Millling uranium ore is one of the first steps in the production of enriched uranium for use as an energy source. One to five pounds of uranium of useful purity can be extracted from approximately two thousand pounds of ore, leaving large quantities of sand-like residual matter known as tailings. This residue contains a number of toxic and radioactive elements, including radium, whose radioactive emissions are thought to be the greatest threat to public safety. Radium decays into radon gas, a carcinogen. Because of the low concentration of radium in tailings, the potential threat to the public health from uranium tailings was not fully appreciated until the early 1970's. However, recent discoveries of the carcinogenic effects of long-term exposure to low levels of radiation, combined with the very long half life of radium, have caused concern over tailings disposal practices.

Because the hazards associated with uranium mill tailings were not recognized until recently, tailings disposal was not regulated for many years. As a result, large quantities of tailings were allowed to pile up at milling sites. In addition to currently active milling sites, there are at least twenty-two abandoned sites in the United States that operated between 1940 and 1970. These sites provided uranium pri-

4. Id. at 28, U.S. Code Cong. & Ad. News at 7455; GAO Rep., supra note 2, at 1, reprinted in House Hearings, supra note 2, at 279.
7. Id.
8. GAO Rep., supra note 2, at 1, reprinted in House Hearings, supra note 2, at 279.
marily to federal projects, although the mills were privately run. Tailings from these previously unregulated, inactive mills have generally been left in unattended piles and ponds.

Growing realization of the long-term hazards posed by uranium tailings has made the cleanup of tailings sites an important public health concern. In addition, the viability of nuclear energy as a long-range energy source depends in part on public confidence in the industry's ability to dispose of radioactive wastes, and effective tailings disposal is imperative if this confidence is to be maintained.

Congress has addressed this issue by enacting the Uranium Mill Tailings Radiation Control Act of 1978. Title I of the Act provides a mechanism for stabilizing and controlling tailings at inactive mill sites. Title II strengthens the Nuclear Regulatory Commission's (NRC's) authority to regulate tailings produced at active sites. This Development outlines the major provisions of the Act and briefly examines their environmental significance.

I

FEDERAL LEGISLATION

A. Title I

Title I of the Act requires the Secretary of Energy to designate "processing sites" at twenty-two statutorily specified locations, establish priorities for remedial action based on the health hazards to the public at each site, and undertake remedial action in accordance with the established priorities.

In taking remedial action, the Secretary must clean up mill sites and provide for the storage of tailings in conformance with standards to be issued by the Environmental Protection Agency (EPA). This action is to be accomplished by means of cooperative agreements between the Department of Energy (DOE) and the states. If a state enters into a cooperative agreement, the Secretary will determine the

9. Id.
10. Id. There has been so little recognition of the hazards of radioactivity from mill tailings and so little regulation of disposal of the materials that in some instances tailings have been used in building construction. Id. at 20, House Hearings at 298.
11. Id. at 6, House Hearings at 284.
13. 42 U.S.C.A. § 7912(a)(1) (West Supp. 1979). The Secretary is authorized to designate other processing sites as well. Id.
14. Id. § 7912(b).
15. Id. §§ 7912(b), 7913(a), 7918.
16. Id. §§ 7918(a), 2022(a).
17. Id. § 7913(a), (b).
18. The voluntary nature of the agreements is reflected in the language of the Act: the Secretary is "authorized" to enter into the agreements and shall do so "to the greatest extent
terms of the agreement,\textsuperscript{19} with much of the content of the agreement dictated by the Act.\textsuperscript{20} Should the states desire federal aid, therefore, they must accept it on terms substantially determined by the Federal Government. When processing sites are located on Indian lands, no state cooperative agreements are necessary. Instead, the Secretary may enter into cooperative agreements directly with the affected Indian tribes.\textsuperscript{21}

The Secretary has designated the inactive sites at which remedial action will be taken and has established a three tier priority system under which each site is classified as high, medium, or low priority.\textsuperscript{22} As of April 9, 1980, EPA had not yet promulgated standards for implementing the remedial action,\textsuperscript{23} nor had DOE begun any onsite action.\textsuperscript{24}

\textbf{B. Title II}

Title II of the Act amends the Atomic Energy Act of 1954\textsuperscript{25} to extend the regulatory authority of NRC to cover uranium mill tailings. Previously, NRC could regulate disposal of tailings from active uranium only in connection with its licensing of those mills.\textsuperscript{26} Tailings, however, were not themselves licensable materials, subject to NRC's direct regulatory authority; NRC had no authority over tailings that were not under the control of current licensees.\textsuperscript{27}

Title II makes several changes in NRC's authority. First, tailings are added to the definition of "byproduct material" in the Atomic En-practicable." \textit{Id.} § 7913(a). The Federal Government will pay 90\% of the costs of remedial action taken pursuant to a cooperative agreement, with the affected state paying the remaining 10\%. \textit{Id.} § 7917(a). There appears to be no barrier to states cleaning up the sites if the state declines federal assistance.

19. \textit{Id.} § 7913(b).

20. These include provisions requiring states to acquire the Secretary to perform remedial action, and any other property interest in the processing sites deemed necessary by the Secretary; to obtain waivers releasing the Federal Government from liability resulting from remedial action; to secure transfer of title to the residual radioactive materials and their final disposition sites to the Federal Government; and to take other actions relating to land disposition. \textit{Id.} §§ 7913(c)(1), (2), (d), 7914(a)-(f)(1).

21. \textit{Id.} § 7915(a). When processing sites are on Indian lands, the Federal Government pays the entire cost of remedial action. \textit{Id.} § 7917(b).


ergy Act, giving NRC authority to regulate them directly, rather than through the licensing process for uranium mills.\(^2\) Second, licenses to operate uranium mills issued or renewed after November 1978 must contain terms prescribed by NRC to assure that prior to termination of the license, decontamination, decommissioning, and reclamation standards will be met, and that ownership of the tailings will be transferred either to the United States or to the state in which the mill is located.\(^2\)

Third, NRC may require licensees to make financial arrangements by bond or otherwise to ensure performance of decommissioning requirements and provide for the long-term stabilization and maintenance of disposal sites.\(^3\)

NRC's regulations under Title II must bring active mills into conformance with standards to be set by EPA.\(^3\) EPA's standards may not be site-specific, however, and no mill operator need obtain a permit from EPA.\(^4\) When a state obtains authority to regulate nuclear materials pursuant to an agreement between the state and NRC,\(^5\) it must ensure compliance with standards governing tailings disposal, which are equivalent to or more stringent than NRC's standards.\(^6\)

EPA proposed standards for active sites have not yet been issued.\(^7\) The Act requires that EPA standards for tailings disposal from active sites be consistent, where possible, with standards under the Solid Waste Disposal Act\(^8\) (SWDA). EPA has issued proposed rules implementing SWDA,\(^9\) and although these rules do not directly apply to mill tailings, NRC has used them as a basis for its own proposed rules governing the issuance of uranium mill licenses.\(^10\) Thus, these proposed NRC licensing rules are not based, as they should be, on EPA


\(^{29}\) Id. § 2113(a).

\(^{30}\) Id. § 2201(x).

\(^{31}\) Id.

\(^{32}\) Id. § 2022(b).

\(^{33}\) States may enter into cooperative agreements with NRC whereby NRC "discontinues" its regulatory authority within that state, allowing the state to regulate the materials that are the subject of the agreement. Id. § 2021(b). NRC's latitude to relinquish authority is not unlimited, however. NRC must retain authority to regulate, inter alia, "operation of any production facility." Id. § 2021(c).

\(^{34}\) Id. § 2021(o)(2) (West Supp. 1979).


\(^{38}\) 44 Fed. Reg. 50,016 (1979). NRC also issued final rules, id. at 50,012-14 (to be codified in 10 C.F.R. pts. 40, 150), providing a general license for all mills licensed by NRC to continue storing tailings until their license expires or is renewed. Id. at 50,014 (to be codified in 10 C.F.R. § 40.26). This general license was designed to prevent active uranium mills from being in technical violation of the Act until their licenses are renewed and terms related to tailings can be incorporated into the licenses according to the Act. Id. at 50,012.
standards promulgated under the Mill Tailings Act, but on EPA standards under SWDA. Although this should cause few problems if the forthcoming EPA Tailings Act regulations conform closely to those under SWDA, to the extent that EPA's standards differ from SWDA standards, NRC proposed licensing rules may require revision.

The technical criteria in the proposed NRC rules require, among other things, that tailings disposal areas be consolidated in remote areas to minimize public exposure. Methods of stabilizing the tailings are prescribed. Preoperational baseline data on background radiation levels must be gathered, and daily inspections of tailings systems must be made, with immediate notice to NRC of any failures or unusual conditions.

The licensee must submit a plan that addresses expected environmental impacts of the mill's operation and decommissioning and tailings reclamation, including cost estimates for decontamination and reclamation. The operator must then make surety arrangements to ensure that funds will be available to carry out these measures. The proposed rules also require, in accordance with the Act, that before expiration of a license, legal title to the tailings and land used for disposal must be transferred to the United States or to the state in which the disposal site is located.

III
ANALYSIS

Although Title II of the Act strengthens NRC's statutory authority, it will have little practical impact. All NRC licenses already contain or will contain requirements that are substantially the same as those set forth in the proposed NRC regulations for future licensing,
and most operations in nonagreement states are already committed to specific plans for decommissioning and tailings disposal. These provisions are included in NRC licenses under authority existing before passage of the Act. Inclusion of tailings as licensable byproduct materials, however, will help to ensure that tailings outside the control of an active licensee—possibly including tailings that are commercially remilled to extract remaining elements—will be within the regulatory reach of NRC.

Title I, on the other hand, is a major entry by the Federal Government into the field of tailings disposal and site cleanup. Although Congress backed away from proposals that the Federal Government pay all the costs of cleanup, it has nonetheless made a substantial financial commitment. Furthermore, the Federal Government will control the cleanup. Although remedial action is to be undertaken according to state cooperative agreements, and states are to be consulted fully in the selection of remedies, it is the Secretary who must establish priorities and select remedies.

The Federal Government’s involvement in tailings cleanup was controversial for several reasons. There was initial concern over whether the government ought to undertake the tailings cleanup program at all. Second, the proper allocation of costs and control of the cleanup between the federal and state governments was disputed. Finally, although it is clear that the remedial action program was intended to eliminate permanently the hazards from inactive mill sites, current technology for disposing of tailings may well be inadequate to prevent hazards, particularly in the distant future.

With regard to the question of whether the Federal Government

47. NRC’s general authority to license “utilization and production facilities” is specified in subchapter IX of the Atomic Energy Act of 1954, 42 U.S.C.A. §§ 2131-2141 (West 1973 & Supp. 1979). A “license shall be issued . . . subject to such conditions as the Commission may by rule or regulation establish to effectuate the purposes and provisions of this Chapter.” Id. § 2133(a).
50. 42 U.S.C.A. § 7918(a) (West Supp. 1979). The state role in the selection of remedies is to be “significant,” but is limited to “consultation” only. House Commerce Comm. Rep., supra note 3, at 34, 40, reprinted in [1978] U.S. Code Cong. & Ad. News 7461, 7467. Since most of the costs of remedial measures would be borne by federal taxpayers, the House Interstate and Foreign Commerce Committee believed that states should not have concurrence or veto power over remedial programs. Id. at 34, U.S. Code Cong. & Ad. News at 7461.
should become involved in tailings cleanup at all, it is generally con-
ceded that there is no federal liability for the hazards posed by tail-
ings.\textsuperscript{52} The inactive mills were operated by private individuals, not the Federal Government.\textsuperscript{53} However, the Federal Government was the primary purchaser of nuclear materials generated at the mills, and thus, indirectly caused tailings production.\textsuperscript{54} This indirect causation, combined with the Federal Government's previous inability to regulate tailings disposal, created what has been seen by some as a moral res-
ponsibility of the Federal Government to assist the states in resolving the tailings disposal problem.\textsuperscript{55}

Aside from any moral obligation to assist the states, strong practical considerations call for federal action. The individuals and corporations that operated the milling sites are an unlikely source of funds because many of the sites have since been sold.\textsuperscript{56} Furthermore, the cost of cleanup in some circumstances may be higher than private parties could afford to bear.\textsuperscript{57}

Once the question of whether the Federal Government would take any action was resolved, the possibility that this action would set a prece-
dent leading to federal responsibility for decontamination or decom-
missioning of other nuclear facilities was of concern. No major nuclear decommissioning effort has yet been necessary.\textsuperscript{58} As existing nuclear power plants, fuel reprocessing facilities, and other installations become obsolete,\textsuperscript{59} however, the issue of who must pay for decommis-
ioning will become more important. Although the House Interstate and Foreign Commerce Committee has explicitly stated that the mill tailings program is not to be considered a precedent for future federal responsibility for decommissioning problems,\textsuperscript{60} the program may yet be cited for the proposition that the Federal Government must bear some of the decommissioning costs.\textsuperscript{61}

Controversy existed, not only as to the allocation of costs between the federal and state governments, but also about control over remedial

\begin{itemize}
\item \textsuperscript{52} GAO Rep., supra note 2, at 8, reprinted in House Hearings, supra note 2, at 287; House Hearings, supra note 2, at 190 (statement of James L. Liverman).
\item \textsuperscript{53} GAO Rep., supra note 2, at 1, reprinted in House Hearings, supra note 2, at 279.
\item \textsuperscript{54} Id. at 7, House Hearings at 285.
\item \textsuperscript{57} GAO Rep., supra note 2, at 8, reprinted in House Hearings, supra note 2, at 286.
\item \textsuperscript{58} Id. at 10, 12, House Hearings at 288, 290.
\item \textsuperscript{59} See id. at 10-11, House Hearings at 288-89.
\item \textsuperscript{61} See GAO Rep., supra note 2, at 10-12, reprinted in House Hearings, supra note 2, at 288-90.
\end{itemize}
programs. Some argued that the states should have more input into the decisions about the choice of remedial action to be taken.62 One bill would have required the Federal Government to pay the entire cost of remedial programs, but would have authorized the states to establish their own remedial plan with the approval of the Secretary.63

As enacted, the Act balances considerations of cost, efficiency, and control. The federal subsidy of ninety percent of remedial action costs64 is a compromise between the need for comprehensive federal action and Congress' concern over the cost to the Federal Government of a program that confers extremely localized benefits and addresses a problem for which the Federal Government is not legally responsible.65 Congress was unwilling to have the Federal Government pay the bulk of the cost while giving the states more than a consultative role in the selection of remedies.66

Having resolved these political issues, those responsible for implementing the program face a serious technical problem: the potential inadequacy of current technology to prevent long-term hazards. In addition to providing for decontamination of milling sites, remedial action must stabilize the tailings to prevent long-term exposure of the public to radon emissions and gamma radiation.67 These measures must prevent wind and water erosion, leaching, and disruption by natural forces so that hazardous materials are not dispersed.68 Hazardous emissions must also be contained.69 Because of the long half lives of radium and thorium, the materials could pose a threat for thousands of years.70 The technology for an adequate one-time cleanup of inactive mills, or for long-term disposal of tailings from active mills may not be available.71

The proposed NRC regulations attempt to solve these problems.72 Erosion control may be possible by locating disposal sites in relatively

64. See note 18 supra.
65. See notes 52-55 supra and accompanying text.
67. GAO Rep., supra note 2, at 9, reprinted in House Hearings, supra note 2, at 287.
70. See note 3 supra.
erosion-free areas and by providing ground and vegetative coverings.\textsuperscript{73} However, such measures would likely involve long-term maintenance and monitoring costs.\textsuperscript{74} Furthermore, radon containment in a tailings pile has never been attempted, and though the use of impermeable covers or a thick earth layer may work in theory,\textsuperscript{75} such measures may result in a hazardous buildup of gamma-emitting radioactive material.\textsuperscript{76} Disposing of tailings in isolated areas to minimize human exposure suffers from the problem that increasing population pressures may well result in encroachment over the next several thousand years on areas that are now isolated.

In sum, the long-term environmental effects of the Act are difficult to assess. Congress has provided a seemingly adequate administrative mechanism for remedying the health hazards caused by inactive tailings sites and preventing these problems from arising at active mill sites. The major unresolved question is whether current technology will prove sufficient to withstand the cumulative impacts of thousands of years of natural forces.

\textit{John Magee}

\textsuperscript{73} Id. (criterion 4).
\textsuperscript{74} GAO Rep., supra note 2, at 9, reprinted in House Hearings, supra note 2, at 287.
\textsuperscript{75} Id.