

Uranium Mining and Milling in Virginia

By Ronald H. Rosenberg

This article is an outgrowth of a study prepared for the Virginia Environmental Endowment concerning federal and state regulation of the uranium mining and milling industry. The study was undertaken in response to the discovery of mineable quantities of uranium ore in Pittsylvania and Culpeper Counties in Virginia. The Marline Corporation began a serious effort to obtain approval for a mine and mill complex in Pittsylvania County. This article is an attempt to place that effort in the context of the environmental concerns associated with uranium production and to explain the regulatory structure that governs the uranium industry.

Uranium Mining and Milling in the United States

The bulk of the American uranium mining and milling industry is located in the arid western states. New Mexico, Wyoming, Texas, Colorado, Utah and Washington are the most significant states as measured by uranium production. Currently, the uranium industry is in a state of recession. The price of processed uranium or yellow cake has dropped to almost half of what it was a few years ago. This probably could be attributed to two important factors. First, import restrictions on yellow cake have been gradually lifted. The price of the commodity on the international market is less than that of domestically produced yellow cake. Secondly, the deceleration in the growth of the nuclear power industry has cut the demand for fuel rods. The nuclear power generators are the largest consumers of uranium fuel production. However, projections for the nuclear power industry foresee no significant growth over the next two to three decades. These factors have led to layoffs and declining exploration, mining, and milling activity. It is within this context of market decline that the Marline Corporation's development interest is to be viewed.

Against this background the Marline Corporation is seeking to develop a mine-mill complex in Pittsylvania County, Virginia. The Marline project appears to be the first serious attempt to mine and mill uranium in a "net precipitation climate," or a non-arid climate. This is significant because of the tailings or waste products produced by the milling operation. The tailings are first disposed of in a semi-liquid form, and then they are allowed to dry out. This can be accomplished in the arid West; however, in Virginia this sort of drying is not likely to occur. Because the tailings will probably retain more water in Virginia than in the western states, the likelihood is greater that harmful heavy metals and radioactive materials will percolate out of the tailings pond and migrate into the groundwater causing severe water table pollution. In 1983 the Virginia General Assembly, concerned with the impact of a mine-mill complex, enacted a moratorium upon uranium mining. It allowed the exploration for uranium to continue. At the same time the

General Assembly designated the Uranium Advisory Group (UAG) of the Virginia Energy Commission to study the benefits and costs of the Marline proposal and to recommend courses of action that the legislature could adopt. On January 13, 1984, the Virginia Energy Commission formally recommended to the General Assembly that: (1) the moratorium on mining continue until the General Assembly adopts legislation governing the subject of uranium production, (2) the UAG continues to study the subject, and (3) an intergovernmental Task Force be established to assist the UAG in its study. After more than two years of effort the legislative study commission is still attempting to define its policy recommendation on the uranium issue.

Uranium Production Technology

Uranium mining and milling constitutes the "front end" of the uranium fuel cycle. In order to understand the significance of the uranium mining question as a matter of public policy, a brief technical understanding of procedures is necessary. The nuclear fuel cycle includes mining and milling of uranium, concentration of the uranium oxide into fuel, fabrication of the uranium fuel rods, and the use of the rods in nuclear reactors. The exploratory phase of mining, that is finding the uranium, has been completed by the Marline Corporation. Marline has decided that the size of the ore body and its quality are of a suitable nature to warrant the construction of a mine-mill complex. There are two types of mining techniques that are practicable in Virginia, underground (deep) and open pit mining. Marline has apparently concluded that the best way to exploit the Pittsylvania deposit is by the latter method. The open pit method is easily understandable. Using heavy machinery, the mining company exposes the uranium ore so that it can be easily removed and transported to the nearby mill for processing. The open pit method is best suited for relatively large ore bodies situated within a few hundred feet of the surface of the earth. In the course of reaching the ore, the overburden, earth, and rock overlying the mining site is excavated, hauled away, and stored for future use in reclamation of the mine.

Once removed from the ground, the ore is hauled from the mine to the mill for processing. At the mill the uranium ore is crushed into a powder, mixed into a paste, and an acid or alkaline solution added to leach out the uranium. The uranium is then precipitated out and dried into a yellow powdery material called "yellow cake." The yellow cake is then placed into metal drums and

Ronald Rosenberg is an Associate Professor of Law at Marshall-Wythe and has been instrumental in developing the environmental law program here. Mr. Rosenberg is currently teaching property and environmental law.

shipped to a plant where the uranium will be concentrated into a form that can be used as nuclear fuel. The uranium is then shipped to another plant where it will be fabricated into fuel rods for use in nuclear reactors.

During the mining and milling process the uranium releases a low level of radioactivity. The radioactivity is so low that the yellow cake needs no special handling while being shipped. However, a potential danger lies in the emission of radon gas released when the ore is mined and put through the milling process. The radon gas, if allowed to concentrate in the air, can pose a significant hazard to human health. This is especially true in an enclosed area, such as an underground mine or mill structure. Probably the largest and enduring problem associated with the mining and milling process is the disposal of tailings (or waste products) produced by the conversion of uranium ore into yellow cake. It is expected that for every four pounds of yellow cake extracted, about one ton of tailings are produced. These

tailings contain a low level of radioactivity from the uranium left in the ore during the milling process. In addition, the tailings may have components of dangerous heavy metals. The average mill in the United States consumes 2,500 tons of ore per day and in essence creates the same amount of tailings in that period of time. Over the course of several years, an average mill can produce a significant amount of tailings. This, in turn, creates a significant environmental and public health concern.

Uranium mining presents many of the same environmental consequences that are already present in other hard rock mining operations. The overburden and waste rock removed to reach the deposits, water pumped out of the mine when the water table is reached, the dust created by these operations, and the scarring of the land itself by the digging and heavy machine operations are the major environmental effects of mining. The mill operation produces effects on the air and possibly the water

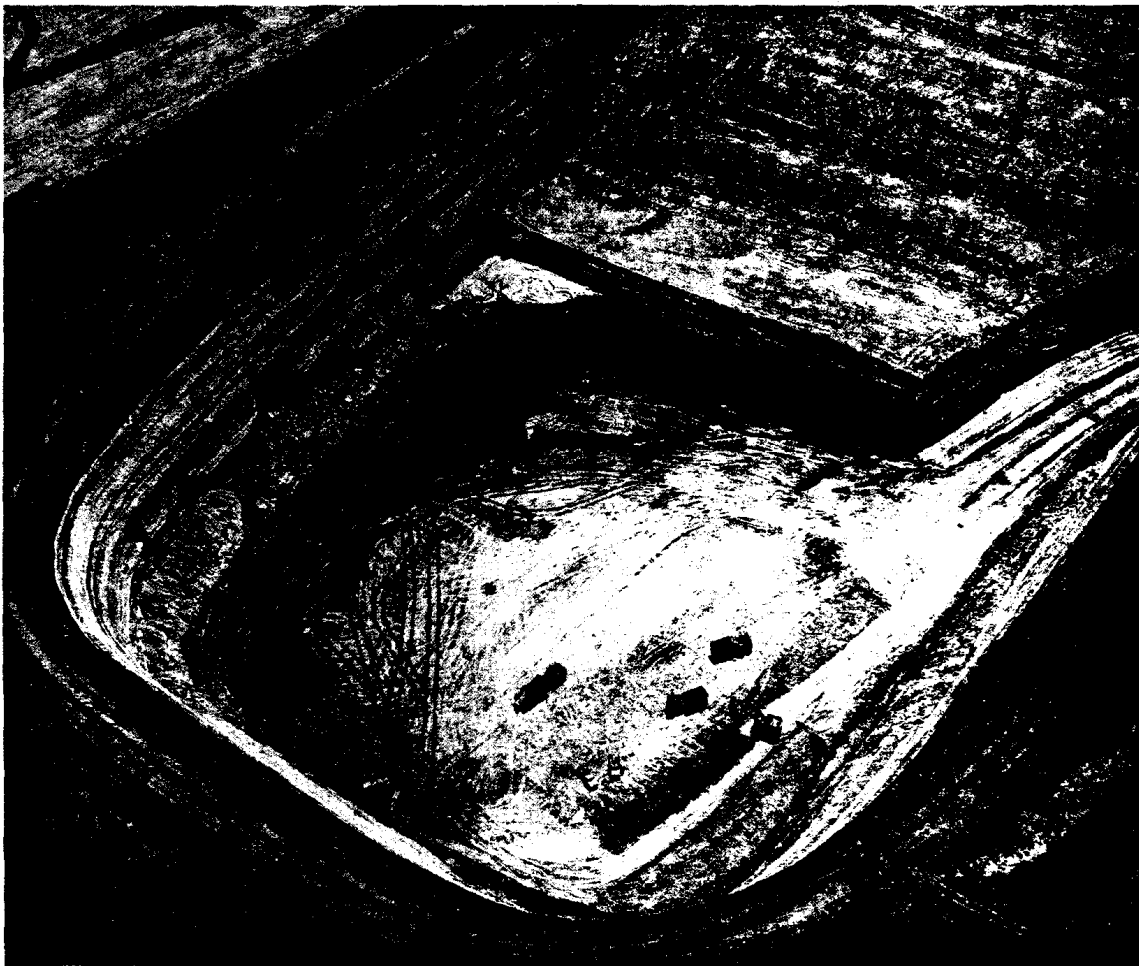


Photo by Chevron Resources Company

The Panna Maria Uranium Mine in Hobson, Texas. Overburden, the layer of earth that covers the ore, is removed to facilitate open pit mining. Huge earth-moving machines can carry 40 tons of material per load.

quality located near the mill. Up until now, the uranium mill operations in the western states have not allowed direct discharges of pollutants into surface waters. As mentioned before, the mill tailings pose one of the most significant effects on the environment because of their quantities and toxicity. The health effects of radon gas in concentrated quantities is now fairly well established. As radon decays, it produces radioactive daughters. Radon or its daughters, if inhaled by humans, cause a significant rise in the chance of developing cancer. Presently the two main areas of concern for radon inhalation are underground mines and in uranium mill operation buildings. In the past, another source of concern was the use of these tailings as fill materials in construction. The radon gas accumulated in these structures are in quantities that pose a significant health hazard. The use of tailings as fill in house construction in Grand Junction, Colorado, sparked enough concern for Congress to pass legislation to control the disposal of mill tailings and to provide funds for remedial treatment of these sites.

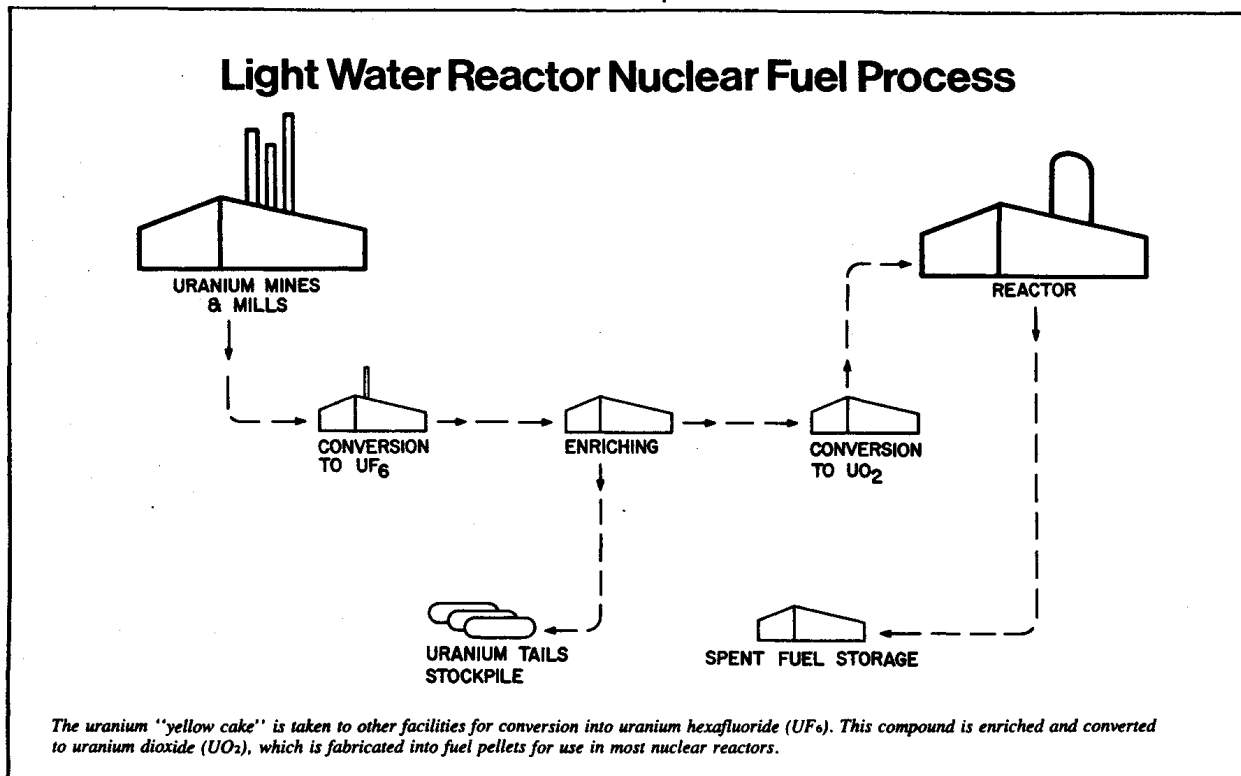
Uranium Mining and Milling Regulatory Scheme

Uranium mining and milling operations are regulated by several independent statutes. The primary act is the Atomic Energy Act (AEA), as amended by the Uranium Mill Tailings Radiation Control Act (UMTRCA) passed by Congress in response to the Grand Junction incident. The AEA gives the Nuclear Regulatory Commission prime regulatory responsibility for the uranium milling operations and their tailings. It, however, also allows for

the delegation of NRC responsibility in this area to individual states under the Agreement States Program. This program applies only to limited areas of the nuclear industry. Milling is one of the areas that can be delegated to a qualified state having a program approved by the NRC. Under the UMTRCA minimum standards for environmental quality for both the NRC and Agreement States control of mill tailings have been established by the Environmental Protection Agency. The NRC's authority, however, does not extend to uranium mining. This is still reserved to the states.

The NRC is also required under the National Environmental Policy Act (NEPA) to make an environmental impact statement (EIS) for each major action significantly affecting the environment. Granting a license for an uranium mill is considered a major federal regulatory action and therefore an EIS is required. An applicant for a license is required to spend a considerable amount of time obtaining background data on the environmental implications of the milling activity that it has proposed. Ultimately the NRC is required to prepare a full environmental impact statement on the proposed license. Under the Uranium Mill Tailings Act agreements states are required to follow a similar procedure. It must be noted that complete regulatory control over the uranium industry is not consolidated into one federal agency. Many aspects of the uranium recovery process are governed by other acts and agencies. To complicate the entire situation, a number of these federal statutes allow the delegation of federal authority to state approved programs,

(Continued on page 15)



URANIUM

(Continued from page 6)

volved are the Clean Water Act, the Clean Air Act, the Solid Waste Disposal Act, the Endangered Species Act, and the Wild and Scenic Rivers Act. Other federal statutes regulate work and safety in the mining and milling locations. Most of these laws are enforced through a permitting system that requires preoperational compliance.

while other acts permit federal regulation to be implemented by state agencies. Among the major laws in-

As one might suspect, at times there is considerable confusion over the proper allocation of regulatory responsibility in the uranium recovery operation. A significant problem facing a state considering the licensing of uranium mining is the acquisition of a clear understanding of regulatory responsibility under federal law. As Virginia moves toward the establishment of uranium production policy, it must clearly understand this allocation of responsibility and consider the adequacy of the existing regulations.

Conclusion

Virginia is now in the process of trying to decide what is to be done. Does the Commonwealth wish to become an Agreement State with the NRC? This would create new costs and require the establishment of knowledgeable regulators within the state government. However, the agreement state status would also give Virginia greater control over all aspects of the uranium recovery process and provide it with the opportunity to develop an overall regulatory scheme. More importantly, the Commonwealth through its elected officials must determine the more fundamental question of whether the benefits of the uranium production industry are justified by the costs imposed by it. Such a determination will require high quality information predicting the impact of the industry upon the environment and the public health within the affected area. This presents a policy issue that lacks sufficient evidentiary support. The most important task for Virginia in the upcoming year is the acquisition of this important information. Once acquired, the responsible officials can then make a knowledgeable judgment as to the desirability of this new industry.
