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## URANIUM MINING AND MILLING IN VIRGINIA: AN ANALYSIS OF REGULATORY CHOICE

*Ronald H. Rosenberg\**

The recent discovery of significant quantities of uranium ore in Pittsylvania County, Virginia has generated interest among mining companies in mining and milling<sup>1</sup> uranium ore in the state.<sup>2</sup> The discovery has given rise to considerable concern as to whether uranium mining and milling should be permitted in Virginia and, if so, how they should be regulated. The prospect of establishing a new mining industry in the state would not normally attract as much public attention as has the recent proposal to mine uranium. However, since uranium is a radioactive material, it has generated considerable controversy.

Uranium has been mined and milled in parts of the western United States for over thirty years. However, Virginia could become the first Eastern state to permit uranium production. Since the eastern United States differs from the West in climate, geological characteristics, and population distribution and density, the social and ecological impacts of uranium production in Virginia are difficult to predict.

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<sup>1</sup> Milling refers to the process by which uranium ore is converted into concentrated uranium oxide or "yellowcake." See text accompanying notes 13-18 *infra*.

<sup>2</sup> In July 1982, Marline Oil Corporation announced the discovery of uranium ore in Pittsylvania County, which it described as "one of the most significant uranium discoveries in the United States." Marline Oil Corporation, Annual Report to Shareholders 11 (1983) [hereinafter cited as Marline Shareholder Report]. In December 1982, Marline and Union Carbide Corporation entered into an agreement to evaluate uranium mineralization on some of Marline's properties within the Swanson Project Area, located about twenty-five miles north of Danville, Virginia. *Id.* During 1983, Marline and Union Carbide completed an evaluation of the Project for a Virginia General Assembly study group charged with reviewing the costs and benefits, including the environmental impacts, of the proposed mining venture. *Id.* at 13. Marline intended to complete its evaluation of the remaining forty-five thousand acres under lease in Pittsylvania County during 1984 and to plan a series of joint venture exploration programs on these lands. *Id.*

The Virginia General Assembly will be required to decide whether the risks associated with a uranium mining and milling industry in Virginia outweigh the benefits to be gained from it. To develop a state policy on uranium production, the state must assess the potential impacts of uranium mining and milling on worker safety, public health and the natural environment. Other Eastern states have approached the issue of uranium mining and milling with extreme caution, deferring a decision on whether to license the industry for as many as ten years pending the results of thorough analysis.<sup>3</sup> The policymakers in Virginia should be no less careful in assessing the risks presented by the proposed industry.

There are several ways to allocate regulatory responsibility over the uranium production industry among units of federal, state and local government. To illustrate the range of choices available to Virginia, this article will describe the means by which other states have chosen to regulate uranium mining and milling. This discussion is intended neither to advocate nor to discourage the authorization of uranium production. Instead, it is intended to describe the legal framework for its regulation that federal and state governments have developed, and to suggest the basis on which Virginia could choose systematically from among the different regulatory schemes.

Section I of the article presents the current state of the domestic uranium mining and milling industry. First, the techniques of mining and milling are described. Second, the section reviews the potential public health and environmental costs and the potential economic benefits of a Virginia uranium industry.

Section II traces the thirty-eight-year history of federal regulation of the uranium industry. This section highlights the federal government's shift from exclusive control over nuclear energy and source material production, toward sharing that authority with the states.

Section III analyzes the roles that various states have assumed in the regulation of the uranium recovery industry. This section examines how the Nuclear Regulatory Commission's Agreement State Program operates in practice, with emphasis on uranium mill licensing. The advantages and disadvantages of agreement state affiliation are considered. The section identifies four models of state involvement in the control of the uranium recovery industry; these

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<sup>3</sup> See *infra* notes 237-48 and accompanying text.

models indicate the range of choices available to Virginia in formulating its policy on uranium production.

The article will conclude by outlining the possible steps that the Virginia General Assembly may take in 1985. Virginia starts with a clean slate. It can exclude the industry altogether, or it can specify the conditions under which it will authorize mining and milling. In this sense, the state can mold the industry to the particular needs of the people of Virginia.

## I. THE URANIUM MINING AND MILLING INDUSTRY

### A. *Uranium Mining Techniques*

To produce source material for nuclear fuel, uranium must be removed from its deposit in nature and processed by an operation called "milling." The end product is uranium oxide ( $U_3O_8$ ), or "yellowcake." Yellowcake is transported to a nuclear enrichment facility for conversion into nuclear fuel pellets that are fabricated into fuel rods for nuclear power plants.

The initial step toward uranium production is the identification of sites with a potential for uranium ore recovery. The location, amount, and concentration of the uranium ore body will determine if it is worth mining. Surveys conducted by the federal government have assisted uranium development firms in the discovery of new ore deposits. In 1974, the Department of Energy initiated the National Uranium Resource Evaluation (NURE) program to provide accurate uranium survey data by conducting aerial surveys of surface radiation, measuring radioactivity in surface and groundwater, and performing underground geological examinations. Uranium-producing companies supplement these data through geological mapping, geochemical surveying, and subsurface core drilling.

Having decided to mine, the developer must select the mining technique. The mining industry has developed four techniques for extracting uranium ore from the surrounding minerals: surface or open pit mining, underground or deep mining, solution or *in situ* mining, and bore hole mining.<sup>4</sup>

In open pit mining, the topsoil and rock overburden are removed from the site and stored at a nearby location. Although surface

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<sup>4</sup> Open pit and underground mining accounted for seventy-five percent of all domestic uranium ore recovered in 1982. U.S. Dep't of Energy, Statistical Data of the Uranium Industry 11 (1983) (Table I-12) (Pub. No. GJO-100) [hereinafter cited as 1983 Statistical Data of the Uranium Industry].

mining uranium is essentially the same as surface mining other minerals, it does require a larger amount of overburden removal.<sup>6</sup> Overburden is transported to a special retention area, where it is stored until used as backfill material in the final reclamation of the site. Once the overburden has been removed, the uranium ore body is excavated by heavy machinery and transported to the mill. Open pit mining is the preferred method when the ore body is less than three hundred feet below the surface, but has been employed for the mining of uranium ore as deep as five hundred feet.<sup>6</sup>

When the uranium ore body is more than three hundred feet below the surface, the high cost of removing overburden usually requires the use of deep mining techniques. The precise method for extracting the uranium depends on the shape, size, altitude and grade of the ore body being mined, the ground stability, and the cost of extraction. When the ore is in small deposits, inclined entries are made into canyon walls or sloping ground;<sup>7</sup> for larger deposits at a depth of six hundred to fourteen hundred feet, vertical shafts are dug into the ground.<sup>8</sup> Tunnels are dug from the shafts to reach the ore deposit.

The ore body is then usually fractured by drilling and blasting with explosives. Once the ore is removed, tailings<sup>9</sup> from the mining process can be backfilled along the mine walls, if the physical characteristics of the ore body permit. This expedites reclamation of the mine and reduces the quantity of tailings that must be disposed of at the surface.

Where the low grade of the uranium ore body precludes the use of conventional mining methods, solution, or *in situ*, mining may be used.<sup>10</sup> Inflow wells are drilled into the ore body at a location upstream of a production well. An acidic or alkaline leaching solution is injected into the ore body to dissolve the uranium. The solution is pumped to the surface and the uranium extracted. This circular process of injection and removal is continued until the

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<sup>6</sup> 2 Nuclear Regulatory Commission, Final Generic Environmental Impact Statement on Uranium Milling B-1 (September 1980) (Pub. No. NUREG-0706) [hereinafter cited as 2 NRC FGEIS].

<sup>6</sup> *Id.*

<sup>7</sup> *Id.*

<sup>8</sup> *Id.*

<sup>9</sup> Tailings are the rock and mineral deposits which are removed from their natural environment as waste materials during the mining of uranium and other minerals.

<sup>10</sup> *In situ* or solution mining constituted approximately 11% of uranium production in 1983. 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 11 (Table I-12).

level of uranium extracted from the solution is too low to continue leaching the ore body. The solution mining process eliminates the risks that conventional mining practices pose to workers and the large volume of tailings produced by conventional methods. However, it is feasible only where the ore lies in a generally horizontal bed below the static water table but above an impermeable rock layer, where the uranium minerals in the ore body are susceptible to leaching, and where the ore deposit is sufficiently extensive to justify the higher cost of this method of recovery.<sup>11</sup>

A fourth method of uranium extraction is bore hole mining. Water is sprayed against the ore body with sufficient force to fracture the ore.<sup>12</sup> This method is still experimental and has not yet been used in the United States.

#### *B. Uranium Milling Techniques*

After the uranium ore is mined, it is converted by milling into uranium oxide,  $U_3O_8$ , a dry substance known as "yellowcake." The conventional milling process produces only one to five pounds of usable uranium oxide from each ton of ore.

The conventional uranium milling process involves three steps. First, the uranium ore is blended to obtain uniform physical and chemical characteristics.<sup>13</sup> Second, the ore is ground in a ball or rod mill, a water-filled rotating drum containing metal balls or rods.<sup>14</sup> Finally, the uranium is extracted from the resulting pulp. Several procedures can be employed, depending on ore composition. Approximately eighty-two percent of current uranium milling capacity uses an "acid leach" process.<sup>15</sup> When the ore contains more than twelve percent limestone, an alkaline leaching process is employed.<sup>16</sup> The leaching process extracts most of the uranium along with impurities. The uranium enriched solution is then separated from the tailings solids.

Where only low grade ore is available, or where the mine site is far from the mill and the ore body is not extensive, "heap leaching" is sometimes used. Low grade sandstone uranium ores are

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<sup>11</sup> 2 NRC FGEIS, *supra* note 5, at B-2.

<sup>12</sup> Rogers, Golden & Halpern, A Report on Proposed Uranium Mining in Virginia 28 (1982).

<sup>13</sup> 2 NRC FGEIS, *supra* note 5, at B-2.

<sup>14</sup> *Id.* at B-4. When solution mining is used, there is no need for the crushing and grinding steps.

<sup>15</sup> *Id.* at B-5.

<sup>16</sup> *Id.* at B-7.

placed on a gently sloped, impermeable pad, and saturated from above with an acidic or alkaline leaching solution. A network of pipes and drain tiles collects the leachate as it percolates to the bottom of the ore pile. The leachate is recirculated until the concentration of uranium in the solution is sufficiently high for extraction.

The solution produced in each of these processes is dewatered in thickeners and filtered.<sup>17</sup> The "filter cake" is dried to produce the yellowcake, containing ninety to ninety-eight percent uranium oxide.<sup>18</sup> The yellowcake is crushed and screened to the required size and placed in steel-reinforced drums, which are sealed and stored for shipping to a uranium enrichment facility.<sup>19</sup>

All commercial nuclear power installations in the United States are light-water reactors that use enriched uranium as the basic fuel. Uranium occurs naturally as two isotopes — uranium 235 and uranium 238 — in dramatically unequal amounts. Only 0.71% of all uranium is the isotope U-235.<sup>20</sup> The spontaneous fission reaction requires a nuclear fuel containing approximately three percent U-235.<sup>21</sup> This U-235 concentration is achieved by converting the uranium oxide into gaseous uranium hexafluoride, UF<sub>6</sub>, and diffusing the gas through a porous membrane to gain a U-235-enriched stream.<sup>22</sup> After enrichment, the uranium hexafluoride is converted into uranium oxide (UO<sub>2</sub>) and formed into ceramic pellets for fuel rod fabrication.

### *C. Adverse Effects Of Uranium Mining and Milling*

Many of the environmental problems created by uranium mining and milling are common to other extractive industries: (1) disruption of the rural life-style, (2) adverse impact upon vegetation, wildlife, and aquatic life, (3) aesthetic damage to the rural land-

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<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> *Id.*

<sup>20</sup> J. Krenz, *Energy: From Opulence to Sufficiency* 149 (1980).

<sup>21</sup> *Id.* The fission process for each uranium atom produces a large amount of energy and approximately 2.5 neutrons. The energy heats a water coolant to produce steam that drives the turbines of a generator. The liberated neutrons bombard other fissile uranium atoms, perpetuating the process until the nuclear fuel is fully consumed or a moderator absorbs or slows down the high-velocity neutrons. *Id.* at 150-51.

<sup>22</sup> J. Duderstadt & C. Kikuchi, *Nuclear Power: Technology on Trial* 100-02 (1979). The U.S. Department of Energy operates three gaseous diffusion plants which enrich uranium for commercial power plants. Other methods of enrichment include gas centrifugation, laser excitation and electromagnetic separation. *Id.* at 101.

scape and to local historic resources, (4) increase in noise and vibration, (5) pollution of air and water and (6) risks of mine collapse and explosion. Because the ore is radioactive, uranium production also presents a number of problems not encountered in the extraction of other minerals.

The primary concern is human exposure to radioactive materials released in uranium development. Radon-222 gas, a uranium decay product, must be ventilated from the mine shafts of underground mines to prevent concentrations hazardous to the miners' health.<sup>23</sup> Non-occupational exposure is also a danger. Residents in the vicinity of the planned uranium mine/mill complex may be exposed to radiation through air, groundwater, or surface water contamination.

The most serious problem, unique to production of radioactive materials, is that of long-term waste disposal. Since only four to five pounds of yellowcake is produced from each ton of ore, the quantity of tailings to be disposed of is tremendous. These radioactive materials and toxic metals must be contained for extremely long periods of time. The adverse effects of uranium mill tailings mismanagement became painfully apparent during the late 1960s. For example, an estimated 300,000 metric tons of radiation-contaminated tailings from uranium mills in Grand Junction, Colorado, had been used as fill material for roads and sewer construction, and as foundations for homes and office buildings.<sup>24</sup> Congress eventually established a financial assistance program and entered into a cooperative arrangement with the state of Colorado to decontaminate the Grand Junction tailings.<sup>25</sup> Uranium mill tailings have been identified in construction fill material at at least six other sites.<sup>26</sup>

Uranium milling operations have also reportedly contaminated public water supplies and affected river flora and fauna.<sup>27</sup> The

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<sup>23</sup> 2 NRC FGEIS, *supra* note 5, at B-1.

<sup>24</sup> These tailings, thought to be innocuous, had been donated by the Climax Uranium Company as a public service. Grammer, *The Uranium Mill Tailings Radiation Control Act of 1978 and NRC's Agreement State Program*, 13 Nat. Resources L. 469, 478 (1981).

<sup>25</sup> 42 U.S.C. § 2017(c) (1982) authorizes the appropriation of funds to clean up contaminated sites.

<sup>26</sup> 1 Nuclear Regulatory Commission, Final Generic Environmental Impact Statement on Uranium Milling 2-2 (September 1980) (Pub. No. NUREG-0706) [hereinafter cited as 1 NRC FGEIS].

<sup>27</sup> See Linker, Beers and Lash, *Radioactive Waste: Gaps in the Regulatory System*, 56 Denver L.J. 1, 7 (1979) (describing contamination of the Animas River below Durango, Colorado).



most severe incident of such contamination occurred in 1979 at Church Rock, New Mexico, when a mill tailings impoundment burst and contaminated a river below the impoundment. Finding a safe disposal site and choosing a material effective for long-term containment of tailings are two difficult problems to resolve before authorizing uranium mining and milling.

#### *D. The Uranium Mining and Milling Industry*

The fortunes of the domestic uranium industry are best described as cyclical. Following World War II, the quantity of uranium ore received by uranium mills gradually increased, peaking in 1980 at 16.7 million tons per year.<sup>28</sup> At present, the uranium industry is depressed. In 1980, 23,300 tons of uranium oxide were produced from all sources.<sup>29</sup> Annual production fell to 13,400 tons in 1982.<sup>30</sup> This dramatic drop in production is the result of a severely depressed market for uranium fuel. Since the demand for electricity has fallen significantly, the price of uranium source material has also decreased. The depressed uranium market is reflected in decreased uranium ore exploration, mining and milling.

##### *1. The Current Uranium Market*

Exploration activity is an important measure of the health of the uranium production industry. There are two types of exploration activity: exploratory drilling, a search for new deposits, and development drilling, determining the size, shape, and grade of a known deposit. Over the last several years, exploration activity has significantly decreased in both areas. Exploratory drilling declined from 28.95 million drilling feet in 1978 to 4.23 million feet in 1982.<sup>31</sup> Development drilling dropped from 19.15 million feet in 1978 to 1.13

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<sup>28</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 7 (Table I-6). The surge in prosperity of the industry at the time of the Second World War was caused by the government's procurement program. Government incentives proved so successful that, by the end of the 1950s, it became apparent that the uranium supply would soon exceed the AEC's demand. Consequently, the AEC continued its contracting at fixed levels, and gradually "stretched out" its buying until the end of procurement in 1970. This "stretch out" of uranium procurement gradually reduced the purchase of uranium oxide by the federal government so as to minimize adverse economic consequences to uranium suppliers. See Groves, *Uranium Revisited*, 13 Rocky Mtn. Min. L. Inst. 87, 95-97 (1967); see also 1 NRC FGEIS, *supra* note 26, at 2-1 through 2-2.

<sup>29</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 12 (Table I-13).

<sup>30</sup> *Id.*

<sup>31</sup> *Id.* at 55 (Table IX-1).

million feet in 1982.<sup>32</sup> Even smaller exploration expenditures for 1984 were estimated.<sup>33</sup> Exploration expenditures will not increase until producers are confident that the market for uranium will improve.

Uranium mining has decreased significantly due to depressed market conditions. In 1981, two hundred fifty-four uranium mines were in operation, producing 19,600 tons of uranium oxide.<sup>34</sup> In 1982, one hundred ninety-six mines were in operation.<sup>35</sup> The more than twenty percent reduction in the number of operating mines reflects the depressed state of the uranium industry.

As the demand for uranium fuel has declined, milling activity has also fallen. At the beginning of 1981, twenty-two conventional uranium mills were operating;<sup>36</sup> by the end of 1982, only fourteen conventional mills were in operation, and these were operating at only sixty-four percent of capacity.<sup>37</sup> Considering both active and inactive mills, the uranium milling industry was operating at forty-five percent capacity during 1982.<sup>38</sup> Many mills are still in operation solely because of long-term, high-priced contracts.

## 2. Future Uranium Requirements

As noted above, uranium oxide demand has decreased significantly during the past several years. This is due to a reduction in electricity demand throughout the nation and the reduced attractiveness of nuclear production of electrical energy. Since nuclear power plants are the primary consumers of uranium fuel, the number of on-line nuclear power plants expected to be in service in the future is an indication of future uranium demand.

As of December 31, 1982, eighty nuclear reactors were in commercial operation, with a combined generating capacity of sixty-four gigawatts (GWe). At that time sixty-five facilities were under construction. Of these sixty-five, forty-six were more than thirty percent complete.<sup>39</sup> However, there have been no new orders for

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<sup>32</sup> *Id.*

<sup>33</sup> Estimated expenditures for 1984 exploration were 34 million dollars for 2.9 million feet of drilling. *Id.* at 58 (Table IV-4).

<sup>34</sup> U.S. Dep't of Energy, Statistical Data of the Uranium Industry 18, 20 (1982) (Pub. No. GJO-100) [hereinafter cited as 1982 Statistical Data of the Uranium Industry].

<sup>35</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 11 (Table I-12).

<sup>36</sup> 1982 Statistical Data of the Uranium Industry, *supra* note 34, at 49.

<sup>37</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 45 (Table VII-3).

<sup>38</sup> *Id.*

<sup>39</sup> *Id.* at 69, Table XII-9.

nuclear power plants since 1978. In fact, from 1978 through 1982, orders for sixty-two nuclear power facilities in the United States were cancelled.<sup>40</sup> It is difficult to determine how many of the plants presently under construction will actually be completed or to project the precise capacity of nuclear generating plants at any point in the future. The most recent Department of Energy forecasts project U.S. nuclear generating capacity to be eighty-seven GWe in 1985 and 133 GWe in the year 2000.<sup>41</sup>

It is difficult to predict the nuclear power capacity that will come on line in the future, and it is even more difficult to project future uranium needs. The Department of Energy (DOE) has predicted a rise in domestic demand for uranium oxide from 12,800 tons in 1982 to 28,100 tons in 2000.<sup>42</sup> However, it seems unlikely that new uranium sources will be necessary, since ore will be available through existing sources in the western states and through foreign procurement.

The DOE estimates predict a much more modest increase in nuclear power production over the next two decades than was predicted ten years ago. In view of these forecasts, it may seem surprising that the discovery of uranium ore deposits has generated such great interest among mining companies, in particular, Marline Oil Corporation. However, Marline asserted that it was optimistic about the investment potential in low cost domestic uranium resources for the following reasons: (1) domestic production of uranium during 1984 was expected to decrease to less than fifty percent of domestic consumption due to a steady depletion of low cost, high grade reserves, (2) foreign sources of uranium supply were unreliable because of economic and political factors, (3) domestic consumption of uranium was expected to increase approximately fifty percent by 1989 as a result of over thirty new reactors being brought on line over the next three to four years, and (4) there was little or no new uranium exploration and development activity currently underway in the United States and, thus, no apparent new domestic sources of supply sufficient to meet expected increases in demand for uranium.<sup>43</sup>

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<sup>40</sup> *Id.* at 68, Table XII-8.

<sup>41</sup> *Id.* at 68, Table XII-7.

<sup>42</sup> Massachusetts Institute of Technology, International Energy Studies Program 2 (1982).

<sup>43</sup> Marline Shareholder Report, *supra* note 2, at 11-13.

### 3. *Potential Economic Benefits of a Virginia Uranium Industry*

Despite projections of a depressed future for the uranium industry, proponents of mining in Pittsylvania County project significant economic benefits for Virginia.<sup>44</sup> They assert that the uranium industry can operate in relative safety and can provide significant societal benefits. Successful operation of the Marline project would add an estimated thirty million tons of uranium ore to domestic supply over a thirteen-year period. This would have a moderating effect on uranium prices and could reduce dependence on foreign source material.

Marline has estimated the economic and employment benefits of uranium production in Pittsylvania County. Mine/mill complex construction expenses have been estimated at \$82.4 million for mill process and open pit mining equipment, building materials and supplies, excavation, concrete, electrical equipment, site preparation, and engineering work. Forty-five percent of these expenditures are expected to be made within the Pittsylvania County area, thereby benefitting the local economy. The work force required for construction will number 315, and will draw \$5.1 million in wages over an eighteen-month period. During the thirteen-year operational phase, the uranium project is expected to employ 453 persons who will be paid annual wages of \$5.9 million (1981 dollars).

Beyond labor costs, the mine/mill proponents project local spending of \$8.8 million for energy, goods, and miscellaneous expenses. Direct tax revenues to Pittsylvania and Halifax Counties and the city of Danville attributable to the plant have been estimated at \$417,000 per year. The state would also benefit from severance taxes on uranium production.

## II. FEDERAL REGULATION OF URANIUM MINING AND MILLING

The element uranium was discovered in 1789; its radioactivity was not discovered until 1896. Uranium was produced in the United States during the earlier part of this century as a by-product of vanadium mining. The discovery in 1938 that bombarding the nucleus of the uranium atom with neutrons yielded tremendous energy led to the element's most significant

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<sup>44</sup> The information in this and the following two paragraphs is cited from Marline/Umetco, Technical Summary and 1984 Supplement with Supporting Technical Memoranda IV-46-47 (August 1984).

application.<sup>46</sup>

### A. *The 1946 Atomic Energy Act*

The Atomic Energy Act of 1946<sup>46</sup> was the first legislation to deal with the post-war consequences of nuclear energy. Because the original application of atomic energy was military, the federal government initially granted itself a monopoly over the nuclear power industry. Under the Act, the federal government retained the control it had assumed over the nuclear energy industry and conferred the responsibility of regulating and promoting the industry to a civilian agency, the Atomic Energy Commission (AEC). Federal control over atomic energy was thus complete.<sup>47</sup>

Under the Act, the AEC was to administer domestic control over atomic energy materials<sup>48</sup> and carry on research, production, and development programs.<sup>49</sup> The Commission was also charged with encouraging and supporting private research and development.<sup>50</sup> Much of the actual work on atomic energy was performed for the government by private contractors.<sup>51</sup> Nevertheless, the 1946 Act sought to create a government monopoly in the field of atomic energy. The 1946 Act provided that the federal government would retain ownership of all fissionable materials<sup>52</sup> and related produc-

<sup>46</sup> The construction of atomic weapons in the World War II era required a supply of fissionable materials not readily available in the United States. Uranium ore used in constructing American atomic weapons came from deposits in the Belgian Congo and Canada. To supplement these foreign sources, uranium ore was procured from vanadium mines and old tailings dumps in Colorado. 1 NRC FGEIS, *supra* note 26, at 2-1.

<sup>46</sup> Pub. L. No. 79-585, ch. 724, 60 Stat. 755 (1946) (codified as amended at 42 U.S.C. §§ 2011-2296 (1982)).

<sup>47</sup> During the 1950s there was considerable interest in permitting the state governments to enter the field of nuclear regulation. A number of commentators wrote in support of allowing the states to regulate at least some aspect of the atomic energy industry. See Krebs & Hamilton, *The Role of the States in Atomic Development*, 21 Law & Contemp. Probs. 182 (1956); Parker, *The Need for State Atomic Energy Programs in the West*, 29 Rocky Mt. L. Rev. 296 (1957); Frampton, *Radiation Exposure — the Need for a National Policy*, 10 Stan. L. Rev. 7 (1957).

<sup>48</sup> The 1946 Act § 5(a)-(c).

<sup>49</sup> *Id.* § 3(a); S. Rep. No. 1211, 79th Cong., 2d Sess. 3-5, reprinted in 1946 U.S. Code Cong. & Ad. News 1327, 1329-31.

<sup>50</sup> The 1946 Act § 3(a). The conflict between promotional activities and regulatory activities was remedied in 1974 by dividing the AEC into the Nuclear Regulatory Commission and the Energy Research and Development Administration.

<sup>51</sup> Prior to 1954, 95% of total federal government expenditures on atomic energy were through private contractors. Parker, *supra* note 47, at 301. In addition, during this period there were about 150,000 persons employed in the atomic energy program, of which contractor employees accounted for about 142,000. *Id.*; see also Frampton, *supra* note 47, at 17.

<sup>52</sup> The 1946 Act § 5(a)(2). The Act provided that "fissionable materials means plutonium,

tion facilities.<sup>53</sup> The Act specifically prohibited private ownership of fissionable materials without AEC authorization.<sup>54</sup> Although the 1946 Act gave the AEC the power to control the possession and transfer of source materials,<sup>55</sup> Congress did not extend the governmental monopoly to the ownership of source materials.<sup>56</sup>

More importantly, the 1946 Act excluded the power to regulate uranium and thorium mining from the extensive authority that it conferred on the federal government. The AEC's licensing and regulatory responsibilities were not to apply to "any source material prior to removal from its place of deposit in nature."<sup>57</sup> The legislative history of the 1946 Act makes it clear that Congress sought to leave the mining and exploration for uranium ore in the hands of private enterprise.<sup>58</sup> During the 1950s, the federal government not only permitted private miners to supply source materials, but also created incentives to encourage uranium mining.<sup>59</sup> Thus, the early statutory structure placed uranium mining outside the scope of federal regulatory control and left it, presumably, to the states. This regulatory structure is reflected in current federal statutory and administrative policy.<sup>60</sup>

### B. The 1954 Atomic Energy Act

The Atomic Energy Act of 1954<sup>61</sup> was the culmination of several

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uranium enriched in the isotope 235, any other material which the commission determines to be capable of releasing substantial quantities of energy through a nuclear chain reaction of the material, or any material artificially enriched by any of the foregoing; but does not include source materials." *Id.* § 5(a)(1).

<sup>53</sup> *Id.* § 4(c). See generally Murphy & La Pierre, *Nuclear "Moratorium" Legislation in the States and the Supremacy Clause: A Case of Express Preemption*, 76 Colum. L. Rev. 392, 394 (1976).

<sup>54</sup> *Id.* § 5(a)(2).

<sup>55</sup> *Id.* § 5(b)(2).

<sup>56</sup> *Id.* § 5(a)(3). Source materials were defined by the 1946 Act to include uranium, thorium and ores containing these two substances in certain concentrations set by the Commission. *Id.* § 5(b)(1). In fact, the statutory definition of "fissionable materials" explicitly excluded source materials. *Id.* § 5(a)(1).

<sup>57</sup> *Id.* § 5(b)(1), (4).

<sup>58</sup> S. Rep. No. 1211, 79th Cong., 2d Sess. 19 (1946).

<sup>59</sup> See *supra* note 28.

<sup>60</sup> NRC regulations require a license for source material only "after removal from its place of deposit in nature." See 10 C.F.R. § 40.3 (1982). This interpretation of agency regulatory jurisdiction has been recognized in passing by the federal courts and the NRC. See *Home-stake Mining Co. v. Mid-Continental Exploration Co.*, 282 F.2d 787, 791 (10th Cir. 1960); *In re Rochester Gas and Elec. Corp.*, 8 N.R.C. 551, 554 (1978).

<sup>61</sup> Pub. L. No. 83-703, ch. 1073, 68 Stat. 919 (1954) (codified as amended at 42 U.S.C. §§ 2011-2296 (1982)).

years of effort on the part of Congress to open the emerging nuclear technology to the private sector.<sup>62</sup> At the same time, the Act established a comprehensive program of federal licensing and regulation. The Act gave the AEC broad licensing and regulatory authority over the possession, transfer and use of source materials,<sup>63</sup> special nuclear materials,<sup>64</sup> and byproduct materials.<sup>65</sup> The 1954 Act also empowered the AEC to license construction and operation of facilities that would produce and use special nuclear material.<sup>66</sup> The statute made no provision for state regulation of byproduct, source, or special nuclear materials.<sup>67</sup>

Under the 1954 Atomic Energy Act, the federal government be-

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<sup>62</sup> By 1954 Congress had recognized that technological advances in both military and peaceful applications of atomic energy required major changes in the framework of the 1946 legislation. See S. Rep. No. 1699, 83rd Cong., 2nd Sess. 2-4, reprinted in 1954 U.S. Code Cong. & Ad. News 3456, 3457-59. The AEC, through the efforts of private industrial contractors, had developed breeder reactors that made nuclear generated electricity feasible for public consumption. *Id.* at 3458.

<sup>63</sup> The Act defined "source material" as "(1) uranium, thorium or any other material which is determined by the Commission. . .to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time." The 1954 Act § 11(s) (codified at 42 U.S.C. § 2014(z) (1982)). NRC regulations define source material as "(1) uranium or thorium, or any combination thereof, in physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of (i) uranium, (ii) thorium, or (iii) any combination thereof." 10 C.F.R. § 40.4 (1982). The apparent intention is to extend licensing and regulatory jurisdiction only to mined ore which has reached a milling site for processing into yellowcake.

<sup>64</sup> The Act defines "special nuclear material" as "(1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the commission. . .determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing, but does not include source material." The 1954 Act § 11(f) (codified at 42 U.S.C. § 2014(aa) (1982)).

<sup>65</sup> The 1954 Act §§ 51-82 (codified as amended at 42 U.S.C. §§ 2071-2114 (1982)). The Act defines byproduct material as "any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material." *Id.* § 11(e) (codified as amended at 42 U.S.C. § 2014(e) (1982)).

<sup>66</sup> *Id.* §§ 41-44 (codified as amended at 42 U.S.C. §§ 2061-64 (1982)).

<sup>67</sup> One commentator has noted:

The only conclusion which can be drawn from the 1954 Act in regard to the allocation of federal and state responsibility for the regulation of source, special nuclear and byproduct materials. . .is that the preoccupation of Congress with the readjustment of the relation of the federal government and private industry in the development of atomic energy foreclosed consideration of the possibility of state regulation, other than traditional regulation of electric power. In ignoring such matters, Congress simply reflected the reality that there was little or no interest in state regulation of this new federal preserve.

Murphy & La Pierre, *supra* note 53, at 397-98. See also Cavers, *State Responsibility in the Regulation of Atomic Reactors*, 50 Ky. L.J. 29 (1961).

came actively involved in acquiring source materials.<sup>68</sup> The AEC encouraged both prospecting for new uranium sources and mining of uranium when located. It protected a locator's rights to mining claims, resolved conflicts between miners, conducted its own exploratory drilling, built access roads to lightly prospected areas on federal lands, withdrew large areas of federal lands from settlement,<sup>69</sup> and performed aerial surveys.<sup>70</sup> The AEC's direct purchase of source material created a boom in uranium production in the western states.<sup>71</sup>

The most important of the government-created incentives for uranium ore production were financial. The AEC established guaranteed minimum prices for its purchases of uranium ores.<sup>72</sup> Exploration was also subsidized by financial aid from the Defense Minerals Exploration Administration, which granted to qualified applicants seventy-five percent of the cost of uranium exploration.<sup>73</sup>

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<sup>68</sup> From 1948 to 1971, the Atomic Energy Commission purchased 173,665 tons of uranium concentrate from private suppliers. 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 72 (Table A-2). The price paid by the AEC has varied considerably, from \$12.35 per pound in 1953, to \$5.54 per pound in 1971. *Id.* Direct annual purchases of uranium concentrate by the AEC peaked at slightly more than 17,600 tons in 1961 and dropped to 4,010 tons in 1970. *Id.*

<sup>69</sup> For instance, between 1948 and 1954 the Atomic Energy Commission stimulated the discovery and production of uranium by withdrawing from settlement 982 square miles of public land in Colorado, New Mexico, Utah and Wyoming. See Palmer, *Problems Arising out of Public Land Withdrawals of the Atomic Energy Commission*, 2 Rocky Mtn. Min. L. Inst. 77, 86 (1956).

<sup>70</sup> These incentives appear to have succeeded. It was estimated that the number of uranium miners grew from 50 in 1949 to 5000 in 1955. See Tippet, *Federal Incentives to Uranium Mining*, 27 Rocky Mtn. L. Rev. 457, 465 (1955).

<sup>71</sup> One lawyer in Utah during the mid 1950s compared the uranium mining boom in that state to the nineteenth century silver and gold discoveries in Cripple Creek, Leadville, and Virginia City. See Melich, *Some Interesting Sidelights in the Development of the Uranium Industry*, 27 Rocky Mtn. L. Rev. 451, 456 (1955).

<sup>72</sup> See Domestic Uranium Circular No. 3, 13 Fed. Reg. 2090 (1948); Domestic Uranium Circular No. 5, Revised, 16 Fed. Reg. 2333 (1951); see also *supra* note 68.

<sup>73</sup> See Tippet, *supra* note 70, at 458. Despite the encouragement of Congress, private utilities had little incentive to participate in the nation's atomic energy program, for two reasons. First, producing electricity via nuclear reactors did not prove to be lucrative. The first civilian nuclear power plant, completed in 1957 by the Westinghouse Company and operated for the federal government at Shippingport, Pennsylvania, produced electricity at ten times the cost of coal or oil powered generators. P. Pringle & J. Speigelman, *The Nuclear Barons* 160-62 (1981). Second, utility companies feared incurring liability in case of a catastrophic reactor accident. No utility wanted to be exposed to the risk of defending the personal injury and property damage claims that might result from a core melt-down. See S. Rep. No. 296, 85th Cong., 1st Sess 1-3, reprinted in 1957 U.S. Code Cong. & Ad. News 1803, 1803-05.

The Joint Committee on Atomic Energy conducted hearings in the spring of 1956 and



*C. 1959 Amendments to the 1954 Atomic Energy Act*

Following the enactment of the 1954 Act, the states demonstrated an interest in regulating and licensing the atomic energy industry. Protection of the public health and safety from perceived radiation hazards fell within the traditional domain of state police powers. Many states established advisory commissions on atomic energy and registration requirements for radiation sources.<sup>74</sup>

In 1959, Congress amended the 1954 Act by adding section 274,<sup>75</sup> creating the AEC's Agreement State Program. The program was designed to permit state participation in regulating a limited segment of the nuclear industry, while insuring that this participation would not conflict with the power of the AEC. Congress intended to have nuclear material licensed and regulated either by the AEC, or by state and local government, but not by both.<sup>76</sup>

Under the Agreement State Program, AEC was authorized to enter into agreements with states to relinquish, rather than delegate, its authority. Thereafter, the agreement state would assume full regulatory authority over uranium mining and milling,<sup>77</sup> source materials, byproduct materials, and special nuclear materials (collectively called "agreement materials"), as long as these materials were in quantities insufficient to form a critical mass.<sup>78</sup> Thus, sec-

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determined that "the problem of liability has become a major roadblock." *Id.* at 1803. In the summer of 1956, the Atomic Energy Commission was directed by the Joint Committee on Atomic Energy to prepare a study on the possible consequences of a total core melt-down. The "worst case scenario" predicted property damage approaching \$7 billion in 1956 dollars. *Id.* at 1803-04.

In an effort to ensure the participation of private utilities in the nuclear energy program, and to provide protection to persons who might be injured in a catastrophic reactor accident, Congress enacted an amendment to the Atomic Energy Act, the Price-Anderson Act, Pub. L. No. 85-256, § 4, 71 Stat. 576 (1957) (codified as amended at 42 U.S.C. § 2210 (1982)). This amendment placed a ceiling on the liability of a utility for the damages caused by a single nuclear accident.

<sup>74</sup> See Frampton, *supra* note 47, at 29-40.

<sup>75</sup> Act of September 23, 1959, Pub. L. No. 86-373, 73 Stat. 688 (codified as amended at 42 U.S.C. § 2021 (1982)).

<sup>76</sup> S. Rep. No. 870, 86th Cong., 1st Sess. 8-9, reprinted in 1959 U.S. Code Cong. & Ad. News 2878-2880 (comments by the Joint Committee on Atomic Energy).

<sup>77</sup> 42 U.S.C. § 2021(b) (1982). It must be recalled that under the AEC's interpretation of its jurisdiction, all states possessed the authority to regulate the mining of uranium ore. See *supra* notes 57-59 and accompanying text.

<sup>78</sup> *Id.* § 2021(b),(c). The first state to enter into an agreement with the Atomic Energy Commission was Kentucky, on March 26, 1962. California became the second agreement state on September 1, 1962. For effective dates of agreement of all agreement states, see National Governors' Association Committee on Energy and Environment, *The Agreement State Program: A State Perspective B-1* (January 1983) [hereinafter cited as *Governors'*

tion 274 offered agreement states a large degree of independence free from significant federal oversight.<sup>79</sup>

Participation in the Agreement State Program entails two steps. First, the state governor must certify that the state is willing to assume regulation of nuclear materials, and that the state "has a program for the control of radiation hazards adequate to protect the public health and safety."<sup>80</sup> This certification must be accompanied by state enabling legislation authorizing the governor to enter into an agreement with the Nuclear Regulatory Commission (NRC).<sup>81</sup> Second, the NRC must determine that the state's radiation safety program is in accordance with the requirements of subsection (o) of section 2021, is adequate to protect the public health and safety, and is "coordinated and compatible" with the AEC's regulatory program.<sup>82</sup> The drafters of section 274 believed that this terminology would lessen "the dangers of conflicting, overlapping, and inconsistent standards in different jurisdictions, to the hindrance of industry and jeopardy of public safety."<sup>83</sup>

The Atomic Energy Commission retained jurisdiction over certain activities which Congress believed were too hazardous to be

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Report].

<sup>79</sup> It is ironic that the Atomic Energy Act granted the states wide latitude with regard to source material recovery, yet attempted to centralize control of nuclear power plant licensing in the federal government. Recently, however, the United States Supreme Court has rejected the notion of absolute federal preemption of nuclear power plant licensing. See *Pacific Gas & Elec. Co. v. State Energy Conservation & Dev. Comm'n*, 103 S. Ct. 1713 (1983) (upholding the state interest in regulating or temporarily excluding nuclear power plants).

<sup>80</sup> 42 U.S.C. § 2021(d)(1) (1982).

<sup>81</sup> In 1974, Congress divided the AEC into the Nuclear Regulatory Commission, responsible for regulatory activities, and the Energy Research and Development Administration, with authority over promotional activities.

<sup>82</sup> *Id.* § 2021(d)(2) & (g). The original regulations implementing the agreement states program, published in 1961, required state standards governing radiation exposure levels to be uniform with the corresponding federal standards. 26 Fed. Reg. 2537 (1961). The NRC no longer requires that the states' programs be identical to that of the federal agency:

Identity, while theoretically possible, can never be achieved because of variations in interpretation and enforcement. The advisory committee members agreed that identity was not only impossible but also ill-advised. States must retain the capability to respond to local or changing circumstances. As another committee member noted, rigid rules may also stymie innovation.

Governors' Report, *supra* note 78, at 39.

<sup>83</sup> S. Rep. No. 870, *supra* note 76, at 8-9, reprinted in 1959 U.S. Code Cong. & Ad. News at 2879. The AEC regulations implementing the Agreement State Program indicated that state radiation protection standards must be uniform with those issued by the Commission. See 26 Fed. Reg. 2537 (1961).

exempted from the Commission's exclusive control.<sup>84</sup> These activities include the construction and operation of reactors, the import and export of reactors, the sea disposal of nuclear waste, and the disposal of any nuclear material which the AEC determines to be hazardous.<sup>85</sup> Under the 1959 Amendments, the Commission also retained the authority to license the sale and distribution of any item containing source, byproduct, or special nuclear material, notwithstanding an agreement with the state.

The Amendments provided that if the AEC determined that a state was not adequately protecting the public from radiation, the Commission could reacquire authority over the licensing or regulation of nuclear material by terminating or suspending its agreement with the state.<sup>86</sup> In 1980, the Atomic Energy Act was amended to permit the NRC to temporarily suspend all or part of an agreement without notice or hearing, and reassert temporary control over matters previously within its exclusive jurisdiction when an emergency exists and the state has not promptly and effectively eliminated the danger.<sup>87</sup> Taken together, these two provisions accord the NRC the ultimate discretion to temporarily or permanently supplant state regulation of agreement materials.

#### *D. The Uranium Mill Tailings Radiation Control Act of 1978*

Throughout the 1960s there was virtually no federal or state regulation of the disposal of uranium mill tailings.<sup>88</sup> The sufficiency of

<sup>84</sup> *Id.* at 10, reprinted in 1959 U.S. Code Cong. & Ad. News at 2880-81.

<sup>85</sup> 42 U.S.C. § 2021(c) (1982).

<sup>86</sup> *Id.* § 2021(j)(1). The drafters of section 274 clearly intended that this reserved power be exercised only in the most extreme circumstances. S. Rep. No. 870, *supra* note 76, at 12, reprinted in 1959 U.S. Code Cong. & Ad. News at 2882.

<sup>87</sup> Act of June 30, 1980, Pub. L. No. 96-295, title II, § 205, 94 Stat. 287 (codified at 42 U.S.C. § 2021(j)(2) (1982)). This section was intended to give the NRC additional flexibility in dealing with emergencies on an expedited basis. The conference report noted, "[t]he conferees recognized that in those rare instances in which an emergency requires NRC to exercise authority the current statutory mechanism is too cumbersome and slow to protect public health and safety." H.R. Rep. No. 1070, 96th Cong., 2d Sess. 32-33 (1980).

<sup>88</sup> The House report on H.R. 13650, which would become the Uranium Mill Tailings Radiation Control Act, noted:

From the early 1940's through the early 1970's there was little official recognition of the hazards presented by these tailings. Federal regulation of the industry was minimal. As a consequence, mill tailings were left at sites, mostly in the Southwest, in an unstabilized and unprotected condition. Some of these tailings were used for construction purposes in the foundations and walls of private and public buildings. There, through the concentrated emission of radon gas, the hazard of tailings and public exposure increased substantially.

H.R. Rep. No. 1480, 95th Cong., 2d Sess. 11, reprinted in 1978 U.S. Code Cong. & Ad. News

the agreement states' supervision of uranium mining and milling activities came into question during the 1970s, when a number of serious environmental problems arose, involving the operation of uranium production facilities. After an unusual legislative process,<sup>89</sup> Congress enacted the Uranium Mill Tailings Act of 1978<sup>90</sup> in response to the deficiencies of the Agreement State Program in dealing with these problems.

Title I of the Act created "a program of assessment and remedial action at [inactive] sites. . . in order to stabilize and control such tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public."<sup>91</sup> Title II established "a program to regulate mill tailings during uranium or thorium ore processing at active mill operations and after termination of such operations."<sup>92</sup> This title significantly changed the federal power to regulate uranium mill tailings, and restructured the Agreement State Program.<sup>93</sup>

Title II of the Uranium Mill Tailings Act produced four major changes in federal regulation of uranium mining and milling. First, by extending the definition of "byproduct material" to include "the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content,"<sup>94</sup> Congress extended the NRC's authority to the regulation of wastes produced with source material.<sup>95</sup> The

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7433, 7434; *see also id.* at 26-28 (documenting lack of concern and minimal early federal role).

<sup>89</sup> The Committee action on proposals dealing with the uranium mill tailings was shared in the House by the Committee on the Interior and Insular Affairs and the Subcommittee on Energy and Power of the Committee on Interstate and Foreign Commerce. The result of this committee action was H. R. Rep. No. 1480, Pts. 1 and 2, 95th Cong., 2d Sess. (1978). Oddly enough, there were no Senate committee reports on this legislation or similar legislation and there was no conference report. The Uranium Mill Tailings Act was passed during the final moments of the 95th Congress and this hurried consideration evidently resulted in numerous errors in drafting. *See Grammer, supra* note 24, at 480.

<sup>90</sup> Pub. L. No. 95-604, 92 Stat. 3021 (1978) (codified as amended at Title 42 (1982)).

<sup>91</sup> 42 U.S.C. § 7901(b)(1) (1982). The statute identified twenty-two abandoned sites in need of remedial action. *Id.* § 7912(a)(1). EPA issued regulations for inactive site cleanup in 1980, *see* 40 C.F.R. §§ 190.10-21 (1982), and proposed tailings disposal standards in 1981, *see* 46 Fed. Reg. 2893 (1981). Final rules were issued in 1983.

<sup>92</sup> 42 U.S.C. § 7901(b)(2).

<sup>93</sup> The Act also contains a Title III, which requires the NRC to study active uranium mill sites in New Mexico to determine whether further remedial steps are necessary. *Id.* §§ 7941-42.

<sup>94</sup> *Id.* § 2014(e).

<sup>95</sup> *Id.* § 2111; *see also* Note, *The Uranium Mill Tailings Radiation Act of 1978*, 8 Ecology L.Q. 801 (1980).

NRC was instructed to insure the management of uranium mill tailings in a manner it deemed "appropriate to protect the public health and safety and the environment from radiological and nonradiological hazards associated with the processing and with the possession and transfer of such material."<sup>96</sup>

Second, the 1978 Act required the NRC to develop decontamination, decommissioning and reclamation standards to be imposed upon mill licensees during the operation of the mill.<sup>97</sup> The Act also required that the land used for mill tailings disposal, as well as the tailings themselves, be transferred to the United States or the state in which the land is located.<sup>98</sup> The legislation empowered the NRC to require the governmental entity to "undertake such monitoring, maintenance, and emergency measures as are necessary to protect the public health and safety."<sup>99</sup> The burden of responsibility over long term maintenance could be a major consideration in a state's determination of whether to accept custody of tailings sites. The Act also required "an adequate bond, surety, or other financial arrangement" be provided by the uranium mill licensee "to permit the completion of all requirements established by the Commission for the decontamination, decommissioning, and reclamation of sites, structures, and equipment used in conjunction with by-product material."<sup>100</sup> The provision does not preclude state and local governments from establishing independent bonding requirements.

Third, the Act established a cooperative relationship between the NRC and the Environmental Protection Agency (EPA) regarding the promulgation and enforcement of environmental standards regulating uranium mill tailings at both inactive and active tailings sites. EPA was commanded to propose and, within eleven months thereafter, to promulgate standards "for the protection of the public health, safety, and the environment from radiological and nonradiological hazards associated with the processing and with the possession, transfer, and the disposal of byproduct material."<sup>101</sup> EPA's role is to set standards, not to enforce them. The

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<sup>96</sup> 42 U.S.C. § 2114(a)(1).

<sup>97</sup> *Id.* § 2113(a)(1).

<sup>98</sup> *Id.* § 2113(b)(1)(A).

<sup>99</sup> *Id.* § 2113(b)(5).

<sup>100</sup> *Id.* § 2201(x)(1).

<sup>101</sup> *Id.* § 2022(b)(1). Unfortunately, these EPA rules were not established within the 11-month time frame set up by the Uranium Mill Tailings Act. The EPA rules were finally proposed on April 29, 1983, nearly three years later than the statute required. In May 1983,

statute clearly allocates the responsibility for implementing and enforcing the EPA standards to the NRC and to those agreement states that assume control over uranium milling operations.<sup>102</sup>

Fourth, the 1978 Uranium Mill Tailings Act amended the 1959 Act to permit agreement states to regulate not only the source materials, but also the tailings produced by the uranium milling process.<sup>103</sup> An agreement state must comply with the requirements of the statute regarding the ownership of mill tailings and mill tailings disposal sites. The state must also adopt standards "for the protection of the public health, safety, and the environment, from hazards associated with [uranium mill tailings] which are equivalent to, to the extent practicable, or more stringent than, standards adopted and enforced by the [NRC]."<sup>104</sup> The ability to regulate uranium milling with standards that exceed federal minima makes agreement affiliation more attractive to a state concerned about the leniency of federal standards.

The Act established certain administrative procedures for licensing and rulemaking with which agreement states licensing uranium milling operations must comply. When a mill license is sought, state law must provide an opportunity for written comments, a public hearing, and a written determination subject to judicial review.<sup>105</sup> In addition, the state must prepare a written analysis of environmental effects for "each license which has a significant impact on the human environment," that must be available to the general public prior to the licensing hearing.<sup>106</sup> The state must provide for public participation in rulemaking through either a public hearing or the submission of written comments and for judicial review of any rules.<sup>107</sup> In this manner, Congress sought to ensure that the mill licensing activities and the administrative practices of

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the Nuclear Regulatory Commission issued a proposed suspension of selected portions of its own mill licensing regulations, located at 10 C.F.R. pt. 40 (1982), once the EPA-proposed general environmental standards became final. 48 Fed. Reg. 23,649 (1983). On August 4, 1983, this proposed suspension of NRC rules became final with only two changes. 48 Fed. Reg. 35,350 (1983).

<sup>102</sup> 42 U.S.C. § 2022(d).

<sup>103</sup> *Id.* § 2022(b)(1).

<sup>104</sup> *Id.* § 2021(o)(2). The 1983 NRC Appropriations Act amended the Tailings Act to permit uranium mill licensees to "take into account local or regional conditions, including geology, topography, hydrology and meteorology" in proposing mill tailing disposal methods alternative to those required by the NRC. Pub. L. No. 97-415, § 20, 96 Stat. 2067, 2079 (1983) (codified at 42 U.S.C. § 2114(c) (1982)).

<sup>105</sup> 42 U.S.C. § 2021(o)(3)(A).

<sup>106</sup> *Id.* § 2021(o)(3)(C).

<sup>107</sup> *Id.* § 2021(o)(3)(B).

agreement states would be open to public scrutiny and criticism.

### III. STATE PARTICIPATION IN REGULATING THE URANIUM MINING AND MILLING INDUSTRY

#### A. *The Agreement State Program: Costs and Benefits*

Despite its complete regulatory control over the licensing of uranium mills, the NRC has never asserted jurisdiction over uranium ore mining. States have retained control over uranium mining as an aspect of their regulation of conventional mining activities. The Agreement State Program provides a means of consolidating regulation over the two activities. Combining the power relinquished by the NRC over uranium milling with traditional state regulation of uranium mining, a comprehensive scheme of state regulation can be achieved. By 1983, twenty-six states had elected through the Agreement State Program to assume some facet of the NRC's regulatory authority.<sup>108</sup> Agreement states now issue nearly sixty percent of all the radioactive materials licenses granted in the United States.<sup>109</sup>

Domestic uranium production has been limited almost exclusively to the western states of New Mexico, Wyoming, and Texas.<sup>110</sup> In 1983, sixty-six percent of the uranium mined in the United States was removed from the Colorado Plateau and the Wyoming Basins.<sup>111</sup> Yet, states with no uranium production industry have adopted regulatory policies concerning the industry.

States have adopted four basic approaches to regulating uranium mining and milling. Four of the most productive states — Texas, Colorado, New Mexico, and Washington — regulate uranium milling under agreement with the NRC.<sup>112</sup> These states comprehensively license and regulate both uranium mining and milling. One non-agreement state, Wyoming, licenses uranium mining and regu-

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<sup>108</sup> The agreement states are: Kentucky, California, Mississippi, New York, Texas, Arkansas, Florida, North Carolina, Kansas, Oregon, Tennessee, New Hampshire, Alabama, Nebraska, Washington, Arizona, Louisiana, Colorado, Idaho, North Dakota, South Carolina, Georgia, Maryland, Nevada, New Mexico, and Rhode Island. The agreement states with uranium mill regulations are New Mexico, Texas, Colorado, Oregon, Washington and California. Governors' Report, *supra* note 78, at B-1.

<sup>109</sup> *Id.* at 10.

<sup>110</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 8-9 (Tables I-7 and I-8).

<sup>111</sup> *Id.* at 9 (Table I-9).

<sup>112</sup> Three agreement states, Arizona, Idaho, and Nebraska, have returned their uranium mill licensing authority to the Nuclear Regulatory Commission. *Id.* at 31 n.13.

lates a number of nonradiological aspects of uranium milling. Another non-agreement state, Utah, regulates the mining of uranium ore but not milling.<sup>113</sup> Finally, at least four states (Vermont, New Jersey, New York and Minnesota) have discouraged uranium production altogether by adopting restrictive legislation.

Before discussing the technical requirements for becoming an agreement state, it is worth noting the major arguments for and against participation in the program. First, agreement state status is desirable to a state that wishes to maximize its control over this potentially hazardous industry. The agreement state program permits the state to unify its regulation of radioactive materials in one agency and thereby undertake a comprehensive regulatory approach toward related public health and safety matters. The agreement states are thought to be more responsive to local conditions and the needs of their citizens, and therefore are better able to provide monitoring and inspection services than would be the federal government. Since the agreement state has taken direct responsibility over enumerated radiological materials, it can identify emergency situations more quickly and respond to them more effectively. Second, while agreement state status does not make that state eligible for federal financial assistance, it does allow state employees to receive NRC training in specialized areas of radiological protection. This training can develop highly competent state personnel to implement the agreement program. Third, an agreement state can consolidate an industry's radiological and nonradiological permitting requirements into one streamlined permit process, saving both the applicants and the state substantial time and money.

The cost is the primary disadvantage of becoming an agreement state. The cost of an agreement state's radiation control program varies with the extent of the functions assumed by the state and the size and complexity of the responsible state agency. A state may embark on a limited or a comprehensive agreement program. Agreement states regulating uranium milling have extensive programs. The cost of administering an agreement program can range from \$100,000 to over \$3 million per year.<sup>114</sup> Despite the costliness

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<sup>113</sup> Utah has commenced negotiations with the NRC regarding agreement status, yet does not wish to regulate uranium mill licensing. See 49 Fed. Reg. 978 (1984).

<sup>114</sup> More than half of the twenty-six agreement states spend between \$100,000 and \$500,000 per year on their programs. Four agreement states allocate from \$500,000 to \$1 million per year, while two states grant between \$1 million and \$3 million per year. One state spends more than \$3 million per year while no state spends less than \$100,000. Governors' Report, *supra* note 78, at 29 (Table 10).



of implementing the Agreement State Program, the number of agreement states has increased. The NRC has reported that four more states — Iowa, Oklahoma, Pennsylvania and Utah — are currently discussing the possibility of agreement state status with the NRC.<sup>115</sup> This indication of interest reflects efforts by the federal government to encourage agreement status. It also demonstrates the willingness of the states to expand their own regulatory agencies. It should be noted, however, that none of these four states is seeking to regulate uranium milling and mill tailings.

### *B. NRC Regulations Governing the Agreement State Program*

The Agreement State Program technically requires the NRC to relinquish certain areas of its authority after the NRC and a participating state have reached formal agreement on the state's regulatory program. In practice, a section 274 agreement is arrived at only after lengthy negotiation between the state and the federal government. A state wishing to regulate uranium milling operations, low level waste material or permanent disposal facilities must become an agreement state. Once a state has entered the Agreement State Program, it may decrease its range of authority or it may leave the program altogether.<sup>116</sup> The NRC has established a set of general criteria for states wishing to become agreement states. In 1981, additional criteria were added for states wishing to regulate uranium milling and tailings in order to conform with the requirements of the 1978 Uranium Mill Tailings Act.

#### *1. General Criteria for Agreement State Approval*

The state regulatory program must include standards for protection against radiation. To achieve uniformity among states concerning maximum permissible radiation levels, the state regulations must be based on the NRC's standards governing maximum permissible radiation levels and radioactivity concentrations.<sup>117</sup>

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<sup>115</sup> *Id.* at 7 n.1.

<sup>116</sup> The NRC encourages a state to regulate as many of the agreement materials as possible in order to limit the total accumulated occupational radiation exposure to individuals. 46 Fed. Reg. 7540 (1981). The agency makes clear, however, that a comprehensive program "is not . . . a necessary or appropriate subject for coverage in the criteria." *Id.* at 7540-41. Recently, three agreement states, Arizona, Idaho and Nebraska, have relinquished regulatory authority over uranium mill tailings to the NRC. Governors' Report, *supra* note 78, at 31 n.13.

<sup>117</sup> 46 Fed. Reg. 7450, 7541 (1981) (criterion 3). These standards are set out in 10 C.F.R. pt. 20 (1983). This section of the NRC regulations creates rules regarding permissible doses,

These standards govern the waste disposal into air, waters, sewers and soil. The state must also require licensees to maintain radiation exposure records, report accidents, and notify employees of excessive radiation exposure.<sup>118</sup> The state regulatory authority must monitor the radiation exposure of personnel and conduct inspections of all licensed facilities;<sup>119</sup> the criteria do not explicitly stipulate the frequency of inspection.<sup>120</sup>

The general criteria set forth the minimum training required of regulatory and inspection personnel. The NRC recommends that personnel who perform evaluation and inspection functions hold a bachelor's degree or equivalent in the physical and/or life sciences, including biology, chemistry, physics, and engineering and have training and experience in radiation protection.<sup>121</sup> The general criteria do not establish specific levels of staffing in the agreement states' regulatory agencies; the level of staffing is apparently determined through negotiation between the agreement state and the NRC over a period of time.<sup>122</sup>

The NRC criteria conclude with an admonition that "[s]tate practices for assuring the fair and impartial administration of regulatory law, including provision for public participation where appropriate, should be incorporated in procedures" for rulemaking, license evaluation, and enforcement actions.<sup>123</sup> Both the Uranium Mill Tailings Act and the specific criteria addressing uranium mill licensing require additional state procedures in these areas. As a guidance document, the general criteria do not provide much spe-

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levels and concentrations of radiation, precautionary procedures, waste disposal requirements, records and notification requirements and enforcement.

<sup>118</sup> 46 Fed. Reg. 7450, 7451 (1981) (criterion 11). Criterion 19 does not specifically require the agreement state to implement any particular enforcement method. It states that the enforcement system "may include, as appropriate, administrative remedies looking toward issuance of orders requiring affirmative action or suspension or revocation of the right to possess and use materials, and the impounding of the materials, the obtaining of injunctive relief, and the imposing of civil or criminal penalties." *Id.* at 7542.

<sup>119</sup> *Id.* at 7541, 7542 (criteria 5, 16).

<sup>120</sup> Criterion 16 states that "frequency of inspection shall be directly related to the amount and kind of material and type of operation licensed, and it shall be adequate to ensure compliance." *Id.* at 7542. This vague standard apparently requires more frequent inspections of larger or complex facilities.

<sup>121</sup> *Id.* The NRC has not clearly established the degree to which an agreement state may rely upon consultants for monitoring and inspection functions.

<sup>122</sup> The sufficiency of agreement state staffing levels may also become a matter of significant conflict after the initial federal/state agreement has been negotiated. The NRC has criticized states for the level of program staffing during periodic state evaluations and in the amendment of existing agreements.

<sup>123</sup> 46 Fed. Reg. 7540, 7543 (1981).

cific advice to a state considering affiliation with the Agreement State Program.

## *2. Additional Criteria for State Regulation of Uranium Milling and Mill Tailings*

Pursuant to the Uranium Mill Tailings Act of 1978, the NRC established a number of procedural requirements for rulemaking and licensing that have special application to states intending to undertake uranium mill tailings licensing. Most likely, many of these procedural requirements are provided under existing state administrative law.<sup>124</sup> If not, legislation must be enacted to ensure the public participation rights required by the NRC.<sup>125</sup>

In addition to procedural requirements for rulemaking and licensing, the NRC requires that an agreement state develop procedures for preparing an environmental impact analysis of a state-issued uranium mill license.<sup>126</sup> The NRC regulations require that the environmental analysis include, at a minimum, an assessment of radiological and nonradiological public health impacts, impacts on surface water and groundwater, alternatives to the licensed activities, and long term impacts of those actions.<sup>127</sup> In practice, some agreement states have produced environmental analyses covering a broad range of potential impacts beyond those specified in the NRC regulations.<sup>128</sup>

The agreement state must designate a lead agency to prepare the

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<sup>124</sup> As of 1980, more than half the states had adopted an administrative procedure act based at least in part on the original or the revised model state administrative procedure act. See 14 Uniform Laws Annotated 357 (master ed. 1980). Arizona, Florida, Indiana, Massachusetts, New Mexico and Oregon have adopted comprehensive administrative procedure legislation not based upon the model act. 1 K. Davis, *Administrative Law Treatise* § 1:10 (2d ed. 1978).

<sup>125</sup> 46 Fed. Reg. 7540, 7543 (1981) (criterion 29).

<sup>126</sup> *Id.* at 7544 (criterion 31).

<sup>127</sup> *Id.*

<sup>128</sup> In Texas, for example, the Texas Bureau of Radiation Control issued an environmental assessment on a conventional uranium mill license application of the Anaconda Minerals Company in 1982. This assessment covered such subjects as climate, air quality, regional demography, socio-economics, land use, cultural resources, geology, hydrology, and the ecology of the area. In addition, the proposed operation of the mill and the supporting mines were analyzed in terms of their non-radioactive and radioactive emissions, stabilization of tailings, operational monitoring, impact of accidents, impact of operations, alternatives, financial security, land ownership, and interagency review. See Texas Department of Health, Bureau of Radiation Control, Environmental Assessment, Safety Evaluation Report, and Proposed License Conditions Related to Anaconda Minerals Company Rhode Ranch Project, McMullen County, Texas (August 31, 1982) (Pub. No. TBRC EA-9) [hereinafter cited as Rhode Ranch Project Environmental Assessment].

environmental analysis for a mill licensing proposal when a number of state and federal agencies have regulatory responsibilities regarding the proposed project.<sup>129</sup> Since the production of an environmental analysis would seem to require significant expertise, the agency may employ outside consulting services.<sup>130</sup>

The background requirements for personnel regulating uranium mills are even more stringent than those for the members of the general regulatory agency. The staffing needed to process uranium mill applications fall into three separate categories: technical, administrative, and support.<sup>131</sup> The NRC criteria define the functions of each of these three categories of employees.<sup>132</sup> The NRC has estimated that between two and two and three-quarters total professional person-years of effort are required to process a new conventional uranium mill license or a major renewal in order to satisfy the requirements of the Uranium Mill Tailings Act.<sup>133</sup> This estimate presumably reflects the manpower necessary to conduct the required environmental assessment and an in-plant safety review. A state should consider whether it can attract sufficiently knowledgeable personnel before deciding to join the Agreement State Program.

Other expenses are not easily measured. The NRC estimates that various miscellaneous post-licensing activities, including the issuance of minor license amendments, inspections, and environmental surveillance, would require from one-half to one person-year of effort per licensed facility.<sup>134</sup> This estimate does not appear to account for the possibility of a major environmental problem after the uranium mill facility is licensed.

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<sup>129</sup> 46 Fed. Reg. 7540, 7544 (criterion 33(b)). This requirement parallels a similar requirement of federal environmental impact statements. The Council on Environmental Quality regulations describe the designation of a lead agency supervising the preparation of an environmental impact statement if multiple agencies are involved in a project subject to NEPA. 40 C.F.R. § 1501.5 (1982).

<sup>130</sup> 46 Fed. Reg. 7540, 7544 (1981) (criterion 33(d)). The criterion emphasizes, however, that the consultants employed by the state be selected following a procedure that ensures, to the maximum extent possible, that they do not have a conflict of interest in the project they are evaluating. *Id.* The criterion states that the agreement agency cannot use the applicant's environmental report in lieu of its own independent assessment of the proposed project. *Id.* (criterion 33(b)). However, the criterion mysteriously states that "the lead agency may prepare an environmental assessment based upon an applicant's environmental report." *Id.* (emphasis added).

<sup>131</sup> *Id.* at 7545 (criterion 34).

<sup>132</sup> *Id.* (criterion 34(a)).

<sup>133</sup> *Id.*

<sup>134</sup> *Id.*

The NRC requires that an agreement state, in addition to licensing personnel, have available "both field and laboratory instrumentation sufficient to ensure the licensee's control of materials and to validate the licensee's measurements."<sup>135</sup> These instruments must be available in a state agency or through a commercial contractor.<sup>136</sup> The use of outside contractors would be unavoidable in a state without a pre-existing laboratory facility and with a small number of mill licensees.

In conclusion, it is difficult to estimate the total manpower necessary to operate a uranium milling and tailings regulatory program. Notably, the existing agreement states appear to have much larger staffs in their radiological control programs than the minimum required by NRC guidelines. Furthermore, it would seem that much of the cost associated with such programs would be incurred during the initial stage of licensing a facility. Less staffing would be necessary to inspect and monitor a facility once it had been licensed. Therefore, without a continual flow of new facilities, a state bureaucracy created to perform environmental assessment and regulatory compliance analysis might find itself with little work to do.

### 3. *Authority Retained by the Nuclear Regulatory Commission*

The NRC has reserved significant authority over uranium milling and tailing regulation in agreement states. The agency requires that state regulatory programs be "equivalent to the extent practical or more stringent than regulations and standards adopted and enforced by the Commission, as required by Section 274 (o)."<sup>137</sup> Therefore, the NRC regulations, as augmented by the EPA general standards, serve as a floor for an agreement state's regulatory program.

The NRC reserves the power to establish minimum standards governing reclamation, long-term surveillance and maintenance, and ownership of byproduct material.<sup>138</sup> In addition, the NRC reserves the right to determine prior to the termination of a ura-

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<sup>135</sup> *Id.* at 7546 (criterion 36).

<sup>136</sup> *Id.* (criterion 36(b)).

<sup>137</sup> *Id.* at 7544 (criterion 32). The NRC regulations concerning the Agreement State Program explicitly state that the agreement state's licensing standards must be equivalent to or more stringent than the NRC standards. 10 C.F.R. pt. 40, Appendix A (1983).

<sup>138</sup> 46 Fed. Reg. 7540, 7544 (1981) (criterion 30(a)); *see also* 10 C.F.R. § 150.15(a), (b) (1983).

mium mill license that the licensee has complied with decontamination, decommissioning and reclamation standards and ownership requirements applicable to the site.<sup>139</sup> Since title to the mill tailings and the tailings disposal site will be transferred either to the federal government or to the state at its option,<sup>140</sup> the governmental entity having custody would assume responsibility to protect the public from risks created by a site which has not been properly decontaminated. The NRC also reserves the authority to require monitoring, maintenance and emergency measures after the license is terminated.<sup>141</sup> Finally, the NRC reserves the right to authorize the use of the surface or subsurface area of a uranium mill or mill tailings disposal site for other purposes after the closure of the facility.<sup>142</sup>

#### 4. *Federal Evaluation of Agreement State Radiation Control Programs*

The NRC has issued guidelines concerning its periodic evaluation of established agreement state programs.<sup>143</sup> The guidelines address six major elements of the state radiation and control program: legislation and regulations, organization, management and administration, personnel, licensing, and compliance.<sup>144</sup> These guidelines are used by the NRC during on-site reviews of agreement state programs conducted approximately every eighteen months. During a review, the NRC determines whether the program is adequate to protect the public health and safety and whether the program is compatible with the NRC regulatory authority.<sup>145</sup> If there is a serious deficiency relating directly to public health or welfare, the NRC requests an immediate response and a follow-up review is conducted within six months.<sup>146</sup> If the state program has not improved or if additional deficiencies are detected, the NRC may initiate proceedings to revoke or suspend part or all of the state's agreement program.<sup>147</sup>

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<sup>139</sup> *Id.* at 7544 (criterion 30(b)).

<sup>140</sup> *See supra* note 98 and accompanying text.

<sup>141</sup> 46 Fed. Reg. 7540, 7544 (1981) (criterion 30(d)).

<sup>142</sup> 42 U.S.C. § 2113(b)(1)(A)-(B) (1982).

<sup>143</sup> 46 Fed. Reg. 59,341 (1981).

<sup>144</sup> *Id.*

<sup>145</sup> *Id.* at 59,342.

<sup>146</sup> *Id.* at 59,343.

<sup>147</sup> *Id.*

*C. State Regulation of the Uranium Mining and Milling Industry**1. Virginia's Approach to the Uranium Industry*

It is common for state legislatures to directly establish policy in an area of significant state interest by enacting statutes which create prospective regulatory programs and administrative responsibilities. Typically, the legislative branch sets forth general principles of governance and permits the state executive agency to implement its authority by administrative rulemaking, licensing and enforcement.

However, the development of the uranium policy in Virginia has deviated from this model. The General Assembly has authorized the creation of a series of commissions to collect information on the nuclear fuels industry and assess the risks associated with establishing a uranium mine-mill complex in Pittsylvania County. In 1982 the state's mining laws were specifically amended to regulate uranium exploration. This statute empowered the Virginia Division of Mines to grant uranium exploration permits and established specific performance standards applicable to uranium prospecting. The legislature was careful, however, to prohibit uranium mining until it had established a more elaborate policy. The effect was to freeze the status quo without recognizing any vested rights to mine uranium.

In 1983, the legislature created the Uranium Administrative Group (UAG) to coordinate and evaluate studies of the effects of uranium mining and to file a report with the Virginia Coal and Energy Commission by December 1, 1983. The report was to inform the Commission of the results of the studies, and make recommendations for legislation, if appropriate. By 1984, the UAG was still not prepared to render a definitive judgment on the future of uranium production in Virginia.

In 1984, the quest for data about the health, safety and economic effects of uranium mining spawned the creation of yet another organization, the Uranium Task Force (UTF). The Task Force, representing various state agencies and other public interest representatives, was directed to formally assess the risks posed by the mining and milling project proposed for the Pittsylvania County site. The UTF made its final report in October, 1984.<sup>148</sup>

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<sup>148</sup> The information in the remainder of this subsection comes from Uranium Task Force, Uranium Study Newsletter, Pub. No. 19 (October 1984).

The information it developed does not address all the questions that should be addressed prior to final licensing of the Pittsylvania County facility. However, it does respond to the mandate for developing an improved technical and administrative base in order to make an informed legislative decision. The Task Force concluded that uranium development activity can be undertaken with an acceptable level of risk and with economic benefits to the state if and only if the following recommendations are adopted:

1. Virginia should become an agreement state with the right to license a uranium production facility.

2. Statewide standards for acceptable levels of radiation exposure should be made more stringent than current federal standards by regulating all sources and pathways in a single two-part standard of twenty-five millirem per year (mrem/yr) for sources other than radon and one picocurie per liter (pCi/l) for radon. Together, these yield a maximum dose of two hundred eighty-five millirem per year. The proposed state standard accepts a statistical increase of 28.5 cases of fatal cancer per million from uranium production, as compared to fifty per million under the federal standard.

3. A uranium mining, milling, and reclamation statute should be adopted.

4. A non-degradation standard should apply to groundwater protection.

5. No surface discharge of process water from either the mill or the tailings facility should be permitted.

6. Those state regulations and performance standards which govern hazardous waste landfills should be specifically applied by statute to uranium development facilities.

7. A schedule of financial guarantees and fines should be developed to assure strict compliance with license and permit conditions, and a strict liability policy for damage should be adopted by the state for uranium facilities.

8. The State should adopt an administrative strategy that assigns the Health Department lead responsibility for negotiating an agreement with the NRC, and the Department of Mines, Minerals, and Energy lead responsibility for on-site monitoring.

9. The UTF should prepare an estimate of the budgetary requirements necessary to regulate uranium development in Virginia.

The legislature may or may not adopt these recommendations. The discussion that follows, examining the regulation of mining and milling industries in other states, is intended as a point of comparison.



## 2. *Regulation of Uranium Mining and Milling in Texas*

Texas has recently emerged as a significant producer of uranium ore. In 1982, it ranked third behind New Mexico and Wyoming with seventeen percent of domestic production.<sup>149</sup> As of January 1, 1983, eleven uranium oxide production facilities were operating in the state: the Chevron Resources Panna Maria uranium processing plant in Hobson, Texas, and ten *in situ* mining facilities.<sup>150</sup> As an NRC agreement state, Texas has undertaken a comprehensive program of uranium mining and milling regulation in which it exerts maximum regulatory control over the uranium recovery industry.

Texas has long been active in the regulation of radioactive materials. The Texas Radiation Control Act was enacted in 1961. Texas became an agreement state with the Atomic Energy Commission on March 1, 1963.<sup>151</sup> Under this arrangement, Texas was permitted to control a wide range of uranium-related activities, including one uranium production facility previously licensed by the AEC. Texas has committed itself to establishing well-staffed state agencies to oversee the uranium industry. The major regulatory responsibilities for uranium mining and milling are accorded to the Texas Railroad Commission, Division of Surface Mining and Reclamation, and the Texas Department of Health, Bureau of Radiation Control.

### a. *Uranium Exploration and Mine Regulation*

The Texas legislature amended preexisting surface mining and reclamation provisions in 1979 to specifically regulate uranium mining.<sup>152</sup> These provisions empower the Texas Railroad Commission to control uranium exploration,<sup>153</sup> issue surface mining permits,<sup>154</sup> approve reclamation plans,<sup>155</sup> establish reclamation standards,<sup>156</sup> create a system of performance bonding,<sup>157</sup> and enforce its own permit conditions and regulations.<sup>158</sup> The Texas statute borrowed heavily from the state's coal surface mining laws. It contains

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<sup>149</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 9 (Table I-8).

<sup>150</sup> *Id.* at 42 (Table VII-2).

<sup>151</sup> Governors' Report, *supra* note 78, at B-1.

<sup>152</sup> Tex. Nat. Res. Code Ann. tit. 4, §§ 131.001-270 (Vernon 1978 & 1984 Supp.).

<sup>153</sup> *Id.* § 131.034 (Vernon 1978).

<sup>154</sup> *Id.* § 131.131.

<sup>155</sup> *Id.* § 131.101.

<sup>156</sup> *Id.* § 131.102.

<sup>157</sup> *Id.* §§ 131.201-214.

<sup>158</sup> *Id.* §§ 131.261-270.

a specific procedure for the designation of certain lands as "unsuitable" for uranium mining, triggered by an application to undertake uranium surface mining.<sup>159</sup> A recent amendment to this statute enables citizens to petition the Railroad Commission to have an area set aside as "unsuitable."<sup>160</sup>

The principal means of regulating uranium mining in Texas is the mining permit. The permitting process contains three desirable features. First, the Railroad Commission is directed to establish a procedure for considering combined permit applications for a number of uranium mines at noncontiguous sites.<sup>161</sup> Second, a uranium mining permit application must be circulated to state agencies having an interest in the matter.<sup>162</sup> Third, a uranium surface mining permittee must obtain liability insurance which provides "bodily injury protection and accidental business property damage" protection, at a level set by the Railroad Commission.<sup>163</sup>

The Texas statute also emphasizes site reclamation. The law requires that a reclamation plan accompany each permit application.<sup>164</sup> This provision is designed to insure that the mined land is "restored to the same condition as the land that existed enjoyed before the mining or some substantially beneficial condition."<sup>165</sup> This is similar to the provision of Virginia law requiring a reclamation plan of non-coal mine operators;<sup>166</sup> however, the Texas law deviates from its Virginia counterpart in setting forth a twenty-part list of reclamation standards applicable to each permittee.<sup>167</sup>

The Texas system of uranium mine licensing is reinforced by a two-pronged mechanism ensuring compliance with reclamation standards and permit conditions: performance bonding and en-

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<sup>159</sup> *Id.* §§ 131.035-.041.

<sup>160</sup> *Id.* § 131.039(a).

<sup>161</sup> *Id.* § 131.137.

<sup>162</sup> *Id.* § 131.139. The Texas statute expressly conditions the granting of a uranium permit on a finding by the Railroad Commission that the permit would be in compliance with state and federal law. *See id.* § 131.140. A permit will be denied if the Texas Water Quality Board or the Texas Air Control Board inform the Railroad Commission that the proposed mining operation would cause pollution of water or air in violation of state law. *Id.* § 131.141(3). The Railroad Commission may also deny the permit under the general rubric that the permit will "endanger the health and safety of the public." *Id.* § 131.141(5). Consequently, the comments and opinions of other state agencies may be extremely important in the permit application process.

<sup>163</sup> *Id.* § 131.143.

<sup>164</sup> *Id.* § 131.101(b)(1)-(7).

<sup>165</sup> *Id.* § 131.102(c).

<sup>166</sup> Va. Code § 45.1-182.1 (1980 & Supp. 1984).

<sup>167</sup> Tex. Nat. Res. Code Ann. tit. 4, § 131.102(b)(1)-(20) (Supp. 1984).

forcement actions. After the Railroad Commission approves an applicant's uranium mining permit and reclamation plan it must set a performance bond at a level sufficient to complete the reclamation project.<sup>168</sup> Although some operators may be accepted as self-insurers, most must post a surety to secure payment of this performance bond.<sup>169</sup> The Texas statute wisely provides for adjustment of the bond "to reflect changes in the cost of future reclamation of lands mined or to be mined."<sup>170</sup> At the conclusion of satisfactory mine site reclamation, the performance bond may be released following a Commission inspection and evaluation of the restoration.<sup>171</sup> A public hearing must be conducted if the Commission determines that the bond release is "significant."<sup>172</sup>

To ensure compliance with permit conditions and statutory operational requirements, the Texas legislation authorized a wide range of enforcement measures, including administrative orders

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<sup>168</sup> Tex. Nat. Res. Code Ann. tit. 4, § 131.202 (Vernon 1978). The Texas statute provides for establishing the amount of the bond at a level "sufficient to ensure the completion of the reclamation plan if the work had to be performed by third party in event of forfeiture. . . ." *Id.* § 131.202(c). The Commission is instructed to set the amount of the bond following the advice of two independent estimates. *Id.* § 131.202(b). This procedure allows the applicant to submit its own estimate of reclamation costs.

<sup>169</sup> *Id.* § 131.203. The Texas statute permits self-bonding by a mine operator when the operator demonstrates the existence of a suitable agent to receive service of process and a history of financial solvency and continuous operation. *Id.* There is no express provision for changing a self-insurance bond to a secured bond in the event that the financial condition of the operator changes in the future.

<sup>170</sup> *Id.* § 131.206. This provision allows for a continuous modification of the bond's amount to reflect the changing costs of reclamation. The modification of the bond amount is made expressly subject to the procedure established by the statute for the release of the performance bond. *Id.* § 131.206(d).

<sup>171</sup> *Id.* § 131.210. The Commission is directed to inspect and evaluate the reclamation work of the operator to determine whether or not the release of the bond is appropriate. The statute directs the Commission to consider the degree of difficulty in completing the remaining reclamation, whether pollution of surface and subsurface water is occurring, the probability of continuance or future occurrence of pollution, and the estimated cost of abating pollution. *Id.* § 131.210(d)(1)-(4).

The Texas statute allows "any person or the officer or head of a federal, state, or local government or agency" to file written objections to the proposed release of a bond placed by a mining operator. *Id.* § 131.214(a). The mining operator must publish a notice of the proposed bond release for four consecutive weeks in a newspaper in the locality of the surface mining and reclamation operation. *Id.* § 131.209. The statute also provides for the direct notification by certified mail of the local governmental authority having jurisdiction over the mine. *Id.* § 131.213.

<sup>172</sup> *Id.* § 131.214(c). The Railroad Commission is accorded the sole responsibility for determining which applications for bond release are significant enough to justify a public hearing. Once a determination of significance has been made, the Railroad Commission must hold a public hearing within the locality in which the uranium mining activity was conducted.

and notices of violation,<sup>173</sup> civil suits for injunctive relief and civil penalties,<sup>174</sup> and criminal prosecutions.<sup>175</sup> Texas law does not expressly provide for citizens' suits. Therefore, enforcing compliance with permit conditions and statutory requirements rests in the hands of those state agencies given regulatory responsibility under the Texas Surface Mining Act, primarily the Railroad Commission and the Texas Attorney General.

*b. Regulation of Uranium Milling in Texas*

As is true in many states, mining and milling regulation in Texas are not consolidated in one state agency. Primary jurisdiction over uranium milling operations has been accorded, under an extensive radiation control statute,<sup>176</sup> to the Department of Health, Bureau of Radiation Control. The Bureau has undertaken an impressive regulatory program and issued a number of regulations governing subjects under its jurisdiction. In October 1981 the agency issued regulations governing the licensing of uranium recovery facilities.<sup>177</sup>

An applicant for a Texas uranium milling license must submit a formal application and an environmental report to the Division of Licensing, Registration and Standards of the Bureau of Radiation Control. The applicant's environmental report must contain the following: (1) a description of the proposed project, (2) a discussion of the site characteristics including ecology, geology, topography, hydrology, meteorology, historical and cultural landmarks, and archaeology, (3) a description of the radiological and non-radiological impacts of the proposed action including waterway and ground

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<sup>173</sup> *Id.* §§ 131.261-.263. The Railroad Commission is given a range of administrative powers to order the elimination of dangerous conditions or practices likely to cause harm to the public. *Id.* § 131.261. The agency is also accorded the power to issue notices of violations to the mine operator for less serious problems. *Id.* § 131.262.

<sup>174</sup> *Id.* §§ 31.265-.266, 31.270. The statute grants the Railroad Commission specific authority to initiate civil suits for injunctive relief and to impose civil penalties of up to \$5000 for each day of violation.

<sup>175</sup> *Id.* §§ 131.267-.269. The Texas law establishes criminal penalties for the willful and knowing violation of a permit condition or for failure to comply with an order issued by the Railroad Commission. Additional punishment for this behavior is a fine of up to \$10,000 or imprisonment for up to one year or both.

<sup>176</sup> Tex. Stat. Ann. art. 4590f (Vernon 1976 & Supp. 1984).

<sup>177</sup> Texas Dept. of Health, Division of Occupational Health and Radiation Control, Texas Regulations for Control of Radiation, Part 43 (October 1981). These regulations and the procedure adopted by Texas for the consideration of uranium mill licenses largely parallel the rules of the Nuclear Regulatory Commission.

water impacts and long term effects, (4) a description of environmental effects of accidents, (5) a discussion of tailings disposal and decommissioning, and (6) mention of site and project alternatives.<sup>178</sup> When the application and environmental report are complete, copies are sent to a number of Texas state agencies for review and comment.

After receiving the environmental report, the Division of Environmental Programs of the Bureau of Radiation Control prepares an environmental assessment of the uranium milling facility, as required under state and federal law.<sup>179</sup> While the draft assessment is being prepared, another branch of the Division of Radiation Control, the Financial Analysis Program, conducts a financial investigation of the applicant and reviews the financial surety proposed for the mill site.

The license applicant must submit a closure plan, including an estimate of closure costs, in conjunction with its environmental report.<sup>180</sup> Should the uranium mill license be granted, the applicant must then post the surety. As with the bonding of uranium mining activities, the mill surety amount may be adjusted to take account of changes in the cost of completing site reclamation.<sup>181</sup> Arrangements must be made for the ultimate transfer of the milling site and tailings material to either the U.S. Government or the state of Texas.<sup>182</sup> If it is anticipated a uranium milling site will be transferred to state ownership, the licensee must pay a charge of at least \$250,000 into the Radiation and Perpetual Care fund to cover the cost of long term care and maintenance of the site.<sup>183</sup> The agency's regulations specify that "the final disposition of tailings or waste should be such that the need for on-going active maintenance, to

<sup>178</sup> *Id.* § 43.26(a)(1)-(6).

<sup>179</sup> The Texas Radiation Control Act contains a specific procedure for licensing of uranium recovery facilities which requires that the Radiation Control Agency prepare a written analysis of any licensing proposal that will "have a significant impact on the human environment." Tex. Stat. Ann. art. 4590f, § 11A(a) (Vernon 1984 Supp.). The federal provision is found at 46 Fed. Reg. 7540, 7544 (criterion 31).

<sup>180</sup> Texas Regulations for Control of Radiation, *supra* note 177, § 43.60(c).

<sup>181</sup> *Id.* § 43.60(e). The regulations provide that the security "shall be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs." *Id.*

<sup>182</sup> Tex. Stat. Ann. art. 4590f, § 6A(b) (Vernon Supp. 1984). These land transfer requirements are imposed upon the state of Texas by the terms of the federal Uranium Mill Tailings Act. See *supra* note 98 and accompanying text.

<sup>183</sup> The Texas Radiation Control statute makes a special provision for the Radiation and Perpetual Care Fund. *Id.* § 16.

the maximum extent practicable, [is] eliminated.”<sup>184</sup>

While the environmental assessment and financial analysis are being performed, the Division of Compliance and Inspection conducts a review of the applicant's proposed facility, equipment, and operating and emergency procedures. The Division of Radiation Control has established an extensive set of technical requirements applicable to the operational features of the proposed uranium mill.<sup>185</sup> The Division of Compliance and Inspection then makes its recommendations to the Division of Licensing, Registration, and Standards concerning potential problems involving the proposed uranium mill project, which are incorporated into a safety analysis. This analysis is combined with the environmental assessment, and a final document is produced by the Bureau of Radiation Control.

### 3. Regulation of Uranium Mining and Milling in Wyoming

Seven uranium mills were operating in the state of Wyoming as of January 1, 1983.<sup>186</sup> In 1982, the state ranked second to New Mexico with twenty percent of domestic uranium oxide production.<sup>187</sup> Wyoming regulates the mining and milling of uranium through four state agencies: the Industrial Siting Commission under the Industrial Development and Siting Act,<sup>188</sup> the Department of Environmental Quality under the Environmental Quality Act,<sup>189</sup> the State Mine Inspector and Mining Bureau,<sup>190</sup> and the State Engineer.<sup>191</sup> The Department of Environmental Quality has been established as the state agency with comprehensive regulatory responsibilities.<sup>192</sup>

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<sup>184</sup> Texas Regulations for Control of Radiation, *supra* note 177, § 43.70(b).

<sup>185</sup> *Id.* § 43.40(a)-(m). These regulations provide a great deal of guidance for the uranium mill applicant in the design of the operational features of the facility.

<sup>186</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 42 (Table VII-2).

<sup>187</sup> *Id.* at 9 (Table I-8).

<sup>188</sup> Wyoming Industrial Development and Siting Act, Wyo. Stat. §§ 35-12-101 to -121 (1977 & Supp. 1984).

<sup>189</sup> Environmental Quality Act of 1973, Wyo. Stat. §§ 35-11-101 to -1104 (1977).

<sup>190</sup> Wyo. Stat. §§ 30-2-101 to -607 (1977).

<sup>191</sup> *Id.* §§ 9-1-901 to -908, 41-3-114, and 41-3-301 to -328.

<sup>192</sup> The Department is divided into three divisions — air, water and land — which have independent jurisdiction over the protection of these resources. *Id.* § 35-11-105. There is no consolidated permitting among the divisions. Telephone Interview with Gary Beach, Department of Environmental Quality, Land Quality Division (July 20, 1983) [hereinafter cited as Beach Interview]. DEQ also has an independent Environmental Quality Council which is the rulemaking body and hearings board for the DEQ. *Id.* § 35-11-112. The Council's proceedings must comply with the Wyoming Administrative Procedure Act. *Id.* § 35-11-112(a)(ii) and (f).

*a. Exploration Licensing*

The Land Quality Division of the Wyoming Department of Environmental Quality has an extensive mineral exploration licensing program, applicable to uranium exploration. A mining firm wishing to explore for uranium with earth-moving equipment must obtain an annual exploration permit from the agency. The mining company must submit an application thoroughly describing the proposed exploration activity<sup>193</sup> and must reclaim and restore the land "as early as practicable so as to prevent unnecessary erosion, sedimentation, and pollution."<sup>194</sup> The mining company must post a bond covering the "costs which would be incurred by the State in the event it is necessary for the State to forfeit such bond and accomplish reclamation of the affected area."<sup>195</sup> The amount of the bond is set by the Land Quality Division and the bond is released or forfeited under the same procedures as for other surface mining bonds.<sup>196</sup>

The Land Quality Division, acting pursuant to statutory authority,<sup>197</sup> has also established "completion and restoration" performance standards and bonding requirements for exploration conducted by drilling.<sup>198</sup> The mining company must post a \$10,000 bond for exploration in any one area, to be released only after compliance with drill hole capping and restoration regulations has been certified by the Administrator of the Land Quality Division.<sup>199</sup>

*b. Mining Regulation*

To commence mining, an operator must obtain permits from all three divisions of the Department of Environmental Quality (DEQ),<sup>200</sup> since each of the divisions operates independently in is-

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<sup>193</sup> State of Wyoming, Department of Environmental Quality, Land Quality Division, Rules and Regulations, Chapter X, § 1(c)(1)-(12) (1983) [hereinafter cited as Wyoming Land Quality Regulations].

<sup>194</sup> *Id.* § 3(a). The Land Authority Division has issued regulations specifying standards for the rehabilitation of the areas which incorporate many of the same regulatory requirements applicable to mining activities. *See id.* §§ 2(a), (c) (referring to Chapter IV, §§ 2(b), 3(a), 2(d), 3(d)).

<sup>195</sup> *Id.* § 4(a).

<sup>196</sup> *Id.* § 5; *see also* Wyo. Stat. §§ 35-11-421 to -423 (1977); Wyoming Land Quality Regulations, *supra* note 193, at Chapter XVI.

<sup>197</sup> Wyo. Stat. § 35-11-404 (1977).

<sup>198</sup> Wyoming Land Quality Regulations, *supra* note 193, at Chapter XV.

<sup>199</sup> *Id.* § 4. If the drill hole plugging requirements are not met, the responsible party may be fined up to \$5,000 or jailed for up to 90 days, or both. Wyo. Stat. § 35-11-404(j) (1977).

<sup>200</sup> *See supra* note 192.

suing permits.<sup>201</sup> The Land Quality Division of the Wyoming DEQ is the sub-agency with primary state regulatory authority over mining. The Wyoming statute creates an unusual double permitting system for mining, licensing both the land and the mine operator. The first regulatory requirement is a permit to mine directed at the tract of land under consideration for mining.<sup>202</sup> The Wyoming statute enumerates specific items to be addressed in the permit application;<sup>203</sup> the most significant of these requirements is the submission of a reclamation plan<sup>204</sup> that must be approved by the DEQ. If written objections are filed to the permit application in a timely manner, the DEQ must treat the case as a contested matter under Wyoming administrative law and hold an adjudicative hearing.<sup>205</sup> The Wyoming statute provides twelve grounds for denying a permit<sup>206</sup> and clear time limits for the administrative process.<sup>207</sup> The second necessary permit is a license to mine, issued to the party who will mine on the land for which a mining permit has been granted.<sup>208</sup> At this point, the DEQ determines the size of the reclamation bond required for the mining project.<sup>209</sup>

The applicant must also obtain permits from the Wyoming State Engineer. The State Engineer must review the operational plans of the mine for approval of the water diversion necessary for the project, the impoundment of any waters in connection with operations, including wastewater ponds, and impoundment design.<sup>210</sup> *In situ* mining has separate permitting requirements.<sup>211</sup>

### c. Milling Regulation

The State Engineer is empowered to regulate many of the same

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<sup>201</sup> Beach Interview, *supra* note 192.

<sup>202</sup> Wyo. Stat. § 35-11-405 (1977).

<sup>203</sup> *Id.* § 35-11-406.

<sup>204</sup> *Id.* § 35-11-406(b). The statute lists seventeen specific elements of the reclamation plan. *Id.* § 35-11-406(b)(i)-(xvii).

<sup>205</sup> *Id.* § 35-11-406(g).

<sup>206</sup> *Id.* § 35-11-406(h).

<sup>207</sup> *Id.* § 35-11-406(e), (f), (g), (h), (j). The DEQ, Land Quality Division, is given 90 days for a completeness review of the application. Upon determination of completeness, the DEQ has 30 days for technical review if no hearing is requested or 60 days if one is. The ultimate decision on the permit must be issued within 15 days thereafter.

<sup>208</sup> *Id.* § 35-11-410.

<sup>209</sup> *Id.* § 35-11-410(c). The bond must be no less than \$10,000 and set at a level to permit reclamation of the land disturbed during the first year of operation. *Id.* § 35-11-417(c).

<sup>210</sup> *Id.* § 41-3-114 (diversion of streams), § 41-3-301 (reservoir permits), § 41-3-308 (approval of impoundment designs).

<sup>211</sup> *Id.* § 35-11-426, -427.



features of uranium mill tailings disposal as does the NRC. Although Wyoming is technically a non-agreement state, the state agencies participate extensively with the NRC in controlling the uranium recovery industry. The State Engineer has a continuing duty to inspect impoundment structures,<sup>212</sup> and the DEQ must also monitor compliance with its operational regulations.<sup>213</sup>

The uranium mill must obtain Wyoming operating permits. As with mining, the milling operator must obtain air, land, and water permits from DEQ and the State Engineer.<sup>214</sup> DEQ's Land Quality Division regulations reflect the state's belief that it retains the authority to regulate uranium mill tailings.<sup>215</sup> The precise extent of this independent state power has never been tested in litigation. However, the NRC has apparently agreed that the Wyoming Land Quality Division will be consulted concerning reclamation plans for the uranium mill and tailings ponds.<sup>216</sup>

The unusual relationship between Wyoming and the NRC has allowed the state to participate in the regulation of the uranium production industry without becoming a fully accredited agreement state. On the other hand, Wyoming's aggressive posture has required the funding of state agencies at a level high enough to permit active supervision of mining and milling operations.

#### 4. *Regulation of Uranium Mining and Milling in Utah*

Utah is a relatively minor producer of uranium oxide. At present there are only three conventional uranium mills and one heap leaching operation in the state.<sup>217</sup> Utah is not an agreement state and does not regulate uranium milling. Therefore, the Utah regulatory program focuses on uranium mining. The Utah statutory and administrative structure is an example of limited state regulation of the uranium mining and milling industry.

The regulation of all mining activities in Utah is governed by the

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<sup>212</sup> *Id.* § 41-3-308. The DEQ also reviews impoundment designs in its permitting process.

<sup>213</sup> *Id.* § 35-11-109.

<sup>214</sup> State regulations apply to uranium milling, because the Engineer's duties extend to any project requiring water and impoundments and because DEQ regards milling as an aspect of mining.

<sup>215</sup> Beach Interview, *supra* note 192.

<sup>216</sup> Telephone interview with Glen Mooney, DEQ, Land Quality Division (July 13, 1983).

<sup>217</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 42 (Table VII-2). The three conventional uranium mills have a relatively small combined operating capacity of 4150 tons of ore per day. *Id.*

Utah Mined Land Reclamation Act.<sup>218</sup> The Board of Oil, Gas and Mining and the Division of Oil, Gas and Mining have primary jurisdiction over mining activity within the state. The Board establishes rules and regulations for the Division to enforce. The Board also has the authority to conduct hearings and issue enforcement orders,<sup>219</sup> while the Division has authority to issue permits.<sup>220</sup> The Utah statute does not distinguish between exploration and operation of the mine; its definition of "mining operations" encompasses "the exploration for, development of, or the extraction of a mineral deposit from its natural occurrences."<sup>221</sup> Under the Reclamation Act, state approval is necessary for a broad range of mine related activities including exploration, mining, and such additional actions as "on-site transportation, concentrating, milling, evaporation, and other primary processing."<sup>222</sup> This definition of state jurisdiction could conflict with the NRC's reclamation standards for uranium mills.<sup>223</sup>

Before beginning a mining operation, a mine operator must file a notice of intention with the Division of Oil, Gas and Mining. The Reclamation Act requires that the applicant submit a reclamation plan with the notice.<sup>224</sup> This statute does not, however, specify the components of the reclamation plan or the standard of performance to be met by the reclamation activities.<sup>225</sup>

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<sup>218</sup> Utah Code Ann. §§ 40-8-1 to -23 (1981 & Supp. 1983).

<sup>219</sup> *Id.* § 40-8-6 (1981).

<sup>220</sup> The Utah statutes do not explicitly provide for the granting of a permit or a license but rather require that an applicant for mining operations file a notice of intention with the Division of Oil, Gas and Mining. *Id.* § 40-8-13(1). If the statutory and administrative requirements are met the Division may allow the mining activity to proceed. *Id.* § 40-8-13(4).

<sup>221</sup> *Id.* § 40-8-4(6).

<sup>222</sup> *Id.*

<sup>223</sup> Utah law does direct the Division of Oil, Gas and Mining to coordinate its rules, regulations and procedures with those of other agencies. The objective of this requirement is to "minimize the need for operators and prospective operators to undertake duplicatory, overlapping, or conflicting compliance procedures." *Id.* § 40-8-5(2).

<sup>224</sup> *Id.* § 40-8-13(1).

<sup>225</sup> Utah statute establishes three objectives for the Mined Land Reclamation program:

(a) to return the land, concurrently with mining or within a reasonable amount of time thereafter, to a stable, ecological condition compatible with past, present, and probable future local land uses;

(b) to minimize or prevent present and future on-site or off-site environmental degradation caused by mining operations to the ecologic and hydrologic regimes and to meet other pertinent state and federal regulations regarding air and water quality standards and health and safety criteria;

(c) to minimize or prevent future hazards to public safety and welfare.

*Id.* at § 4-8-12(a)-(c). These statutory objectives do not require that the land be restored to the productivity and quality that it had immediately preceding the mining activity. In fact

The Utah statute requires the mine operator to furnish evidence of insurance policies or other information indicating that it will be "financially responsible during the proposed mining operations for the payment of off-site public liability or property damage claims for which he may become liable."<sup>226</sup> The insurance requirement stands in addition to the reclamation surety that is statutorily required for the mining operation.<sup>227</sup>

The application procedure established by statute requires that the Oil, Gas and Mining Division tentatively decide on the merits of the notice of intention. Assuming that the agency recommends approval, this tentative decision must be published in local newspapers and newspapers of the capital city, and mailed to the local zoning authority.<sup>228</sup> Any person or agency who wishes to challenge the decision must file a written protest with the Oil, Gas and Mining Division within thirty days after the date of last publication.<sup>229</sup> If the written objections are timely received, the Board must hold a hearing<sup>230</sup> and enter its decision within sixty days.<sup>231</sup>

After the operator's notice of intention to mine is approved, the operator must post a surety with the Division in an amount sufficient to cover reclamation costs.<sup>232</sup> Once approved, the notice of intention becomes a permanent permit to mine unless it is withdrawn for one of several enumerated reasons.<sup>233</sup> The Division of Oil, Gas and Mining conducts inspections of the mine site and requires an annual progress report from the mine operator.

The Mined Land Reclamation Act specifically requires that the mining company comply with all other applicable statutes, rules and regulations.<sup>234</sup> The statute also directs the Division to cooperate with all local, state and federal agencies. Consequently, before mining operations begin, a conference is held by the Division and other state agencies having regulatory authority over the mine, in-

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its language presents a rather amorphous standard of restoration.

<sup>226</sup> *Id.* § 40-8-13(1).

<sup>227</sup> *Id.* § 40-8-14; *see infra* note 232 and accompanying text.

<sup>228</sup> *Id.* § 430-8-13(4).

<sup>229</sup> *Id.*

<sup>230</sup> *Id.*

<sup>231</sup> *Id.* § 40-8-8(1).

<sup>232</sup> *Id.* § 40-8-14. The Oil, Gas and Mining Board establishes the amount of the surety for a mine operator whose notice of intention has been approved. The surety could be provided by a written contractual agreement, collateral, bond or other form of insured guarantee, deposited securities, or cash. *Id.* § 40-8-14(3).

<sup>233</sup> *Id.* § 40-8-16(2)(a)-(c).

<sup>234</sup> *Id.* § 40-8-17(1).

cluding the Solid and Hazardous Waste Committee, the Air Conservation Committee, and the Water Pollution Committee.<sup>235</sup> This conference is designed to determine what state permits, if any, the project will need and to expedite the permit process.

### 5. *Legislative Responses to Uranium Development in Non-Western States*

While the Western states of New Mexico, Wyoming, Texas, Washington, Colorado, and Utah have dominated the uranium industry, exploration for new sources of uranium ore has recently occurred in many Eastern states. Despite the recent recession in the nuclear fuels industry, companies are still exploring for new domestic sources of uranium. In 1982, approximately twenty-five percent of all exploratory drilling for uranium resources took place in Alaska, Arizona, Michigan, Minnesota, Montana, Nebraska, Nevada, Oklahoma, Oregon, South Dakota, Virginia and Washington.<sup>236</sup> Reacting to this developing interest, several Eastern states have recently adopted legislation restricting or prohibiting uranium production within their borders.

#### a. *New Jersey*

In New Jersey, the legislature acted to ban uranium exploration, mining and milling within the state for a period of seven years, until 1988.<sup>237</sup> This action followed the discovery of uranium in a geological area known as the Redding Prong<sup>238</sup> and the adoption of several township ordinances prohibiting exploration, mining and milling of uranium.<sup>239</sup> The legislation granted the New Jersey Department of Environmental Protection six years in which to prepare a report for the Governor and the legislature analyzing the dangers associated with uranium mining and milling and including "recommendations for the prohibition or regulation of these activities upon the expiration of this act."<sup>240</sup> The law established strict enforcement sanctions for violations of the moratorium.<sup>241</sup> In addi-

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<sup>235</sup> Telephone conversation with Thomas Tetting, Engineering Geologist, Utah Division of Oil, Gas and Mining (July 28, 1983).

<sup>236</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 49 (Table VIII-1).

<sup>237</sup> N.J. Stat. Ann. § 13:1 J-1 (West Supp. 1984).

<sup>238</sup> N.Y. Times, Aug. 23, 1980, at 26, col. 3.

<sup>239</sup> *Id.* at 26, col. 5.

<sup>240</sup> N.J. Rev. Stat. § 13:1 J-5(a) (West Supp. 1984).

<sup>241</sup> *Id.* § 13-1 J-2(b).

tion, it preserved the right of local governments to regulate or prohibit uranium development.<sup>242</sup>

*b. New York*

In June 1983, New York enacted a statute which prohibits the uranium mining by any method within the state for a period of ten years.<sup>243</sup> Unlike the New Jersey law, which comprehensively prohibits the exploration, mining and milling of uranium, the New York legislation bans only mining. The statute does not specifically preclude uranium exploration but could be interpreted to prohibit such activities.<sup>244</sup>

Under the statute, the New York Department of Environmental Conservation must study the uranium mining issue and submit to the Governor and the legislature recommendations concerning the extension of the moratorium.<sup>245</sup> The statute suggests, however, that the present legislation could be preempted by federal law.<sup>246</sup> The legal implications of a permanent state-wide ban on uranium mining and milling in New York have not yet been confronted in litigation.

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<sup>242</sup> *Id.* § 13:1 J-4.

<sup>243</sup> N.Y. Envtl. Conserv. Laws Ann. § 22-1010 to -1070 (McKinney 1984). The New York legislature grounded its moratorium upon findings that "mining of uranium may pose a significant danger to public health, safety and welfare" due to (1) the potential contamination and depletion of surface and groundwater, (2) possible impact of radioactive airborne particulates upon public health and agriculture, (3) non-existence of adequate waste storage methods for uranium mining, (4) high governmental costs associated with the clean-up of abandoned mine site, (5) lack of technical and administrative techniques to abate the hazards of uranium mining and (6) the damaging effect of uranium mining upon scenic qualities and tourism. *Id.* § 22-1030(1)-(6).

<sup>244</sup> The statute defines mining as "the extraction or removal of minerals from the ground or the breaking of the surface soil in order to facilitate or accomplish the extraction or removal of such minerals for commercial or industrial use; but shall not include excavation or grading when conducted solely in aid of on-site farming or construction." *Id.* § 22-1050(1). This definition is followed by the general prohibition that "no person shall mine for uranium by any method including, but not limited to, drilling, excavation, and liquid or chemical extraction." *Id.* § 22-1070. Although the statute does not seem to address itself to the commercial exploration of uranium sources, the definition of mining is broad enough to include active exploration methods.

<sup>245</sup> L. 1983, c. 384, §4 (June 27, 1983).

<sup>246</sup> The notes following this section of the New York Code contain a severability clause which states that "this act shall be construed so as not to conflict with applicable federal or state laws, rules or regulations. In the event that a state or federal law, rule or regulation is held to preempt any clause or section of this act, or in the event that any such clause or section is held invalid, such clause or section shall be severable and shall not affect the validity of the remainder of this act." L. 1983, c. 384, §5 (June 27, 1983).

c. *Vermont*

The Vermont legislature enacted a statute in April 1980 which is quite different from the temporary moratorium and agency study laws of New York and New Jersey. Rather than prohibiting uranium mining and milling, Vermont adopted a unique procedure requiring the state's General Assembly, by act of legislation, to legislate express prior approval authorizing the local district environmental commission to consider an application for a uranium processing facility.<sup>247</sup> The effect of the 1980 amendment was to require formal legislative approval in addition to the pre-existing regional land use permit. The action of the Vermont legislature has apparently deterred potential uranium mining and milling firms; however, these special approval requirements may be subject to legal challenge.<sup>248</sup>

The statutes enacted in New Jersey, New York and Vermont clearly do not encourage firms wishing to produce source material. The legislatures of these states have been persuaded that uranium production, if not totally unacceptable, at least raises serious enough environmental and social concern that a long-term evaluation of the industry must be conducted before uranium production is authorized. The caution with which these three states have approached the issue reflects the uncertain environmental effects of implementing in an Eastern state mining and processing technology developed in the West.

d. *Minnesota*

During 1982, mining firms undertook exploratory drilling for uranium ore in Minnesota.<sup>249</sup> The Minnesota legislature has not yet adopted statutes that specifically address the regulation of the uranium mining and milling industry. It has, however, enacted a conventional array of governmental controls that would apply to uranium mining and milling.

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<sup>247</sup> Vt. Stat. Ann. tit. 10, § 6083(c) (Cum. Supp. 1983). Under general Vermont land use and development law, activities coming within a statutory definition of "development" (including uranium mining and milling) must receive a permit from the regional District Commission. *Id.* § 6001(3). A uranium development project would have to satisfy an extensive list of conditions in order to receive a permit from the District Commission. *Id.* § 6086(a)(1)-(10). The statute clearly notes that approval of the proposal by the General Assembly "shall not be construed as approval of any particular application or proposal for development." *Id.*

<sup>248</sup> See N.Y. Times, Apr. 15, 1980, at 20, col. 3.

<sup>249</sup> 1983 Statistical Data of the Uranium Industry, *supra* note 4, at 49 (Table VIII-1).

The Minnesota Department of Natural Resources has responsibility for granting prospecting permits and mining permits on state lands.<sup>250</sup> As part of this licensing process, a reclamation plan must be filed by the applicant for proposed mines and mills.<sup>251</sup> A bond must be posted to ensure performance of the reclamation plan.<sup>252</sup>

The Department of Health has authority over exploratory boring,<sup>253</sup> including the responsibility to inspect sites and license exploratory boring.<sup>254</sup> The Department of Natural Resources is responsible for permitting the use and diversion of surface and ground water and inspecting dams.<sup>255</sup> The Minnesota Pollution Control Agency conducts the state's water, air, noise, and solid waste program. As in most states, uranium mines and mills would be subject to any applicable air and water pollution control regulations.<sup>256</sup>

Of special importance to the uranium industry is the Minnesota Radioactive Waste Management Act, which prohibits construction of a "radioactive waste management facility" without express authorization from the state legislature.<sup>257</sup> The broad definition of "radioactive waste" would appear to encompass the disposal of uranium mill tailings<sup>258</sup> and would therefore make construction of a uranium mill dependent on permission from the Minnesota legislature.

The Environmental Quality Board carries out the provisions of the Minnesota Environmental Policy Act (MEPA).<sup>259</sup> This Act requires an environmental impact statement for a project having a significant environmental impact and a connection to state governmental action.<sup>260</sup> A uranium recovery facility under state permit authority would be required to comply with MEPA. The Act also

<sup>250</sup> Minn. Stat. Ann. § 93.43 (West 1977 & 1982 Supp.).

<sup>251</sup> *Id.* § 93.481.

<sup>252</sup> *Id.* § 93.49 The process of submitting a reclamation plan and posting a bond is similar to the licensing system in Virginia. *See* Va. Code §§ 45.1-182.1, -183, -184 (1980).

<sup>253</sup> Minn. Stat. Ann. § 156A.01 (West Supp. 1982) (authorization to control, for health purposes, not only exploratory boring, but also water wells).

<sup>254</sup> *Id.* § 156A.071.

<sup>255</sup> *Id.* §§ 105.37, 105.41, 104.415, 105.417, 105.42, 105.46, 105.47, 105.52.

<sup>256</sup> *Id.* §§ 115, 116.

<sup>257</sup> *Id.* § 116C.72.

<sup>258</sup> "Radioactive waste" means "(a) useless or unwanted capturable radioactive residues produced incidental to the use of radioactive material; or (b) useless or unwanted radioactive material; or (c) otherwise nonradioactive material made radioactive by contamination with radioactive material." *Id.* § 116C.71(6).

<sup>259</sup> *Id.* § 116D.04.

<sup>260</sup> *Id.* § 116D.04(2a).

provides that feasible alternatives should be considered and that economic considerations alone should not dictate feasibility.<sup>261</sup> This statute also imposes upon state agencies procedural duties and substantive standards similar to those NEPA imposes on the federal government, enforceable under state law.<sup>262</sup>

In 1981, the Minnesota Environmental Quality Board prepared a report for the state legislature expressing a number of concerns about uranium mining and milling.<sup>263</sup> The report implicitly assumed that new rules governing uranium mining and milling would need to be adopted, and that the state should take an active role in regulating the industry. Specifically, the report advised the state to adopt special reclamation plans for uranium mining facilities, and to control radon release from the mines.<sup>264</sup> The report also advised that ambiguous points in the state's environmental regulations, such as whether the Solid Waste Management Act applies, be clarified before the new industry is authorized.<sup>265</sup> The report also recommended that Minnesota become an agreement state in order to assume responsibility for hazards associated with uranium mill tailings.<sup>266</sup>

Minnesota's response to exploratory drilling illustrates a state with an elaborate system of environmental laws in place — all of which would apply to uranium mining — which yet wishes to actively control the development of the industry by tailoring laws specifically to uranium mining.

#### IV. CONCLUSION

From this discussion it is clear that different states have approached the uranium production industry in a variety of ways. Some have considered it an acceptable industry that nonetheless requires regulation by the federal and state governments, while others have banned it altogether. Virginia could become the first

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<sup>261</sup> *Id.* § 116D.04(6).

<sup>262</sup> The obligations imposed by MEPA fall upon state agencies. The state legislature enacted the Minnesota Environmental Rights Act in 1971 to provide a mechanism by which citizens can enforce the duties established under the Environmental Policy Act and other state statutes. *Id.* § 116B.01-.13; see *Peer v. Minn. Envir. Quality Council*, 266 N.W.2d 858 (Minn. 1978).

<sup>263</sup> Minnesota Environmental Quality Board, *Uranium Exploration, Mining and Milling in Minnesota: A Review of the State's Regulatory Framework* (May 1981).

<sup>264</sup> *Id.* at 6, 14-15, 22.

<sup>265</sup> *Id.* at 14, 15, 52-53.

<sup>266</sup> *Id.* at 32-35.



Eastern state to sanction uranium mining and milling within its borders. Should Virginia choose to accept uranium development, it will have great flexibility in setting the terms which control the operation of the new industry. In 1985, the Virginia General Assembly can choose from among at least five potential courses of action. The ways in which other states have chosen to regulate the industry reflect a range of positions on the safety of the industry and the regulatory capabilities of various government agencies.

First, the General Assembly could permanently ban uranium mining. A permanent ban might be challenged in court by proponents of uranium development on grounds of federal preemption or obstruction of interstate commerce.

Second, the Assembly could conclude that it does not yet have sufficient information to make a decision on uranium development and extend the uranium mining moratorium until such information is available.

Third, the legislature could without enacting specific legislation simply lift the current prohibition. Uranium exploration and mining would then be regulated by state agencies under the authority they currently possess. Uranium milling would be regulated by the NRC. This alternative requires the least initiative and involves the state government only in oversight of exploration and mining.

Fourth, the Assembly could amend the state's mining laws to specifically accommodate uranium mining. This would acknowledge that uranium mining creates hazards justifying specific statutory attention. As with the third alternative, the regulation of uranium milling operations would still rest with the NRC.

Fifth, the Assembly could adopt legislation regulating uranium mining and committing the state to becoming an agreement state under the NRC program. This would be the most active and costly level of state involvement in the regulation of the uranium industry, but it offers Virginia maximum possible control over the industry.

Should the General Assembly adopt this fifth option it should consider three issues in its legislation: the allocation of regulatory responsibilities to state agencies, environmental impact review analysis, and financial liability provisions. The Assembly must decide what kind of institutional organization should regulate the uranium industry. Should pre-existing or newly created state agencies regulate this new industry? The legislature must consider cost and institutional capabilities. Next, the legislature must establish decisionmaking standards to govern the agencies' actions. Such

standards should constrain agency discretion in licensing uranium facilities. In addition, the legislature must implement administrative procedures which define the method by which important licensing decisions will be made. The question of public participation must be adequately addressed. Since the issue of uranium facility licensing is controversial, it is important to insure that the public is provided with the opportunity to obtain relevant information and to participate in both rulemaking and licensing proceedings. It is especially important that the opinions of those residents living close to a proposed uranium facility be incorporated into the decisionmaking process. In addition, the legislature should authorize judicial review of rulemaking and licensing decisions. This would insure that determinations regarding uranium development activities are tested by an impartial judicial body. Funding the regulatory system is also a key issue. The legislation should secure financial support for the regulatory system through the imposition of severance taxes and/or permit and licensing fees. This policy would force the regulated industry to bear the expenses of its own governmental regulation and would assure that funds not be diverted from other state purposes.

Environmental impact review of the uranium production industry is another important issue. The Uranium Mill Tailings Act requires that states regulating uranium mills conduct an environmental review similar to that required by the National Environmental Policy Act. Should Virginia become an agreement state, the authorizing legislation would have to consider the necessary administrative agency responsibilities and what actions would be subject to this environmental analysis. The analysis should be similar to an environmental impact statement prepared by the Nuclear Regulatory Commission. The state agency should prepare an analysis not only of the proposal currently before the legislature but also of license renewals and any proposals for new mines or mills. The environmental analysis and review should consider in an integrated fashion both the mining and milling aspects of uranium development. The legislation must clearly define the administrative responsibility for environmental impact review. Since a number of state agencies will possess regulatory control over any proposal, it will be necessary to designate a lead agency which will be responsible for the preparation of the impact statement. The legislation must also establish a process for environmental impact review including timetables, comment periods, publication requirements, and public hearing rights.

The financial liability of uranium mining and milling facility operators is a final significant issue. Any uranium development permitted in Virginia would be required to conform to stringent design, operation and closure requirements. The authorizing legislation should provide for financial liability for those operators who fail to meet these requirements. The statute should require that an operator of a uranium mine or mill post a sufficient performance bond to insure that all required operation and closure activities are performed. The legislation should also create liability for property damage, personal injury, and remedial action associated with the operation of the facility, tied to a liability standard based on negligence, modified strict liability, or true strict liability. The liability could be unlimited or confined by a statutory maximum. The statute should also allocate burdens of proof in any action arising under the liability provisions. The inclusion of a liability provision may be important in obtaining approval of the authorizing legislation and would serve as a backstop should injuries occur in spite of the best governmental efforts at regulating the industry.

The uranium mining issue presents Virginia with the task of establishing policy on a matter requiring a careful balancing of public health and safety risks against potential economic benefits. Whatever the resolution of the issue, the success or failure of the ultimate policy choice will not be immediately known. Regulatory choices made today will be tested over the indefinite future. Due to the uncertainty inherent in this decision, Virginia's legislators find themselves confronting difficult policy decisions.

In an area of uncertainty, with significant public health risks, it is critically important to secure accurate information to aid in selecting the best policy alternative. It is also necessary in developing a controversial state policy to include a wide spectrum of views in the decisionmaking process. The meaningful participation of public interest organizations, individuals, and local governments should be encouraged. Regulation of a new industry calls for an accurate estimation of the regulatory capabilities of relevant governmental agencies; an honest appraisal of these capabilities is necessary to establish a framework of regulatory responsibility.

These concerns should govern the Assembly in adopting its policy on the uranium production issue. Decisions made today will have important effects not only tomorrow but for many years thereafter.