BEFORE THE UNITED STATES NUCLEAR REGULATORY COMMISSION

In the matter of Required Atomic Energy Act Safety Determination Regarding Disposal of High-Level Radioactive Wastes	)	NRC Docket No.______

PETITION OF THE
NATURAL RESOURCES DEFENSE COUNCIL
FOR A DETERMINATION, PRIOR TO
ISSUANCE OF REACTOR OPERATING
LICENSES, WHETHER RADIOACTIVE
WASTES CAN BE DISPOSED OF SAFELY

EXHIBIT C

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EXHIBIT C

Excerpt from Memorandum of Points and Authorities in Support of Nuclear Regulatory Commission Licensing of the Energy Research and Development Administration's High-Level Waste Storage Facilities Under the Energy Reorganization Act of 1974 Before the Energy Research and Development Administration, pp. 1-40 (July 28, 1975).

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BEFORE THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

In Re Licensing Of The Energy Research And Development Administration's Projects:

(1) Project 76-6-a, Additional Facilities, High-Level Waste Storage, Savannah River, South Carolina;

(2) Project 76-6-b, Additional High-Level Waste Storage Facilities, Richland, Washington; and

(3) Project 74-1-c, Calcined Solids Storage And Plant Safety Improvement, [INEL].

MEMORANDUM OF POINTS AND AUTHORITIES IN SUPPORT OF NUCLEAR REGULATORY COMMISSION LICENSING OF THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION'S HIGH-LEVEL WASTE STORAGE FACILITIES UNDER THE ENERGY REORGANIZATION ACT OF 1974

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I. INTRODUCTION

The Energy Research and Development Administration (ERDA) currently plans to construct in the near future the following facilities for the storage of high-level radioactive waste generated by the Administration:

(1) Additional high-level radioactive waste storage tanks at the Hanford Reservation near Richland, Washington;

(2) Additional high-level radioactive waste storage tanks at the Savannah River Plant near Aiken, South Carolina; and

(3) A set of additional storage bins in concrete vaults to store solidified high-level radioactive waste at the Idaho National Engineering Laboratories (INEL).

Under current ERDA operational plans, these facilities will be used to store the high-level waste for 20 to 200 years or more.

The Energy Reorganization Act of 1974, in a "major enhancement"[1/] of the authority of the Nuclear Regulatory Commission (NRC), provides that NRC "shall . . . have licensing and related regulatory authority" over ERDA "facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration." 42 U.S.C. § 5842(4). The above facilities which ERDA proposes to construct constitute "facilities" covered by section 5842(4) and must, therefore, be licensed by NRC as required by the Act.

II. FACTUAL BACKGROUND

To provide the necessary background for applying section 5842(4), it is necessary to sketch briefly the Atomic Energy Commission's experience with the management of high-level radioactive waste and to set out ERDA's plans for managing the waste in the future.

A. The Atomic Energy Commission And High-Level Radioactive Waste: An Unhappy Record

Nearly all of the accumulated high-level radioactive wastes in this country have been generated by the government during the past 30 years, in the course of three programs:

1/ S. Rep. No. 93-980, 93d Cong., 1st Sess. 59 (1974).

(1) production of plutonium for nuclear weapons, (2) research and development programs, and (3) reprocessing spent fuel from reactors in nuclear powered submarines. Most of these wastes have been generated and stored at three principal AEC and now ERDA facilities: the Hanford Reservation near Richland, Washington; the Idaho National Engineering Laboratory (INEL),[2/] near Idaho Falls, Idaho; and the Savannah River Plant (SRP) near Aiken, South Carolina. The amounts of waste and the conditions of storage vary from facility to facility. Hanford, which was the original AEC production site (operations began in 1944), has approximately 60 million gallons of high-level waste stored in near-surface underground tanks -- approximately three-quarters of the nation's total inventory of high-level radioactive wastes. Savannah River has approximately 18 million gallons of such waste, and INEL about two million gallons.

High-level waste, as it comes from the reprocessing plant, generates substantial heat and is extremely radioactive. If it is not cooled, it will boil for years. Elaborate technology is required to reduce the level of radiation, remove excess heat and decontaminate vapor, while insuring that no radioactivity is released.

The record of the AEC's management of these wastes has not been good. At Hanford, the near-surface tanks in which

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2/ Formerly, the National Reactor Testing Station (NRTS).

high-level and other radioactive liquid wastes have been stored have experienced 20 leaks (six in the past two years), releasing approximately 450,000 gallons of waste to the soil.[3/] One leak which received widespread publicity following its discovery in June 1973, released 115,000 gallons of high-level waste to the soil and went undetected for nearly two months.[4/] The more recent Savannah River Plant, which began operations in 1950, has experienced eight leaks from its tanks.[5/] By contrast, at the much smaller INEL, the AEC has demonstrated that more secure, though more costly, technology can prevent releases of radioactive wastes to the environment.

1. Hanford Reservation

a. History

The history behind the AEC's leaking tanks reflects an

3/ There have also been several leaks from connecting pipes which have released substantially more than 50,000 gallons of waste containing more than 37,000 curies of cesium-137, and thousands of curies of other fission products, as well as significant amounts of plutonium. U.S. Atomic Energy Commission, Draft Environmental Impact Statement, Waste Management Operations, Hanford Reservation, Richland, Washington, Appendix II.1-C, Part 8, at Table II.1-C-27 (Sept. 1974) (WASH-1538) [hereinafter cited as Draft WASH-1538].

4/ U.S. Atomic Energy Commission, Report on the Investigation of the 106 T Tank Leak at the Hanford Reservation, Richland, Washington, July 1973.

5/ According to the government, very little of the waste material leaked to the environment at SRP, because of a secondary barrier. This is in contrast to the leaks at Hanford which occurred in single-walled tanks.

early -- and to some extent a continuing -- priority to minimize costs. At Hanford, the first high-level radioactive liquid wastes were poured into "soft" carbon single-wall steel underground tanks during 1944.[6] More chemically resistant stainless steel was not used for those first tanks at Hanford because it was substantially more expensive and not readily available during the war years.[7] Then, having established what was thought to be a satisfactory storage means -- alkaline slurries in carbon steel tanks -- the system was not changed even though the chemical process waste streams changed dramatically during the early 1950's.[8] During the first decade of operations at Hanford very little thought evidently was given to the long-term waste storage problem. Thus, when new carbon steel tanks were used, "[t]here was no consideration involving subsequent waste handling and treatment because no such methods had been developed."[9]

It was not until 1957 that the development of a long-range waste management program at Hanford was

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6/ General Accounting Office, Observations Concerning The Management of High-Level Radioactive Waste Material, [B-16405], p. 47 (May 29, 1968), [Secret Classification was cancelled December 18, 1970.] [hereinafter cited as GAO 1968 Report].

7/ W. Lennemann, Management of Radioactive Aqueous Wastes From U.S. Atomic Energy Commission's Fuel Reprocessing Operations, Experience and Planning, p. 13 (1972). (Reprinted in Hearings on Nuclear Reactor Safety Before the Jt. Comm. on Atomic Energy, 93d Cong., 1st Sess., Part 1, at 198, 211 (1973).)

8/ Draft WASH-1538, at II.1-20.

9/ Lennemann, supra note 7, at 13.

initiated.[10/] By that time, however, the situation was already rapidly deteriorating. The first tank leak is reported to have occurred in 1958.[11/] There were four more leaks by the end of 1960. The seriously weakened state of some of the high-level waste tanks by 1967 has been described as follows:

> "Analyses of the stresses induced in heated reinforced concrete tank structures have revealed that some of the reinforcing steel is being stressed beyond design limits. While a modification of operating procedure was sufficient to hold the stress within acceptable limits in the nonboiling tanks, current analyses by the Illinois Institute of Technology have revealed that the A, AX and SX structures [containing the selfboiling wastes] are being stressed well beyond accepted design limits." 12/

In 1968, the General Accounting Office concluded that

10/ J. H. Warren, "General Site Description and Waste Management Summary" in R.W. Harvey, Editor, Management of Radioactive Wastes at the Hanford Plant, p. 13 (June 1969). (It has been reported that the development of this long-range plan was perhaps stimulated ". . . by a classified study by the U.S. Geological Survey in 1953 which labeled the waste storage tanks a 'potential hazard' . . . ." Wayne Thompson, "At Hanford: Secrecy, mismanagement, misunderstanding . . . but no danger," The Oregonian (Forum), p. 1 (September 2, 1973.).

11/ The dates of some leakages listed in the AEC's draft environmental statement on Hanford (Draft WASH-1538, supra note 3) differ from the dates for the same tanks in the GAO 1968 Report, supra note 6, as follows:

(1) for 104-U tank, 1960 by GAO and 1958 in EIS;
(2) for 108-SX, 1964 by GAO and 1962 in EIS; and
(3) for 115-SX, 1963 by GAO and 1965 in EIS.

Additionally, GAO lists the volume of the leakage from 113-SX as 35,000 gallons while the leakage is given as 15,000 gallons in the EIS.

12/ P.W. Smith and R.E. Tomlinson, Hanford High Level Waste Management Reevaluation Study, ISO-981 DEL, p. 22 (August 31, 1967) [hereinafter cited as Hanford HLW Reevaluation Study].

". . . Richland was faced with a potentially serious situation with respect to the condition of its existing tanks. The operating contractor has estimated that the expected life of the 20 Richland tanks equipped to accommodate self-boiling wastes is probably no more than 20 years or could be as little as 10 to 15 years. Eleven of the 20 tanks have been in service for 10 years or more. Further, recent studies have cast doubt upon the wisdom of reusing such tanks after they have been emptied, regardless of their age. In this regard, it appears that in the last half of 1969, Richland may be confronted with a situation of having only used tanks available as spare tanks for high-level self-boiling waste storage." 13/

At the beginning of the planning process, the importance of short-term cost considerations in evaluating potential remedial action is clear.

"The developing [waste management] program was largely influenced by a few overriding considerations . . . . The 250,000 tons of contaminated salts now contained in the wastes to be processed provided a strong incentive to develop a process that can be used with low unit cost. Significant quantities of radioactivity are sorbed on the soil outside the tanks, and the removal of these materials to another site would be very expensive -- probably hundreds of millions of dollars. In view of these factors, a low cost means was sought to immobilize the bulk of the wastes onsite."14/

13/ GAO 1968 Report, *supra* note 6, at 12.

14/ Hanford HLW Reevaluation Study, *supra* note 12, at 7 (emphasis added).

One high AEC official has publicly indicated that financial costs were given at least as much importance as safety in appraising alternatives for preventing substantial leaks of high-level wastes to the soil:

> "During the early 1960's, the AEC considered the financial and safety implications of continuing with tank storage of liquid wastes in comparison with conceptual alternatives. However, it was felt that storing the high-level wastes in underground tanks could be continued almost indefinitely under normal conditions without jeopardizing environmental safety provided the stored wastes are transferred periodically to new tanks before the existing tanks begin to show even a minor leak. On the other hand, <u>concentrating these wastes to less mobile residual salts was indicated to be less expensive by annual expenditures than continuing the practice of liquid storage in tanks because of the cost of new generations of storage tanks, including the transfer of liquids from one tank to another</u>. Also, there were certain obvious problems involved in periodically transferring the waste, particularly with moving the sludges in the AEC's alkaline wastes. Furthermore, there is no known way to predict when a waste tank is going to have small leaks and leakage of a single-shell tank invariably results in escape of some radioactivity." 15/

Thus, to reduce the leaks and to maintain low annual (as opposed to cumulative) operating costs, the AEC chose to "solidify" the in-tank wastes through evaporation rather than build new tanks. Before the self-boiling (*i.e.*, more concentrated)

15/ Lennemann, *supra* note 7, at 6 (emphasis added).

liquid wastes could be evaporated to salt cake, however, the primary heat-generating radionuclides cesium-137 and strontium-90 had to be removed to a substantial extent[16/] from the in-tank supernatants and sludges, respectively, whenever possible.[17/]

The decision to evaporate the high-level liquid waste to salt cake produced several other problems. It generated additional waste forms which ERDA labels "terminal liquor," and "interstitial liquid."[18/] These liquids remain after the current waste has been evaporated as far as current technology permits. As a concentrate of the former dilute liquid waste, terminal liquor is far more caustic than earlier liquid waste forms and may result in increased corrosion rates of the tanks in which it is placed. In addition, its extremely caustic composition may result in it migrating more rapidly downward

16/ About 70 to 90% of the cesium and strontium is removed during the fractionization of the high-heat wastes. (C.M. Unruh, A Preliminary Safety Analysis of Near Surface Storage of Radioactive Waste as Salt Cakes, BNWL-1194, p. 2 (January 1970).)

17/ Apparently the sludge from the 15 SX tanks cannot be removed hydraulically due to their leaky and weak condition. (Draft WASH-1538, p. II.1-70) The draft statement is unclear about whether or not a similar situation arises with regard to other tanks. For instance, how many of the 14 tanks that are no longer in use because of suspected loss of integrity are in the SX Tank Farm? (Draft WASH-1538, p. II.1-78)

18/ Rodewald, Campbell, Schuler, Bruns, Salt Cake Retrievability, Technology Development and Demonstration: Planning Document, April 1974, at 11 (ARH-2978) [hereinafter cited as Retrievability Planning Document]

22/

toward the water table if it is accidentally released to the environment. There are also some indications that the moist salt cake exhibits greater pitting corrosion than liquid waste, suggesting an even more rapid deterioration in tanks storing salt cake.[19/]

In sum, a poor choice in terms of long-term management was made when the wastes were initially stored. The long-term storage problem was greatly complicated when the waste management facilities were expanded without adequate forethought about the ultimate disposal of the long-lived wastes. Today what was initially viewed and repeatedly proclaimed as only a temporary storage means -- high-level wastes in near-surface storage tanks -- has become the long-term storage program.

b. Long-Term Storage Plans At Hanford

Testifying on March 6, 1975, in support of ERDA's request for authorization to construct the additional high-level waste tanks at Hanford and Savannah River, Frank Baranowski, the Director of ERDA's Division of Production and Materials Management, introduced his "waste management statement" by stating:

> "I would like to review in general our waste management programs at the three production sites as illustrated in chart 6. Specifically, I will discuss

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19/ Atlantic Richfield Hanford Company Quarterly Report, Waste Management and Transportation Technology Development, October 1974-December 1974, at 31 (Kupfer and Van Slyke eds.) (ARH-ST-110B)

> the interim waste management program and not the long-term program of the Division of Waste Management and Transportation as shown on the right hand side of the chart."[20]

Chart No. 6 placed in the record by Mr. Baranowski[21] is reproduced on the next page of this memorandum. As noted on Chart 6, this chart is taken from the AEC document entitled Plan for the Management of AEC-Generated Radioactive Wastes.[22]

The chart indicates that ERDA's current plan for so-called 'interim' storage at Hanford is "Salt Slurries in Tanks." Further the chart indicates that ERDA's current plan for "long-term storage" at Hanford is "Salt Cake In Existing Underground Tanks." In short, ERDA currently plans to use the requested tanks for storage of high-level radioactive wastes indefinitely.

Indeed, virtually every AEC and ERDA document considering the question confirm that the present -- and perhaps unavoidable -- plan for the long-term storage of the high-level wastes at Hanford is to leave the wastes in the near-surface underground tanks. These documents do recognize that permanent tank

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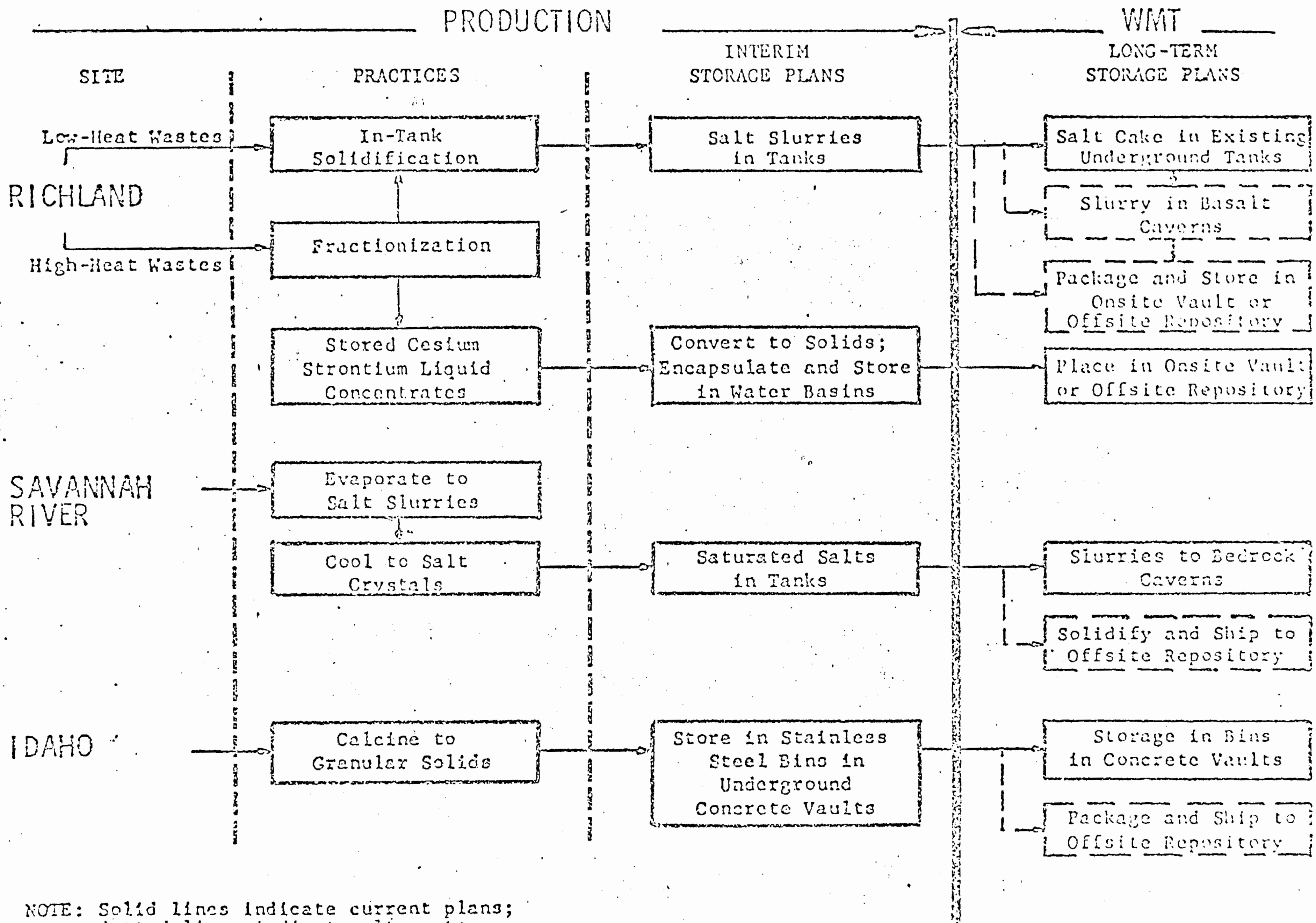
20/ Hearings on ERDA Authorizing Legislation FY 1976 Before the Subcomm. on Legislation of the Jt. Comm. on Atomic Energy, 94th Cong., 1st Sess., Part 3, at 1914 (March 6, 1975).

21/ Id.

22/ U.S. Atomic Energy Commission, Plan for the Management of AEC-Generated Radioactive Wastes, at 42, Figure C-1 (WASH-1202 (73)) (July 1973).

COMPARISON OF PLANS FOR LONG-TERM STORAGE OF HIGH-LEVEL RADIOACTIVE WASTES



NOTE: Solid lines indicate current plans; dotted lines indicate alternates.

SOURCE: Figure C-1, WASH-1202

CHART 6

storage may not prove acceptable and therefore recognize the need for further study. However, long-term tank storage is consistently identified either as the present plan or as the preferred alternative. 23/ Thus, the Draft Environmental Statement written by the AEC on its waste management operations at Hanford stated:

> "The final plan for ultimate disposal of the high-level radioactive waste will emerge only after technology is developed . . . . Currently, four ultimate disposal alternatives are being investigated. All four are in the research and development stage with primary emphasis currently on alternatives 1 and 2.
>
> Alternative # 1 is to leave the high-level radioactive salt waste in the tanks where they are formed. . . .
>
> Alternative # 2 is to leave the salt wastes in the tanks but add various engineered improvements to the storage system to increase the assurance of containment. . . ." 24/

Similarly, a paper prepared by the AEC contractor that operates the high-level waste storage tanks at Hanford for ERDA set out the "long-term storage alternatives for Hanford high-level wastes" in precisely the same fashion, indicating

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23/ "To declare the existing tank storage system adequate for the long term requires a comprehensive understanding of the waste and its present and possible environment. . . . Technology development efforts toward this end have been underway at Hanford for many years. . . . If the results of this analysis and evaluation are negative, consideration of other alternatives will be required." A.E. Smith, ARHCO, "Technology Development for Long Term Storage in Tanks" in Management of High Level Radioactive Wastes at the Hanford Site (compiled and edited by Forsman and Schmidt), pp. 47, 49 (September 1972).

24/ Draft WASH-1538, *supra* note 3, at V-21.

that leaving the wastes in the tanks represented the two preferred "storage modes." (Chart on following page)[25]

In fact, these plans have been largely forced on ERDA by several considerations. ERDA has emphasized that any decision to remove the wastes must confront three significant deterrents: (1) the threat of radioactive exposure to workers removing the wastes, as well as potential releases during removal operations;[26] (2) the technical difficulty of con-

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[25] Schulz and Kupfer, Solidification and Storage of Hanford's High-Level Radioactive Liquid Wastes, at 10 (1974) (Atlantic Richfield Hanford Company, ARH-SA-177). In addition, the document that sets out the current operating program of the contractor charged with responsibility for managing the Richland high-level wastes in the tanks, states:

> "The Atlantic Richfield Hanford Company believes that the presently planned waste storage modes [long-term storage in tanks] have a finite probability of providing adequate long-term protection for the public and the environment. It is even more probable that the stored salt cake . . . will be adequate for up to 100 years. However, in order to make these determinations, considerable technical information must be established." Hopkins and Smith, Technology Program for Storage of Hanford High-Level Radioactive Waste (Revised), at 6 (1973)(Atlantic Richfield Hanford Co., ARH-2881)(emphasis added).

[26] "I might add also that one of the key things that we also have to consider is the exposure to workers who would have to do this job. That has to be balanced against any risk there is to other members of the population because it is all one problem." U.S. Energy Research and Development Administration, Public Hearings on the Draft Environmental Impact Statement-Waste Management Operations-Hanford Reservation-Richland, Washington (WASH-1538), Transcript at 111-112 (Jan. 23, 1975; Portland, Oregon).

TABLE V

LONG-TERM STORAGE ALTERNATIVES FOR HANFORD HIGH-LEVEL WASTES

Order of Preference	Storage Mode	Waste Product Form
I	PRESENT	
	Present tanks	Salt cake
	Water basins	Encapsulated $^{137}CsCl$ & $^{90}SrF_2$
II	ENGINEERED IMPROVEMENTS	
	Present tanks	Salt cake
	Water basins	Encapsulated $^{137}CsCl$ & $^{90}SrF_2$
III	ONSITE REPOSITORY	Immobile silicates
IV	OFFSITE REPOSITORY	Immobile silicates

structing a repository and packaging and shipping the hundreds of thousands of tons of material; and (3) the tremendous cost of these operations estimated at up to a billion dollars or more.[27/]

Most recently, the General Accounting Office in December 1974 filed a Report to the Congress on the AEC's plans for handling high-level radioactive waste. The GAO described the plans as follows:

> "Richland is studying various schemes for further immobilizing its salt cake. Two basic approaches to these studies are: (1) removing the material from the tanks for disposal or storage elsewhere on site or off site and (2) treating the salt cake and leaving it in the tanks for the foreseeable future.
>
> This first approach calls for removing the waste, which may amount to several hundred thousand tons. Studies show that it will have to be mined from the tanks either hydraulically or mechanically. After reviewing these studies, we find both methods risky with respect to releasing contamination and costly. AEC officials said that introducing water into the tanks would dissolve previously self-sealed leaks and that much waste would leak from the tanks. Mechanical mining could release contamination to the atmosphere unless some sort of containment is devised. Either method could be very costly -- according to AEC Richland officials, billions of dollars -- and there is still the question of what to do with the waste

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27/ General Accounting Office, Report to the Congress, *Isolating High-Level Radioactive Wastes From The Environment: Achievements, Problems, And Uncertainties*, at 22 (December 18, 1974) [hereinafter cited as *GAO 1974 Report*]; *Draft WASH-1538*, *supra* note 3, at V-22.

once it is removed from the tanks.

> AEC is also studying methods of adding material to the salt cake and possibly covering the tanks with concrete or asphalt to prevent water, animals, or humans from getting into the tanks and dispersing the wastes. Considering safety, economics, and the fact that 5 to 10 square miles of the Richland site -- containing waste tanks, reactors, burial grounds, etc. -- is so grossly contaminated from past operations that it probably never can be cleaned up, leaving the waste in place, after immobilization, might be a reasonable alternative to cleaning up the site." 28/

In summary, documents and testimony presented by ERDA to Congress and ERDA's own public and internal working documents consistently indicate that ERDA's current plan is to leave the Hanford wastes in the near-surface tanks, subject only to

> "further experimentation, studies, and evaluation. . . leading to a decision on the acceptability of storage of salt cake in present tanks. Studies will include varying time periods over which storage might be acceptable." 29/

c. ERDA's "Interim Plans" And Practical Considerations Establish That The High-Level Waste Will Remain In The Tanks For At Least 20-30 Years

Even if ERDA does not follow through on its plans to store the high-level Hanford waste in the tanks permanently,

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28/ GAO 1974 Report, supra note 27, at 21-22 (emphasis added).

29/ U.S. Atomic Energy Commission, supra note 22, at 17.

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ERDA intends to -- and indeed must -- store the high-level waste in the tanks for at least two to three decades, and probably much longer. This period of time is identified in ERDA's official plan, Chart 6 *supra* at p. 12, as "Interim Storage -- Salt Slurries In Tanks." This minimum period of time is required for two reasons: (1) the technological difficulty of removing the wastes, and (2) the fact that there is no place to put the wastes even if they were removed.

As described above, the Hanford waste tanks have deteriorated to the point that their ability to contain liquid can no longer be assumed. To the contrary, ERDA has repeatedly predicted future leaks as long as liquids remain in the tanks. This judgment led to the decision to evaporate the wastes to salt cake to reduce the number and extent of leaks. However, eliminating the excess liquid has to a great extent also ended ERDA's ability to remove the wastes from the tanks since, as damp solids, the wastes can no longer be pumped hydraulically out of the tanks. Moreover, liquid cannot be reintroduced into many of the tanks to resuspend the wastes since to do so would almost certainly result in substantial leaks to the ground. Indeed, a recent tank leak (April 1975) developed while wastes were being removed from the tank using liquid,[30] and has led to

[30] Letter from O.J. Elgert, Director, Production and Waste Management Programs Division, ERDA Richland Operations Office, to G.T. Stocking, President, Atlantic Richfield Hanford Company, dated April 15, 1975.

a reevaluation of ERDA's sluicing practices at both Hanford and Savannah River.[31/]

Recognizing this fact, ERDA has declared it intends to mine the wastes physically from the tanks.[32/] However, at present the necessary technology does not exist, and the task will be difficult. Most operations will have to be remotely controlled since the penetrating radiation from the wastes precludes the presence of workers. In addition, some type of containment structure will have to be built over the mining operations to ensure that none of the material becomes air-borne. The mining itself poses other problems. The majority of the tanks, buried 6 to 9 feet underground, have a diameter of about 75 feet and range from 34 to 56 feet deep.[33/] The only access to the tanks is through "risers" (pipes) with

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31/ Letter from H.T. Shaw, Vice President-Research and Engineering, Atlantic Richfield Hanford Company, to O.J. Elgert, Director, Production and Waste Management Programs Division, ERDA Richland Operations Office, dated May 30, 1975.

32/ Letter (submitting ERDA staff responses to questions posed at WASH-1538 public hearings) from Richard Hames, Chief Counsel, ERDA Richland Operations Office, to Professor Robert Hamilton, Chairman of the Hearing Board, dated February 26, 1975, Attachment A (Part 2), at page 13, answer No. 8:

> "ERDA does not intend to use conventional sluicing or redisolving techniques to retrieve the salt cake and sludges which will be contained in the tanks at the conclusion of the solidification program. Rather, this material will be retrievable using adaptions and modifications to mining and other standard techniques for excavation and movement of solid materials."

33/ Retrievability Planning Document, supra note 18, at 14.

openings of 42" in diameter or less which extend up from the concrete domes that cover the tanks.[34/]

The physical form of the highly radioactive "salt cake" to be removed from the tanks is quite varied. It contains about 20 to 30 per cent liquid. The wet salt cake has been described as "wet beach sand" or quite sticky "cream-of-wheat-type mush"[35/]. In some tanks the material has crystallized on the tank liners or interior pipes into hard "giant salt 'lollipops'".[36/] Sludges at the bottom of the tanks which contain many of the most hazardous radionuclides range from "a thick, sticky paste-type" material to sludge "as hard as concrete" that can support a pressure of 600 pounds per square inch.[37/]

Furthermore, many tanks have metal airlift circulators (used to cool the tanks) which are long open cylinders, 17-22 feet long and 30" in diameter, installed vertically in the tanks, which will present obstacles to any mining of the tanks. For most tanks, however, ERDA has "no record of the amount and type of metallic objects" in the tanks.[38/] At a minimum the tanks

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34/ *Id.*, at 15.

35/ *Id.*, at 6.

36/ *Id.*

37/ *Id.*, at 9.

38/ *Id.*, at 12.

contain "a wide range of debris. . . includ[ing] rocks, bolts, bottles, pipes, airlift circulators, and gloves."[39/] In addition, the AEC in earlier attempts to stop leaks added about 450,000 tons of diatomaceous earth to several tanks creating about 74,000 gallons of a "mud-like" material. Another tank received about 63 tons of cement in November 1966; AEC documents characterize this tank as "salt-filled."[40/]

At present, removal efforts are complicated by the potential for explosion or fire due to possible chemical reactions between various materials in the tanks.[41/] In addition, ERDA does not know the current "actinide content of various Hanford high-level wastes such as salt cake, sludges, and terminal liquor," and has only initiated efforts within the past year to analyze the problem.[42/]

Moreover, ERDA currently has no information on the extent to which the concrete vaults have been weakened either by radiation or by chemical corrosion. Studies of the effects of the heat generated by the wastes and of the physical weight

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39/ Id., at 6.

40/ Id., at 12.

41/ Atlantic Richfield Hanford Company Quarterly Report, Waste Management and Transportation Technology Development, October 1974 Through December 1974, at 21 (Kupfer and Van Slyke eds.) (ARH-ST-110B).

42/ Id., at 41; Retrievability Planning Document, supra note 18, at 12-13.

the tanks have borne predicted the existence of cracks in the concrete. These cracks have been confirmed by samples taken from the tanks.[43/]

Assuming a mining technique could be devised to remove this material safely, substantial additional technology would be required (1) to solidify and package it for shipment to another location, and (2) to construct an acceptable repository. Neither of these problems has yet been solved. However, the AEC contractor responsible for managing the Hanford high-level waste tanks has devised a timetable for accomplishing these tasks. Specifically, the contractor estimated that, if the timetable for R & D set out was adhered to, it would be possible to begin removing waste in the mid-1990's with relocation to be completed by 2000 A.D.[44/] However, this future estimate is highly conjectural, and, in light of the difficulties and past experience with such projections, probably optimistic. Indeed, the planning document itself--written in November 1973--notes that the timetable it sets out already reflects a two-year slippage from initial dates set out in WASH-1202 issued

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43/ Retrievability Planning Document, supra note 18, at 15.

44/ Hopkins and Smith, Technology Program for Storage of Hanfor High-Level Radioactive Wastes (Revised), at 8, (November 1973) (ARH-2881).

five months earlier in July 1973.[45/]

Moreover, the timetable set out in this planning document assumes the availability of some place to put the wastes if they were removed from the tanks on such a schedule. In this respect ERDA's ability to remove the wastes from the tanks probably depends on the same variables as its plans to remove commercially generated high-level wastes from a retrievable surface storage facility: It must await development of a suitable repository. At present, ERDA has indefinitely suspended its consideration of underground disposal in the basaltic rock near Richland.[46/] In fact, ERDA is currently developing

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45/ Id., at 6, 14:

> "This program follows the general plan of WASH-1202(73), 'Plan for the Management of AEC-Generated Radioactive Wastes.' Several of the decision dates are different due to revised estimates of the required investigation time . . ."
>
> "Document WASH-1202(73) called for a decision in FY 1974 on storage of salt cake in the present as-is. Our plan shows this decision deferred until FY 1976. . . ."

46/ "This alternative has been under investigation, but at the present time the program is inactive." R.E. Isaacson, ARHCO, "Long-Term Storage Alternativs for Hanford High-Level Radioative Wastes" in Management of High Level Radioactive Wastes at the Hanford Site (compiled and edited by Forsman and Schmidt), p. 51 (September 1972). See, also, A.M. LaSala, Jr. and G.C. Doty, USGS, Open-File Report, "Preliminary Evaluation of Hydrologic Factors Related To Radioactive Waste Storage In Basaltic Rocks At The Hanford Reservation, Washington," 1971; and R.C. Newcomb, J.R. Strand and F. J. Frank, USGS Professional Paper 717, "Geology and Ground-Water Characteristics of the Hanford Reservation of the U.S. Atomic Energy Commission, Washington," 1972, p. 48, both of which suggest that due to the potential hazards associated with storing high-level wastes in the basaltic rock at Hanford, substantially more study must be completed to determine the degree of safety involved in this alternative.

only one final disposal technology on a pilot plant basis: a pilot geologic disposal plant for alpha (low-heat) wastes, with no present development of geologic facilities for high-level waste (such as those at Hanford) that include fission products.47/ According to its September 1974 draft EIS on commercial wastes, the AEC estimated that "successful completion of the pilot phase could lead to availability of permanent disposal by two to three decades from now." 48/

There are no grounds for believing that ERDA will be able to develop and demonstrate final disposal facilities for its Hanford waste any sooner than for commercial waste. If anything, in view of the substantially greater difficulties involved in handling the large quantities of weapons-related waste, it is likely that a longer time period will be involved. Therefore, even if ERDA decides to remove the waste at a cost of up to several billion dollars, the wastes must first remain in the tanks for at least two to three decades, and probably longer.49/

47/ Hearings on ERDA Authorizing Legislation FY 1976 Before The Subcomm. on Legislation of the Jt. Comm. on Atomic Energy, 94th Cong., 1st Sess., Part 2, at 1262-63 (February 27, 1975) [hereinafter cited as FY 1976 Waste Management Authorization Hearings].

48/ U.S. Atomic Energy Commission, Draft Environmental Impact Statement, Management of Commercial High Level and Transuranium-Contaminated Radioactive Wastes, at 1.2-18 (September 1974; WASH-1539) (emphasis added).

49/ ERDA officials have suggested that waiting 200 to 300 years might be preferable. See Public Hearings Transcript, supra note 26, at 111 (Statement of Mr. Standerfer).

2. Savannah River Plant

a. History

The Savannah River Plant (SRP), the AEC's second production site, was established in 1950 and today is the primary facility producing plutonium and other special nuclear material for the government's weapons and R & D programs. Three reactors feed two reprocessing plants at SRP, and ERDA projects the continuing production of 4 million gallons of high-level liquid waste each year.[50/] At SRP the AEC also chose to minimize costs by constructing less expensive "mild" (carbon) steel tanks, instead of stainless steel tanks, to store the original wastes. As at Hanford, this decision required the neutralization of the acid waste streams from the reprocessing plant to allow the wastes to be placed in these tanks. Most waste at SRP continues to be generated as an acid, and is made alkaline by adding sodium compound equal to more than 60 per cent of the original waste volume.[51/] In the same fashion as it has at Hanford, the AEC has paid the price for this early decision at SRP in the form of significantly increased volume of wastes, leaking tanks and a waste form that has proved technologically very difficult to solidify in an acceptable form. However, certain improvements were made in the tanks

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50/ U.S. Atomic Energy Commission, Final Environmental Statement, Additional High-Level Waste Facilities, Savannah River Plant, Aiken, South Carolina, at II-1 (August 1974)(WASH-1530).

51/ GAO 1974 Report, supra note 27, at 22.

built at SRP. Built between 1951 and 1956, the original 16 high heat waste tanks are enclosed in concrete vaults with secondary 5 foot high steel pans and utilize cooling coils[52/] to cool the wastes, rather than allowing the wastes to self-boil as at Hanford. Eight single shell tanks without cooling coils were constructed for low-heat wastes.

Despite these improvements, eight of the original 16 high-heat tanks had leaked by mid-1974,[53/] though, with one exception, the secondary containment apparently prevented any major release to the environment. The AEC characterized these leaks as hairline leaks,[54/] although one reached a rate of three gallons per minute -- a deluge that exceeded the capability of the tank's pumps to remove the liquid from the tank's secondary containment. As a result, some 700 gallons over-flowed the five-foot high steel secondary containment into the concrete vault. The AEC estimates "a few tens of gallons" escaped to the soil.[55/] Since at SRP the bottoms of the waste tanks are below the level of the groundwater, the waste that escaped the double containment was released almost directly into the water table.[56/]

52/ U.S. Atomic Energy Commission, Final Environmental Statement, supra note 50, at II-16.

53/ Id.

54/ Id.

55/ Id., at 17.

56/ Id.

Thus, while SRP's record of preventing leaks to the environment from the high-level waste tanks has to date been significantly better than Hanford's, the consequences of a major leak at SRP would be immediately far greater than at Hanford since the radionuclides would move almost immediately into the much-used Tuscaloosa aquifer.

To minimize the potential for leaks, the AEC decided in the 1960's to evaporate SRP's high-level waste to damp salt cake. SRP currently has about 20 million gallons of salt cake, sludge, and liquid[57/] which is stored in existing tanks and will also be stored in tanks to be constructed in the future. SRP has 30 high-level waste tanks, of which 16 are between 19 and 23 years old, and 8 others are between 13 and 17 years old.[58/] Half of the older tanks have already developed leaks. The damp salt cake, which contains about 20-30 per cent interstitial liquid, and the terminal liquor, are more caustic than the dilute liquid waste that they replace.[59/] Whether these materials will result in more rapid pitting and other corrosion is uncertain particularly at SRP where the major heat generators, cesium and strontium, remain in the tanks. Cesium and strontium were not removed because the tanks have cooling coils to reduce the temperature in the tanks. (About ten per cent of the cooling coils

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57/ GAO 1974 Report, supra note 27, at 8.

58/ FY 1976 Waste Management Authorization Hearings, supra note 47, at 1917.

59/ See text accompanying notes 18 and 19, supra.

had developed leaks by 1972; two tanks had more than 50 per cent of their cooling coils out of service.[60/]) Given the condition of the tanks, SRP may also soon lose the ability to retrieve the salt cake hydraulically, forcing it to rely on as yet undeveloped, risky, and costly mining techniques if the wastes are ever to be removed.[61/]

Since the original 16 high heat tanks were built in the early 50's, SRP has constructed or has under construction approximately nine additional high heat tanks.[62/] The AEC had identified stress corrosion cracking as one of the major probable causes of the earlier leaks; therefore, a variety of changes have been made in the design of the new tanks including full stress relief and "other advantages indicated by experience to be desirable."[63/]

The AEC received Congressional authorization to spend $30 million for six more tanks and an evaporator in FY 1975. Due to "potential problems regarding safety features for the

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60/ Lennemann, supra note 7, at 11.

61/ It should be noted that the Legislature in South Carolina is opposed to permanent storage of high-level wastes in South Carolina. See, Report of the Committee to Study the Establishment of Plants or Facilities for the Recovery of Nuclear Fuel and the Storage of Waste Nuclear Material, p. 20 (1972).

62/ U.S. Atomic Energy Commission, Final Environmental Statement, supra note 50, at II-17. Eight low-heat tanks were constructed in 1958-62. Id., at II-16.

63/ U.S. Atomic Energy Commission, Final Environmental Statement, Future High-Level Waste Facilities, Savannah River Plant, at 21 (1973)(WASH-1528).

tanks" and other reasons,[64] the project had to be "rescoped" from the original proposal to build six tanks and an evaporator at a cost of $30 million to a proposal to build only four tanks at a cost of $33 million.[65] As a result of these problems, the AEC undertook a "complete review of the project including potential safety features and several alternatives."[66] Oddly, the final environmental statement for the FY 1975 project, published in August 1974, one month after this "complete review" was undertaken, noted only that the "cost estimate" was "under review," but made no mention of any design changes or potential safety problems.[67] As of the start of 1975, conceptual design was 60 per cent complete on the four tanks remaining in the FY 1975 project, and construction had not begun.[68]

64/ U.S. Atomic Energy Commission, First Semi-Annual Report From AEC to JCAE on "Status of Major Construction Projects Experiencing Significant Variances" as of June 30, 1974, reprinted in Hearings on ERDA Authorizing Legislation FY 1976 Before the Jt. Comm. on Atomic Energy, 94th Cong., 1st Sess., Part 1, at 355, 357 (1975).

65/ U.S. Energy Research and Development Administration, Second Semi-Annual Report, From ERDA to JCAE on "Status of Major Construction Projects Experiencing Significant Variances" as of December 31, 1974, reprinted in Hearings on ERDA Authorizing Legislation FY 1976, Part 1, supra note 64, at 371, 372 (1975).

66/ U.S. Atomic Energy Commission, First Semi-Annual Report, supra note 64.

67/ Final Environmental Statement, Additional High-Level Waste Facilities, Savannah River Plant, Aiken, South Carolina, at I-1 to I-2 (1974) (WASH-1530).

68/ U.S. Energy Research and Development Administration, Second Semi-Annual Report, supra note 65.

Since Savannah River will be generating substantial amounts of waste in the future, Savannah River's continued reliance on alkaline waste storage in carbon steel tanks, with subsequent evaporation of high-level liquid waste to salt cake may not be the safest and most desirable course of action.[69/] As one high AEC official noted in 1972:

> "Longer tank service, significantly smaller quantities of waste, better feed for further treatment, and cost analyses all indicate that, for today's fuel reprocessing technology, acid waste storage [in stainless steel tanks] is preferrable."[70/]

The General Accounting Office has also pointed out that calcine solidification, which can be utilized only with acid waste, has three substantial advantages over ERDA's current salt cake storage program: "(1) expected retrievability from storage bins, (2) convertibility to a more insoluble form under present technology, and (3) reduction of volume involved."[71/] And the U.S. Environmental Protection Agency has expressed serious reservations with continued alkaline waste storage:

> "In our opinion, the Commission's experience with the storage of alkaline wastes argues for developing a more positive approach to the management of wastes before circumstances require

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69/ See, EPA Comments in U.S. Atomic Energy Commission, Final Environmental Impact Statement, supra note 50, at C-16, et seq.

70/ Lennemann, supra note 7, at 13.

71/ GAO 1974 Report, supra note 27, at 22.

> additions to the Savannah River storage system in order to maintain essential production capability.
>
> Thus we continue to express our strong concerns with respect to maintaining current waste management practices indefinitely, particularly where there appear to be other practical, although costly, alternatives available." 72/

However, SRP has recently decided -- based primarily on economics -- to continue to rely on alkaline waste stored in carbon steel tanks through the year 2000:

> "This conclusion was based principally on economics, considering plant operations through the year 2000. The cost of a modified alkaline system was estimated at about $1.5 billion, whereas the most competitive acid system was estimated to cost about $1.8 billion. A combination acid and alkaline system was estimated to cost about $2.1 billion." 73/

b. Future Plans

Chart 6 introduced in Mr. Baranowski's 1975 testimony before the JCAE and reproduced at page 12 of this Memorandum, reflects that "interim storage" plans for SRP are "saturated salts in tanks." It reflects that "long-term storage plans" are "slurries to bedrock caverns." Unfortunately, for the accuracy of Mr. Baranowski's testimony, the AEC indefinitely

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72/ EPA Comments in U.S. Atomic Energy Commission, Final Environmental Impact Statement, supra note 50, at C-17.

73/ GAO 1974 Report, supra note 27, at 23. See also Crandell and Porter, Economic Comparisons of Acid and Alkaline Waste Systems at SRP, July 31, 1974 (DPST-74-95-37) (Secret classification cancelled June 18, 1975).

deferred its bedrock disposal plans in 1972,[74/] and the 1973 revision of the Figure which he reproduces in his testimony reflected this change in plans.[75/] The current chart, reproduced on the following page of this Memorandum, which in all other respects reflects plans identical to the earlier document reproduced by Mr. Baranowski, shows three "alternatives," but no "current plan" for "long-term" storage of SRP's high-level waste, illustrating to some extent the difficulty the AEC has had in devising acceptable long-term solutions. The three alternative plans are (1) "Wastes to bedrock vaults;" (2) "Solidify and ship to offsite repository;" and (3) "Solidify and store in onsite repository."

Each of these alternative possibilities faces formidable difficulties. As noted above, in 1972, the AEC postponed indefinitely its plans to develop the first alternative of placing the waste in bedrock vaults below the SRP. This decision was reached in the wake of a May 1966 report by a National Academy of Sciences-National Research Council Committee that concluded:

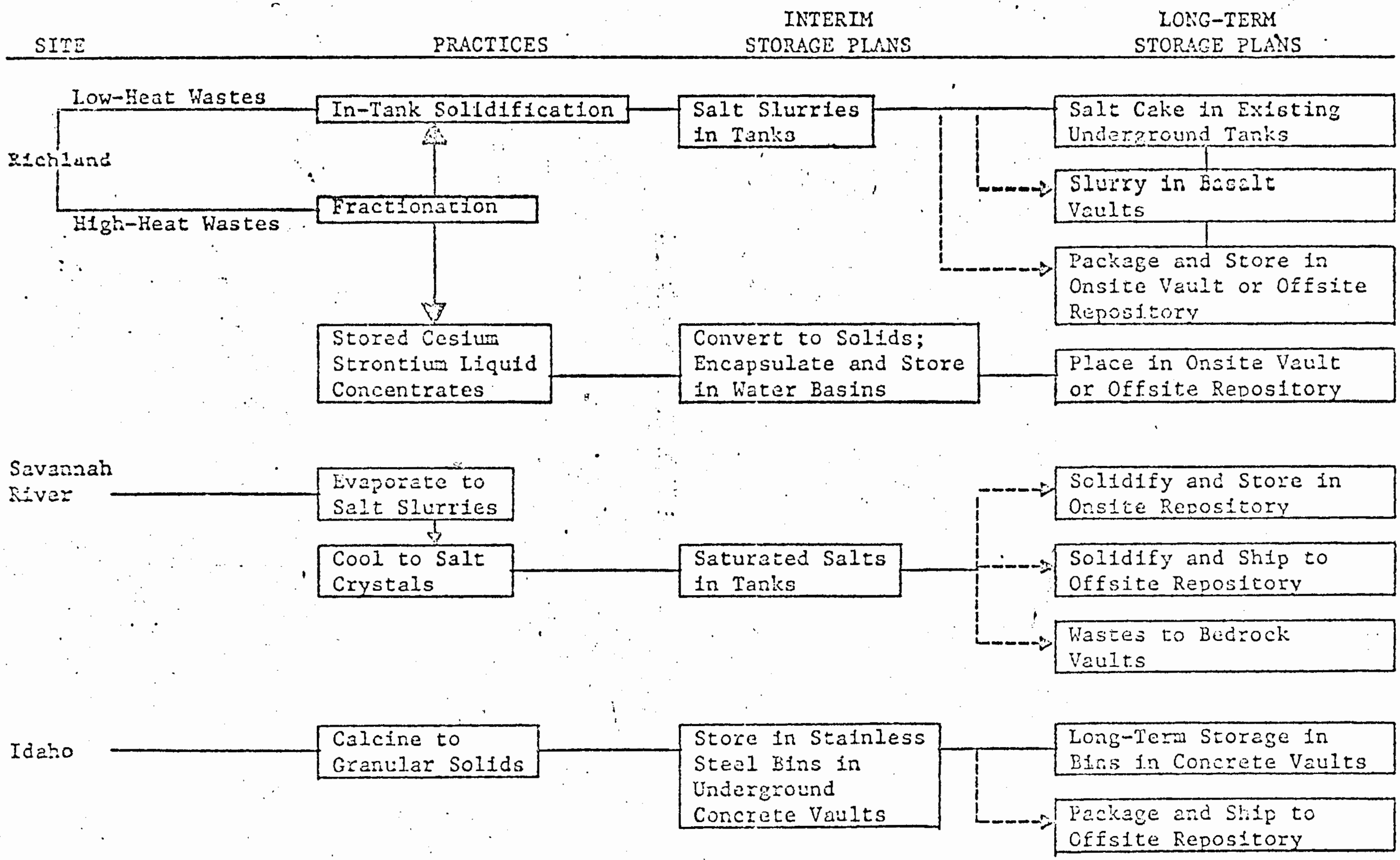
> "The Committee recognizes with appreciation the intensive and intelligent work of the SRP staff on the problems connected with the bedrock-storage concept, but is still dubious about its demonstrated safety. The placement of high-level wastes 500 or 1000 feet below a very prolific and much-used aquifer is in its essence dangerous and will certainly lead to public controversy. Any demonstration of its safety must leave no shadow of doubt. . . ."
>
> "In summary, it can be seen that there is doubt that it will be possible

74/ U.S. Atomic Energy Commission, supra note 22, at 22.

75/ Id., at 42, Figure C-1.

FIGURE C-1

COMPARISON OF PLANS FOR LONG-TERM STORAGE
OF HIGH-LEVEL RADIOACTIVE WASTES



NOTE: Solid lines indicate current plans; dotted lines indicate alternates.

> to prove safety of the proposed bed-rock-storage system for high-level liquid or soluble wastes. Acting on the views of the majority of the Committee members, and still recognizing the existence of many uncertainties, the Committee recommends that investigations toward bedrock storage at SRP be discontinued."[76]

Despite further NAS studies that recommended further investigation,[77] the AEC indefinitely deferred investigation of the bedrock concept.[78]

The alternative of shipping the wastes off-site cannot become operational until ERDA develops an off-site repository judged safe for permanent disposal and the development of technology to retrieve, solidify and transport the salt cake. The most optimistic timetable for the development of such a facility appears to be two to three decades under ERDA's present budget and R & D plans.[79]

The third alternative listed in WASH-1202(73) for SRP high-level waste is to solidify and store in an on-site reposi-

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[76] National Academy of Sciences-National Research Council, Division of Earth Sciences, Committee on Geologic Aspects of Radioactive Waste Disposal, "Report to the Division of Reactor Development and Technology, United States Atomic Energy Commission," at 42, 75 (May 1966).

[77] National Academy of Sciences-National Research Council, Committee on Radioactive Waste Management, "An Evaluation of the Concept of Storing Radioactive Wastes in Bedrock Below the Savannah River Plant Site" (1972).

[78] U.S. Atomic Energy Commission, Final Environmental Statement, *supra* note 50, at V-1; U.S. Atomic Energy Commission, Plan, *supra* note 22, at 22.

[79] *See* text accompanying notes 47-49.

tory. At the outset, it is not clear that such an alternative will be politically viable. South Carolina officials have consistently insisted that SRP should not become a repository for extended storage of either government or commercial high-level waste.[80/] Indeed, they specifically opposed a surface storage facility for commercial wastes precisely comparable to the on-site storage suggested here. Moreover, in view of ERDA's recent reassessment of the RSSF for commercial wastes, it is difficult to understand why a similar facility would be acceptable for SRP's high-level wastes. However, assuming objections could be overcome, the official timetable for the solidification and storage in a near-surface facility at SRP estimates that the waste would not be finally removed from the tanks until the year 2000 A.D.[81/] Significantly, long range production forecasts at SRP also assume the waste will remain in the tanks at least through 1999.[82/]

Thus, even if the AEC's most optimistic timetable for developing this third alternative were adhered to, the high-level waste will remain in the SRP tanks for at least 25 years.

80/ See U.S. Atomic Energy Commission, Final Environmental Statement, supra note 50, at C-23 (letter from South Carolina Governor); GAO 1974 Report, supra note 27, at 35.

81/ U.S. Atomic Energy Commission, Final Environmental Statement, supra note 50, at V-1.

82/ U.S. Atomic Energy Commission, Final Environmental Statement, Future High-Level Waste Facilities, Savannah River Plant, Aiken, South Carolina, April 1973, at 27 (WASH-1528).

In short, the "interim storage" period during which SRP's high-level waste will be kept in the SRP tanks will be at least 20-25 years and in all likelihood, considerably longer than that.

3. Idaho National Engineering Laboratory

a. History

By contrast with the Hanford Reservation and the Savannah River Plant, the INEL has utilized stainless steel tanks to contain acid high-level waste since it started reprocessing spent nuclear fuels in 1953. The INEL, which generates a much smaller volume of waste (primarily from processing spent fuel from naval and research reactors), began in 1963 calcining the liquid waste into granular solids which are placed for storage into stainless steel bins enclosed in buried concrete vaults. The solid material produced at INEL's fluidized-bed calcination process is a dry, granular solid which is transported to the storage bins pneumatically. This solid form suffers one major disadvantage: it is relatively leachable (soluble). This fact requires that the highly radioactive material "be isolated from aqueous sources which could possibly reach man's environment."[83/]

At present there exist seven bins of 1/4 inch stainless

[83/] U.S. Atomic Energy Commission, Final Environmental Statement, Calcined Solids Storage Additions, National Reactor Testing Station, Idaho, April 1973, at 6 (WASH-1529).

steel plate; they are twelve feet in diameter, and range from 53 feet to 61 feet in height. The bins themselves are set in a two-foot thick concrete vault 50 feet in diameter and 67 feet high -- 50 feet underground and 17 feet above.[84/]

The storage bins are designed to be cooled by natural convection. Portions of the bin walls may reach temperatures of 400°F, and the maximum temperature at the center of the bins is designed to be no more than 1480°F. Some potential for the solids "melting" together (sintering or agglomerating) exists if the temperatures of the waste were to reach 1700°F, in addition to possible volatilization of some radionuclides. To date, the AEC and ERDA have reported no leaks of high-level waste either from the stainless steel tanks storing liquid high-level waste or from the stainless steel bins containing the solidified high-level waste. The current seven bins at INEL are expected to be full in 1976 with a total of about 78,000 cubic feet of calcined solids containing about 30 million curies of cesium-137, 30 million curies of strontium-90, and 30 thousand curies of plutonium isotopes.[85/]

In 1974, the AEC proposed to build additional calcined storage bins -- Project 74-1-c -- to hold an additional 40,000[86/] cubic feet of calcined solids which would satisfy storage needs

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84/ Id., at 8.

85/ Id., at 3.

86/ Id., at 4. However, the AEC's construction project data sheet submitted to Congress in support of its budget request for Project 74-1-c indicated that the storage capacity of the new bins would be "limited to approximately 35,000 cubic feet." Hearings on AEC Authorizing Legislation, FY 1974 Before The Jt. Comm. on Atomic Energy, 93d Cong., 1st Sess., Part 1. at 626 (1973).

through 1979. The AEC proposed building the bins similar to the current facilities, except that the new bins would be of a smaller diameter (probably ten feet) to allow storage of calcine with a higher decay-heat generation. The AEC originally estimated that the life of the bins would be 500 years,[87/] but revised its estimate to "several hundred years" when the Department of the Interior objected that "since wall temperatures of 200°C are expected, this estimate of tank lifetime is much too great."[88/]

As with the Savannah River Plant's high-level waste storage tanks, however, severe difficulties developed, and the bins will not apparently be built according to their original specifications. The AEC advised the Joint Committee on Atomic Energy at the start of 1975 that changes in bin design and calcine temperatures, among other factors, had led to reducing by more than 50 per cent the projected additional storage space to be constructed to about 17,000 cubic feet;[89/] even at this reduced level, the AEC requested an additional half million dollars to construct the project. As of the start of 1975, no construction work had been performed, and design work was about 35 per cent complete.[90/]

87/ U.S. Atomic Energy Commission, Draft Environmental Statement, Calcined Solids Storage Additions, National Reactor Testing Station, Idaho, December 1972, at 9 (WASH-1529).

88/ U.S. Atomic Energy Commission, Final Environmental Statement, *supra* note 83, at B-27.

89/ U.S. Energy Research and Development Administration, Second Semi-Annual Report, *supra* note 65, at 375.

90/ *Id.*

b. Future Plans

ERDA's current plans for storing the high-level calcined solids at INEL are plainly reflected in WASH-1202(73), and as noted above, were introduced in testimony before the JCAE in March of this year by ERDA in support of its FY 1976 budget request. Specifically, ERDA's plans for "interim storage" are "Store in Stainless Steel Bins in Underground Concrete Vaults;" current plans for "long-term storage" are "Storage in Bins in Concrete Vaults."[91/] As at Hanford, therefore, ERDA's present plan for the proposed bins is to use them to store the high-level waste indefinitely.

Moreover, ERDA's plan to store these high-level wastes in these bins for centuries is reflected consistently in AEC documents and Congressional testimony. Thus, the environmental statement prepared on the proposed additions to the calcined waste storage facilities notes that the design life for the bins is "several hundred years," and that they "provide long-term, interim isolation of solid wastes from the environment." [92/] In its Plan for the Management of AEC-Generated Radioactive Wastes, the AEC explicitly amplified and explained its current plan to leave the calcined solids in their present bins as follows:

> "The calcine in its present near-surface location may prove acceptable for long-term storage. The storage facilities

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91/ See page 12 of this Memorandum.

92/ U.S. Atomic Energy Commission, Final Environmental Statement, supra note 83, at 24, reprinted in Hearings, supra note 86, Part V, at E.30.

> are expected to retain their integrity for 300-500 years. Site characteristics are favorable for the isolation of wastes from man's environment. . . . The alternative under consideration is long-term offsite storage in a Federal repository.
>
> Further studies and evaluations will be made to supplement the available technical and economic bases for a decision on long-term storage in the present vaults." 93/

In testimony submitted to the Senate Government Operations Committee while it was considering the Energy Reorganization Act of 1974, Dixy Lee Ray, then chairman of the AEC, described the Idaho waste storage plans as follows:

> "At the Idaho Chemical Processing Plant, waste is solidified to a calcine form using the fluid bed calcine process. The calcine waste form is a dry stable solid stored in specially designed stainless steel bins located inside concrete vaults underground at the Idaho site. This storage is expected to be satisfactory for an extended period."94/

The construction project data sheet submitted by the AEC to the Joint Committee on Atomic Energy for the calcined storage facility specifically justified the need for the project on the ground that it would assure isolation from the environment "with minimal reliance on perpetual maintenance and surveillance."95/

93/ U.S. Atomic Energy Commission, *supra* note 22, at 23.

94/ *Hearings on S. 2135 and S. 2744 Before the Subcomm. on Reorganization, Research and Int'l Organizations of the S. Comm. on Government Operations*, 93d Cong., 2d Sess., at 343-44 (1974).

95/ *Hearings on AEC Authorizing Legislation FY 1974 Before the Jt. Comm. on Atomic Energy*, 93d Cong., 1st Sess., Part 1, at 626 (1973) (emphasis added).