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REPORT BY THE
Comptroller General
OF THE UNITED STATES

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Cleaning Up Commingled Uranium Mill Tailings: Is Federal Assistance Necessary?

On October 19, 1978, Senator Clifford P. Hansen, as ranking minority member of the Senate Committee on Energy and Natural Resources, asked GAO to determine whether Federal assistance should be given to operating mill owners that have processed uranium for sale to both Government and industry and, thus, generated residual radioactive wastes. The wastes generated for both Government and commercial use are called "commingled" uranium mill tailings.

GAO recommends that the Congress provide assistance to active mill owners to share in the cost of cleaning up that portion of the tailings which were produced under Federal contract. Further, GAO believes that the Congress should also consider having the Federal Government assist those mills who acted in good faith in meeting all legal requirements pertaining to controlling the mill tailings that were generated for commercial purposes and for which the Federal Government is now requiring retroactive remedial action. At the same time, the Congress should make sure that this action establishes no precedent for the Federal Government assuming the financial responsibility of cleaning up other non-Federal nuclear facilities and wastes, including those mill tailings generated after the date when the Federal Government notified industry that the tailings should be controlled.



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Report
EMD-79-29
FEBRUARY 5, 1979





COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

February 5, 1979

B-164052

The Honorable Mark O. Hatfield
Ranking Minority Member
Committee on Energy and Natural
Resources
United States Senate

Dear Mr. Hatfield:

On October 19, 1978, former Senator Clifford P. Hansen, on behalf of the minority members of the Senate Committee on Energy and Natural Resources, asked that we study certain issues pertaining to so-called "commingled" uranium mill tailings. Commingled uranium mill tailings are the sand-like radioactive wastes produced as a result of the processing of uranium for both Government and commercial purposes.

In response to the request and subsequent discussions with Committee staff, this report primarily addresses the need for the Federal Government to assist active uranium mill owners in cleaning up commingled uranium mill tailings. Other questions asked by Senator Hansen are also discussed in the report.

Pursuant to discussions with the office of the Senate Committee on Energy and Natural Resources, we did not seek agency comments on this report. We are sending a copy of this report to the Chairman of the Committee. We plan to send copies to other interested parties and make copies available to others upon request.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Thomas A. Staska".

Comptroller General
of the United States

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ABBREVIATIONS

DOE	Department of Energy
GAO	General Accounting Office
NRC	Nuclear Regulatory Commission



COMPTROLLER GENERAL'S REPORT
TO THE HONORABLE MARK O. HATFIELD
UNITED STATES SENATE

CLEANING UP COMMINGLED
URANIUM MILL TAILINGS:
IS FEDERAL ASSISTANCE
NECESSARY?

D I G E S T

Uranium mill tailings are the sand-like radioactive wastes produced as a result of processing raw uranium for eventual use in nuclear weapons or nuclear powerplants. Since the 1940s, about 35 privately-owned mills, of which 12 are still in operation, have produced and sold uranium to the Federal Government for use in the Manhattan Engineering District and Atomic Energy Commission programs. As of December 31, 1977, the total amount of uranium mill tailings in the United States was 144.5 million tons. Uranium mills are either licensed to operate by the Nuclear Regulatory Commission or by States having agreements with the Commission. (See p. 5.)

In our June 20, 1978, report entitled "The Uranium Mill Tailings Cleanup: Federal Leadership at Last?" (EMD-78-90), we recommended to the Congress that the Federal Government should take the lead in cleaning up 25 million tons of tailings at 22 inactive uranium mills. (See p. 1.)

Subsequently, the Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604) which authorizes the Federal Government, through the Department of Energy, to assist in cleaning up the abandoned uranium mill tailings at 22 inactive mill sites in the United States. Virtually all of the abandoned tailings were produced as a result of the Federal Government's atomic energy programs. The act does not, however, authorize the Federal Government to financially assist active mills. (See p. 1.)

On October 19, 1978, Senator Clifford P. Hansen, on behalf of the minority members of the Senate Committee on Energy and Natural Resources, asked GAO to determine, in

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essence, whether Federal assistance should also be provided to active mills to clean up the mill tailings that were generated as a result of processing uranium for both Government and commercial uses--the so-called "commingled" uranium mill tailings. (See p. 2.)

A BACKGROUND ON COMMINGLED URANIUM MILL TAILINGS

Of the 19 active mills in the United States, 12 have generated tailings as a result of processing uranium for both the Federal Government and private industry. Seven have generated tailings as a result of processing uranium for industry only. As of December 31, 1977, there were 99 million tons of commingled tailings. Of these, 53.7 million tons (54 percent) were produced under contract with the Federal Government and 45.3 million tons (46 percent) were produced for commercial purposes. The majority of these tailings are in an unstabilized ¹/ _{condition, primarily because the mills are still in operation. (See p. 5.)}

Until recently, the tailings were believed to be of such low radiation that they were not considered to be harmful to the public. As a result, the tailings were often left in uncontrolled piles. Recent concern about the possible adverse effects of low-level radiation over long periods of time, however, has served as an impetus for various organizations to seek ways to prevent the tailings from causing any harm to the public. (See p. 1.)

During our review GAO learned that:

--The cost of cleaning up all of the tailings at the 12 active mill sites is highly uncertain. According to preliminary Nuclear Regulatory Commission estimates, the cost of cleaning up all of the tailings

¹/Stabilization may be broadly defined as decontamination and reclamation of the mill site.

to be generated at the 12 sites could range from \$4 million to \$315 million using current technology. Thus, the proportionate cost of cleaning up only the tailings that were generated under Federal contract could range from about \$2 million to \$129 million. Of course, costs will vary for each mill depending on the type of remedial action taken; but even in the most expensive case, they should still be less than 1 percent of the price of the uranium product. The Department of Energy has estimated that cleaning up all of the tailings could cost roughly \$150 million. (See p. 11.)

- No provisions were incorporated in the original contracts with the owners of the active sites, with one possible exception, regarding the responsibility for cleaning up the tailings. (See p. 7.)
- The Federal Government has not paid any funds to the owners of the active mills for stabilization of the tailings. (See p. 7.)

SHOULD THE CONGRESS PROVIDE ASSISTANCE IN CLEANING UP COMMINGLED TAILINGS?

Only by considering a broad range of social, economic, political, and technical factors, can reasonable decisions regarding national energy policy be made. Surely, this is true in deciding whether the Federal Government should assist active mill owners in cleaning up commingled uranium mill tailings. In making this decision, GAO believes that the following factors are most important:

- To what extent do the mill tailings constitute a hazard to the public's health and safety?
- Is the mill tailings cleanup program necessary for nuclear power to become a substantial source of energy for the future?
- Who is responsible for creating the mill tailings situation?

--How much will the cleanup effort cost?

--Are adequate cleanup technologies presently available?

--What is the relationship of the commingled mill tailings cleanup program to other nuclear facilities that may eventually need to be cleaned up?

Cleaning up all of the commingled tailings would have the advantages of reducing a possible health hazard and taking another step toward resolving some of the problems of safely disposing of radioactive wastes --a barrier preventing the United States from placing greater reliance on nuclear power as a future energy source. (See p. 14.)

Offsetting these advantages, however, are some strong disadvantages. The cleanup costs could go as high as \$315 million using current technology. Further, the cleanup program could be considered as an additional precedent for cleaning up other nuclear facilities--a far more costly endeavor. This is extremely important because the question of who should pay for cleaning up nuclear facilities has not yet been fully considered, primarily because very little decommissioning of these facilities has been done to date. (See p. 14.)

In GAO's view, the most significant factor in favor of providing Federal assistance in cleaning up commingled tailings pertains to the Federal Government's role in creating the mill tailings situation. The mill owners apparently acted in good faith in carrying out their responsibilities in meeting contract provisions and Federal regulations. Unfortunately, like the Federal Government, they did not recognize that the tailings were a potential health hazard and did not provide for their control. Now, the Federal Government is requiring the mill owners to clean up all of the tailings, including those generated before the hazard was recognized. We believe it is unfair for

(industry to bear all of the costs in cleaning up the tailings. (See p. 14.)

RECOMMENDATION TO THE CONGRESS

In order to assure that the uranium mill tailings are controlled in a safe and environmentally sound manner, we recommend that the Congress provide assistance to the active mill owners to share in the cost of cleaning up that portion of the commingled mill tailings that were generated under Federal contracts. These are the tailings for which the Federal Government has a strong moral responsibility.

The Congress should also consider having the Federal Government assist those mill owners who acted in good faith in meeting all legal requirements pertaining to stabilization of the mill tailings that were generated for commercial purposes and for which the Federal Government, through the Nuclear Regulatory Commission, is now requiring retroactive stabilization. At the same time, the Congress should make clear, however, that this establishes no precedent for the Federal Government assuming the financial responsibility of cleaning up other non-Federal nuclear facilities and wastes, including those mill tailings generated after the date when the Federal Government notified industry that the tailings should be controlled. (See p. 14.)

AGENCY COMMENTS

Pursuant to discussions with the office of the Senate Committee on Energy and Natural Resources, we did not seek agency comments on this report.



CHAPTER 1

INTRODUCTION

If nuclear power is to become a viable energy source for the future, many major problems must be overcome. One of these problems is the lack of progress by the United States in developing and operating acceptable disposal systems for radioactive wastes--even though such wastes have been accumulating for more than 30 years.

Until recently, the sand-like radioactive wastes --commonly called uranium mill tailings--from uranium mills were not considered to be part of the overall waste disposal problem. The tailings were believed to be of such low radiation that they were not considered to be harmful to the public. As a result, the tailings were often left in uncontrolled piles. Recent concern about the possible adverse effects of low-level radiation over long periods of time, however, has served as an impetus for various organizations to seek ways to prevent the tailings from causing any harm to the public.

During the past 5 years, there has been considerable congressional and public interest in the uranium mill tailings issue. The General Accounting Office (GAO) has also been interested in this area and has issued four reports since May 1975 that have dealt with the subject of cleaning up radioactive uranium mill tailings, 1/ and a number of other reports discussing various radioactive waste disposal problems. In our most recent report dated June 20, 1978, we recommended to the Congress that the Federal Government should take the lead in cleaning up 25 million tons of tailings at 22 inactive uranium mills. Subsequently, the Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604) to clean up these abandoned uranium mill tailings, most of which had been produced from the early 1940s through the early 1970s as a result of the Federal Manhattan Engineering District and Atomic Energy Commission programs.

1/"The Uranium Mill Tailings Cleanup: Federal Leadership at Last?" (EMD-78-90, June 20, 1978), "Comments on Proposed Legislation to Amend Public Law 92-314 and for Other Purposes" (EMD-77-52, July 19, 1977), "Cleaning Up the Remains of Nuclear Facilities--A Multibillion Dollar Problem" (EMD-77-46, June 16, 1977), and "Controlling the Radiation Hazard from Uranium Mill Tailings" (RED-75-365, May 21, 1975)

THE URANIUM MILL TAILINGS RADIATION
CONTROL ACT OF 1978

The Uranium Mill Tailings Radiation Control Act of 1978 became law on November 8, 1978. In it, the Congress found that uranium mill tailings located at both active and inactive milling operations may pose a potential and significant health hazard to the public. The act, therefore, states that every reasonable effort should be made to provide for the stabilization, disposal, and control of the tailings in a safe and environmentally sound manner.

To do this, the act provides for:

- a program of assessment and remedial action at various inactive mills to stabilize 1/ and control the tailings in a safe and environmentally sound manner, as well as to minimize or eliminate radiation health hazards to the public; and
- a program to regulate mill tailings during and after uranium or thorium ore processing at active mill operations in order to stabilize and control the tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public.

Under the first program, the Federal Government will generally pay up to 90 percent of the costs of stabilizing or cleaning up the mill tailings at 22 inactive mill sites and any additional designated sites, with the remainder paid by the States. The Department of Energy (DOE), which is primarily responsible for administering this portion of the act, expects the total cost of this remedial action program to range from \$80 to \$126 million in 1977 dollars.

A REQUEST FOR GAO TO STUDY THE ISSUE

As discussed above, the new act allows the Federal Government to financially assist in cleaning up inactive mills, not those still in operation. Since many of the active mills produced uranium for the Federal Government's nuclear energy programs, but are not eligible for Federal assistance, former Senator Clifford P. Hansen, on behalf of the minority members of the Senate Committee on Energy and Natural Resources, asked GAO to initiate a study to mainly determine whether Federal

1/Stabilization may be broadly defined as decontamination and reclamation of the mill site.

assistance should be provided to clean up the mill tailings that were generated as a result of processing uranium for both commercial and Government uses--the so-called "com-mingled" uranium mill tailings. This report mainly addresses this subject.

In response to the October 19, 1978, request, which is included as appendix I, this report also identifies

- all active mill sites where tailings were generated under Government contracts;
- current and past owners of the mill sites which generated tailings under Government contracts;
- the quantity of mill tailings generated at each of the sites under Government and private contracts;
- estimated costs of performing remedial action at each of the active sites;
- whether the mill operators have stabilized any of the tailings;
- whether the original Government contracts with the owners of the active sites specified the owners' responsibility for cleaning up the tailings;
- the legal responsibility of the owners of these active sites regarding the stabilization of the tailings; and
- the funds, if any, that have already been paid to the owners of these active sites by the Federal Government for stabilization of the tailings.

SCOPE OF THE REVIEW

We obtained the information contained in this report by reviewing key documents, studies, reports, correspondence, and other records and by interviewing officials at

- DOE headquarters, Germantown, Maryland; and
- Nuclear Regulatory Commission (NRC) offices, Bethesda, and Silver Spring, Maryland.

While we also received information from most of the Nation's active mill operators in response to a questionnaire, much of our work was based on our previous involvement in

evaluating the Nation's uranium mill tailings and radioactive waste disposal problems and programs.

AGENCY COMMENTS

Pursuant to discussions with the office of the Senate Committee on Energy and Natural Resources, we did not seek agency comments on this report.

CHAPTER 2

THE NEED FOR FEDERAL ASSISTANCE TO CLEAN

UP COMMINGLED URANIUM MILL TAILINGS

With passage of the Atomic Energy Act of 1946, a strong emphasis was placed on the development of new sources of uranium. This development was encouraged by the former Atomic Energy Commission through guaranteed fixed prices for ore, bonuses, and other forms of incentives.

Today, there are 19 active and about 25 inactive uranium mills in the United States. These mills, which extract uranium from ore for eventual use in nuclear weapons or nuclear powerplants, produced more than 300 thousand tons of uranium from 1947 through 1977. As of December 31, 1977, the total amount of uranium mill tailings--the radioactive wastes from the milling process--was 144.5 million tons, of which about 119 million (82 percent) are located at active mills. All active mills are licensed to operate by either NRC or by States having agreements with NRC. GAO concentrated on evaluating the need for Federal assistance to clean up the tailings at the active sites.

A BACKGROUND ON COMMINGLED URANIUM MILL TAILINGS

Of the 19 uranium mills currently in operation, 12 have produced commingled tailings, i.e., those that were generated as a result of the production of uranium for both Government and industry. The other seven have generated tailings as a result of processing uranium for industry only.

As of December 31, 1977, there were approximately 99 million tons of commingled tailings at the 12 active sites, of which 54 million tons (54 percent) can be attributed to the uranium produced for the Federal Government. The 12 sites are located in Colorado, New Mexico, Utah, Washington, and Wyoming. All 12 sites are currently owned by private industry, and unless Federal assistance is provided, the owners will likely bear all of the costs associated with the remedial action to stabilize or clean up the tailings. To date, little remedial action has been taken because most of the tailings areas are still in use by the mills.

The table on page 6 shows the location of the active sites where commingled tailings were produced; the current and past owners; the amount of tailings produced for the Federal Government, and the amount produced for commercial purposes; the current status of the tailings piles; and some

ACTIVE MILLS WITH COMMINGLED URANIUM TAILINGS

<u>Mill location</u>	<u>Current owner</u>	<u>Owner at time of Government contract</u>	<u>Quantities of tailings (note c)</u>			<u>Current status of Government tailings</u>	<u>Possible cost of remedial action (note d)</u>		
			<u>Govt.</u>	<u>Comm.</u>	<u>Total</u>		<u>Govt.</u>	<u>Comm.</u>	<u>Total</u>
			<u>(millions of tons)</u>			<u>(millions of dollars)</u>			
Ambrosia Lake, NM	Kerr-McGee Nuclear Corp.	Kerr-McGee Nuclear Corp.	10.51	12.58	23.09	Fenced	\$ b/	\$ b/	\$ b/
Cannon City, CO	Cotter Corp.	Cotter Corp.	.27	.88	1.15	Unstabilized	b/	b/	b/
Carbon County, WY	Getty Oil Co.	(note a)	.77	2.29	3.06	Unstabilized	.22	.78	1.00
Ford, WA	Dawn Mining Co.	Dawn Mining Co.	1.17	1.09	2.26	Covered with wood chips	1.22	1.23	2.45
Fremont County, WY	Western Nuclear, Inc.	Western Nuclear, Inc.	3.37	2.28	5.65	Interim stabilization	3.0-6.0	2.0-4.0	5.0-10.0
Gas Hills, WY	Federal-American Partners	Federal-American Partners	2.10	2.48	4.58	Unstabilized	1.6-2.3	3.5-5.0	5.1-7.3
Gas Hills, WY	PathFinder Mines, Corp.	Lucky Mc Uranium Corp.	2.92	2.95	5.87	Unstabilized	2.97	.89	3.86
Gas Hills, WY	Union Carbide, Corp.	(note b)	2.16	3.20	5.36	Unstabilized	.44	.76	1.20
Grants, NM	The Anaconda Co.	The Anaconda Co.	9.04	5.86	14.90	Partly stabilized	b/	b/	b/
Grants, NM	United Nuclear-Homestakes Partners	Homestake Sapin Partners and Homestake New Mexico Partners	10.98	6.44	17.42	Unstabilized	b/	b/	b/
Moab, Utah	Atlas Corp.	Uranium Reduction Co.	5.05	2.69	7.74	Unstabilized	2.34	1.26	3.6
Uravan, CO	Union Carbide, Corp.	Union Carbide, Corp.	5.32	2.59	7.91	Partly stabilized	b/	b/	5.0
			<u>53.66</u>	<u>45.33</u>	<u>98.99</u>				

a/Tidewater Oil Company, Skelly Oil Company, Getty Oil Company, and Kerr-McGee Corporation.

b/Information not provided by mill owners.

c/Information provided by DOE.

d/Information provided by mill owners.

preliminary estimates on the cost of remedial action at the sites. These estimates were provided by the mill owners.

Contract provisions for stabilization

According to DOE, none of the Federal contracts with the mill owners contained any provisions that would require either the Federal Government or mill owners to clean up or stabilize the uranium mill tailings. When the contracts were executed, the radiation hazards of the tailings were not fully recognized.

To verify this, we reviewed some of the contracts and also asked the mill owners. None of the contracts that we reviewed contained any provisions requiring stabilization. In addition, all but one of the mill owners we contacted stated that there were no contract provisions. This mill owner told us that the provisions are not clear.

Federal funds for stabilization

According to DOE and the mill owners that responded to our request for information, no Federal funds have been spent for cleaning up commingled uranium mill tailings.

Liability of the active mill owners

The liability of owners of the active sites ^{1/} must be explained in the context of the Uranium Mill Tailings Radiation Control Act of 1978. Title II of this act amends the Atomic Energy Act of 1954 and expands the definition of "by-product material" to include uranium mill tailings. This extends the authority of NRC to regulate uranium mill tailings at all active sites.

Title II also requires that the grant or renewal of a license to operate a uranium mill be conditioned on compliance with stabilization standards to be developed by the Environmental Protection Agency and prescribed by NRC. Termination of a license is also conditioned on compliance with the standards. In addition, licensees must provide bond to insure completion of the stabilization projects. Thus, licensees of active mills are, in effect, locked into the completion of a stabilization project, approved by NRC.

^{1/}An active site may be defined as a uranium processing mill whose license to operate was in effect as of January 1, 1978.

Title II also amends the Atomic Energy Act to provide for adherence by those States which have an agreement with NRC to license and regulate mills in the State ^{1/} to the stabilization standards within 3 years. If the licensees in the Agreement States have not agreed to commence compliance measures by November 8, 1981, licensing authority over non-compliant mills reverts to NRC. It is expected that most, if not all, of the mills in the Agreement States will be able to meet the deadline. Some Agreement States already require some form of stabilization. Colorado, for example, has required stabilization of mill sites since 1967. The liability question is discussed in more detail in Appendix II.

SHOULD THE CONGRESS PROVIDE ASSISTANCE
IN CLEANING UP COMMINGLED TAILINGS?

Only by considering a broad range of social, economic, political, and technical factors, can reasonable decisions regarding national energy policy be made. Surely, the same is true in deciding whether the Federal Government should assist active mill owners in cleaning up commingled uranium mill tailings. Therefore, in making this decision, we believe the following factors are most important:

- To what extent do the mill tailings constitute a hazard to the public's health and safety?
- Is the mill tailings cleanup program necessary for nuclear power to become a substantial source of energy for the future?
- Who is responsible for creating the mill tailings situation?
- How much will the proposed program cost?
- Are adequate cleanup technologies presently available?
- What is the relationship of the commingled mill tailings cleanup program to other nuclear facilities that may eventually need to be cleaned up?

^{1/}These "Agreement States" are Colorado, Washington, New Mexico, and Texas. Under section 274 of the Atomic Energy Act the authority of the Federal Government to license and regulate uranium mills may be delegated to a State.

The effect of the mill tailings on
the public's health and safety

In our view, one of the most important factors to be considered is the effect of radiation emitted from the mill tailings on the public's health and safety. About 85 percent of the total radioactivity originally in uranium ore remains in the tailings after removal of the uranium because radium and thorium--the principal contributors to radioactive emissions--were not normally removed from the uranium ore during milling.

Of the two, radium is the most significant radioactive waste product in the tailings. It has a very long radioactive life, taking thousands of years before it loses its radioactivity. This loss--called radioactive decay--produces two distinct types of hazards. The first type is highly penetrating gamma radiation. Exposure to sufficient amounts of gamma radiation can cause cancer, such as leukemia. The second hazard--radon gas--produces other radioactive products which attach to particles in the air and are deposited in the lungs when inhaled. Exposure to large concentrations of these radon products can increase the risk of lung cancer.

The possible health effects of the radiation at the 12 mill tailings sites have not been firmly established. However, NRC preliminary estimates indicate that if all existing and projected tailings piles were left uncovered, there might be about 4,700 premature cancer deaths over the next 1,000 years because of radon released from all of the tailings generated in the United States until the year 2000. If the tailings piles were covered to reduce the radon resulting from tailings to just above the background level, then the estimated number of health effects would be reduced to 21 cancer deaths over the next 1,000 years. Since the 4,700 premature deaths would result from the operation of about 70 mills through the year 2000, the radiation from 12 active mills with commingled tailings would likely cause a significantly lower number of deaths.

Nuclear power as a substantial future
energy source

Nuclear power provides about 10 percent of the Nation's electricity. As of March 1978, 69 nuclear powerplants were in operation in the United States and another 140 were either being built or on order. Whether nuclear power will continue to grow to become a substantial energy source for the future is dependent on the resolution of several problems. Among these problems is the United States' lack of progress in

developing and operating waste disposal systems to adequately manage radioactive wastes.

Uranium mill tailings are only one of the types of radioactive wastes that have to be managed. Failure to clean them up could continue to foster the impression that the radioactive waste problem is unsolvable and that the nuclear power option is unacceptable. Cleaning up mill tailings is a step in the right direction for making nuclear power a more acceptable energy source.

The responsibility for creating the mill tailings problem

Determining who is responsible for creating the mill tailings problem for active mills is a complex undertaking. In a previous report 1/ on cleaning up the tailings at inactive mill sites we concluded that no one has a clear responsibility. The same is true for the active mill sites. It is important to recognize that:

- The Federal Government was a principal purchaser of the uranium from these mills for its Manhattan Engineering District and Atomic Energy Commission programs.
- The possible adverse health effects of low-level radiation from mill tailings was not generally recognized until very recently.
- Requirements for cleaning up the tailings were not included in the Government's uranium procurement contracts.
- Until recently, neither the Atomic Energy Commission nor its regulatory successor, NRC, exercised regulatory jurisdiction over the tailings.
- Industry and the States also benefitted from the mill tailings operations, either through profits, taxes, or improved employment.

Cost of the program

Another important factor to consider in making a decision on providing Federal assistance for stabilization of the tailings is the cost. Unfortunately, the cost of

1/"The Uranium Mill Tailings Cleanup: Federal Leadership at Last?" (EMD-78-90; June 20, 1978).

stabilization of the tailings at the 12 active mills with commingled tailings was not available for all mills. Some of the mill owners did provide us with their estimates of the cost of stabilization. Others, however, told us that they could not estimate the costs. (See the table on page 6 for these estimates.)

NRC has developed very preliminary estimates of costs of tailings management for a model mill. According to NRC, the lifetime tailings management costs for a model mill, using current technology, ranges from \$322,000 to \$26,240,000 with a possible cost of \$136,590,000 if departures from current technology are considered. The range in costs is due to the different types of remedial actions taken to stabilize the sites. The lowest cost is associated with minimal actions and the largest cost is for burial of the tailings in a mine after combining the tailings with asphalt.

Applying this range to the 12 active mills with commingled tailings, the cost of a lifetime stabilization program using current technology to clean up all of the tailings at these sites would range from about \$4 million to \$315 million and up to \$1.6 billion if departures from current technology are considered.

Assuming that the portion of tailings generated under Federal contract is about 41 percent (the percentage of Federal tailings to all of the tailings that have been and will be produced at the mills), the cost of cleaning up only the tailings that were generated under Federal contract could cost from about \$2 million to \$129 million using current technology. Although the actual cost is dependent on the type of remedial action selected for each mill, the most expensive cost will still be less than 1 percent of the price of the uranium product.

DOE believes that the costs are highly uncertain, but estimates that cleaning up all of the tailings could cost roughly \$150 million.

Adequacy of mill tailings cleanup technology

The objective of cleaning up the uranium mill tailings is to prevent radioactive and other toxic particles from adversely impacting on the environment. Ideally, complete stabilization of radioactive tailings would eliminate the possibilities of (1) wind and water erosion, (2) leaching of radioactive materials and other chemicals, (3) radon emanation from the tailings piles, and (4) gamma radiation being emitted from the tailings.

A DOE contractor, in its assessment of each of the 22 inactive mill tailings sites, stated that it reviewed all present methods, technology, and research data on uranium mill tailings site stabilization. It found that much research and development remains to be performed before complete stabilization of radioactive mill tailings can be realized. In particular, the contractor found that (1) reasonably effective means of wind and water erosion control are available, although they will involve continued maintenance costs; and (2) possible methods exist for the control of leaching. Up to this time, however, no attempt has been made to contain radon in a tailings pile. Although a thick earth cover is theoretically effective, it has never been attempted.

DOE officials are confident that the problems of uranium mill tailings stabilization can be resolved in a timely manner by practicable methods. However, they also indicated that they do not know all of the answers for tailings stabilization, including

- the practicality of extracting all radioactive elements from tailings,
- how a site should be contoured to minimize radon emanation,
- whether practicable tailings' surface sealants exist, and
- whether quick growing self-sustaining vegetative covers can be developed.

There have been no attempts at long-term stabilization of tailings at the sites.

Cleaning up other nuclear facilities

Any materials, equipment, or facilities that come into contact with a nuclear reaction or radioactive material could become contaminated or radioactive. They cannot be abandoned or reused unless the radiation has been removed or reduced to acceptable levels. This cleanup process usually consists of decontamination and/or decommissioning. Decontamination is the process of cleaning up surface contamination--a process that often consists of scrubbing and washing. Decommissioning is a term indicating the closing or shutting down of a facility with some actions taken to prevent--at least temporarily--health and safety problems.

The commingled uranium mill tailings cleanup program can be viewed as a precedent for the Federal Government becoming

involved in the decommissioning of other nuclear facilities. Perhaps the greatest immediate danger of this idea taking hold pertains to the nuclear fuel reprocessing plant at West Valley, New York. This plant, the only commercial reprocessing plant to operate in the United States, was shut down in 1972. According to DOE, it will cost from \$90 million to \$600 million to dispose of all the radioactive material, including dismantling and removing the structures. 1/

Who is going to pay for the cleanup program at West Valley is still not certain. When the plant owner decided in 1976 to transfer control of the site to the New York State Energy Research and Development Authority, it imposed a very large financial burden on the State. Because of this, the New York Authority has asked the Federal Government to completely take over the West Valley site. DOE has not accepted this request, but has agreed to discuss the problem with the Authority.

In our view, the inactive mill tailings cleanup program, the West Valley situation, and now, the commingled uranium mill tailings cleanup program--if all are paid for primarily by the Federal Government--might serve as a strong precedent and trend for the Federal Government to pay for most, if not all, decommissioning activities.

CONCLUSIONS

Should the Federal Government give financial assistance for cleaning up commingled mill tailings at 12 active uranium mills? Certainly, the answer to this question is not clear cut. After considering the factors identified above, it is apparent that while there are sound reasons for the assistance, a number of other reasons argue against it.

GAO compared the advantages and disadvantages of allowing the assistance. Cleaning up all of the commingled tailings, including those generated for industry, would have the advantages of reducing a possible health hazard and taking another step toward resolving some of the problems of safely disposing of radioactive wastes--a barrier preventing the United States from placing greater reliance on nuclear power as a future energy source.

1/We have issued a report on this subject entitled "Issues Related to the Closing of the Nuclear Fuel Services, Incorporated, Reprocessing Plant at West Valley, New York" (EMD-77-27, March 8, 1977).

However, offsetting these advantages are some strong disadvantages. The cleanup costs could go as high as \$315 million using current technology. Further, the cleanup program could be considered as an additional precedent for cleaning up other nuclear facilities--a far more costly endeavor. This is extremely important because the question of who should pay for cleaning up nuclear facilities has not yet been fully considered, primarily because very little decommissioning of these facilities has been done to date.

In our view, the most significant factor in favor of providing Federal assistance in cleaning up commingled tailings pertains to the role of the Federal Government in creating the mill tailings situation. The mill owners apparently acted in good faith in carrying out their responsibilities in meeting various contract provisions and legal obligations. Unfortunately, like the Federal Government, they did not recognize that the tailings were a health hazard and did not provide for their control. Now, the Federal Government is requiring the mill owners to clean up all of the tailings, including those generated before the hazard was recognized. In our view, it is unfair for industry to bear all of the costs in cleaning up the tailings.

RECOMMENDATION TO THE CONGRESS

In order to assure that the uranium mill tailings are controlled in a safe and environmentally sound manner, we recommend that the Congress provide assistance to the active mill owners to share in the cost of cleaning up that portion of the mill tailings that were generated under Federal contracts. These are the tailings for which the Federal Government has a strong moral responsibility.

The Congress should also consider having the Federal Government assist those mill owners who acted in good faith in meeting all legal requirements pertaining to stabilization of the mill tailings that were generated for commercial purposes and for which the Federal Government, through NRC, is now requiring retroactive stabilization. At the same time, the Congress should make clear, however, that this establishes no precedent for the Federal Government assuming the financial responsibility of cleaning up other non-Federal nuclear facilities and wastes, including those mill tailings generated after the date when the Federal Government notified industry that the tailings should be controlled.

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United States Senate

COMMITTEE ON
 ENERGY AND NATURAL RESOURCES
 WASHINGTON, D.C. 20510

October 19, 1978

GRENVILLE GARBIDE, STAFF DIRECTOR AND COUNSEL
 DANIEL A. DREYFUS, DEPUTY STAFF DIRECTOR FOR LEGISLATION
 D. MICHAEL HARVEY, CHIEF COUNSEL
 W. O. CRAFT, JR., MINORITY COUNSEL

The Honorable Elmer B. Staats
 Comptroller General of the United States
 441 G Street, N.W.
 Washington, D.C. 20548

Dear Mr. Comptroller General,

As you know, the Senate passed, and sent to the President, H.R. 13650, the Uranium Mill Tailings Radiation Control Act of 1978. H.R. 13650 is the House-passed companion to Senate bill S. 3078, the Residual Radioactive Materials Act of 1978, which was introduced by Senator Jackson at the request of the Administration.

The Senate substitute amendment in the Senate-passed H.R. 13650 included in Title I the remedial action program which was the subject of S. 3078, as introduced. Nothing in Title I addresses the issue of so-called "co-mingled" mill tailings piles at active uranium mill processing sites. In fact, Section 115(a) of the Senate amendment expressly states that such co-mingled mill tailings piles at active sites, which are subject to regulation by the Nuclear Regulatory Commission, shall be excluded from the remedial action program under Title I. As you know, an identical provision is in the House-passed bill, so that both Houses of Congress now have acted to exclude active mill processing sites from the coverage of the remedial action program.

S. 3078, as reported by the Senate Energy and Natural Resources Committee, included in Section 3(b) the requirement for a study by the Secretary of Energy, in consultation with the Nuclear Regulatory Commission, regarding the issue of co-mingled piles at active sites. The language of Section 3(b) as reported, states as follows:

"(b) The Secretary, in consultation with the Commission, shall conduct a study of active uranium mill sites at which residual radioactive materials were generated during the production of uranium for sale to the United States prior to the date of enactment of this Act. The Secretary shall determine what portion of the residual radioactive materials at such sites can be attributed to operations associated with contracts with the United States Government and whether Federal financial

assistance for an appropriate portion of the costs of any remedial action which may be taken at such sites would be consistent with the policies and intent of the programs prescribed in this Act."

The requirement in Section 3(b) was the result of the strong feeling of many members of this Committee that there is an element of artificiality in limiting Federal assistance only to remedial action for mill tailings located at inactive sites, while placing a full financial burden on operators of active sites to complete remedial actions for mill tailings which also resulted from our nation's nuclear weapons program. At the same time, however, the Committee recognized that it had insufficient information available to it on this issue, as well as the absence of a fully-formulated Administration position on it, to reach any fully-informed conclusion in the consideration of this legislation in this Congress. The required study in Section 3(b), therefore, was intended to provide the Committee with the necessary information to allow for the fully informed consideration of the issue in the next Congress. It also was the clear intention of the Committee to affirmatively consider this issue at that time, upon receipt of the study results and an Administration position on this issue. The Committee in taking this position recognized that Title II of the House-passed bill and the Senate substitute amendment would clarify the authority of the Nuclear Regulatory Commission to require remedial actions by operators of active sites by regulation. The Committee, however, did not believe that the existence of that authority necessarily was determinative of the active site issue for either the immediate future or the longer term.

As a result of discussions with Members of the House of Representatives attendant to the formulation of the Senate substitute amendment, the Committee agreed to strike the requirement in Section 3(b) from the substitute amendment. The Committee fully intends, however, as stated in the Floor Statements of the managers of the bill on the Senate Floor, to develop the required information and revisit the active site issue in the next Congress. Consequently, I request, on behalf of the Minority Members of the Energy Committee, that you promptly initiate a thorough study of the active site issue, with particular emphasis on the question of the relative equities applicable to the co-mingled mill tailings piles at active sites, notwithstanding the now-clear authority of the Nuclear Regulatory Commission to regulate the active site operators.

In conducting this study, I request that you address the following factors of relevance to our future consideration of this issue.

1. Identification of all active mill sites including the tailings generated under government contracts prior to 1973; current owners of those sites and those who owned the site at the time of those contracts.

2. Statement of the quantity of mill tailings generated at each of these sites under government contract and the percentage designated for commercial use.
3. Statement of the Department's basis for identifying the quantities of materials generated under government contract at each site, concurrent with an accuracy rating for the identification process.
4. Estimation of the cost of performing remedial action at each of the active sites.
5. A statement pursuant to the mill operator's establishment of stabilized piles in compliance with applicable regulations for that section of the tailings pile generated by commercial contracts, relating the added cost of expanding that action to include the proper stabilization of the tailings generated under government contract.
6. The provisions incorporated in the original contracts with the owners of these active sites regarding the owner's responsibility for stabilizing these piles.
7. The legal responsibility of the owners of these active sites regarding the stabilization of the comingled tailings piles.
8. The funds, if any, under prior contracts for the stabilization of these sites, which may have already been paid to the owners of these active sites by the Federal government.
9. Federal funding for remedial action concerning these comingled tailings.
10. Recommendations for Federal participation, if any, in the stabilization of comingled tailings at active sites.

I note that the General Accounting Office recently completed a detailed study of this issue in your report of June 20, 1978, "The Uranium Mill Tailings Cleanup: Federal Leadership at Last?". In fact, this study was conducted pursuant to a request by one of the House subcommittees of jurisdiction for the Administration-proposed remedial action legislation. As the report notes, you also have completed several other related studies in the past three years, which bear on the uranium mill tailings issue. Consequently, I am confident that the General Accounting Office has the immediately available, requisite expertise to quickly review this issue for the Committee. I, therefore, would request that the study described above be completed for our use no later than January 30, 1979 to support the Committee's consideration of this issue during the fiscal year 1980

Department of Energy budget and authorization cycle. Please coordinate this request with Charles Trabandt of the Committee Minority Staff, at 224-3221.

Sincerely,

A handwritten signature in black ink, appearing to read "Cliff Hansen", followed by a long horizontal line extending to the right.

Clifford P. Hansen
United States Senator
Ranking Minority Member

THE LIABILITY OF ACTIVE MILL OWNERS

The liability of owners of active sites 1/ must be explained in the context of the Uranium Mill Tailings Radiation Control Act of 1978. Title II of this act amends the Atomic Energy Act of 1954 and expands the definition of "by-product material" to include uranium mill tailings. This extends the authority of NRC to regulate uranium mill tailings at all active sites.

Title II also requires that the grant or renewal of a license to operate a uranium mill be conditioned on compliance with stabilization 2/ standards to be developed by the Environmental Protection Agency and prescribed by NRC. Termination of a license is also conditioned on compliance with the standards. In addition, licensees must provide bond to insure completion of the stabilization projects. Thus, licensees of active mills are, in effect, locked into the completion of a stabilization project, approved by NRC.

Title II also amends the Atomic Energy Act to provide for adherence by the "Agreement States" 3/ to the stabilization standards within 3 years. If the licensees in the Agreement States have not agreed to commence compliance measures by November 8, 1981, licensing authority over non-compliant mills reverts to NRC. It is expected that most, if not all, of the mills in the Agreement States will be able to meet the deadline. Some Agreement States already require some form of stabilization. Colorado, for example, has required stabilization of mill sites since 1967.

With respect to the Non-Agreement States, licensing and regulatory authority is exclusively the responsibility of the Federal Government. A number of recent court cases have held that the doctrine of Federal preemption bars concurrent Federal-State regulation in the field of nuclear energy. See,

1/An active site may be defined as a uranium processing mill whose license to operate was in effect as of January 1, 1978.

2/Stabilization may be broadly defined as decontamination and reclamation of the mill site.

3/The Agreement States are Colorado, Washington, New Mexico, and Texas. Under section 274 of the Atomic Energy Act the authority of the Federal Government to license and regulate uranium mills may be delegated to a State.

for example, Northern States Power Co. v. Minnesota, 447 F2d 1143 (8th Cir. 1971), aff'd 405 U.S. 1035 (1972); Marshall v. Consumers Power Co., 237 N.W. 2d. 266 (1975).

There may have been some room for State regulation of uranium mill wastes prior to passage of the Tailings Control Act because the mill tailings were not subject to NRC jurisdiction. However, with the inclusion of mill tailings in the definition of "byproduct material" the role of the Federal Government as the exclusive regulatory authority in Non-Agreement States is now clear. Consequently, Non-Agreement States possess no authority to control the radioactive hazards caused by uranium mill tailings. Nevertheless, it is possible that under some circumstances uranium mill tailings may constitute a public or private nuisance (such as water contamination) and could be subject to civil damages or an injunction under State law.

By contrast, in the Agreement States, uranium mills are subject not only to the licensing authority delegated by the Atomic Energy Act but also to the full authority of a State to regulate land use. For example, in the State of Washington, uranium mills, like other mining operations, are subject to the State's Environmental Policy Act which requires the preparation of environmental impact statements in connection with its ongoing stabilization program. It should be emphasized, however, that despite the difference in regulatory authority between the Agreement and Non-Agreement States, the purpose of Title II of the Tailings Control Act is to establish and enforce uniform stabilization standards with respect to active mills in all States. The purpose of the uniformity of the standards to avoid situations where the uranium mills in one State have a competitive advantage over the mills in another State by virtue of a disparity in stabilization requirements.

Finally, while it is clear that the Congress intended that active uranium mills be controlled in a uniform manner, other Federal statutes are potentially applicable. ^{1/} For example, with respect to sites where mill tailings contaminate a public water system, the Safe Drinking Water Act permits remedial action to curtail or eliminate the contaminant. The

^{1/}The Clean Air Act and the Federal Water Pollution Control Act both contain provisions which under certain circumstances could require some degree of stabilization and also enforce the requirements by injunction and civil penalties.

act specifically defines "contaminant" to mean "any physical, chemical, biological, or radiological substance or matter in water." This definition was intended to include any radioactive materials whether or not they originated from source material regulated by NRC. Although the responsibility for enforcement of this act rests primarily with the States, a failure by State authorities to take remedial action permits the Environmental Protection Agency, under certain conditions, to take action to halt continued contamination.

In addition, uranium mill sites located on Federal land administered by the Bureau of Land Management are subject to regulations that require compliance with applicable Federal and State standards for disposal and treatment of solid waste and compel a substantial degree of stabilization, including control of erosion and water runoff. In addition, mining operations on land administered by the Forest Service (Department of Agriculture) are subject to regulations similar to those of the Bureau.



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