

Appendix A

U.S. Regulatory History of Uranium Mills

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Because of the military importance of uranium during the cold war, the federal government encouraged and supported the development of a domestic uranium industry starting in 1946 with the passage of the Atomic Energy Act (AEA). The federal programs, which were initiated by the Atomic Energy Commission (AEC), included guaranteed prices for uranium ore production and guaranteed cost recovery and return on investment for mills. The AEC's programs gradually phased out in the late 1960s and ended in December 1970. The uranium industry contracted substantially in size during this phase-out period; however, the industry grew rapidly in the mid- to late-1970s to supply uranium for the expanding nuclear power plant market.

In response to increasing health and safety concerns regarding uranium milling, the Energy Reorganization Act (ERA) was passed in 1974, which resulted in the creation of the Nuclear Regulatory Commission (NRC or Commission). This was followed in 1978, with the Uranium Mill Tailings Radiation Control Act (UMTRCA), which established NRC as the lead agency for regulating the production containment and monitoring of uranium and thorium mill tailings, which are defined in the AEA under section 11e.(2) as byproduct material. The U.S. Department of Energy (DOE) was required, under UMTRCA, to remediate inactive mill sites and conduct long-term surveillance and monitoring of mill sites after reclamation. The U.S. Environmental Protection Agency (EPA) also played an important role as they issued standards for the control of uranium mill tailings in 1983, which were then integrated into NRC's regulations. NRC implements and enforces those regulations through its licensing process. Colorado is one of five Agreement States that have since been authorized by the NRC to license AEA section 11e.(2) byproduct material under state regulations that are as strict or stricter than the federal regulations.

Since its inception in the mid-1970s, the statutory and regulatory program associated with the uranium industry has undergone massive development with the assistance of federal/state governmental entities, regulators, industry members, and interested stakeholders. There were many "lessons learned" as all of the uranium mills, to date, were built and began operating prior to the development of the current regulations. This has resulted in substantial monitoring, cleanup, and closure costs for older mill facilities, which had little or no controls in place for disposal of byproduct material. The regulatory program implemented by NRC and the Agreement States for uranium recovery facilities is now a mature and comprehensive program that ensures adequate protection of public health and safety and the environment. A detailed regulatory history of uranium mills, also commonly referred to as uranium recovery facilities, is provided below.

Atomic Energy Commission. Prior to World War II, the most important use for ores containing radioactive constituents such as uranium was for medical purposes.¹ In 1939, the splitting of the atom created a viable military use for uranium and, after World War II, the United States Congress enacted the AEA² in recognition of the strategic value of possessing significant and secure supplies of uranium for military purposes. The AEA created the AEC and Congress empowered the AEC to procure and control uranium supplies, as well as to create a domestic uranium recovery industry, to build nuclear weapons and to develop and regulate a nuclear power industry.

¹ Earle Gray, *The Great Uranium Cartel* at 16 (McClelland & Stewart) (1982).

² Atomic Energy Act of 1946, Pub. L. No. 79-585, 60 Stat. 755 (1946).

Initially, the AEC recognized that the United States was primarily dependent on uranium ores from the Belgian Congo and, to a lesser extent, Canada for such materials. In order to alleviate this dependency, the AEC sought to stimulate creation of a domestic uranium recovery industry by enacting policies that encouraged private companies and individuals to explore for uranium reserves and to fully develop such reserves. The AEC's biggest obstacle was the lack of a market for domestically-produced uranium in light of the significant exploration, extraction, and processing costs associated with the recovery of such uranium reserves. As a result, the AEC developed a program that guaranteed prices for uranium ore production, that provided bonuses for the initial production at new mines, and that reimbursed producers for transportation and other costs.³ These incentives were provided through a series of "Domestic Uranium Production Circulars" issued by the AEC. The AEC also established a number of ore-buying stations in areas of anticipated ore production.

In addition to the need for exploration, location, and mining of uranium ores, the AEC recognized that it needed to encourage the development of a domestic uranium milling industry. Accordingly, the AEC set out to encourage the private development of milling facilities by creating an incentive system in the form of agreement by the AEC to purchase processed uranium on terms that allowed private companies to recover the cost of constructing and operating a mill during the life of a particular contract.⁴ Under this program, uranium mills were privately constructed and operated pursuant to AEC contracts which guaranteed cost recovery and a reasonable return on investment.⁵

By 1951, the AEC was able to announce that the United States was second among the free nations in uranium mining and processing; by 1955 that the United States was the single largest producer of uranium ore in the world; by 1957 that its emphasis was no longer on expanding production but in maintaining and developing ore reserves for future needs; and by 1963, in a report to the President, that the United States was now self-sufficient in uranium mining and milling and need not depend on foreign sources.⁶

In an announcement issued May 24, 1956, the AEC established a new domestic procurement program for the period from April 1, 1962 through December 31, 1966. This action was taken "in recognition of the need for a continuing Government market in order to maintain a high rate of exploration and development." One of the main purposes of this program was to provide assurances of a uranium market during the 1962-1966 timeframe, and, thus, assure the continued development of a domestic mining and processing industry until a commercial market developed that could support this industry.

The new program established a minimum price of \$8 per pound for concentrate purchased by the AEC subsequent to March 31, 1962. According to the AEC, "[t]he \$8 price was determined on the basis of a study of existing contracts, known sources of supply and estimated costs of production."⁷ The program guaranteed a Government market for all uranium concentrates produced by domestic mills from domestic ores, subject to a limitation of 500 tons per year from

³ Gray *supra* note 1 at 42-43.

⁴ United States Nuclear Regulatory Commission, *Final Generic Environmental Impact Statement*, NUREG-0706, Volume 1, at 2-1 (September 1980) (hereinafter "GEIS").

⁵ See generally *American Mining Congress, Commingled Uranium Mill Tailings-A Historical Perspective*, (March 4, 1985).

⁶ *Civilian Nuclear Power—A Report to the President*, p. 58.

⁷ AEC Release No. 150.

any one mining property or mining operation. The AEC ore purchase and price guarantees were to be discontinued after March 31, 1962.

The last major change in the AEC procurement policy was announced on November 17, 1962. The announcement established a new program—the “stretch-out” program—for the period of January 1, 1967 through December 31, 1970. AEC requirements through 1970, as then currently estimated, were significantly below the amounts which it had committed to purchase. To effect a better balance between AEC receipts and requirements and to assure an ongoing, operating industry capable of supplying the anticipated (but still non-existent) commercial market, the AEC offered mill operators the option of deferring a portion of the concentrate contracted for delivery to the AEC in 1963-1966, and delivering it in 1967 and 1968. In return, in 1969 and 1970, the AEC would purchase an additional quantity of concentrate equal to the amount deferred. The price to be paid for the deferred material in 1967 and 1968 was to be \$8 per pound, the same as in the 1962-1966 contracts. The price to be paid in 1969 and 1970 for concentrates produced from ore mined from properties controlled by the mill contractor would be calculated by use of a formula based on average allowable costs of production during the 1963-1968 period, as determined by an audit of mining and milling costs. The price per pound would be eighty-five (85) percent of the allowable production cost per pound plus \$1.60, subject to a maximum price of \$6.70 per pound. The price for all concentrates produced from ores purchased from independent producers would be \$6.70 per pound of concentrate. The contracts permitted mill operators to cease deliveries to the AEC upon a showing that continued production at the 1969-1970 contract price would result in a net loss. Many of the older mills, mines, and buying stations closed.

Nuclear Regulatory Commission. As discussed above, amidst growing concern by congress regarding the health and safety aspects of the uranium industry, the ERA was passed and resulted in the creation of the NRC in January 1975, which assumed the regulatory control of uranium milling as well as enrichment operations and nuclear power generation. Other non-regulatory functions of the AEC, such as the promotion of atomic energy, were transferred to the Energy Research and Development Administration (ERDA), which, in 1977, became the DOE.

In 1978, Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) to provide the express statutory authority to regulate the production, containment, and monitoring of uranium and thorium mill tailings. UMTRCA was based upon a finding that uranium and thorium mill tailings located at active (i.e., licensed) and inactive (i.e., abandoned) mill sites may pose a significant, potential radiation health hazard to members of the public. In Section 11e.(2) of UMTRCA, tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content were defined as byproduct material, which is now commonly referred to as section 11e.(2) byproduct material. In the implementing regulations, contaminated mill equipment and other materials generated during cleanup and decommissioning were also included in the definition of byproduct material.

In Title I of UMTRCA, Congress established a program to identify and remediate so-called “inactive” sites; that is, sites at which uranium milling operations had occurred in the past or that contained tailings and other wastes produced during such operations and that were not covered by an existing license. Under the program set out in Title I of UMTRCA, DOE is authorized to enter into “cooperative agreements” with States containing inactive sites for the purpose of remediating those sites. Remedial actions undertaken by DOE under Title I are required to have the NRC’s concurrence and to conform with generally applicable standards developed by the EPA for the protection of public health and safety and the environment from potential

radiological and non-radiological hazards associated with tailings and other uranium milling wastes.⁸ Following remediation of these inactive sites, title to the tailings and wastes from the sites and to the land used for their disposal resides with DOE, and the sites are to be maintained by DOE in perpetuity pursuant to license issued by the NRC.⁹ In addition, the NRC is authorized to require that DOE, as the custodian of remediated inactive sites, undertake such monitoring, maintenance, and emergency measures as the NRC may deem necessary to protect public health and safety.¹⁰ The NRC can also require DOE to take other actions that the NRC deems necessary to comply with EPA's generally applicable standards for protection against potential radiological and non-radiological hazards associated with uranium mill tailings and related wastes.¹¹

In parallel with the Title I program is Title II, wherein Congress granted EPA and NRC expansive authority to regulate directly all aspects of the management and disposition of uranium mill tailings and related wastes generated at "active" (i.e., licensed) uranium mill tailings sites.¹² Like Title I, Title II establishes a tripartite jurisdictional scheme involving EPA, NRC, and DOE,¹³ each of which have a defined role, which for NRC and DOE are similar yet different. Under Title II, NRC has the lead on addressing regulation and closure of sites, and DOE has only the long-term surveillance and monitoring responsibility that it also has under Title I. EPA's responsibilities are essentially the same under both Titles I and II.

Pursuant to Section 275 of the AEA, Congress assigned EPA the authority to promulgate generally applicable standards for the protection of public health and safety and the environment from the potential radiological and non-radiological hazards associated with the possession, transfer, and disposal of 11e.(2) byproduct material.¹⁴ For the non-radiological hazards associated with 11e.(2) byproduct material, these generally applicable standards are to provide equivalent protection to that provided by EPA's Resource Conservation and Recovery Act (RCRA) standards.¹⁵ As a result, 11e.(2) byproduct material is specifically exempted from EPA regulation under RCRA¹⁶ and permitting authority over such material is deliberately withheld from EPA.

Implementing UMTRCA's mandate, EPA issued its first set of generally applicable standards in 1983 which applied only to "inactive" mill tailings sites (i.e., sites regulated under Title I of UMTRCA that were no longer operated under an active license).¹⁷ This occurred 3 years after

⁸ 42 U.S.C. § 7918 (1994).

⁹ 42 U.S.C. § 7914 (1994); *see also* 10 CFR § 40.28.

¹⁰ 42 U.S.C. § 2113(b)(5).

¹¹ In many respects, the role assigned to DOE under Title of UMTRCA is akin to that of a super "potentially responsible party" or (PRP) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601 *et seq.*, since DOE is responsible for remediating Title I sites and maintaining them in perpetuity, and the agency is responsible for most of the costs associated with those efforts. Indeed, because of the unique role performed by DOE at Title I sites, Congress deemed it appropriate to specifically exclude those sites from the reach of CERCLA. *See* 42 U.S.C. § 9601(22).

¹² Under Section 274 of the AEA, States can enter into agreements with NRC under which the States assume the authority of the NRC with respect to the regulation of uranium mill tailings and related wastes.

¹³ In 1974, the AEC was terminated and divided into a promotional and a regulatory agency. The Energy Research and Development Administration, the precursor to the current DOE, was the promotional agency. The new regulatory agency was NRC.

¹⁴ 42 U.S.C. § 2022(b).

¹⁵ 42 U.S.C. § 2114(a)(3).

¹⁶ *See* 40 CFR § 261.4.

¹⁷ 48 Fed. Reg. 590 (January 5, 1983).

NRC issued its Generic Environmental Impact Statement (GEIS) and its initial regulations for uranium milling. EPA established 20 picocuries per meter squared per second (20 pCi/m²/s) radon standard for emissions from reclaimed tailings facilities. EPA's inactive site regulations also established what has come to be known as the "5/15" clean-up standard for radium-226 in soil, primarily due to "windblown" tailings or tailings spills. Under this standard, radium concentrations in soil are to be reduced to levels of no more than 5 pCi/g above background levels in the first 15 cm of soil and no more than 15 pCi/g above background levels in each descending 15 cm soil horizon averaged over 100 square meter segments. In addition, EPA required that disposal systems be designed to provide "reasonable assurance" of achieving the radon emission standard for 1,000 years, but no less than 200 years and to do so without the need for "active" maintenance.

Under UMTRCA, Congress specifically designated NRC as the lead agency for implementing and enforcing EPA's generally applicable standards through licensing.¹⁸ Section 275(d) of the AEA provides that "[i]mplementation and enforcement of the standards promulgated [by EPA] pursuant to subsection (b) of this section shall be the responsibility of the NRC in the conduct of its licensing activities under this Act."¹⁹ In addition, Congress expanded NRC's regulatory authority under Section 84 of the AEA to develop its own requirements for the management of 11e.(2) byproduct material.

The NRC's regulations providing for the safe disposal, containment, and long-term oversight of 11e.(2) byproduct material are contained in Criteria set forth in 10 CFR Part 40, Appendix A. Appendix A sets forth broad, performance-oriented criteria governing uranium recovery activities and waste disposal. At a time when emerging environmental regulations were typically extremely prescriptive (e.g., EPA), Appendix A may be classified as somewhat "ahead of its time" because NRC sought to develop performance-oriented Criteria rather than prescriptive regulations so that uranium recovery licensees could address site-specific circumstances effectively.²⁰ In total, Appendix A contains thirteen Criteria designed to require licensees to properly locate, manage, and decontaminate and decommission their sites. These Criteria have been adopted in total by the State of Colorado.

In 1983, in response to discontent among licensees seeking to propose site-specific alternatives, Congress amended Section 84 of the AEA to allow NRC to approve licensee-proposed alternatives to the NRC's requirements if the licensee-proposed alternatives provide a level of protection that is "equivalent to, to the extent practicable, or more stringent than" the level of protection afforded by NRC standards.²¹ Congress' 1983 amendments also clarified NRC's responsibilities under Section 84(a) of the AEA by specifically requiring that EPA/NRC consider environmental and economic costs and balance those costs against potential risks when developing standards and requirements for the management of 11e.(2) byproduct material.²²

Agreement States. Under the AEA, Congress sought to create a pervasive, comprehensive statutory and regulatory regime in which the AEC/NRC would have the primary authority for

¹⁸ 42 U.S.C. § 2022(d).

¹⁹ *Id.*

²⁰ NRC Staff developed these Appendix A Criteria "mindful of the fact that the problem of mill tailings management is highly site-specific. The precise details of a program can be worked out only when the unique conditions of a site are known." Indeed, the word "requirements" in the Introduction to "Appendix A" was replaced with the word "criteria", NUREG 0706, Volume II A-81, 82.

²¹ 52 Fed. Reg. 43, 553 (1987).

²² Pub. L. No. 97-415 § 22 (1983).

implementation and enforcement of AEA requirements for the licensing of source, special nuclear,²³ and byproduct material. However, Congress also empowered NRC to withdraw its regulatory authority over AEA materials and to enter into an “agreement” permitting State regulatory authorities to regulate such materials in accordance with the AEA.

Congress enumerated the requirements for States to assume such authority in Section 274 of the AEA entitled *Cooperation With States*.²⁴ Under Section 274, Congress authorized the NRC to enter into agreements with State regulatory authorities “providing for discontinuance of the regulatory authority of the Commission ...with respect to any one or more of the following materials within the State:

- (1) byproduct materials as defined in section 11e.(1);
- (2) byproduct materials as defined in section 11e.(2);
- (3) source materials;
- (4) special nuclear materials in quantities not sufficient to form a critical mass.”²⁵

With respect to 11e.(2) byproduct material, Congress noted that “[t]he NRC shall also retain authority under any such agreement to make a determination that all applicable standards and requirements have been met prior to termination of a license for byproduct material, as defined in section 11e.(2).”²⁶ Thus, 11e.(2) byproduct material facilities require final “sign-off” by the NRC of a State-approved closure prior to final site closure and license termination.

In June of 1981, representatives of Agreement States complained that NRC was not permitting those States to develop their own site-specific requirements for uranium mill tailings to operate in lieu of the requirements promulgated by NRC, even if those State alternatives provided levels of protection equivalent to those afforded by NRC regulations. Indeed, Senator Pete Domenici summarized the testimony succinctly:

“NRC is saying that regardless of what the law says with reference to an equivalent, to the extent practicable, or more stringent than, that their interpretation now is since they have no EPA standard, it will be [the NRC standards] or nothing else.”²⁷

Similar problems were reported by a number of licensees, who found NRC unwilling to accept any licensee-proposed alternatives to the standards promulgated by the NRC. In response, Congress amended the AEA to modify certain sections previously added by UMTRCA.²⁸ In particular, Section 274 of the AEA was amended to provide Agreement States with explicit authority to adopt “alternatives (including, where appropriate, site-specific alternatives) to the requirements adopted and enforced by the Commission” provided they achieve a level of

²³ States under Section 274 of the AEA are only permitted to regulate special nuclear material in quantities not sufficient to form a critical mass. Regulation of special nuclear material in quantities sufficient to form a critical mass is expressly reserved to the NRC.

²⁴ 42 U.S.C. § 2021.

²⁵ 42 U.S.C. § 2021(b)(1-4) (emphasis added).

²⁶ 42 U.S.C. § 2021(c).

²⁷ Implementation of the Uranium Mill Tailings Radiation Control Act of 1978: Hearings Before the Subcomm. On Nuclear Regulation of the Senate Comm. on Environment and Public Works, 97th Cong. 17 (1981).

²⁸ Pub. L. No. 97-415, 96 Stat. 2067 (1983).

protection “equivalent to, to the extent practicable, or more stringent than” the level of protection afforded by NRC’s standards.²⁹

As the Agreement State program is currently constituted, in order for the NRC to withdraw its regulatory authority over one or more AEA materials listed in Section 274(b), the petitioning State must demonstrate to the NRC the following:

- (1) that the State desires to assume regulatory responsibility for the relevant AEA material(s); and
- (2) that the State has a radiation control program adequate to protect public health and safety from the potential hazards of the relevant AEA material(s)³⁰

Further, the relevant State must adequately demonstrate to the NRC that its radiation safety program for AEA materials is compatible with AEA/NRC requirements.³¹ When the NRC determines that the proposed agreement with the relevant State should become effective, the AEA requires that such agreement be published once a week for four consecutive weeks so that the public may submit comments.³² After such comments are reviewed, the NRC will determine whether or not the agreement should be executed or whether revisions to such agreement are required.

Pursuant to the AEA, the NRC retains the authority to suspend or cancel a State’s Section 274 Agreement if it determines that such program is either insufficient to protect public health and safety or is incompatible with the AEA and the NRC’s regulatory program. With respect to ongoing review of Agreement State programs, NRC has developed a system of compatibility categories into which all aspects of a State radiation control program, including its statutory and regulatory sources of authority, are classified. STP (Office of State and Tribal Programs) Procedure SA-200 defines the relevant compatibility categories for Agreement States to follow when creating radiation safety program regulations:

- (1) Category A is defined as “[b]asic radiation protection standard or related definitions, signs, labels or terms necessary for a common understanding of radiation protection principles. *The State program element should be essentially identical to that of NRC;*”
- (2) Category B is defined as “[p]rogram element with significant direct transboundary implications. *The State program element should be essentially identical to that of NRC;*”
- (3) Category C is defined as “[p]rogram element, the essential objectives of which should be adopted by the State to avoid conflicts, duplications or gaps. *The manner in which the essential objectives are addressed need not be the same as NRC, provided the essential objectives are met;*”³³

These compatibility requirements serve as a primary basis for NRC’s STP’s Integrated Materials Performance Evaluation Program (IMPEP). Under the IMPEP reviews of Agreement State

²⁹ *Id.* codified at 42 U.S.C. § 2021(o).

³⁰ 42 U.S.C. § 2021(d).

³¹ 42 U.S.C. § 2021(d)(2).

³² 42 U.S.C. § 2021(e)(1).

³³ United States Nuclear Regulatory Commission, Office of State and Tribal Programs, *Compatibility Categories and Health and Safety Identification for NRC regulations and Other Program Elements*, STP Procedure SA-200 (October 8, 2004). Previously, Category A compatibility regulations required identical language to that of NRC.

radiation safety programs are conducted to ensure that such programs are adequately protective of public health and safety and are compatible with AEA/NRC requirements.

Long-Term Surveillance and Monitoring Program. Under UMTRCA, DOE is designated as the primary responsible party for long-term surveillance and monitoring of all 11e.(2) byproduct material and the land(s) on which such material is deposited. Under Section 83 of the AEA, as amended, as stated above, Congress mandated that title to all 11e.(2) byproduct material and the land(s) on which such material is deposited be transferred to either (1) the United States or (2) the State in which such material is deposited.³⁴ In each case where a mill tailings site has been transferred for long-term surveillance and monitoring, the site has been transferred to DOE as States generally do not wish to avail themselves of the opportunity to take title to such sites.

As a result, in January of 1998, DOE, in conjunction with NRC, generated a protocol for the transfer and licensing of mill tailings sites to DOE for long-term surveillance and monitoring following site closure and license termination. This *Working Protocol of Long-Term Licensing of Commercial Uranium Mills* sets forth a number of principles for NRC and DOE to follow in affecting the transfer of these sites. For example, the Protocol specifies that NRC will require current licensees to demonstrate that all applicable NRC requirements have been met before the NRC will terminate current licenses. In addition, the Protocol provides that NRC “will not terminate any site-specific license until the site licensee has demonstrated that all issues with state regulatory authorities have been resolved.”³⁵ This provision of the Protocol was consistent with NRC’s interpretation of “concurrent jurisdiction” at the time.

As a general proposition, regardless of whether a mill tailings facility is located in an Agreement or non-Agreement State, the NRC has the final “sign-off” on whether site closure and license termination is proper.³⁶ As a result, the NRC has generally required that DOE be informed of the status of mill tailings sites destined for site closure and license termination and that DOE concur with all proposed site-specific issues such as groundwater containment and monitoring, institutional controls, and engineered barriers. Licensees have maintained, however, that this “concurrency” requirement is merely inter-agency courtesy, as any final NRC decision regarding final site closure is binding on DOE.

When an 11e.(2) byproduct material site has satisfied its NRC-approved reclamation plan, pursuant to 10 CFR § 40.51, the licensee is then required to transfer title to all 11e.(2) byproduct material and the lands within the long-term surveillance site boundary to DOE or the State in which the site is located.³⁷ This transfer must be completed at no cost to the government (i.e., federal or state government) and must be accompanied by a transfer of funds equal to the amount prescribed in Appendix A, Criterion 10 or to another amount designated by NRC. At the time of transfer, as required by 10 CFR § 40.51(c), DOE or the State will possess the site as a licensee of NRC in perpetuity and subject to all appropriate site-specific license conditions, as imposed by the NRC.³⁸

³⁴ 42 U.S.C. § 2113(b)(1)(A).

³⁵ See United State Nuclear Regulatory Commission, *License Termination/Site Transfer Protocol Between the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission* (1998).

³⁶ *Id.*

³⁷ 10 CFR § 40.51((b).

³⁸ 10 CFR § 40.51(c).