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COMMENT

URANIUM MILL TAILINGS: THE PROBLEM OF DISPOSAL— WITH A SPECIAL LOOK AT NEW MEXICO

BACKGROUND INFORMATION AND HISTORY

The extraction of uranium from its ore yields tailings containing toxicants and various radioactive materials that are believed to be harmful to those living in the immediate vicinity. Although it has been known for some time that uranium mill tailings pose a problem, not until fairly recently has there been any concerted effort to deal with this situation. Steps are now being taken to study the problem systematically in order to determine the best solution.¹ This comment will focus on the problem and possible solutions, with an emphasis on the situation in New Mexico.

In 1974 a study was conducted of 21 abandoned sites in western states where there were potential or actual tailings problems. Each site was the result of the cessation of production and consequent termination of Atomic Energy Commission (AEC) or state licenses before the problems associated with tailings stabilization were identified.² The amount of tailings at each of the 21 sites studied varied from 90,000 tons to 3 million tons. Total tailings at the sites amounted to 25 million tons, or about 20% of all tailings impounded through 1973 at all sites in the United States, both active and inactive.³ Radium occurs naturally in uranium mill tailings and is the major source of concern because of the radon gas that is continuously emitted. Since radium has a half-life of 1600 years,⁴ the problem will continue for a considerable time.

Mill operators licensed by the AEC are required to control tailings during operations and to stabilize tailings after operations cease.⁵ Permission to cease milling operations is not granted until stabiliza-

1. 41 Fed. Reg. 22,431 (1976).

2. *Legislation to Authorize the Atomic Energy Commission to Enter into a Cooperative Agreement with the State of Utah to Contain and Render Harmless Uranium Mill Tailings; Hearings on S. 2566 and H.R. 11378 Before the Subcomm. on Raw Materials of the Joint Comm. on Atomic Energy, 93rd Cong. 2d Sess. 1353 (1974)* (statement of Dr. W. D. Rowe) [hereinafter cited as 1974 Hearings].

3. *Id.* at 1404 (*Summary Report, Phase I Study of Inactive Uranium Mill Sites and Tailing Piles*).

4. *Id.* at 1359 (statement of Dr. James L. Liverman).

5. *Id.*

tion and long-term control arrangements are assured. However, genuine long-term stabilization is an elusive goal.

In May of 1975 the Natural Resources Defense Council, Inc. (NRDC) petitioned the Nuclear Regulatory Commission (NRC) to issue regulations requiring Commission-licensed uranium mill operators to post a performance bond that would cover the cost of stabilization and ultimate disposal of uranium mill tailings. In addition, it asked that each Agreement State⁶ require uranium mill operators licensed by the State to post a similar performance bond. NRDC also asked that an environmental impact statement be prepared for the Commission's uranium milling regulatory program and for those parts of the program administered by Agreement States. After notice and due consideration,⁷ the Commission agreed that a generic environmental impact statement (GEIS) dealing with tailings management would be appropriate and agreed to prepare the GEIS for release in the summer of 1978.⁸

After uranium ore is mined, it is transported to the mill where it is processed by blending it with either an acid or alkaline solution (depending on the quality of the ore). It is then ground, roasted, and leached by an acid solution. The waste product, a fine sandy or silty residue called tailings, is separated from the uranium "yellowcake." Even after extensive processing and separation the tailings contain toxic products, including radioactive products in the form of dangerous radon "daughters." The magnitude of the problem can be understood by considering the proportion of the volume of tailings to the volume of the original ore⁹: for each ton of ore mined, one pound of uranium is produced. If the amount of uranium contained in the ore is less than one pound per ton, the ore is not regulated.¹⁰

Jurisdiction over uranium mills is with the NRC. Certain states, termed Agreement States, have contracted with the NRC to take over its authority within their boundaries. There are at present 25 Agreement States, including New Mexico. The NRC or the state licenses the mills; under the NRC licensing requirements mills must be monitored with respect to environmental effects. An application and license fee is required by the NRC to assure that the mills will comply with the monitoring and containment requirements. The

6. See *infra* at 432-33 for a discussion of "Agreement States."

7. The consideration lasted over one year.

8. 41 Fed. Reg. 22,430 (1976). Hearings are currently being held in various areas of the U.S. in order to get public input on this matter.

9. [1976] ENVIR. REP. (BNA) 511.

10. The Atomic Energy Act regulates only source material, which is defined by 10 C.F.R. §40.2(a) & (c) (1976).

amount of the fee does not, however, cover the costs of correcting any errors made in disposing of the tailings or in solving any past problems. State programs, under the terms of the Agreement, are required to be the equivalent of the NRC program and are, in fact, reviewed for equivalency each year.

The study conducted by the Environmental Protection Agency (EPA) of inactive mill sites in some western states (Arizona, Colorado, Idaho, New Mexico, Texas, Utah and Wyoming) found that adjacent to the tailing piles, which ranged in size from two to 107 acres, the land was contaminated with radiation in excess of background levels. ("Background levels" are the amounts of radiation that occur naturally in the environment.) The tailings, because they consist of sandy or silty residues, are particularly susceptible to wind and water erosion, and may be spread throughout the environment. People living near the inactive mill tailings piles are exposed to increased levels of radon gas and its decay products ("daughters"), radionuclide particles from the surface of the piles, gamma radiation from radionuclides within the piles, and possible internal exposure from contaminated ground and surface water. NRC standards require licensees to show that any activities carried on will not subject anyone in unrestricted areas¹¹ to annual doses of more than 0.5 rem.¹² The EPA estimated that annual radiation doses to those living near the tailings piles could be as high as 8 rem at 50 yards from the pile, 3 rem at one-half mile, and 0.1 rem at one mile.¹³ Exposure to windblown radioactive particles or to gamma radiation can be controlled by covering the piles with compacted dirt, but unless the covering is 10-20 feet thick radon gas will continue to be above the values observed for normal soils.¹⁴

Regulation of tailings does not appear to have been carried out adequately in the past. In fact the question of who had the authority to regulate radioactive discharges into waterways was not resolved until fairly recently. In *Train v. Colorado PIRG*,¹⁵ the U.S. Supreme Court denied that even though the EPA has authority to regulate discharges of pollutants, authority over discharges of source, by-product, and special nuclear material is vested in the NRC under

11. An unrestricted area is one to which the public has uncontrolled access for purposes of protection from exposure to radiation and radiation materials.

12. "Rem" stands for "roentgen equivalent (in) man" and is defined as the quantity of ionizing radiation whose biological effect is equal to that produced by one roentgen of X-rays.

13. For a discussion of this problem, see Morgan, *Adequacy of Present Standards of Radiation Exposure*, 1 ENV'TL AFF. 91 (1971).

14. [1976] ENVIR. REP. (BNA) 49.

15. 426 U.S. 1 (1976).

provisions of the Act. However, the EPA has authority to regulate discharges beyond the immediate area of power plant sites (at the boundaries), and it could be argued that it should have similar power to regulate tailings discharged at mill site boundaries. Such authority would be desirable because the EPA has the obligation to assess the potential impact on public health as completely as possible, while NRC regulatory power is less inclusive. Implementation of on-site standards is still left to the NRC.¹⁶

THE FEDERAL ACT AND REGULATIONS

The Atomic Energy Act was passed in 1946 and was amended extensively in 1954. Its stated purpose was to encourage atomic energy and to regulate the processing and utilization of source material so as to "provide for the common defense and security and to protect the health and safety of the public."¹⁷ In 1959 an amendment to the Atomic Energy Act of 1954 was passed which provided that in place of the exclusively federal system of licensing and regulation the AEC could enter into an Agreement with the governor of any state to transfer certain responsibilities. The Agreement would provide for the discontinuance of regulatory authority by the Commission and the assumption of that authority by the state. The state requirements are to be consistent with the federal regulations they supplant. But certain regulatory activities are still reserved to the NRC/AEC,¹⁸ including oversight of construction and operation of production facilities.

After adoption by Congress of the National Environmental Policy Act (NEPA) the regulations were further amended in 1974. An Environmental Impact Statement (EIS) was required before certain activities, such as licensing of uranium mills or production of uranium, were undertaken. An EIS is required for "any other action which the Commission determines is a major Commission action significantly affecting the quality of the human environment."¹⁹

LICENSING

A license is required by any person who wishes to transfer, deliver, receive possession of or title to, or export from the U.S. any

16. 40 C.F.R. §190 (1976), Environmental Radiation Protection Requirements for Normal Operations of Activities in the Uranium Fuel Cycle, Final EIS, Vol. 1, at 18, 21.

17. 42 U.S.C. §2012(d) (1970).

18. Under the Energy Reorganization Act of 1974, the Commission was split into two entities, the NRC and the Energy Research and Development Administration (ERDA). The NRC took over the regulatory duties of the AEC. 42 U.S.C. §5801 (Supp. IV 1974).

19. 10 C.F.R. § 51.5(10) (1976).

source material²⁰ containing uranium after removal from its place of deposit in nature. Included in this licensing requirement is the disposition of raw source material such as residues or tailings dumped into streams or sewers or disposed of in such manner that recovery is not possible.²¹ In issuing a license, the Commission is required to consider four points:

- 1) that the common defense and security is assured;
- 2) that there are adequate source materials for production, research or development;
- 3) that source materials are not used in any manner inconsistent with national welfare;
- 4) that health and safety be preserved.²²

Should the Commission determine, after a license has been issued, that the public health, interest or safety requires that a license be modified, suspended, revoked, or annulled, the Commission is empowered to do so.²³

The requested license may provide for the milling of uranium or the production of uranium hexafluoride. Those actions have been determined to be the kinds of activities significantly affecting the human environment.²⁴ Thus, the Director of Regulation, before granting the license, must weigh the environmental, economic, and technical benefits against the environmental costs. He is also empowered to require of the licensee certain conditions of the licensee's operation which he feels are necessary to protect environmental values.²⁵

The Commission is empowered to determine what is or is not "source material." It may alter that definition as it sees fit so long as it determines:

- 1) that any material so defined is essential to the production of special nuclear material;
- 2) that to find such material to be source material is in the interest of the common defense and security.

In addition, the President must assent in writing to such a determination. A 30-day waiting period is required before any such determination is adopted, but this may be waived.²⁶

20. See *infra* at 435-36 for definition and discussion of source material.

21. 10 C.F.R. §40.10 (1976).

22. 10 C.F.R. §40.22 (1976).

23. 10 C.F.R. §40.25 (1976).

24. 10 C.F.R. §51.5(a)(5) (1976).

25. 10 C.F.R. §40.32 (1976).

26. 42 U.S.C. §2091 (1970).

The Atomic Energy Act defines source material as follows:

- (1) uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of § 61 [42 U.S.C. § 2091] to be source material; or
- (2) ores containing one or more of the foregoing materials in such concentrations as the Commission may by regulation determine from time to time.²⁷

The Regulations define it thus:

source material means any material, except fissionable material, which contains by weight one-twentieth of one percent (0.05%) or more of (1) uranium, (2) thorium, or (3) any combination thereof. (c) "Raw source material" means (1) source material which has not been chemically processed in any manner and (2) source material in the form of residues or tailings.²⁸

The EPA, in a recent action setting radiation standards, defined uranium ore to be equivalent to the NRC definition of source material, i.e., any ore containing 0.05% or more uranium by weight. But it was called to the attention of the EPA that to exclude ores containing less than that quantity of uranium might be undesirable because future demand for such ores may later make its use economically feasible.²⁹ The EPA definition was therefore changed to eliminate any reference to a percentage of uranium in the ore.

One must be licensed in order to transfer source material in any form, with exceptions provided for those who are under contract with the Commission³⁰ and for those who are dealing with minimal quantities of source material.³¹

Part 20 of the Code of Federal Regulations (C.F.R.) deals with standards for protection against radiation hazards that arise from activities licensed by the AEC. Sources of radiation that are not licensed by the Commission are not included. If exposure to the licensed material is added to exposure from unlicensed material, the amount of radiation cannot exceed the standards of radiation protection that are prescribed in the Regulations.³²

Licenses must comply with the radiation protection standards,³³ as must source material that contains one-twentieth of one percent

27. 42 U.S.C. § 2041(z) (1954).

28. 10 C.F.R. § 40.2(a) & (c) (1976).

29. 42 Fed. Reg. 2860 (1977).

30. 10 C.F.R. § 40.11 (1976).

31. 42 U.S.C. § 2092 (1970).

32. 10 C.F.R. § 20.1(b) (1976).

33. 10 C.F.R. § 20.2 (1976).

(0.05%) of (1) uranium or (2) thorium, or a combination of the two.³⁴ Standards are established for exposure of individuals in restricted areas.³⁵ A different standard is set for those in unrestricted areas.³⁶ Effluents that flow from a restricted to an unrestricted area are also regulated.³⁷ The concentrations of materials released are measured at the point where the radioactive material leaves the restricted area. Should it leave the restricted area via stack, tube, pipe, or other conduit, it is measured at the point where it leaves the conduit.³⁸ Concentrations may be determined by averaging them over a one-year period.

An annual report is required of each licensee authorized to use source material in uranium milling or in production of uranium hexafluoride. The report must specify the amount of radionuclides that are released to unrestricted areas, via either the air or water. This allows the Commission to estimate the maximum potential annual radiation doses to the public. Should the licensee exceed the amount of radionuclides that were estimated to be released at the time of making the license application, he may be required to take corrective action.³⁹

An applicant may wish to increase the allowable limits of radioactivity flowing into unrestricted areas. To do this he must propose higher limits, which may be approved if the applicant can show that a reasonable effort was made to minimize the radioactivity flowing into unrestricted areas. If the new limits are approved, the licensee must also show the improbability that any individual would be exposed to radioactive materials exceeding the limits set forth in § 20.106.⁴⁰

NEPA,⁴¹ passed in 1969, calls for the evaluation of the significant effects a given federal action will have on environmental quality. The regulation in 10 C.F.R. § 40.32 requires the Commission to consider benefits of the action as balanced against environmental risks before issuing a license for uranium milling, production of uranium hexafluoride, commercial waste disposal, or any other activity that the Commission determines will "significantly affect the quality of the environment." An EIS is required before a license can be issued in

34. 10 C.F.R. § 20.3(13) (1976).

35. 10 C.F.R. § 20.101 (1976).

36. 10 C.F.R. § 20.102 (1976).

37. 10 C.F.R. § 20.106 (1976).

38. 10 C.F.R. § 20.106(c) (1976).

39. 10 C.F.R. § 40.65(a)(1) (1976).

40. 10 C.F.R. § 20.106(b)(1)(2) (1976).

41. National Environmental Policy Act of 1969, 42 U.S.C. § § 4321 *et seq.* (1970).

any of the above cases.⁴² The information required for the EIS should allow the assessment of risk to the general public from tailings.

A fee for a uranium milling or production license is required and must accompany the application.⁴³ The fee schedule is set forth in 10 C.F.R. §§ 170.21 and 170.31.⁴⁴ Certain exemptions are listed in 10 C.F.R. § 170.11, the most significant of which, insofar as this paper is concerned, is 10 C.F.R. § 170.11(a)(9). It states that: No application filing fees, license fees, or annual fees shall be required for . . . a license for possession and use of byproduct material, source material, or special nuclear material applied for by, or issued to, an agency of a State or any political subdivision thereof. Licenses for source material to be used in milling operations and those for refining mill concentrates to uranium hexafluoride require an application fee of \$10,050 and an annual fee of the same amount.⁴⁵ Failure to pay the annual fee required may lead to suspension or revocation of the license, or any other remedy the Commission determines to be appropriate.⁴⁶ Criminal and civil sanctions are available under the Act.⁴⁷

As indicated above, the Act of 1954 was amended in 1959. The 1954 Act permitted private ownership of nuclear facilities, but only under a comprehensive, pervasive system of federal regulation and licensing. States were given no authority under the original Act except that which they traditionally had exercised over the generation, sale, and transmission of electric power, even though such power might be produced by use of nuclear facilities. But the interest of states in having some control over the possible hazard to the health and safety of its citizens increased, and several bills were introduced that provided for federal-state cooperation. Legislation was finally enacted in 1959. Its purpose was to promote an orderly regulatory pattern between the federal and state governments with respect to regulation of byproduct, source, and special nuclear materials, and to avoid dual regulation.⁴⁸ Upon the request of the governor of any state, an agreement could be made between the governor and the Commission. The Agreement would provide for discontinuance of the Commission's regulatory authority with respect to byproduct,

42. 10 C.F.R. § 51.5(a)(5) & (10) (1976).

43. 10 C.F.R. § 40.31(e) (1976).

44. The former covers production and utilization facilities; the latter, materials licenses.

45. 10 C.F.R. § 170.31 (1976).

46. 10 C.F.R. § 170.41 (1976).

47. 10 C.F.R. § 150.30 (1976).

48. Interpretation by the General Council: AEC jurisdiction over nuclear facilities and materials under the Atomic Energy Act. 10 C.F.R. § 8.4(d) & (e) (1976).

source, or special nuclear materials in quantities not sufficient to form a critical mass. Under such an agreement the state has the responsibility to regulate the materials covered for the protection of the public health and safety.⁴⁹ Notwithstanding any such agreement, the Commission still retains the authority and responsibility for the regulation of the disposal of any byproduct, source, or special nuclear material that it determines should be licensed because of any actual or potential hazards inherent in the disposal process.⁵⁰ If an application for a license in this category is made to the Commission, the Commission must notify the state of the licensee or in which the license is requested of the application. The state must then be given an opportunity to engage in fact-finding and to act in an advisory capacity to the Commission with respect to the license.⁵¹

An Agreement requires the governor of the participating state to certify that the state has a program for the control of radiation hazards adequate to protect the public health and safety with respect to those materials covered by the proposed Agreement. The governor must also certify that the state wants to assume regulatory responsibility for such materials.⁵² In addition, the Commission must find that the state program is compatible with the Commission's program for the regulation of such materials. It must also find the state program is adequate to protect the public health and safety with respect to the materials covered.⁵³

Should it become necessary, the Commission may terminate or suspend the Agreement with the state and reassert its licensing and regulatory authority. This action may be done to protect the public health and safety, and can take place either upon request of the governor of the Agreement State or (after notice and an opportunity for a hearing) upon the Commission's own initiative.⁵⁴ Thus, the NRC could, should it so desire, assume all authority over mill tailings.

No moves in that direction have been made, either by the NRC or by the states, nor has any Congressional action been taken. A bill was introduced in Congress on October 10, 1977 to set up an independent agency in the Executive branch of the government to carry the sole responsibility for the safe disposal of wastes and facilities. Mining and mill tailings would fall under the jurisdiction of this proposed

49. 42 U.S.C. §2021 (1970).

50. 42 U.S.C. §2021(c)(4) (1970).

51. 42 U.S.C. §2021(1) (1970).

52. 42 U.S.C. §2021(d)(1) (1970).

53. 42 U.S.C. §2021(d)(2) (1970).

54. 42 U.S.C. §2021(j) (1970).

agency. The status of the bill is uncertain. Hearings were to be held in the 1978 congressional session.⁵⁵

THE STATE ACT AND REGULATIONS

In 1971 the New Mexico Legislature enacted the Radiation Protection Act providing for state licensing of all radioactive material, except as directed by the Board.⁵⁶ The Board referred to is the Environmental Improvement Board which was established under the Environmental Improvement Act.⁵⁷ The Board sets the policy under the Act and promulgates the rules, regulations, and standards.⁵⁸ The Environmental Improvement Agency (EIA) is the enforcement arm of the Board.⁵⁹

In 1973 the governor certified that New Mexico had a program for the control of radiation hazards adequate to protect the public health and safety and that the state wished to assume regulatory responsibility in this area. Notice was published in the Federal Register in January of 1974, and New Mexico became an Agreement State on March 4, 1974.

The New Mexico regulations promulgated under the auspices of the Radiation Protection Act are, for the most part, parallel to the NRC regulations. However, they are not so detailed, nor do they cover as many aspects. Under these regulations, anyone who possesses, uses, stores, disposes of, manufactures, processes, repairs, or alters any radioactive material is required to have a license from either the AEC (now the NRC), an Agreement State, or from the EIA.⁶⁰ Failure to comply is a misdemeanor,⁶¹ but no criminal penalties are specified. The Board is empowered to exempt from licensing or registration any quantities of radioactive material that it determines not to be a health or environmental hazard.⁶² The Board can, after notice and an opportunity to be heard, issue a cease and desist order against any violator of a Board regulation,⁶³ or seek injunctive relief.⁶⁴ Tailings within the mill site boundaries are included under these regulations.

The regulations of the Board, promulgated on June 16, 1973,

55. [1977] ENVIR. REP. (BNA) 919.

56. N.M. STAT. ANN. § 12-9-10 (Supp. 1971).

57. N.M. STAT. ANN. § 12-12-2 (Repl. 1976).

58. N.M. STAT. ANN. § 12-12-6 (Repl. 1976).

59. N.M. STAT. ANN. § 12-12-9 (Repl. 1976).

60. N.M. STAT. ANN. § 12-9-7A (Supp. 1971).

61. *Id.* § 12-9-7B.

62. *Id.* § 12-9-7D.

63. *Id.* § 12-9-9A.

64. *Id.* § 12-9-9C.

define "source material" in the same manner as the Atomic Energy Act.⁶⁵ An "unrestricted area" is defined in the regulations as "any area, access to which is not controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive materials . . ."⁶⁶

Licensees and registrants are required to perform various tests for sources of radiation, tests of facilities where sources of radiation are used or stored, and any other tests the EIA determines would be appropriate or necessary.⁶⁷

Radioactive material not covered by a specific or general license issued by the AEC/NRC is required to be licensed by the Agency.⁶⁸ But anyone who is dealing with source material that is less than 0.05% of the mixture, compound, solution, or alloy in which it is found, or who is dealing with unrefined and unprocessed ore containing source material, is exempted.⁶⁹

The Agency prescribes the form for specific licenses,⁷⁰ and may require further statements from the applicant at any time before the license expires in order to determine more accurately whether the application should be granted or denied or whether the license should be modified or revoked.⁷¹ The Agency must determine that the applicant is qualified to use the material in question in such a way as to minimize danger to public health and safety or property. It must also decide whether the facilities, equipment, and procedures are adequate to minimize any danger and the Agency must establish that the issuance of the license will not be inimical to the health and safety of the public. Should an applicant comply with all the above, a special license will be issued. At the time the license is issued, or at any time thereafter pursuant to a rule, regulation, or order, the Agency may incorporate into the license any additional requirements and conditions the Agency deems appropriate or necessary to minimize danger to public health and safety or property.⁷² The licensee is also entitled to request amendment of his license. He must specify how and why such action should be taken.⁷³ Licenses are not transferable without agency consent in writing.⁷⁴ The Agency recognizes

65. Env'tl Improvement Bd. Regs. 1-102 MM, NN (1973) (available on request).

66. *Id.* 1-102.TT.

67. *Id.* 1-115.A, B.

68. *Id.* 3-100.A.

69. *Id.* 3-110.A, B.

70. *Id.* 3-300.A. A specific license is issued to an individual.

71. *Id.* 3-300.B.

72. *Id.* 3-400.A.B.1.

73. *Id.* 3-400.

74. *Id.* 3-410.B.

licensees holding licenses granted by the AEC/NRC or any Agreement State, with certain restrictions, and will grant any such licensee a general license to carry on his activities within the State for 180 days per year.⁷⁵

Standards for protection against radiation are set forth in Part 4 of the Board's regulations (available on request). Permissible levels of radiation from external sources in unrestricted areas are identical with those set forth in 10 C.F.R. §20.102(b)(1)(2). "No doses greater than two millirems per hour should the individual be present continuously in the area; no doses greater than 100 millirems in any 7 consecutive days, should the individual, again, be continuously present in the area."⁷⁶ These standards are used both by the state and by the NRC.

In the case of effluents released to unrestricted areas, the language is also very similar to that of the Federal Regulations (10 C.F.R. §20.106). However, the state regulations allow the Agency some discretion in approving or disapproving higher concentrations of effluents to unrestricted areas,⁷⁷ while the Federal Regulations state that "The Commission will approve the proposed limits. . . ."⁷⁸

A licensee must notify the Agency in writing at least 30 days in advance of plans to vacate any premises (or relinquish control or possession of them) that may have become contaminated with radioactivity as a result of his activities. The Agency may require the licensee to decontaminate the premises.⁷⁹

Guidelines for uranium mill licensing require that an application form be filled out in duplicate at least 9 months before the mill is constructed, including any documentation related to the application that the Agency believes would be helpful in making its decision. Notice is published by the Agency. It informs the public that a license request for a mill has been submitted. The application can be inspected by the public along with other materials relating to the public health and safety of the proposed project. Unless there are deficiencies in the application or there is reason to believe Agency regulations will be violated, the license will be issued after the end of the review period. The Agency may call on state or federal agencies to assist it in the review of the application. Independent consultants in the field of radiation protection may also be retained to help in the review. An EIS will be accepted by the Agency to use in analy-

75. *Id.* 3-600.

76. *Id.* 4-150.A.1, 2.

77. *Id.* 4-160.B.

78. 10 C.F.R. §20.106(b) (1976).

79. Env'tl Improvement Bd. Regs. 4-460 (1973) (available on request).

zing the health and safety aspects of the application, although none is presently required. Once the plant is operating, the Agency will inspect it to insure that its operation meets all agency regulations.⁸⁰

POSSIBLE SOLUTIONS

That there is a problem is obvious; although the solutions are not simple, they do exist.

One possible solution would be to allow the NRC to reassume responsibility for the problem. Under the terms of the Agreement,⁸¹ the states have the authority to regulate the materials covered by the Agreement for the protection of the public health and safety from radiation hazards.⁸² But the Commission may, upon its own initiative (after notice and a hearing) or upon request of the governor of an Agreement State, terminate or suspend its agreement with the state. It is then empowered to reassert its licensing and regulatory authority should the Commission find this action is required to protect the public health and safety.⁸³ That tailings *do* pose a threat to the public health and safety is unquestioned. The NRC has been reluctant in the past to assume any jurisdiction or responsibility for tailings because they fall outside the definition of "source material." One is encouraged, however, by the EPA change in its definition of uranium ore. Though it was formerly defined to be any ore containing 0.05% or more uranium by weight, the EPA recently changed the definition when it decided that "it is not desirable to exclude ores containing less than this quantity of uranium, since future demand for ore may make the use of such ores economically feasible."⁸⁴ A similar change by the NRC would encompass tailings in the definition of "source material" and the NRC would thereby acquire jurisdiction over them. In addition, the fact that a GEIS is being prepared by the NRC to examine longer-range policy in dealing with tailings and to assess the environmental impact of uranium milling opera-

80. Guidelines for Uranium Mill Licensing. Surprisingly enough, there has been little litigation in this area within the past year. A suit was brought in the New Mexico District Court by the Natural Resources Defense Council, *et al.* to stop licensing by the State and the NRC of a uranium mill without preparation of an EIS. [1977] ENVIR. REP. (BNA) 81. A related suit brought by NRDC against the NRC in the United States Court of Appeals seeking review of the licensing Action by the State and NRC was dismissed insofar as it sought review of the licensing Action. A hearing on the matter before the NRC was determined to be outside the jurisdiction of the NRC and was therefore denied. *Natural Resources Defense Council v. Nuclear Regulatory Comm'n*, No. 77-1570 (D.C. Cir. 1977).

81. 42 U.S.C. § 2021 (1970).

82. 42 U.S.C. § 2021(b) (1970).

83. 42 U.S.C. § 2021(j) (1970).

84. 42 Fed. Reg. 2859 (1977).

tions⁸⁵ may cause the NRC, protective of its authority, to usurp tailings regulation in order to pre-empt the EPA. This could only operate to the public's advantage.

Another solution would be an NRC take-over of the milling process itself. Again, its authority to do so might be inferred from its ability to regulate if there is a threat to the public health and safety. Compensation would have to be made, of course, to those currently owning and operating the mills. Milling may be an extremely profitable activity at present, but the possible risks down the line, the threats to the health and safety of residents in the area, and the potential for legal liability⁸⁶ and environmental harm may well convince mill owners to relinquish such operations. Giving the government authority over milling would extend the scope of its involvement in the nuclear fuel cycle. It already is the only organization involved in reprocessing, since it is the only entity with adequate facilities to carry out such activities.

A third possibility might be state regulation of the milling process under its licensing authority. In New Mexico this might be done because the EIA has the authority to protect the public health and safety.⁸⁷ However, should the courts determine such regulations would be an unwarranted extension of Agency authority, the legislature would have to expand the Agency's scope of authority. The State Senate, in the 1977 Legislative Session, showed a surprising willingness to do exactly that. Senate Bill 447 dealt with the problem at hand. It amended §§ 12-9-1 through 12-9-11 of the New Mexico statutes and enacted new §§ 12-9-5.1, 12-9-5.2, 12-9-9.1, 12-9-9.2 and 12-9-12.⁸⁸

Senate Bill 447 required, for the first time, that license fees be charged.⁸⁹ It requires that a bond be paid to the state in adequate amounts to ensure compliance with the requirements of the regulations or license conditions, including actions that might be necessary during or after the cessation of operations by a licensee in cases of abandonment, default, or failure to comply with specified require-

85. *Id.* It is still being prepared.

86. It would be difficult to argue assumption of the risk when the Government, as recently as 1971, argued the risks were not sufficiently well-established to show a causal connection.

87. Currently EIA regulates tailings on mill property via its licensing authority. Should the tailings escape the property, nuisance remedies have been used in the past (Telephone conversation with Bruce Garver, a member of the EIA Legal Staff, March 10, 1977).

88. 1971 N.M. Laws, ch. 284, § 1; 1959 N.M. Laws, ch. 185, § § 2 & 3; 1971 N.M. Laws, ch. 284, § § 4-11 *as amended*.

89. N.M. STAT. ANN. § 12-9-5.1.C. (Inter. Supp. 1977).

ments.⁹⁰ It also establishes a continued care fund deposit.⁹¹ A uranium mill license holder will be required to pay \$0.10 per pound of U_3O_8 , unless a lesser amount is found to suffice. No mill will have to pay more than \$1,000,000 as a continued care deposit. Provision is made for the NRC to adopt regulations governing such activities. Should it do so, the Board is then authorized to adopt more stringent continued care requirements when the Board finds they are necessary because of unique or special circumstances in New Mexico.⁹²

Money in the continued care fund is to be used to remedy and prevent situations that involve abandoned wastes or inoperative facilities that are or were operated by depositors to the fund.⁹³ Emergency expenditures of up to \$100,000 for any single incident may be made by the Board.⁹⁴

An emergency cease and desist order is provided for, though not without a hearing. However, the hearing may be held after the order goes into effect.⁹⁵ Injunctive relief is also provided.⁹⁶ Additionally a civil penalty of up to \$5,000 per day may be imposed.⁹⁷ A criminal penalty is also specified: it is a misdemeanor to willfully violate any provision of the Radiation Protection Act.⁹⁸ Should there be an emergency, the Director may impound sources of radiation in the possession of any person not equipped to comply with or who fails to comply with the Act or its provisions.⁹⁹

The above law appears to be a well thought-out attempt to deal with the tailings problem. But the State does not possess the ability to enforce such a law properly. Presently, its mill inspection is carried out by a single individual, who visits each of New Mexico's half-dozen active mills once or twice a year. The mills are, however, also monitored by the NRC, and one assumes there is an exchange of information between the EIA and the NRC.

A fourth possibility for handling this problem would be for the EPA's setting of stronger standards at the site boundaries, because that is where the EPA's authority currently begins. This would en-

90. N.M. STAT. ANN. § 12-9-5.2.A. (Inter. Supp. 1977).

91. N.M. STAT. ANN. § 12-9-5.1.C. (Inter. Supp. 1977).

92. *Id.* § 12-9-5.1.D.

93. N.M. STAT. ANN. § 12-9-5.2.B. (Inter. Supp. 1977).

94. *Id.* § 12-9-5.2.C.

95. N.M. STAT. ANN. § 12-9-9.A, B. (Inter. Supp. 1977).

96. *Id.* § 12-9-9.C.

97. *Id.* § 12-9-9.D.

98. N.M. STAT. ANN. § 12-9-9.1 (Inter. Supp. 1977).

99. N.M. STAT. ANN. § 12-9-9.2 (Inter. Supp. 1977). "Radiation source" is not defined so it presumably can mean tailings. This leads to a strange mental image of the Director's impounding huge mountains of tailings!

able the EPA to set standards that would affect radioactive effluents. Under its authority, EPA would probably be able to compel action to be taken with respect to the tailings themselves.

A fifth solution—or set of solutions—was proposed by the Western Interstate Nuclear Board. Among them are:

1. an adequate plan for reclamation and disposal of tailings as a condition of mill licensing, with the licensing agency responsible for assuring compliance;
2. imposition of a tax or fee per ton of ore processed to generate an escrow account over lifetime of the mill, or a requirement of a performance bond to assure an operator of meeting short-term decommissioning requirements;
3. accumulation of an annuity by tax or fee per ton of ore processed to meet long-term financial requirements for maintenance and surveillance of the stabilized pile;
4. provision in licensing agreements for transferring ownership to government;
5. identification or construction of a price index suitable for adjusting the taxes, fees, or bonds so as to maintain purchasing power parity of the financial requirements.¹⁰⁰

A sixth answer might be the NRC's imposition of bonding requirements, which would force Agreement States, in turn, to strengthen *their* bonding requirements so as to be compatible with the federal regulations. At present, there are apparently no federal bonding requirements; New Mexico specifies in its new law that the bonding shall run only to the state.

Improvement of state enforcement and inspection is yet another possibility. However, that will entail an increase in both expenditures and personnel. It might also require a stiffening of state standards by the legislature.

Perhaps it would be premature to do any of the above without doing some preliminary research to determine the best course to follow. Such research has already begun. A study of inactive uranium mill sites and tailings piles was begun in 1974. Phase I included visiting each site in order to determine, among other things, its condition, the need for corrective action, its ownership, its proximity to populated areas, and prospects for population increases near the site. For each mill site, a preliminary report was prepared in order to decide whether a Phase II engineering assessment of the site would be

100. [1977] NUCLEAR FUEL 18 (March 7). New Mexico's bill incorporates aspects of 2 and 3. That transfer to government ownership is contemplated may indicate a willingness to do so.

necessary.¹⁰¹ Phase II is to include evaluation of the problems and consideration of alternative solutions as well as cost estimates and plans for remedial action.

Conditions at the various sites differed, but none were very satisfactory. The report characterized the work done to date as "a holding action, sufficient for the present, but not a satisfactory answer for long-term storage."¹⁰²

At all sites, radioactivity was found to have spread from the mill site by a number of methods: wind-blowing solids, radon gas and its daughters; deliberate removal of tailings and other materials for off-site use; water erosion and dissolution; ground water and soil contamination; and the dumping or spilling of low grade ores and mine wastes offsite.

At some sites, housing and buildings remaining from the mill sites are still used for housing, warehousing, schools, and even as a sewage disposal plant.

The Phase I study indicated that Phase II studies should include consideration of the following items, although the list was subject to change should further work demonstrate a need for it.

- a) Moving of of tailings piles. This was considered to be justifiable only if the two criteria were met:
 - 1) exposure or potential exposure of a large population to substantially increased radiation levels, and
 - 2) unsuitability of the site for long-term stabilization.¹⁰³
- b) Stabilization and decontamination;
- c) Long-term control;
- d) Radioactive materials used in construction;
- e) Research and development to develop improved stabilization methods. (Obviously more work needs to be done in this area).

Phase II studies have been begun and are nearing completion.¹⁰⁴ It will be interesting to see what its recommendations are.

CONCLUSION

A properly done GEIS will provide a good definition of the problem. A joint research program should be established between EPA

101. 1974 Hearings, 1397, *Summary Report, Phase I Study of Inactive Uranium Mill Sites and Tailings Piles*.

102. *Id.* at 1399.

103. Since the study team found *no* site had satisfactorily managed to stabilize tailings, perhaps the second criterion is *always* met.

104. Telephone conversation with Wayne Kerr, member of NRC Office of State Programs (March 1, 1977).

and NRC. Both have information in the area; a joint effort should keep them from wrangling over jurisdictional problems. The study should establish:

- 1) the risks involved as measured at real sites;
- 2) what can be expected to happen at these locations in the future;
- 3) the best corrective measures to avoid the risks.

Joint EPA-NRC regulations should require the research results to be implemented appropriately; any final solution should be objective, with the general public's interest considered first. The time for public advocacy is after the research is completed. Once the problems are defined in a satisfactory manner, an adequate bonding program should be established to prevent future recurrences of the tailings problems.

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