of extremely high radiation fields at Dresden One, caused by the accumulation of crud, Commonwealth Edison "requested and was granted relief from some inservice inspection requirements in 1973." (Draft EIS, p. 2-5) That is, for five years prior to the shutdown in November 1978 for the proposed decontamination and NRC-mandated retrofitting, the NRC had "waive(d) inspection requirements for safety-related components in plant locations where significant radiation exposures could occur." ("Identification of Unresolved Safety Issues Relating to Nuclear Power Plants," NUREG-0610, January 1979, p. 44). As a result, critical nozzles, an estimated 40 to 50 primary coolant pipe welds, beltline welds on the reactor pressure vessel itself, and no doubt other safety-significant components have not been inspected for several years. (Draft EIS, pp. 4-1 and 5-2).

How, then, can anyone accurately predict the potential volume or locations of leakage during the proposed 100-hour flushing? Who knows what will happen when five or ten tons or more of a caustic, chelate-based solvent come in contact with an embrittled twenty-year-old vessel, corroded heat exchangers and pumps, five miles of convoluted piping, etc. -- with valves, welds and components fabricated out of literally countless different metals and alloys?

If this system-wide demonstration project is not an experiment, as the NRC claims on the first-page-four of the Appendix, why is the federal government helping to fund it? If it is not an experiment, why are there so many unknowns?

As "decontamination of reactors" was described by the NRC's Advisory Committee on Reactor Safeguards in its March 21, 1979, list of unresolved generic items of safety [illegible] ull scale decontam[illegible] (of [illegible] potential problems [illegible] such [illegible] potential hideout of radioactive [illegible] ollowing decontamination, and the [illegible] in the pressure boundary with the

B. [illegible] ation, what will be the effect upon

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the workers and the public nearby?

Apparently no one has studied the synergistic effects of industrial solvents mixed with radiation. Although chelates are administered to workers who have accidentally swallowed plutonium or mercury, etc., essential trace elements normally found in biological tissues or cells are subsequently provided to replace those materials inadvertently removed. And the quantities involved in the therapeutic use of chelates are of course miniscule compared to this project.

No one has denied there will be leakage within the plant -- there always has been. Workers will therefore be exposed to unknown health risks, not only during the flushing, but during the evaporation, solidification, and shipment of the wastes, as well. Furthermore, if the chelates are broken down, as they should be to protect the public, this additional step will also increase the workers' risks. At this point I am absolutely unwilling to participate in the benefit/risk game. I firmly believe that neither the workers nor the public should be placed at risk!

C. What radioactive wastes and other toxic chemicals are apt to be released to the atmosphere during the evaporation, and in what quantities?

There seems to have been some debate among scientists at the EPA, NRC and ERDA about whether the presence of radionuclides in unexpected places at the Maxey Flats, Kentucky, radioactive waste burial site could be blamed on the ability of nuclides to migrate at subsurface levels (perhaps, it was hypothesized, because of the presence of chelates) or whether the evaporator plume from the solidification process was responsible for the dispersion. (EPA/ORP 520/3-75-021 and EPA-520/5-76/020)

D. Does anyone really know what it is inside the primary cooling system that you want to let out? Is this perhaps the ultimate Pandora's box? What is the composition of the crud?

Answers to these questions are important because they affect the reliability of the NRC's prediction that "the longest lived significant isotope that will be solidified after the decontamination is Co-60 with half-life of 5.2 years. Tests have been performed to demonstrate that the stability of the solid polymer will not substantially alter for over 50 years, corresponding to 10 half-lives of Co-60." (Appendix, second-page-five).

1. Fission products:

Although a few fission products are listed on page 2-2 among the radionuclides expected to be present in the Dresden crud -- namely, cerium-141 (half-life of 32 days), cerium-144 and protactinium-144 (290 days), and rubidium-103 (41 days), plus three additional curies of "MFP" or mixed fission products -- is it not highly probable that a far greater variety of isotopes is present, and a great deal more radioactivity? And is it not possible that some of the corrosion products, fission products, and actinides in the crud may have half-lives longer than cobalt-60's?

a. Assuming the amount of fission products deposited along the inner surfaces of the Dresden piping is dependent in large part upon the amount of fuel rod cladding failures, the prognosis for Dresden's crud is not good. In several publications cladding failures at Dresden One are specifically mentioned.

(1) In the first place, stainless steel cladding, used at least in the initial years at Dresden, is virtually obsolete. The only boiling water reactor still using stainless steel clad fuel is the tiny 47 MWe reactor at LaCrosse, Wisconsin.

"Stainless steel is no longer the preferred cladding material for most light water reactors because it absorbs more neutrons than does Zircaunder burial conditions, and when subjected to radiation and chelates? As studies in California, South Dakota and Illinois have shown, data collected in Oklahoma also indicate that "low levels of many potentially undesirable organic compounds were being contributed to groundwater within and immediately under the Norman (Oklahoma) landfill by solid waste deposited in this landfill." (W. J. Dunlap et al., from a symposium on "Gas and Leachate from Landfills," EPA-600/9-76-004, March 1976, p. 105. Emphasis added.) As the Dow solidification agent breaks down, could it, too, release components that in themselves may bond onto the Dresden radionuclides and other wastes already at Hanford and Beatty, adding to the migration problem?

G. Can anyone be sure the Washington and Nevada sites will remain dry?

A U.S. General Accounting Office report lists characteristics identified by earth scientists about America's low-level waste dumps for which inadequate data have been collected, and "about which not enough is known to reasonably predict the migration direction and rate (of radioactivity movement) or to determine whether reasonable predictions can be made." Major information lacking about the Hanford site includes: "rate of infiltration (the amount of water that is not evaporated or transpired and is free to move downward), rate and direction of ground water movement, and interconnection between shallow and deep aquifers." The data needed for the Beatty site include: "rate of infiltration, and direction and rate of ground water movement." ("Improvements Needed in the Land Disposal of Radioactive Wastes -- A Problem of Centuries," RED-76-54. January 12, 1976; pp. 13 and 45-46.)

The same report describes the following: "Through 1974 over 140 billion gallons of liquid waste containing about 5 million curies have been discharged into the ground at Savannah River, Idaho, and Hanford with the intention that the radioactivity would be trapped as it moved through the soil beyond the point of release and that the extent of migration would be limited by removing the driving force of further liquid releases. As soon as technically and economically practical, ERDA (DOE) plans to discontinue such practices." (Op. cit., pp. 5, 6)

Where are those Hanford liquid wastes now?

Because of the possibility that long-lived transuranics and fission products may be present in the crud at Dresden, as well as long-lived corrosion products; and because chelates in the proposed Nuclear Solvent-1 are known to cause the migration of radionuclides through the environment; and because neither the proposed polymer matrix nor the mild steel drums is capable of serving as a permanent barrier to keep the Dresden wastes segregated from other known and unknown, liquid and solid wastes already present at the Hanford and Beatty sites or apt to arrive in the future; and because Mother Nature -- who is in charge of 500-year rainfalls, the Columbia River and the Amargosa, groundwater and aquifers, the Cascade Mountains, earthquakes and climates -- refuses to be held accountable, I urge the Nuclear Regulatory Commission to withhold its permission for Commonwealth Edison to use chelates to flush its crud out into the human environment.

Sincerely,

Kay Drey

Mrs. Leo Drey (Kay)

Northern Illinois University
DeKalb, Illinois 60115

Department of Biological Sciences
815 753 1753
815 753 0433

July 16, 1980

Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

I submit the following comment on the draft environmental statement for decontamination of the Dresden 1 nuclear power station, NRC report NUREG -0686, Docket No. 50-10, May, 1980.

4.2.2. (C)

EIS "Leach tests on samples indicated that the Dow solidification process is equivalent or better than other solidification methods being routinely employed by nuclear power plants"

COMMENT In view of the long-term nonbiodegradability and rapid migration of chelated radionuclides and MFP in ground disposal, leach tests must demonstrate decided superiority over solidification methods employed routinely by nuclear power plants.

What leachate was used by Dow for testing chelated samples solidified by the Dow method? How close in composition was the test lechate to that anticipated at the disposal site? pH?

EIS "The amount of radioactivity of the solidifed radwaste amounts to less than 0.1% of the 4.3×10^6 Ci of total radioactivity shipped to commercial burial sites as of 1977. The volume of solidified radwaste expected to be generated by the Dresden Unit 1 decontamination operation amounts to less than 0.06% of the 1.8×10^7 cubic feet of total radwaste shipped to commercial burial sites as of 1977"

COMMENT Means, Crerar, and Duguid (Science, Vol. 200) state: "In the United States there are six commercial and five Energy Research and Development Administration terrestrial radioactive waste burial sites which have in the past received or are currently receiving low- and intermediate-level radioactive wastes. Varying levels of radionuclide migration from original disposal sites have been observed at four of these burial sites other than ORNL, including the Savannah River Laboratory, South
...on facilities; West Valley, New
... The Chalk River facility in
...migration problems. Actual

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Ben Ruekberg

5644 S. Drexel Avenue

Chicago, Illinois 60637

July 16, 1980

Director Division of Licensing

Nuclear Regulatory Commission

Washington, D. C. 20555

Dear Sir,

I find the Draft Environmental Impact Statement by the Nuclear Regulatory Commission on the Decontamination for the Dresden Nuclear Power Station, Unit No. 1 (NUREG-0686) an unsatisfactory document. It appears to be a rehash of old responses adorned with meaningless figures. For example, the annual man-rem exposure from Dresden I is not given, but rather the average from the three Dresden reactors (1973-1977.) What is that supposed to mean? Don't you know or aren't you telling the exposures from Dresden I? If not, why not? It is fascinating that the operation will expose workers to one-fourth as much more radiation as one would recieve in one's entire live living in Denver rather than Washington. What if you took in one hour one-fourth the additional caffeine you would get from drinking espresso all your life instead of Sanka? You would [illegible]soned. Where did you get [illegible] o 12,500 man-rems? "The [illegible] waste amounts to less than

0.1% of the...total radioactivity shipped to commercial burial sites as of 1977" and occupies less than 0.06% the volume. A... hat means to me is that the radioactivity is about 1½ times as concentrated as the average shipment in that period, not even that the average shipment was safe or if it falls into the concentration range of the previous shipments. Where does the dollar cost of replacement power (5.2) enter into the environmental safety of this operation? I am disturbed by this array of irrelevant numbers.

Equally meaningless the the claim of proprietary information. How can a response be meaningful if the nature of the solvent and the solidifying resin are unknown? By precluding the meaningful response you invalidate the environmental impact statement!

There yet remain a number of unanswered questions. If the deposits in the pipes are "trace quantities of metals (that) have become neutron activated," what fraction of the deposits are radioactive? If the fraction is small enough, then the solvent may become saturated long before the radiation has been reduced. A much larger volume of solvent (and solidified waste) will be necessary to accomplish the described goal. The task will take longer and involve more exposure time to workers and more corrosion of the pipes by the solvent. An higher than anticipated ion content may adversely affect the ability of the solvent and resin to hold the radionuclides.

Evaporator effluents include Co-60 (Transactions of the American Nuclear Society, Vol. 34, June 1980, p. 154) If monitoring reveals that the waste cannot be safely concetrated, what alternate methods have you planned for dealing with the 200,000 gallons of liquid ?

RPF Ecological Associates
727 Reba Place
Evanston, Illinois 60202

July 17, 1980

Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

I am enclosing the following comments on NUREG-0686, draft environmental statement related to primary cooling system chemical decontamination at Dresden Nuclear Power Station Unit #1, Commonwealth Edison Company, Docket No. 50-10.

I have several reservations about this draft environmental statement that are listed below:

1. I could not find an evaluation of occupational or public radiation exposure that might result from a serious vehicle accident during transportation of the solidified waste to a licensed burial facility. What is the probability factor of such an accident? If barrels were broken and solidified waste were spread onto a highway in a worst-case accident, what would be the level of public radiation exposure? Certainly the risks involved of such an accident should be evaluated as part of potential, although unlikely, radiation exposure.

2. On page 15 of Appendix A, it is stated that decontaminations of Canadian and British reactors indicate no evidence for an accelerated recontamination or crud deposition rate. Were these reactors decontaminated with Dow NS-1? How many years of reactor operation have passed since decontamination of those reactors? Were these contaminations on primary cooling systems? Have these reactors been free of pipe structural problems years later?

3. In the evaluation of the Impact of Alternatives, the option to shut down the reactor permanently seems to be inadequately considered. Will the reactor really be available as much as 60% over the next 15 years? What is the basis for computing a cost of $100,000 per day for purchasing replacement power? Is this the going purchase price? Would electrical generation by coal, by oil, or by gas result in a cheaper power alternative? If even 20 million dollars would be spent to encourage electrical conservation, would there be a need to replace the power at all?

Please send me the final EIS when it is available.

Sincerely,

Robert W. Guth

Robert W. Guth, Ph.D.
Ecologist

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18 July 1980

Citizens For A Better Environment

Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket # 50-10

Dear Mr. Eisenhut,

Enclosed please find six copies of Citizens for a Better Environment's Comments on the Draft En ironmental Statement related to the chemical decontamination of Dresden I.

It is possible that we will be filing some late, supplemental comments on the Draft Statement because we have a Freedom of Information Request, dated 2 July 1980, outstanding to the NRC for which we have not received any information. I have been informed by Sarah Weddington that some materials are on the way from NRC. In the event that the materials are relevant to our comments, we will file the supplement as soon as possible.

Yours truly,

Robert Goldsmith
Attorney for
Citizens for a Better Environment

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Entire document previously entered into system under:

ANO 8007220548

No. of pages: 26

12-939-1984/Research 312-939-1530

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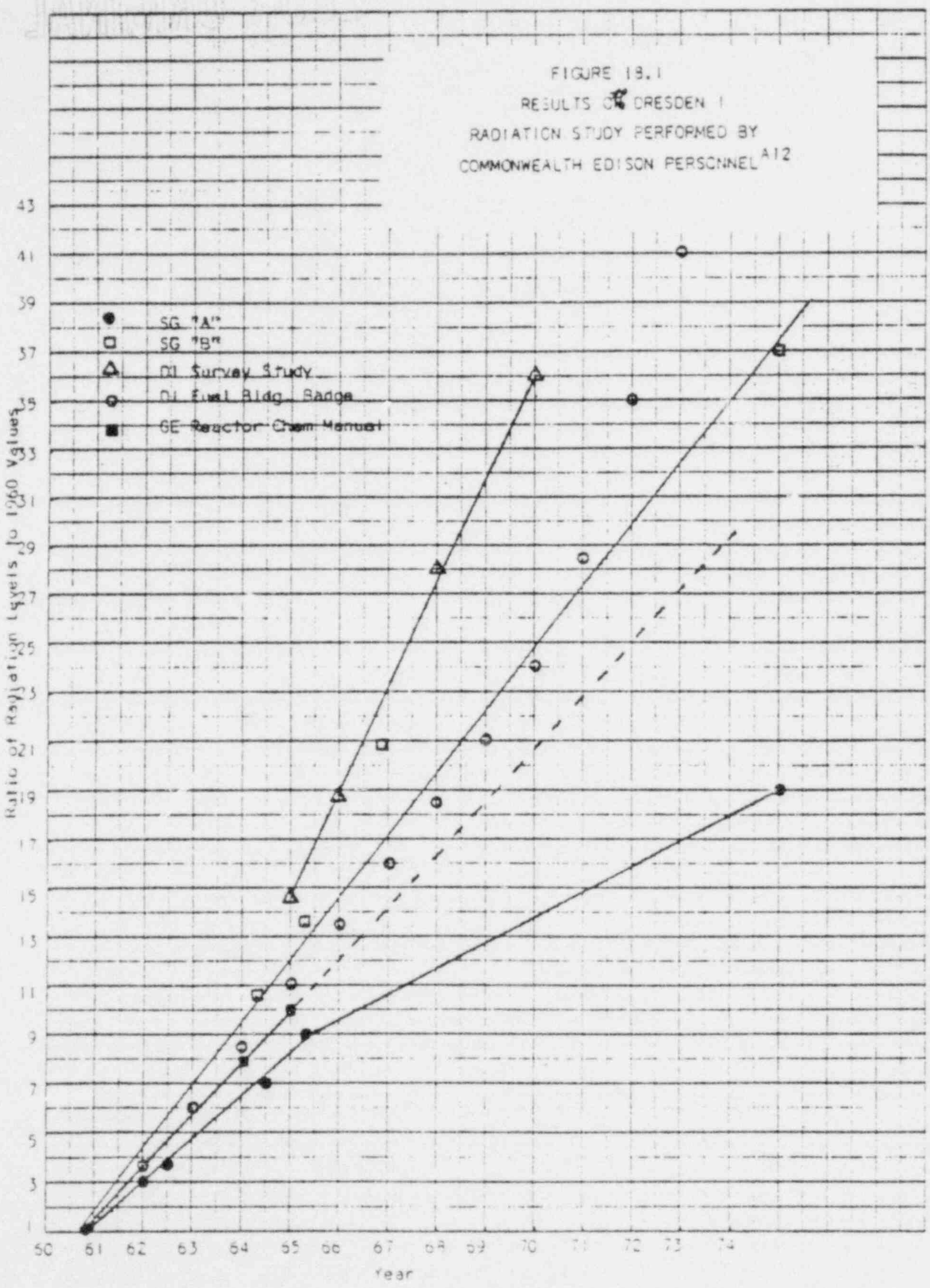

POOR ORIGINAL

DATE: July 18, 1980

TO: Director, Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

FROM: Catherine Quigg, research director
Pollution & Environmental Problems, Inc.
Box 309, Palatine, Illinois 60067

RE: Draft Environmental Impact Statement related to Chemical Decontamination at Dresden. NUREG-0686

1. NUREG-0686 states that Dow Chemical's proprietary solvent NS-1 will be used for the decontamination process.

COMMENT: The NRC and the nuclear industry should be obliged to disclose the chemical composition of NS-1 to the public. The public will have to bear the health burdens of potential impacts from NS-1 and is therefore entitled to this information. The protection of the public health and safety should supercede the proprietary rights of the Dow Chemical Company.

2. In Appendix A, page 9, NUREG-0686 states: "Migration as observed at the Oak Ridge site would not occur at the Beatty, Nevada or Hanford, Washington sites. A solid waste is to be disposed at the commercial sites. The climate, geology and hydrologic conditions eliminate the possibility for flow to saturate soils and transport radionuclides as observed at Oak Ridge."

COMMENT: The NRC's entire premise of safe burial of NS-1 contaminated wastes from the Dresden cleanup is based on the supposition that Hanford and Beatty are arid lands where the potential for transport of radionuclides is virtually non-existent. The NRC has not provided the public with specific factual data on the geohydrology of the Hanford and Beatty sites to back up its contentions that these sites are safe for the burial of radioactive wastes containing NS-1 which, most likely, contains EDTA -- a chelating agent known to speed the migration of radionuclides through the soil and groundwater.

The NRC thus obliges the citizen interested in the protection of public health and safety to take a giant leap of faith in accepting the NRC's assessment of the suitability of these sites. We refuse to take that leap and urgently request the NRC to provide current scientific documentaion on the geology and hydrology of these sites and their past experiences with leaks, seepage and migration. This investigation should be made by independent hydrologists and geologists. The NRC has not made its case for the safe disposal of these wastes. We await adequate information upon which to base sound decisions as to the full environmental impacts of the decontamination of Dresden-1.

C002 S,10

WILLIAM J. SCOTT
ATTORNEY GENERAL
STATE OF ILLINOIS
160 NORTH LA SALLE STREET
CHICAGO 60601

TELEPHONE
793-3500

July 18, 1980

U.S. Nuclear Regulatory Commission
Director, Division of Licensing
Washington, D.C. 20555

Re: Docket No. 50-10

COMMENTS OF THE STATE OF ILLINOIS ON DRAFT ENVIRONMENTAL STATEMENT, NUREG-0686

The PEOPLE OF THE STATE OF ILLINOIS, by WILLIAM J. SCOTT, Attorney General of the State of Illinois, submit the following comments on the Draft Environmental Statement relating to the Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station, Unit No. 1.

I. The Selection of a Solvent

The formation of the NS-1 solvent is stated to be proprietary and thus is not disclosed. This prevents the reader from making even a cursory evaluation of the possible side effects, residue, vapors, corrosive nature of the solvent, etc. In addition, the planned operating condition for the NS-1 solvent (100 hours at 250°F) is not justified as being optimum and is not directly com-

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The selection process used by Commonwealth Edison used generalized criteria (e.g., "slow corrosion" and "greatest possible reduction in radiation levels") rather than specific values, so it is difficult to determine if any solvent really met their absolute requirements.

The choice of NS-1 may be justified but the Draft Environmental Statement does not indicate why. One reason is that NS-1 is not listed in Tables 4 and 5, so its effectiveness compared to the others cannot be readily discerned by the reader.

Thus, the Draft Environmental Statement does not justify the use of NS-1 since its selection process, formulation and capabilities are not adequately revealed in the document.

II. Predictions and Criteria

The Environmental Statement fails to document the specific criteria for the decontamination process and results. For example, what is considered an acceptable corrosion rate; What is the solvent selection criteria for radiation reduction; What final radiation levels are required for safe operation and inspection?

If the processes are as predictable and proven as the Applicant believes, then it should be possible to make some reasonable predictions for inclusion in the decision base of the Environmental Statement. What is the effect on the conclusion reached in the Environmental Statement if, for example, the process is only half as effective and creates twice the exposure and twice the waste? Without specifically defined estimates and cri-

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

REC'D
JUN 26 1980
Edwin R. McCullough
Chicago, Illinois

Docket No. 50-10

JUN 23 1980

Mr. Edwin R. McCullough, Esq.
1 North La Salle Street
Chicago, Illinois 60602

Dear Mr. McCullough:

This is in response to your letter dated April 9, 1980 in which you restated your previous position relative to the need for preparation of an environmental impact statement for the chemical decontamination of Dresden Nuclear Power Station Unit No. 1.

The NRC staff has concluded its environmental review of this matter and has concluded that the proposed action will not significantly affect the quality of the human environment. I have reviewed the staff's conclusion and have decided that an environmental impact statement should be prepared for this action. A copy of this statement is enclosed for your information.

Sincerely,

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosure:
Draft Environmental
Statement (NUREG-0686)

Appendix A

NOTICE OF VIOLATION

Commonwealth Edison Company Docket No. 50-010

Based on the inspection conducted on April 7 - May 2, 1980, it appears that certain of your activities were in noncompliance with NRC requirements, as noted below. These items are infractions.

1. Unit 1 Technical Specifications, Section 6.2.B requires that radiation control procedures be maintained, made available to all station personnel, and adhered to. Radiation Control Standards Procedure 37-1-E-3, "Work in Controlled Areas (Radiation Areas and High Radiation Areas)," requires that personnel not eat, drink, smoke, or chew in those controlled areas.

   Contrary to the above, on April 17, 1980, while making a routine tour of the Unit 1 turbine building (a posted radiation area), the NRC inspector observed evidence of eating, drinking, and smoking (i.e., the presence of numerous cigarette butts, empty soft drink cans, empty candy wrappers, and a half eaten hamburger) in this radiation area.

   This is a repetitive item of noncompliance since the same problem was identified twice previously in NRC Inspection Reports No. 50-010/79-19, dated October 18, 1979, and No. 50-010/79-25, dated January 28, 1980.

2. 10 CFR 50, Appendix B, Criterion II requires activities affecting quality be accomplished under suitably controlled conditions, including adequate cleanness. The licensee's Quality Assurance Program, Section 2.2 requires that the licensee adhere to all mandatory requirements of ANSI N18.7. ANSI N18.7-1976, Section 5.2.10 requires quality housekeeping practices encompassing all activities related to control of fire prevention and protection, including disposal of combustible material and debris.

   Contrary to the above, on April 17, 1980, during a routine tour of the Unit 1 sphere, the NRC inspector observed numerous oily rags/papers, a tipped over lube oil can, and scattered debris above the elevator shaft which were not being controlled and which represented a fire hazard.

3. Unit 1 Technical Specifications, Section 6.2.B requires that radiation control procedures be maintained, made available to all station personnel, and ahered to. Radiation Control Standards Procedure

37-1-A-1 requires that contaminated clothing should be removed from controlled contaminated areas when not in use and, further, requires that clothing hampers marked "Deposit Contaminated Rubber Goods Here" and "Deposit Contaminated Canvas Goods Here" be placed at the exits from all areas where protective clothing is required.

Contrary to the above, on April 17, 1980, during a routine tour of the Unit 1 turbine building, the NRC inspector observed contaminated clothing lying inside a controlled contaminated area (Unit 1 condensate demineralizer control area) and that no clothing hampers were located at the exit of this area. This condition was determined to have existed for a period of two weeks.

739 Hillcrest
DeKalb IL 60115
July 19, 1980

Director, Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Licensing Director:

Please accept my comments on NRC's Draft Environmental Statement for Decontamination of Dresden I Nuclear Power Station. It reads more like a promotional from the utility than a dispassionate appraisal by a neutral government agency. There appears throughout enthusiastic, uncritical acceptance of each of the utility's claims, "tests" and promises.

An outstanding example is the repeated assurances that the waste from the so-called decontamination process would be safely buried at Hanford, Washington, or Beatty, Nevada. Since both states in the recent past have refused to accept radiaactive wastes from Commonwealth Edison because of its poor safety record in shipping, how can NRC be so sure they will accept these wastes? And if not, what then?

On page 2 of Appendix A, a statement is made that no migration of radionuclides had been observed at either Beatty or Hanford. Has not migration of plutonium been reported from the Hanford site, causing concern about pollution of the Columbia River?

The details of the extremely hazardous waste disposal methods which were permitted at Oak Ridge do not impart a feeling of confidence in the regulating agencies. As a former resident of Oak Ridge, I am appalled at what was allowed to occur in that beautiful part of our country by such sloppy disposal of radioactive materials. Much may be learned afterwards by such disasters about precautions which should have been taken. It is time we stopped proceeding to inject this dangerous material into the environment until we have proven evidence that it can be safely contained over the long periods that it remains a threat.

Your assumtion on page 4-5 that the additional radiation exposure to workers involved in the decontamination process is negligible is based on a 1974 study. Should you not at least acknowledge several later studies (such as that by Mancuso) that <u>any</u> additional amount of radiation is harmful to human health?

Highly questionable is the EIS assumption that closing Dresden I would necessitate a $300 million expense for purchase of replacement fuel over a 15-year-period. Such a conclusion ignores the excess generating capacity of ComEd which renders replacement of Dresden I output unnecessary.

Further attention should be given to the advisability of shutting down Dresden I.

Sincerely,

Cecile Meyer

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The SASSAFRAS AUDUBON SOCIETY
of LAWRENCE - GREENE - MONROE - BROWN -
MORGAN & OWEN COUNTIES, INDIANA

RECEIVED

JUL 23 1980

U.S. Nuclear Regulatory Commission
Mail Section

July 19, 1980

To the Director of the Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

QUESTIONS AND COMMENTS ON THE DRAFT ENVIRONMENTAL STATEMENT (DES)
related to PRIMARY COOLING SYSTEM CHEMICAL DECONTAMINATION
AT DRESDEN NUCLEAR POWER STATION UNIT NO. 1, COMMONWEALTH
EDISON COMPANY, MAY 1980.

The chemical decontamination of Dresden 1 is viewed as a highly profitable venture by Commonwealth Edison, representing $300 million dollars of power over the remaining 15 years that the Dresden license would be in effect. To the NRC it seems an excellent opportunity to prove that excessively "hot" reactors can be returned to service. As noted on page - - following Table 3, a project goal is to "Develop and prove techniques usable on other reactors."

DRESDEN DECONTAMINATION NOT AN EXPERIMENT?

The NRC, in their response to Question 3, page 4, Appendix A, asserts that "The Dresden decontamination is not an experiment, it represents the application of a proven method of decontamination that has been specifically developed and tested before being used on the Dresden Unit 1 primary cooling system." While the use of NS-1 may be a proven method of decontamination on a laboratory scale, the results of a full-scale flushing out of miles of primary cooling system may not be one and the same thing, and the results unknown until the flushing-out and post-cleaning surveillance program have been completed. In this sense it is an experiment. Particularly with Dresden 1 where some inservice inspection requirements were waived for a considerable period of time.

> Can it be said with certainty that one flushing (of approximately 100 hours) will do the job?
>
> Or how long occupational exposure levels may be reduced to "acceptable" levels?
>
> Or that the integrity of the primary cooling system will not be affected?

The NRC, in their response to Question 6, page 15, Appendix A, says that "there is no anticipated acceleration in the buildup of crud" after the cleaning, but notes in the same response that "in the future it is quite possible that, following the strong decontamination solution the utility may elect to use a weaker but more frequent decontamination process on line that is currently being developed under EPRI sponsorship by Battelle Northwest." This statement is indicative of the uncertainties surrounding the Dresden 1 decontamination experiment.

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THE CASE AGAINST CHELATES

Chelates have the capacity to form strong complexes with radionuclides and to reduce, markedly, the adsorption capacity of soil and rock for radionuclides; to accelerate aqueous transport of radionuclides in the ground; and are extremely persistent in the natural environment. The migration potential of chelated radionuclides may be decreased when placed in a solid waste matrix and disposed of in a semi-arid disposal site but the fact remains that it is a dangerous if not unacceptable practice to bury radioactive wastes bound to chelates that are not biodegradable.

THE STABILITY OF BEATTY, NEVADA AND/OR HANFORD, WASHINGTON?

Has either Beatty, Nevada, or Hanford, Washington accepted responsibility for the disposal of the Dresden 1 decontamination wastes? Why was this not finalized before issuance of the DES?

It is essential to know the length of time that radioactive wastes associated with the Dresden decontamination must be isolated from the environment in terms of the stability of the waste disposal site. The DES states that about 95% of the radioactivity expected will be in the form of cobalt isotopes with Cobalt-60 with a half life of 5.3 years the isotope of greatest concern.

The question about the possibility of transuranics was answered on page 3, Appendix A, to the effect that Com Ed was committed to measurement of them if they are present. We have heard, however, that Nickel-63 with a half life of 92 years may be present in the oxide layer and this is not mentioned in the DES. Is it expected, and if so to what extent?

There is a question of geologic instability at both the Beatty and Hanford sites. Hanford is about 120 miles from Mt. St. Helens and considerable movement of the earth's crust as evidenced in earthquakes and volcanic eruptions. The Hanford site has also been subject to considerable disturbance from the practice of "water mounding" which added to the problem of the "escape" of large quantities of liquid radioactive wastes into the ground, particularly since Plutonium had been complexed with a wetting agent in some instances which promotes its movement through the soil.

Mr. Cleve Anderson, testifying before the House Subcommittee on Environment, Energy, and Natural Resources on nuclear waste disposal (1977) said that over 2000 wells had been drilled with more budgeted to determine where the radioactivity that had escaped to ground had migrated in the ground water. The drainage channels flow toward the Columbia River.

Dresden 1 wastes are to be solidified but they can be affected by moisture and it is not difficult to imagine scenarios where chelated wastes might be vulnerable to dissemination while still toxic.

Beatty, Nevada is near a seismically active area, and only 50 miles from the Nevada atomic bomb testing grounds. The Beatty, Nevada site has had numerous problems with Governor List supposedly fed up with the dangers of radioactive wastes, the burden of taking care of other people's problems, and the lack of adequate inspection by the Federal Government.

IS DRESDEN 1 REALLY NEEDED?

Dresden 1 was not designed to limit necessary occupational exposure of workers to what is termed ALARA, e.g. for required inservice inspections as radiation levels rose and the plant aged. It is a poor candidate for a decontamination experiment with the many uncertainties surrounding its clean-up.

The DES does not address sufficiently alternatives to the decontamination which would enable Com Ed to shutdown and decommission Dresden 1 immediately. We ask that this be done in the Final EIS with a discussion of Com Ed facilities, both nuclear and others (coal, oil, natural gas etc) and how they can be used effectively to compensate for the decommissioning of Dresden 1. Natural gas seems to offer an exceptional low-risk alternative to nuclear power at this time and far into the future while soft energy alternatives are being developed.

Our Society would appreciate a copy of the Final EIS when issued.

Yours sincerely,
Mrs David G. Frey

Mrs. David G. Frey
Energy Policy Committee,
Sassafras Audubon Society
2625 S. Smith Road
Bloomington, Indiana 47401

COMMENTS ON NUREG-0686,
DRAFT ENVIRONMENTAL IMPACT STATEMENT
BY THE
U.S. NUCLEAR REGULATORY COMMISSION
FOR
DRESDEN NUCLEAR POWER STATION, UNIT NO. 1
PRIMARY COOLING SYSTEM CHEMICAL DECONTAMINATION
COMMONWEALTH EDISON COMPANY
Docket No. 50-10

by Peter Montague, Ph.D., Director

National Campaign for Radioactive Waste Safety
East Coast Office
29 Pine Knoll Drive
Lawrenceville, NJ 08648

July 20, 1980

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Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

July 21, 1980

Director, Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Unit 1
Comments on Draft Environmental
Statement for Primary System
Chemical Decontamination

Reference (a): D. M. Crutchfield letter to D. L. Peoples
dated May 30, 1980

Dear Sir:

This letter is to provide the Commonwealth Edison Co. comments on the Draft Environmental Statement, NUREG-0686, for the Dresden 1 Primary System Chemical Decontamination which was transmitted by Reference (a).

The Final Environmental Statement should specifically address the factors identified in Sections 102 (2)(C) and 102(2)(E) of NEPA, 42 U.S.C. §§4332(2)(C) and 4322(2)(E). The Draft Environmental Statement explicitly discusses only two of those factors: environmental impact, Section 102(2)(C)(i); and alternatives, Section 102(2)(C)(iii), although the discussion of occupational exposure is probably responsive to Section 102(2)(C)(ii), which calls for a discussion of any adverse environmental effects which cannot be avoided should the proposal be implemented.

There is no explicit discussion in the Draft Environmental Statement of "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity," as required by Section 102(2)(C)(iv). While this prescription is somewhat difficult to apply to the facts at hand, it seems reasonable to say that the proposed decontamination does not significantly affect the trade-off between short term and long term uses of the environment implicit in the decisions to build and
... e more than twenty years
... ive wastes produced by this
... s not affect the trade-off
... the environment which was
... s conclusion is supported
... sposal found in Section

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4.2.3. and Appendix A of the Draft Environmental Statement. Further, from Table 1 it can be seen that the dominant radioactive isotope to be buried will be ^{60}Co, with a half-life of 5.3 years. Essentially all of the radioactivity therefore will have decayed away in fifty years.

Section 102(2)(c)(v) directs federal agencies to consider "irreversible and irretrievable commitments of resources." For the Dresden decontamination, these would be the money involved, the concrete and steel used to build the decontaminatin facility, the NS-1 solvent, the Dow vinyl ester-styrene polymyer solidification system, the 55-gallon steel drums, and the burial space to be occupied. Although Commonwealth Edison does not believe NEPA requires consideration of financial resources, see Consumers Power Company (Midland Plant, Units 1 and 2) ALAB 458, 7 NRC 155 (1978), the cost of the decontamination project is obviously very small compared with the savings to be gained by carrying out the project, as described elsewhere in these comments. Similarly there is no shortage of stainless steel or concrete in this country. Both the NS-1 solvent and the Dow solidification polymer are petroleum-based products. However, the amount of oil needed to make these products is small in absolute terms and in conmparison to the energy savings associated with continued reactor operation.

Finally, NEPA Section 102(2)(E) requires federal agencies to "study, develop and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." The Draft Environmental Statement's discussion of alternatives is adequate, with the modifications suggested elsewhere in these comments. Nevertheless it seems worth pointing out that this project does not involve unresolved conflicts concerning alternative uses of available resourcese. Dresden Unit One was built to operate and this project will contribute to that goal. The burial facilities to which radioactive waste will be sent were licensed for that purpose. And, of course, the NS-1 solvent and the Dow solidification system were developed for projects such as the Dresden decontamination.

Although Commonwealth Edison does not question the authority of the NRC in the performance of a Environmental Statement for the chemical decontamination, we question the necessity of performing one for an action which has minor impact on the public and the environment, considering the cost involved. The decision to perform an environmental statement at such a late date and the resulting delay in the chemical cleaning will add to Commonwealth Edison's cost to complete the project. These costs will in turn be borne by Commonwealth Edison's customers. As indicated in

Director, Licensing Bureau;

This question is in reference to the Environmental Impact Statement on Dresden One. What are the relative possible positive and/or negatve effects of using other decontaminating agents that might not contribute to increased radionuclide ~~activity?~~ mobility?

How do strong acids, bases, oxidizing agents or citrates, tartrate, oxalate, gluconate, phosphate, bisulfate, and fluoride measure up to DOW'S NS-1 ?

Sincerely,

Rose H. [illegible]

Rose Levering
7370 A Dale
St Louis Mo 63117

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Citizens Against Nuclear Power

P.O. Box 6625, Chicago, IL 60680
Office: 407 S. Dearborn, Rm. 930
Telephones: (312) 472-2492, 764-5011, or 786-9041

NO NUKES!

July 23, 1980

Director, Division of Licensing
U.S. NRC
Washington DC 20555

RE: Docket No 50-10

Dear Director:

Contained herein is CANP's "Comments" on NUREG-0686, the draft EIS done for the proposed chemical decrudding of the Dresden One reactor.

It has been brought to my attention this morning as we prepared to mail this document to you, that the date by which all comments on NUREG-0686 were to have been received to ensure that they would be taken into consideration during the preparation of the final EIS, was July 21, 1980. CANP was ignorant of this requirement, as the copy of NUREG-0686 which we were sent by Jan Strasma of the Region III NRC office, was blank where the date was to have been printed (the page on which the "Abstract" appears).

Since you should receive this document only 3 days after the July 21 deadline, and since the copy of NUREG-0686 we received was silent on the exact deadline, CANP strongly requests that you do everything in your power to ensure that the enclosed document is indeed taken into consideration in the process of preparing the final EIS.

For a nuclear-free future,

Edward Gogol

Edward Gogol, Coordinator

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA STATE AND PRIVATE FORESTRY
370 REED ROAD — BROOMALL, PA 19008
Telephone (215) 461-3170

1950
July 23, 1980

Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing
Nuclear Regulatory Commission
Washington, DC 20555

Refer To: NUREG-0686
Docket 50-10, draft
Environmental Statement,
Cooling System, Dresden
Plant No. 1, IL

Dear Sir:

We anticipate no significant effect on forested land from the decontamination projects. Shutting down the reactor, on the other hand, would result in construction of an alternative plant, with considerable effect on vegetation.

Sincerely,

R A Kraus
for WILLIAM G. HERBOLSHEIMER
Acting Assistant Area Director
Forest Insect and Disease Management

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

25 JUL 1980

OFFICE OF THE
ADMINISTRATOR

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Director, Division of Licensing

The U.S. Environmental Protection Agency (EPA) in accordance with Section 309 of the Clean Air Act has reviewed the draft Environmental Impact Statement (EIS) for the Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station Unit No. 1. EPA has no objection to the action described in this EIS; however, we have developed the attached comments which correct several inaccuracies in this EIS and which also identify several information gaps which we believe should be filled in the final EIS.

EPA also proposes that the U.S. Nuclear Regulatory Commission (NRC) prepare a generic EIS identifying the available waste treatment and disposal options for the eventual decontamination of other nuclear power reactors. This generic EIS should also address the cumulative environmental impacts of the whole series of likely decontaminations.

EPA has rated this EIS as "LO-2" (no objections to the action; incomplete information in the EIS), and EPA will inform the public of this rating by publishing it in the Federal Register as required by Section 309 of the Clean Air Act.

If you have any questions concerning EPA's rating or the attached comments or if we can be of any further assistance to you in this matter, please contact Ms. Betty Jankus of my staff; her phone number is (202) 755-0770.

Sincerely yours,

for Thomas R. Shackell
William N. Hedeman, Jr.
Director
Office of Environmental Review

Enclosure

THE U.S. ENVIRONMENTAL PROTECTION AGENCY

DETAILED COMMENTS ON THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

PREPARED BY
THE U.S. NUCLEAR REGULATORY COMMISSION (NRC)
FOR THE
PRIMARY COOLING SYSTEM CHEMICAL DECONTAMINATION
AT DRESDEN NUCLEAR POWER STATION NUCLEAR NO. 1
(NUREG-0686, Docket No. 50-10)

1. EPA recommends that NRC prepare a generic EIS discussing the options for waste treatment and disposal from all likely decontaminations of nuclear power reactors. EPA further proposes that this generic EIS address the cumulative environmental impacts of all decontaminations. Given the uncertainty concerning the continued availability of disposal facilities, EPA believes that this generic EIS should also discuss the availability of environmentally sound waste disposal facilities in the future.

2. It would be helpful to both technical and non-technical readers if diagrams of the plant layout and process flow were included. The diagrams should show the design features that mitigate emissions to the air (Section 4.2.2.B.) and those that preclude releases to the Illinois River. Most chemical processing operations can be more easily understood with such diagrams. The FEIS should also address the cumulative impacts of the emissions added to those from the other Dresden units and compare them to EPA's Uranium Fuel Cycle Standard (40 CFR 190).

3. Additional piping and equipment will be installed in order to decontaminate the piping of Unit No. 1. Once the decontamination is completed, these modifications may be removed. The FEIS should discuss whether this equipment will be contaminated and require special disposal and/or cleanup measures.

4. Section 4.3 contains a discussion of postulated accidents. This section should briefly discuss what contingency plans exist in the event of unplanned releases.

5. The EIS makes it clear that no free liquids will be present in the decontamination waste; however, other waste buried in the same waste trench at the disposal site might contain toluene or xylene, which could dissolve the Dow vinyl-ester resin in which the radionuclides will be solidified. This problem should be addressed in the final EIS.

6. Section 4.2.1 contains the discussion of occupational radiation exposure, yet does not clearly indicate how the exposures for the decontamination procedure were determined. We suggest 1) that a sample calculation be shown and 2) that the occupational exposures from the decontamination operation be summarized in a table in the final EIS. Section 4.2.1.C appears to contain an "additional" exposure of 100 rem which may or may not be an additional exposure over and above the 300 rem identified in Section 4.2.1.B. The final EIS should identify what the specific tasks are in the procedure that produce the highest individual occupational dose.

7. Table 1 (page 2-2) should indicate that cobalt-58 has a half-life of 71 days and that manganese-54 has a half-life of 303 days. (The same corrections should be made to table 1 in Appendix A on page 4.) [These tables should also list the estimated concentrations of long-lived corrosion products such as iron-55 (half-life of 2.6 years), nickel-63 (half-life of 92 years), and nickel-59 (half-life of 80,000 years).]

8. The list in Table 4 of decontamination factors for alternative cleaning solutions should include the decontamination factor for NS-1.

9. The response to question 3 of the ISEA petition incorrectly lists 10 nanocuries per gram as 10^{-9} Ci/gm. This should read 10^{-8} Ci/gm.

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

OFFICE OF THE SECRETARY

August 1, 1980

MEMORANDUM FOR: Leonard Bickwit, General Counsel

FROM: Samuel J. Chilk, Secretary

SUBJECT: SECY-A-80-101 - DIRECTOR'S GRANT IN PART AND DENIAL IN PART OF 2.206 RELIEF (IN THE MATTER OF COMMONWEALTH EDISON COMPANY)

This is to advise you that the Commission (with all Commissioners concurring) agrees that no review of the Director's decision is required.

In connection with their approvals, the Commissioners commented as follows:

Chairman Ahearne commented:

> I am troubled by several points made in the OGC paper and the backup material:
>
> (a) If the impacts are not significant, I see no reason to search for the "obviously superior" alternative--for insignificant impacts, any alternative should be satisfactory.
>
> (b) If the NRC had a surfeit of people and funds and if EIS's did not add any time to the regulatory process, then perhaps doing EIS's when they are not needed might be acceptable (although not a responsible use of taxpayers' funds)--but since neither condition is the case, EIS's should not be done when they are not required.

Commissioner Gilinsky commented:

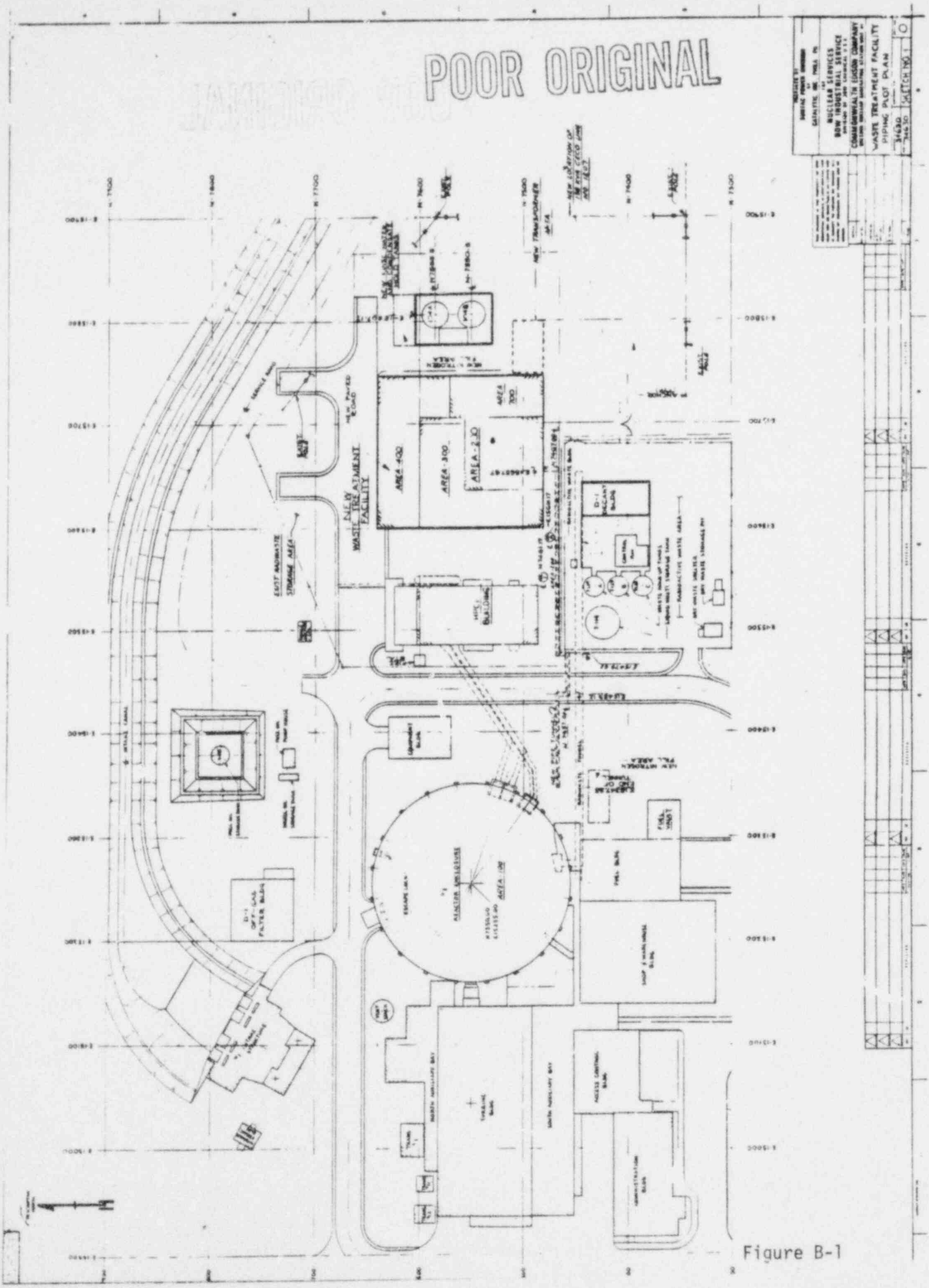
> I agree that guidance on the discretionary preparation of EIS's is not necessary. I do not see any need for a study of the "obviously superior" standard.

cc: Chairman Ahearne
Commissioner Gilinsky
Commissioner Hendrie
Commissioner Bradford
Commission Staff Offices
W. Dircks, Acting EDO
H. Denton, NRR

CONTACT:
S.J.S. Parry, SECY
63-41410

APPENDIX B

DRAWINGS



WASTE TREATMENT FACILITY
PIPING PLOT PLAN
NUCLEAR SERVICES
COMMONWEALTH EDISON COMPANY
NEW WASTE TREATMENT FACILITY
AREA-400
AREA-300
AREA-200
AREA 700
NEW TRANSFORMER
REACTOR ENCLOSURE
AREA-100
EXIST RADWASTE STORAGE AREA
NEW PAVED ROAD
D-1 OFF-GAS FILTER BLDG
D-1 VACANT BLDG

Figure B-1

POOR ORIGINAL

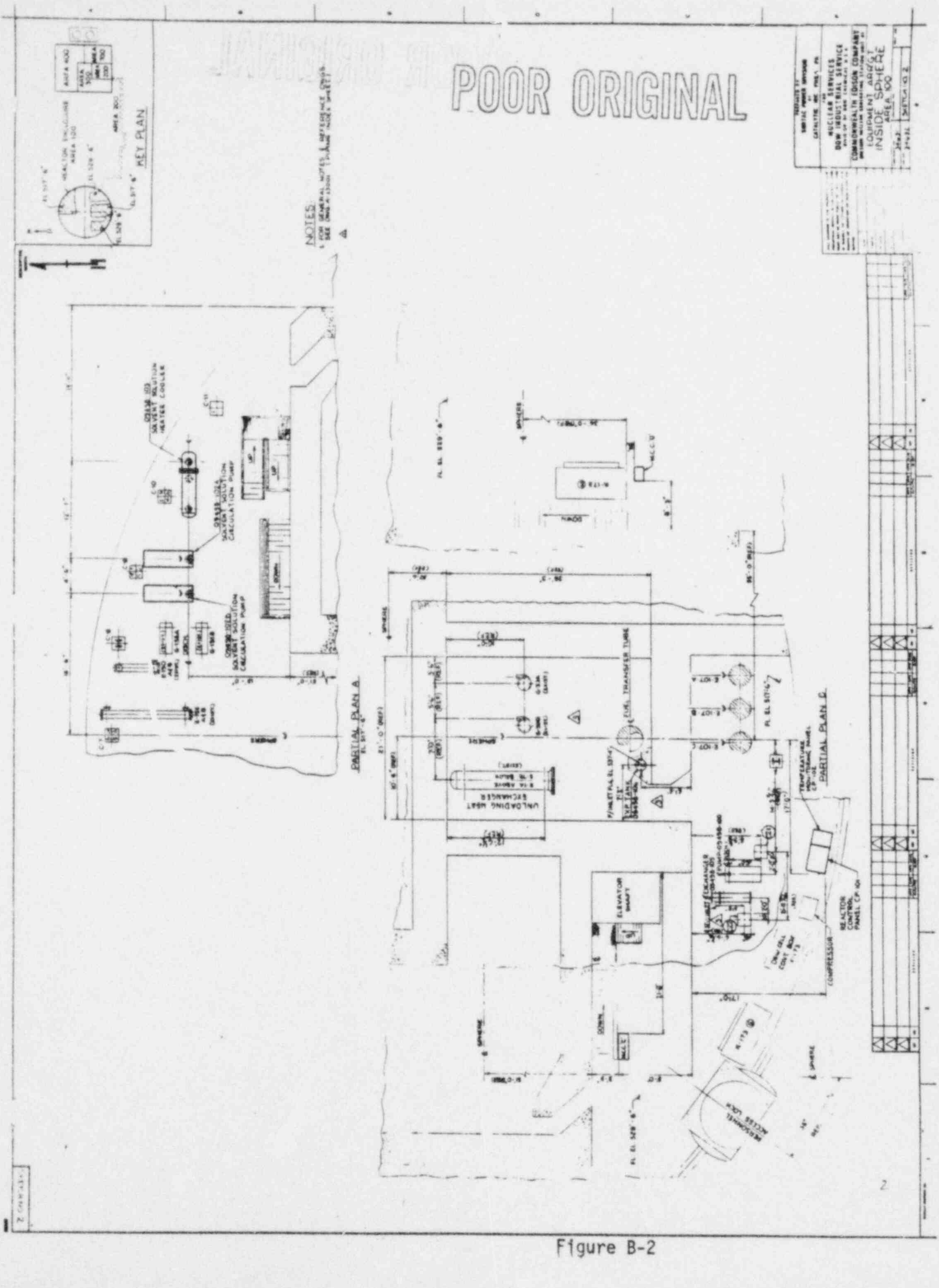


Figure B-2

POOR ORIGINAL

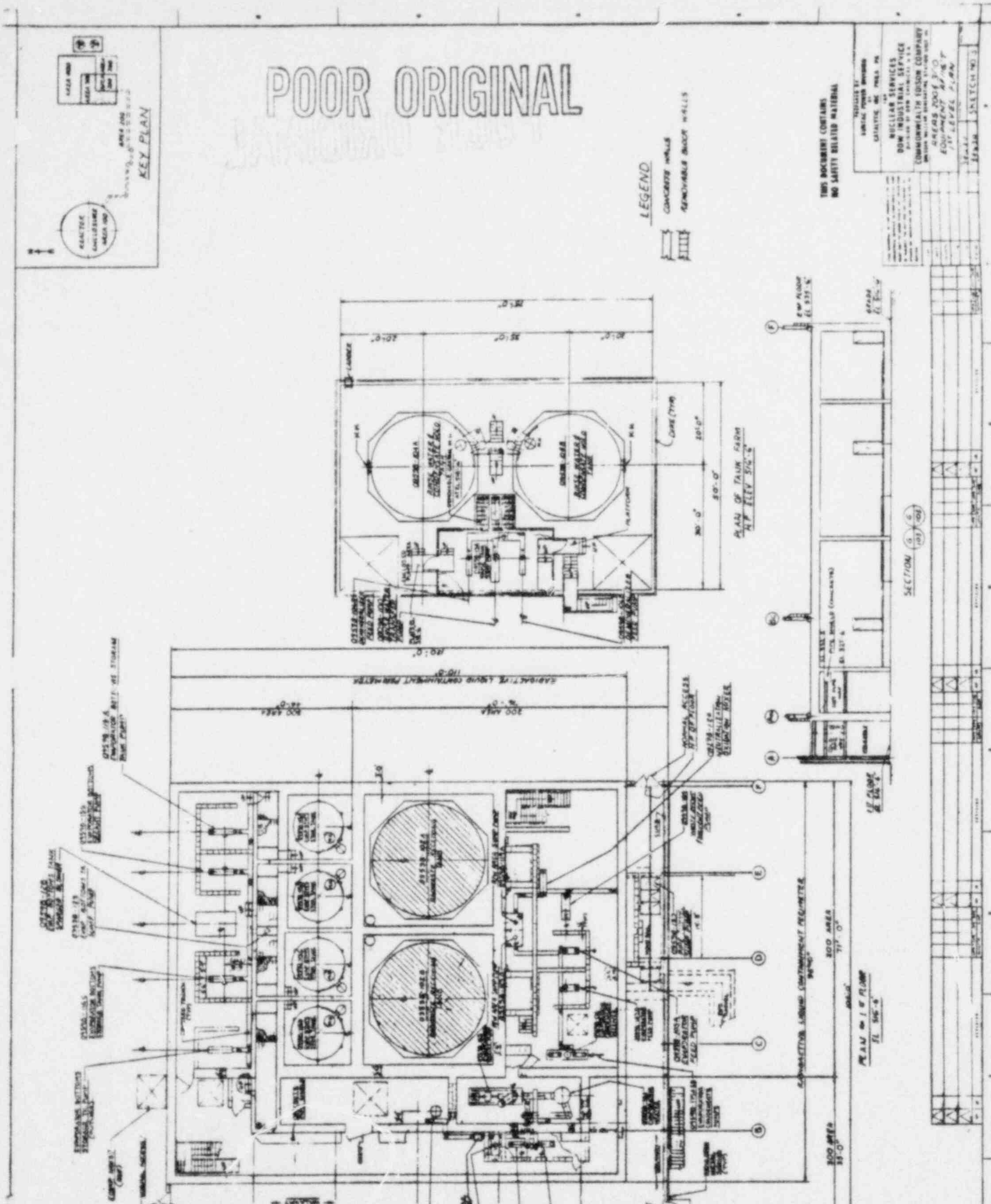


Figure B-3

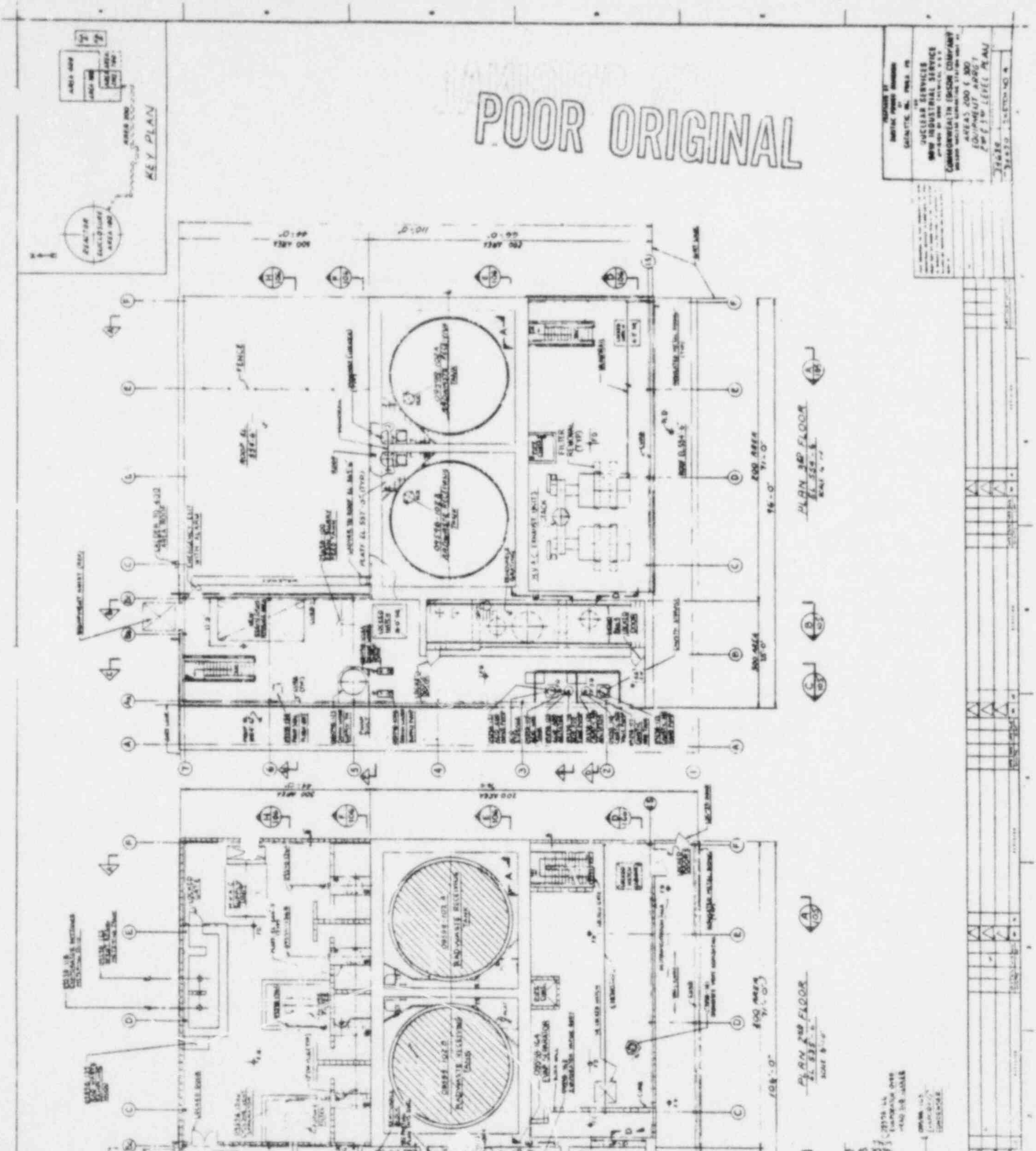


Figure B-4

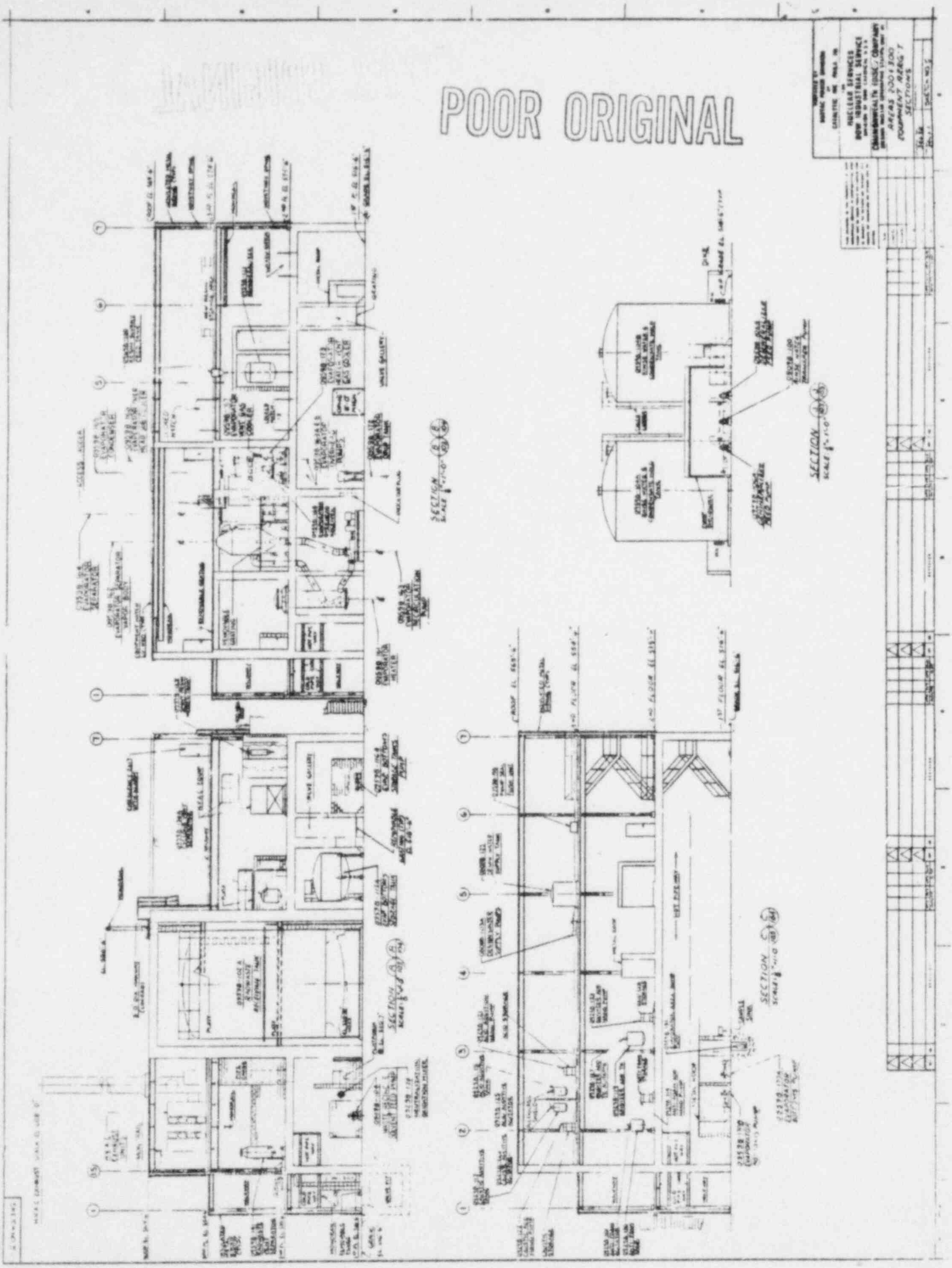
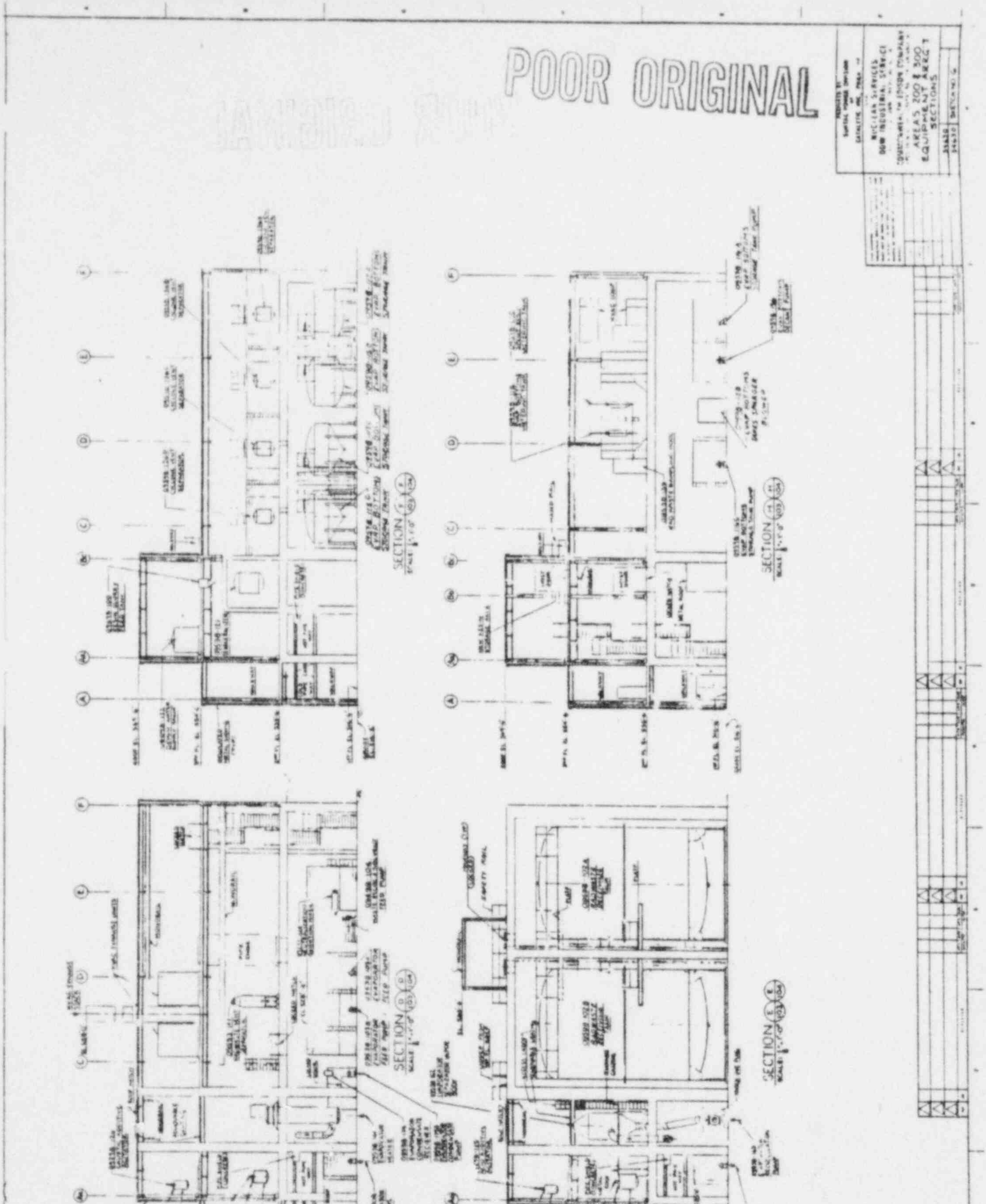


Figure B-5



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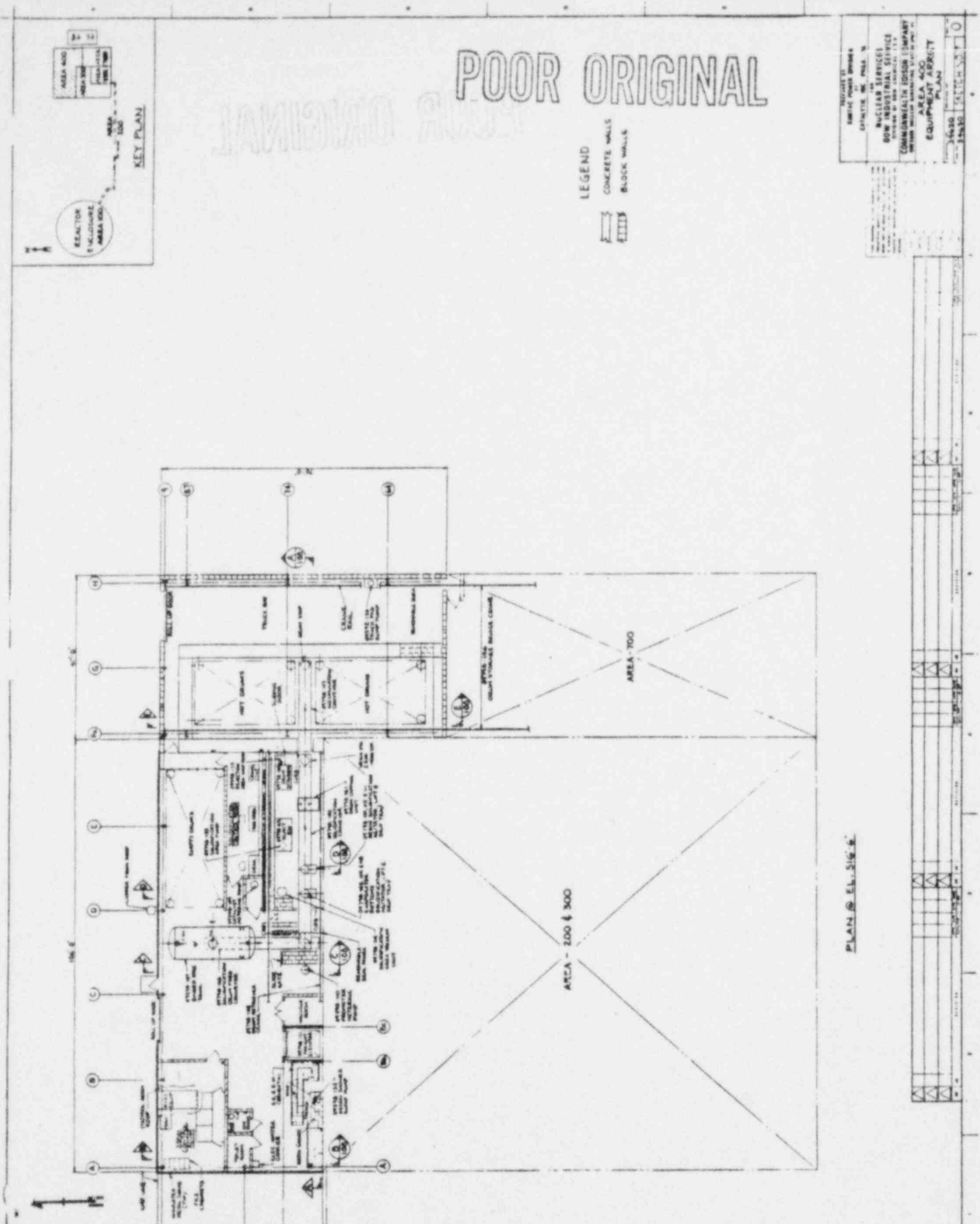
POOR ORIGINAL
LEGEND
CONCRETE WALLS
BLOCK WALLS
KEY PLAN
AREA - 200 & 300
AREA - 700
PLAN @ EL. 516'-6"
COMMONWEALTH EDISON COMPANY
AREA 400
EQUIPMENT ARRGT
PLAN

Figure B-7

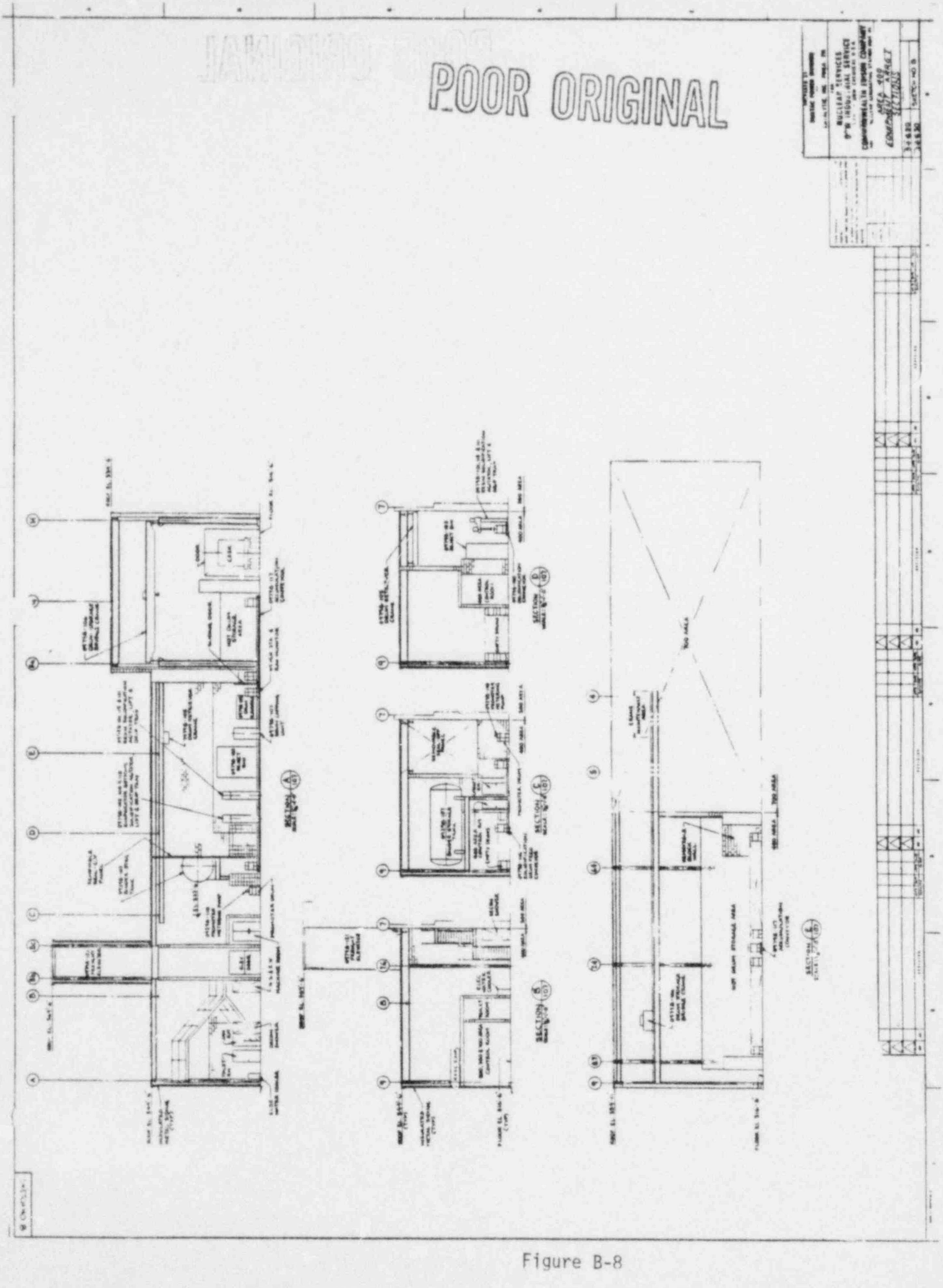

Figure B-8

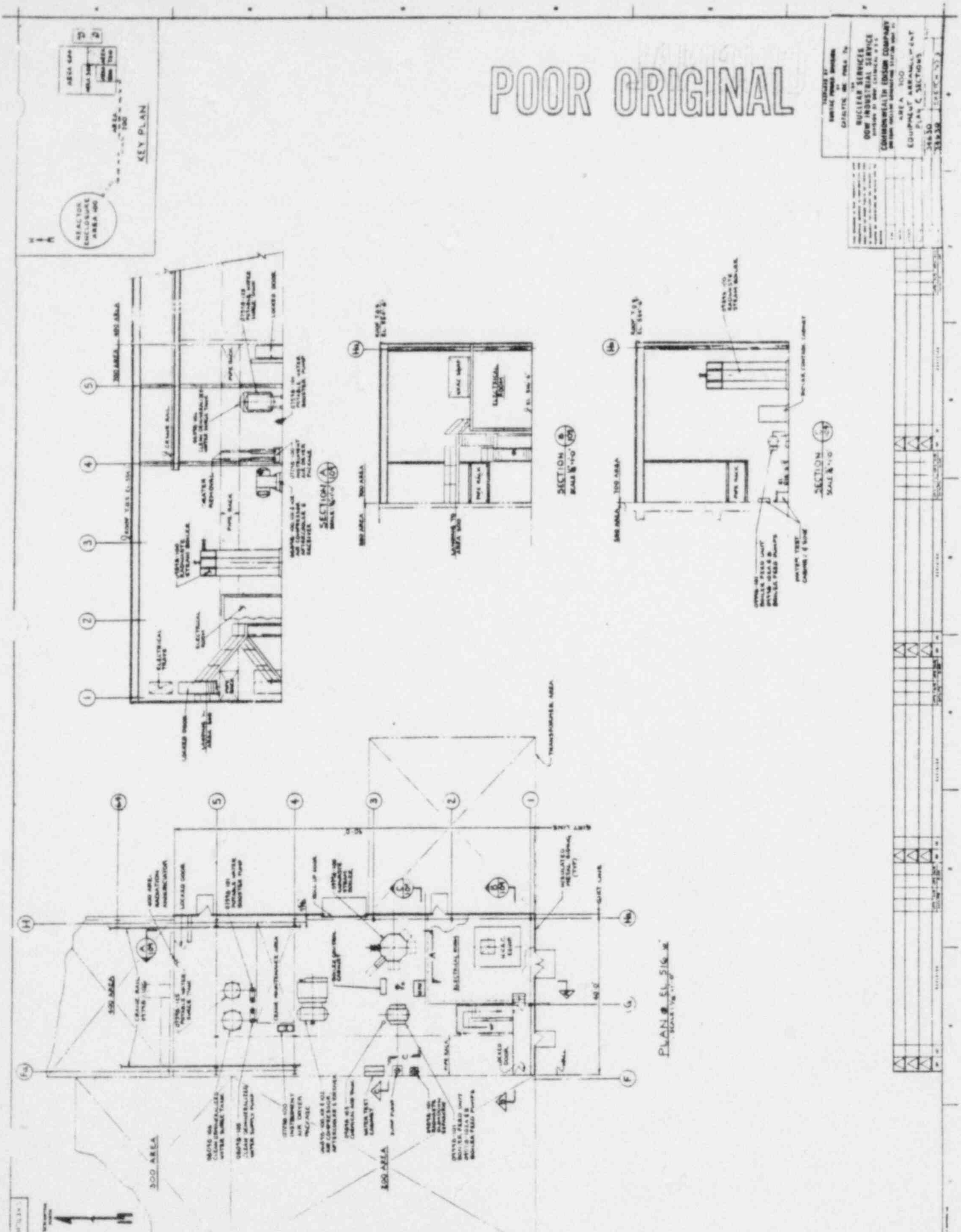

Figure B-9

POOR ORIGINAL

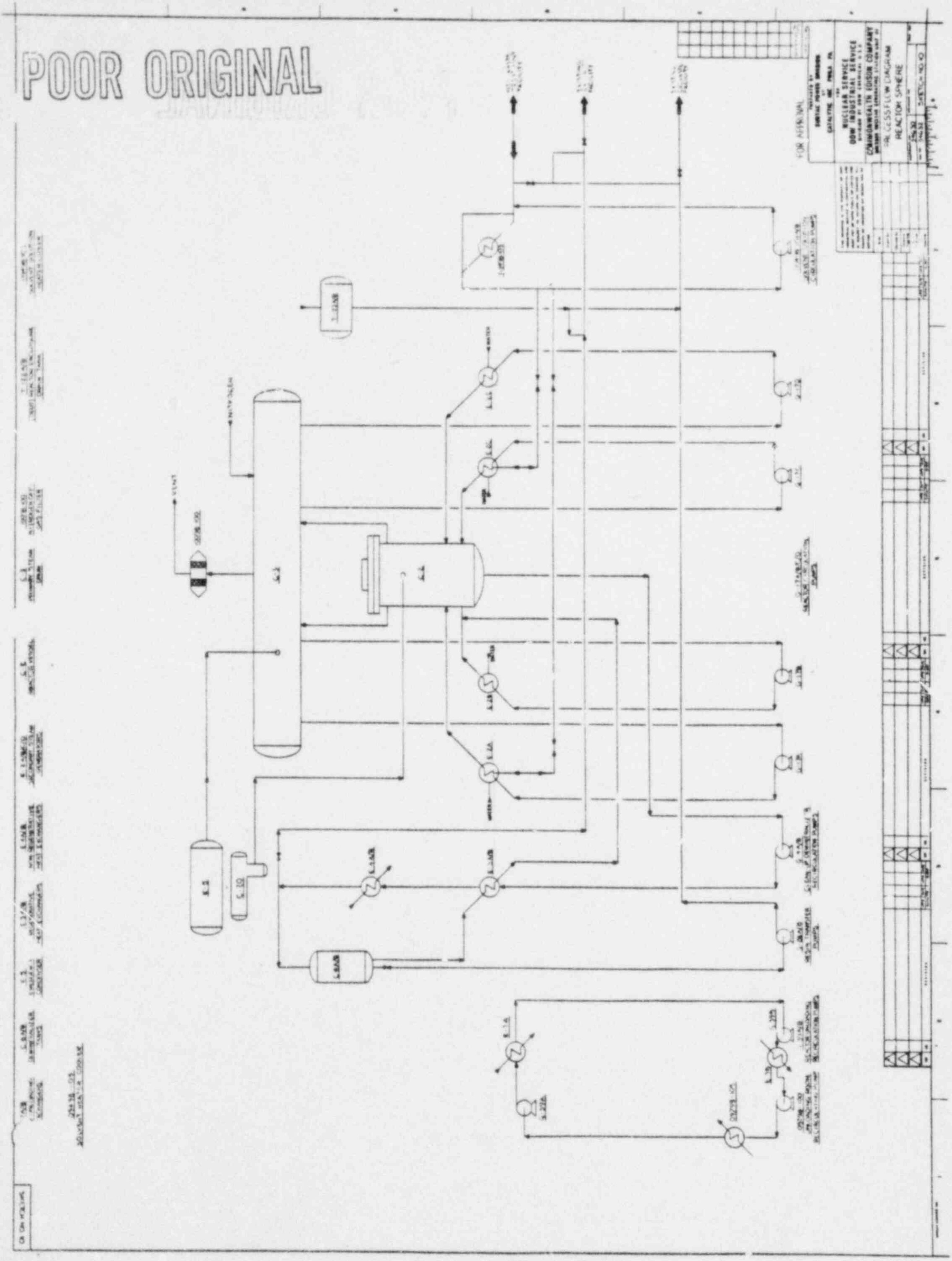

Figure B-10

RADWASTE PROCESS SOLVENT

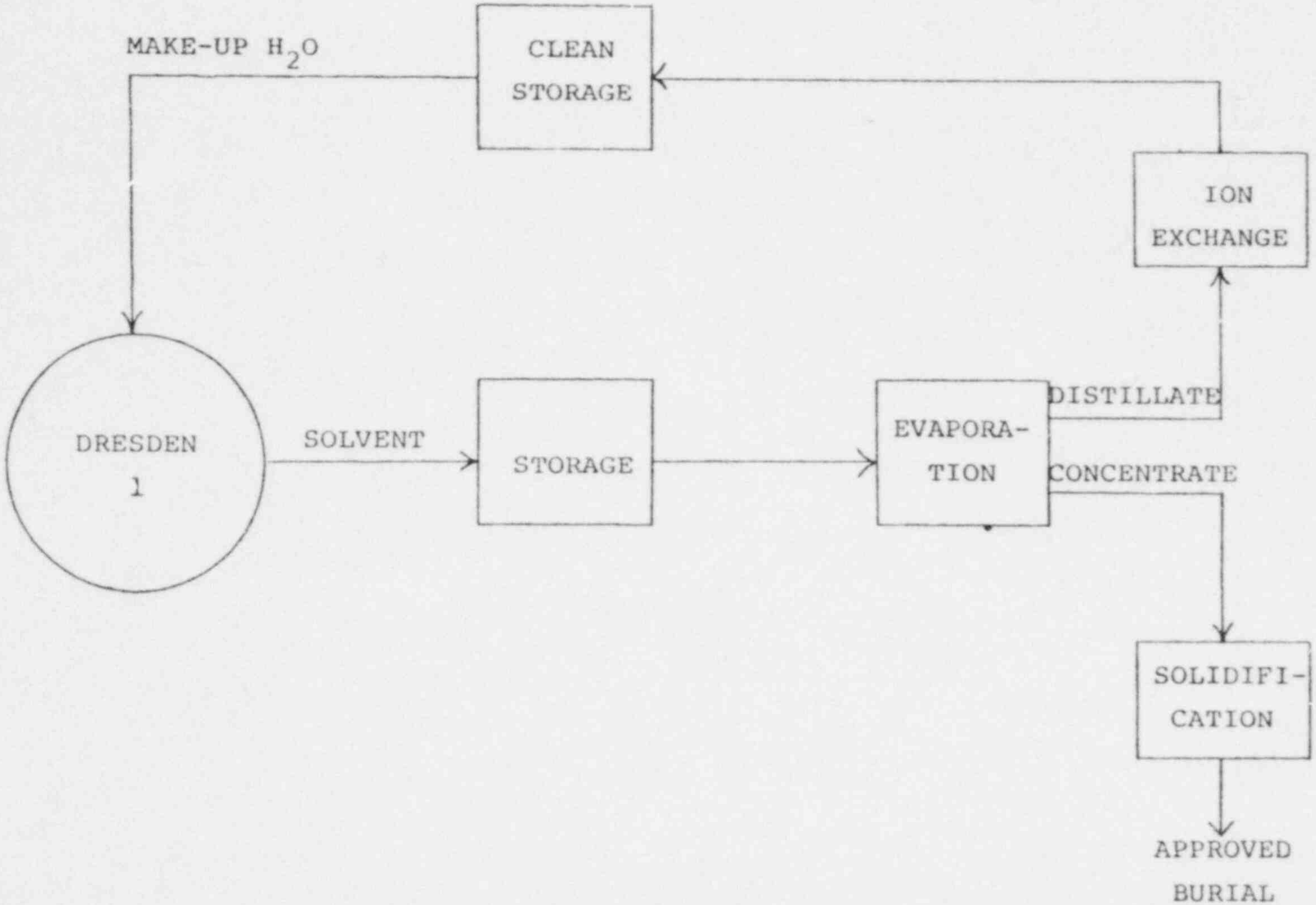

Figure B-11

RADWASTE PROCESS

RINSES AND FLUSHES

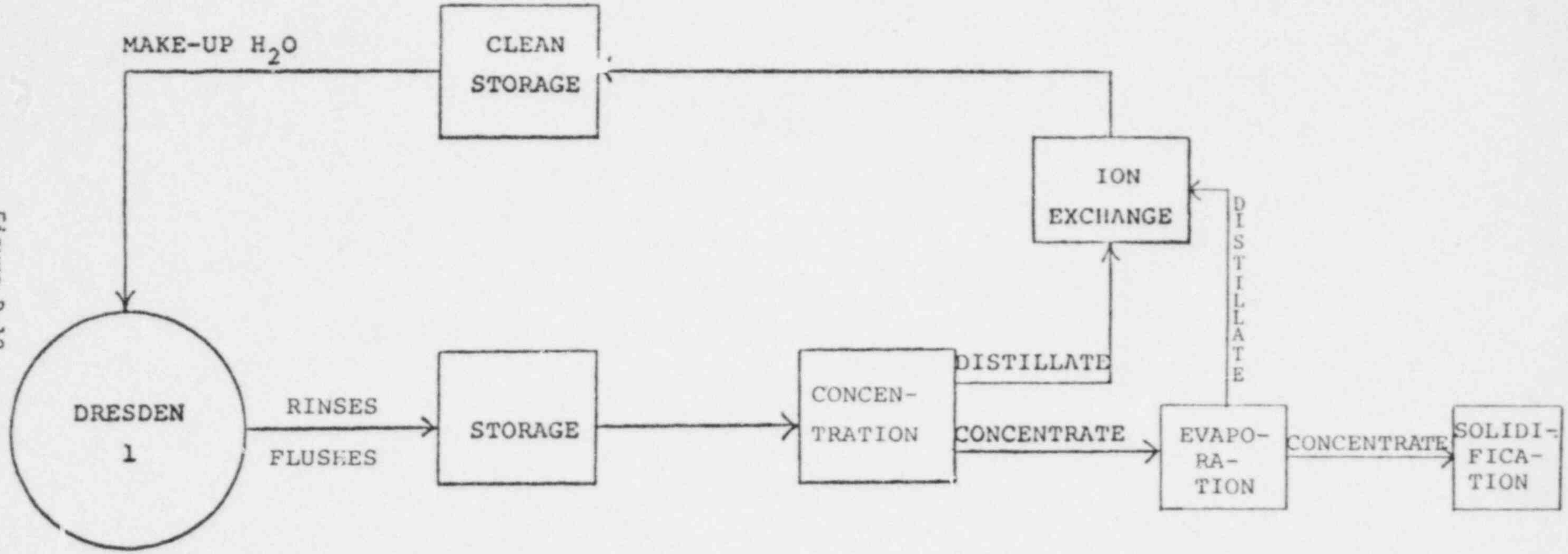

Figure B-12

APPENDIX C

EMERGENCY PLAN CLASSIFICATIONS

TABLE 5.0-1
DESCRIPTION OF TRANSPORTATION ACCIDENT

A. CLASS DESCRIPTION

This class involves an accident involving the transportation of radioactive or other hazardous material to or from a generating station.

B. RELEASE POTENTIAL

Depending on the materials involved and the type of accident, there is a wide range of possible releases, i.e., the accident could be of almost any severity.

C. INITIATING CONDITIONS

A Transportation Accident condition shall exist if any vehicle transporting radioactive materials or nonradioactive hazardous materials to or from a generating station is involved in a situation which could possibly breach or has breached the integrity of a shipping container(s).

TABLE 5.0-2
DESCRIPTION OF UNUSUAL EVENT

A. CLASS DESCRIPTION

This class involves events which indicate a potential degradation of the level of safety at a nuclear station. The situation may or may not have caused damage to the plant, but if there is damage, it does not necessarily require an immediate change in plant operating status.

B. RELEASE POTENTIAL

No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

C. INITIATING CONDITIONS

1. An aircraft crash or other missile impacting onsite from whatever source.

2. Earthquake being experienced at less than or equal to Operating Basis Earthquake (OBE) levels.

3. Explosion causing damage onsite but not affecting plant operation.

4. Fire requiring offsite assistance but not affecting plant operation.

5. Flood being experienced (e.g., rupture of cooling pond dike affecting offsite property).

6. Tornado nearby that could potentially strike the facility.

7. Toxic gas incident observed near or onsite.

8. Security threat which results in the activation of the GSEP Station Group in accordance with the Station Security Plan. (Refer to Section 10.3 for more information with regard to the Station Security Plan).

9. Loss of required systems to the extent that a unit shutdown is required due to a Technical Specifications ACTION statement (such as for ECCS, fire protection systems, etc).

10. Loss of primary coolant indicated or probable due to:

    a. An unplanned initiation of ECCS resulting in injection of coolant; or

    b. Failure of a primary system safety valve to close; or

    c. Exceeding either primary/secondary leakage Technical Specification or primary system leakage rate Technical Specification limit.

TABLE 5.0-2 (CONT)

11. Rapid depressurization of PWR secondary side.

12. A gaseous effluent release greater than the 10CFR20 instantaneous release limits (per 10CFR20.105).

13. A liquid effluent release at levels indicated in Table 5.0-6.

14. Transportation of a radioactivity contaminated injured person to an offsite medical facility.

15. Any other condition of equivalent magnitude to the criteria used to define this category, as determined by the Station Director.

TABLE 5.0-3
DESCRIPTION OF ALERT

A. CLASS DESCRIPTION

This class describes events which involve actual or potential substantial degradation of the level of safety at a nuclear station. An Alert situation may be brought on by either manmade or natural phenomena and can reasonably be expected to occur during the life of the plant.

B. RELEASE POTENTIAL

Offsite doses up to the lower EPA Protective Action Guides (1.0 rem whole body or 5.0 rem thyroid) are possible.

C. INITIATING CONDITIONS

1. Aircraft crash or other missile impacting onsite and affecting plant operation (e.g., requiring a unit shutdown due to an ACTION statement of the Technical Specifications).

2. Earthquake being experienced at levels greater than Operating Basis Earthquake (OBE) levels.

3. Explosion causing damage to facility and affecting plant operation (e.g., requiring a unit shutdown due to an ACTION statement of the Technical Specifications).

4. Fire requiring offsite assistance and affecting plant operation (e.g., requiring a unit shutdown due to an ACTION statement of the Technical Specifications).

5. Flood near design levels.

6. Tornado striking facility or sustained winds near design levels.

7. Toxic gas entry into the facility at life threatening levels but not affecting vital areas.

8. Evacuation of Control Room anticipated or required with control of shutdown systems established from local stations within 15 minutes.

9. Security threat involving contingency events which involve actual or potential substantial degradation of the level of security at the nuclear station.

10. Loss of offsite power to the onsite Class IE distribution systems or all diesel generators inoperable as per the Technical Specifications.

11. Loss of vital DC power for less than 15 minutes.

TABLE 5.0-3 (CONT)

12. Loss of plant shutdown systems:

    a. Loss of all systems capable of maintaining cold shutdown; or

    b. Failure of the Reactor Protection System to initiate and complete a reactor trip which brings the reactor subcritical.

13. Loss of required systems addressed in the Technical Specifications to the extent that an immediate unit shutdown is required.

14. Loss of one of the following three fission product barriers:

    a. Cladding

    b. Reactor Coolant System

    c. Primary Containment

15. Loss of primary coolant indicated by a reactor coolant system leakage increase greater than 50 gpm.

16. Significant primary to secondary leakage for a PWR due to a failure of steam generator tubes.

17. Fuel damage accident with release of radioactivity to containment or fuel handling building.

18. A gaseous effluent release greater than ten times the 10CFR20 instantaneous release limits (per 10CFR20.105).

19. A liquid effluent release at levels indicated in Table 5.0-6.

20. An activity in the containment, if released under worst case meteorological conditions, would result in an offsite dose of greater than 50% of but less than or equal to the lower EPA Protective Action Guides (1.0 rem whole body or 5.0 rem thyroid).

21. Any other condition of equivalent magnitude to the criteria used to define this category, as determined by the Station Director.

TABLE 5.0-4
DESCRIPTION OF SITE EMERGENCY

A. CLASS DESCRIPTION

This class describes events which involve major failures of plant functions needed for the protection of the public.

B. RELEASE POTENTIAL

Offsite doses up to the upper EPA Protective Action Guides (5 rem whole body or 25 rem thyroid) are possible.

C. INITIATING CONDITIONS

1. Aircraft crash or other missile impacting onsite, affecting vital structures, and requiring an immediate unit shutdown.
2. Earthquake being experienced at levels greater than Safe Shutdown Earthquake (SSE) levels with a unit not in cold shutdown or refueling.
3. Explosion causing severe damage and requiring immediate unit shutdown.
4. Fire requiring offsite assistance and requiring immediate unit shutdown.
5. Flood exceeding design levels.
6. Sustained winds exceeding design levels.
7. Toxic gas entry into vital areas at life threatening levels.
8. Evacuation of Control Room and control of shutdown systems not established from local stations within 15 minutes.
9. Security threat involving an imminent loss of physical control of the facility.
10. Loss of offsite power to the onsite Class IE distribution systems and all diesel generators inoperable as per the Technical Specifications.
11. Loss of vital DC power for more than 15 minutes.
12. Loss of all systems capable of maintaining hot shutdown.
13. Loss of two of the following three fission product barriers:
    a. Cladding
    b. Reactor Coolant System
    c. Primary Containment

TABLE 5.0-4 (CONT)

14. Loss of primary coolant

    a. (BWR) reactor coolant system leakage increase greater than 500 gpm; or

    b. (BWR) main steam line break outside containment without isolation; or

    c. (PWR) reactor coolant system leakage increase greater than make-up capacity; or

    d. (PWR) steam line break with greater than 50 gpm primary to secondary leakage and indication of fuel damage.

15. Severe primary to secondary leakage for a PWR due to a failure of steam generator tubes.

16. Major damage to spent fuel in containment or fuel handling building.

17. Effluent monitors detect levels corresponding to greater than 50 mR/hr for ½ hour <u>or</u> greater than 500 mR/hr whole body for two minutes at the site boundary for worst case meteorological conditions.

18. A liquid effluent release at levels indicated in Table 5.0-6.

19. An activity in the containment, if released under worst case meteorological conditions, would result in an offsite dose greater than the lower EPA Protective Action Guides (1.0 rem whole body or 5.0 rem thyroid) but less than or equal to the upper EPA Protective Action Guides (5.0 rem whole body or 25 rem thyroid).

20. Any other condition of equivalent magnitude to the criteria used to define this category, as determined by the Station Director.

TABLE 5.0-5

DESCRIPTION OF GENERAL EMERGENCY

A. CLASS DESCRIPTION

This class involves events which involve actual or imminent substantial core degradation or melting with the likelihood of a related release of appreciable quantities of fission products to the environment. This class is characterized by offsite consequences requiring protective measures as a matter of prudence or necessity.

B. RELEASE POTENTIAL

Doses greater than the upper EPA Protective Action Guides (5 rem whole body or 25 rem thyroid) are possible for the offsite public.

C. INITIATING CONDITIONS

1. Security threat involving a loss of physical control of the facility.

2. Loss of two of the following three fission product barriers with an imminent loss of the third fission product barrier:

   a. Cladding

   b. Reactor Coolant System

   c. Primary Containment

3. Effluent monitors detect levels corresponding to greater than 1 rem/hr whole body at the site boundary under actual meteorological conditions.

4. A liquid effluent release at levels indicated in Table 5.0-6.

5. An activity in the containment, if released under worst case meteorological conditions, would result in an offsite dose greater than the upper EPA Protective Action Guides (5.0 rem whole body or 25 rem thyroid).

6. Any other condition of equivalent magnitude to the criteria used to define this category, as determined by the Station Director.

TABLE 5.0-6

EMERGENCY ACTION LEVELS
FOR RADIOACTIVITY IN LIQUID EFFLUENTS

GSEP CLASSIFICATION	BASIS	EMERGENCY ACTION LEVEL[a]	
		GROSS BETA/GAMMA	TRITIUM
UNUSUAL EVENT	Parallel logic to the NRC EAL for airborne release: T.S. limit < Release ≤ 10xT.S. limit	$1x10^{-7} < C(\mu Ci/ml) \le 10^{-6}$	$3x10^{-3} < C(\mu Ci/ml) \le 3x10^{-2}$
ALERT	Lower limit based on EPA's suggested 10 mrem whole body limit for drinking water alert level[b]	40 < A(Ci) ≤ 2000[c]	500 < A(Ci) ≤ 20,000
	Upper limit based on FDA's preventive level of 500 mrem whole body OR Release 10xT.S.>limit	OR $C(\mu Ci/ml) > 10^{-6}$	OR $C(\mu Ci/ml) > 3x10^{-2}$
SITE EMERGENCY	Lower limit based on FDA's preventive level		
	Upper level based on FDA's emergency level of 5000 mrem whole body	2000 < A(Ci) ≤ 20,000	$2x10^{4} < A(Ci) \le 2x10^{5}$
GENERAL EMERGENCY	In excess of FDA's emergency level	$A(Ci) > 2x10^{4}$	$A(Ci) > 2x10^{5}$

a EALs are measured or estimated to be in discharge water flow.

b Unofficial EPA guidance.

c Assumptions:

- Water dilution of 10^{10} liters (typical for any station).
- Weighted concentration limit of 0.2 μCi/l for FDAs preventive level (assumes a mixture of 1% each I-131, Sr-90; 10% Sr-89; 44% each Cs-134, Cs-137).
- Dose from Cs-134 is twice that from Cs-137 per unit of activity consumed.

NRC FORM 335 (7-77)

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

4. TITLE AND SUBTITLE (Add Volume No., if appropriate) Final Environmental Statement related to Primary Cooling System Chemical Decontamination at Dresden Nuclear Power Station, Unit No. 1.	1. REPORT NUMBER (Assigned by DDC) NUREG-0686 2. (Leave blank) 3. RECIPIENT'S ACCESSION NO.
7. AUTHOR(S)	5. DATE REPORT COMPLETED MONTH October YEAR 1980
9. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) U. S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation Washington, D. C. 20555	DATE REPORT ISSUED MONTH YEAR 6. (Leave blank) 8. (Leave blank)
12. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) U. S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation Washington, D. C. 20555	10. PROJECT/TASK/WORK UNIT NO. 11. CONTRACT NO.
13. TYPE OF REPORT Final Environmental Statement	PERIOD COVERED (Inclusive dates)
15. SUPPLEMENTARY NOTES Pertains to Docket No. 50-010	14. (Leave blank)

16. ABSTRACT (200 words or less) The staff has considered the environmental impact and economic costs of the proposed primary cooling system chemical decontamination at Dresden Nuclear Power Station, Unit 1 located in Grundy County, Illinois. This statement focuses on the occupational radiation exposure associated with the proposed Unit 1 decontamination program, on alternatives to chemical decontamination, and on the environmental impact of the disposal of the solid radioactive waste generated by this decontamination. The staff has concluded that the proposed decontamination will not significantly affect the quality of the human environment. Furthermore, any impacts from the decontaminaiton program are outweighed by its benefits.

17. KEY WORDS AND DOCUMENT ANALYSIS	17a. DESCRIPTORS
17b. IDENTIFIERS/OPEN-ENDED TERMS	

18. AVAILABILITY STATEMENT	19. SECURITY CLASS (This report) Unclassified	21. NO. OF PAGES
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