William & Mary Environmental Law and Policy Review

Volume *37 (2012-2013)*
Issue 1

Article 8

November 2012

Virginia's Moratorium: Is Uranium Mining on the Horizon in the Commonwealth?

William Brice Fiske

VIRGINIA'S MORATORIUM: IS URANIUM MINING ON THE HORIZON IN THE COMMONWEALTH?

WILLIAM BRICE FISKE*

INTRODUCTION

Beginning in 1982, the Commonwealth of Virginia imposed a moratorium on the issuance of permits for the mining of uranium.[1] While it has allowed limited permits for uranium exploration, the ability to mine uranium has been prohibited.[2] The moratorium was put into place so that the Virginia Coal and Energy Commission ("Commission") could study uranium mining and determine whether it could be done safely in Virginia.[3] The Commission delivered their report to the Virginia General Assembly in 1985.[4] The Commission recommended, by a vote of 12–8, that uranium mining be allowed, but that the state create a strong regulatory framework to curtail any potential environmental and community damage.[5]

Despite the Commission's recommendation, there was strong dissent in the General Assembly concerning the allowance of uranium mining.[6] As a result, the General Assembly never lifted the moratorium on uranium mining and milling.[7] What began as a temporary measure to gather more information on the subject of uranium mining has become a twenty-plus-year prohibition. In 2007, Virginia Uranium, Inc. ("VUI")

---

* Brice Fiske is a third-year law student at William and Mary Law School. The author would like to thank the editorial staff of the *Environmental Law and Policy Review*, particularly Ashley Wright and Mia Shirley, for their hard work on this Note. The author would also like to thank Eric, Judy, and Clark Fiske, for their continuous support throughout law school, and more importantly, life.

[1] *See* VA. CODE ANN. § 45.1-283 (West 2002).

[2] *Id.*; *see* News Release, George Willis, Director, Commonwealth of Virginia: Department of Mines, Minerals, and Energy, State Issues Exploration Permit to Virginia Uranium, Inc. (Nov. 28, 2007), *available at* http://www.dmme.virginia.gov/NewsReleases/2007releases/UraniumPermit.pdf.

[3] *See* REPORT OF THE VA. COAL AND ENERGY COMM'N TO THE GOVERNOR AND THE GEN. ASSEMBLY OF VA., S. DOC. NO. 15, at 10 (1985) [hereinafter COMMISSION REPORT].

[4] *Id.*

[5] *See id.* at 7–8.

[6] *See* Katherine E. Slaughter, *Will Uranium Get a Glowing Welcome in Virginia?*, 28 VA. ENVTL. L.J. 483, 489 (2010).

[7] *See id.* at 489–90.

was formed by owners of the Coles Hill property in Pittsylvania.[8] VUI's current primary goal is to have the uranium moratorium lifted so that uranium mining can begin in earnest in Virginia.[9]

This Note addresses the current moratorium on uranium mining in Virginia, arguing that the moratorium should not be lifted. Further, this Note analyzes the costs and benefits of uranium mining in Virginia from three perspectives: public health, environmental quality, and economic effects. Finally, recognizing that the moratorium could be lifted based upon potential economic benefits, this Note proposes a regulatory framework which should be instituted.

This Note contains five parts. Part I gives a brief technical description of the uranium mining and milling process, as well as a brief history of the practice in the United States. Part II details a brief history of uranium discovery in Virginia and describes the reasons the moratorium was placed on mining the ore in 1982 and still has not been lifted. It also explains the developments that have led to the push for lifting the moratorium in the past few years. Part III examines the potential effects of uranium mining on three distinct areas of concern: the public health, the environment, and the economic climate of Virginia. Part IV discusses the complex federal regulatory framework currently governing uranium mining in the United States and examines two particularly relevant regulation schemes, the Coloradan and Canadian schemes, and their viability in Virginia. Part V concludes with the argument that Virginia's capacity to regulate uranium mining is not sufficient to merit lifting the moratorium. Additionally, recognizing the possibility that the moratorium could be lifted, this Part proposes a regulatory framework should the moratorium be lifted.

I. INTRODUCTION TO THE URANIUM MINING PROCESS

A. Mining

In the United States, there are three primary methods of uranium mining in use: open-pit, underground, and in-situ.[10] Open-pit mining, while

---

[8] *See* Andrew Rice, *Nuclear Standoff*, THE NEW REPUBLIC (Mar. 12, 2010), http://www.tnr.com/article/world/nuclear-standoff.

[9] *See* Virginia Uranium, Inc., *Our Plans and Prospects*, VIRGINIA URANIUM, http://www.virginiauranium.com/plans-prospects/ (last visited Nov. 14, 2012).

[10] David Riccitiello et al., *Uranium Mining & Milling: A Primer*, *in* 4 SOUTHWEST RESEARCH & INFORMATION CENTER, THE WORKBOOK 221, 224 (1979), *available at* http://www.sric.org/uranium/1979_SRIC_URANIUM_PRIMER.pdf [hereinafter URANIUM PRIMER].

it can be done below 500 feet, is typically employed in uranium deposits shallower than 300 feet.[11] Similar to mining for coal, open-pit mining involves the use of earth-moving equipment such as bulldozers, backhoes, and diesel shovels to remove the earth.[12] To keep the floor surface workable, accumulated groundwater must be pumped out and discharged into surface creeks and rivers.[13] The pumping process can adversely affect underground water availability and possibly contaminate surface waters.[14]

Underground mining is used when the ore is more than 300 feet underground.[15] Underground mining involves creating cave-like tunnels of ore, which are supported either by pillars of ore that has not been mined or through backfill operations that put waste produced back into the mine to reinforce other areas.[16] Underground mining requires that the groundwater be pumped out and discharged or used in the milling process.[17]

In-situ mining involves pumping a leaching solution into the ore, "thereby dissolving the uranium into the leaching field."[18] Afterwards, the solution is pumped to the surface where the uranium is extracted.[19] This process continues until the uranium extraction drops below a specified cut-off level.[20] In-situ combines the mining and milling process into one step, "reduc[ing] the exposure of personnel to dangerous radioactive materials."[21]

B. Milling

Milling is the procedure by which ore is processed to create the final product of uranium oxide (U_3O_8), "yellowcake."[22] The milling process consists of manipulating the ore through blending, crushing, and grinding, ultimately mixing the result with water, creating "a half liquid, half solid slurry."[23] The slurry is then run through a leaching solvent to remove

---

[11] *Id.*
[12] *Id.*
[13] *Id.*
[14] *Id.*
[15] *See id.*
[16] *See* URANIUM PRIMER, *supra* note 10, at 224.
[17] *See id.*
[18] *Id.* at 225.
[19] *Id.*
[20] *Id.*
[21] *Id.*
[22] Ronald H. Rosenberg, *Uranium Mining and Milling in Virginia: An Analysis of Regulatory Choice*, 4 VA. J. NAT. RESOURCES L. 81, 85 (1984).
[23] URANIUM PRIMER, *supra* note 10, at 225.

enriched uranium.[24] The leaching solvent is either acid or alkali, depending on the chemical properties of the slurry—most critically its lime content.[25] Once the milling process is complete, one to five pounds of yellowcake are extracted per ton of ore.[26] The remaining ore, uranium, and solution mixture is called "tailings," and must be disposed.[27]

Tailings are what pose the greatest environmental and public health threats.[28] These tailings pose such a large threat because they retain almost eighty-five percent of the original radioactivity for hundreds of thousands of years.[29] They retain this radioactivity because certain radioactive materials, such as radium and thorium, are not extracted during the milling process.[30] In addition to their radioactivity, the tailings also contain other potentially hazardous substances, such as arsenic, the toxicity of which could adversely affect public health if it seeped into groundwater or surface water.[31]

C. Uranium Mining in the United States

Uranium mining saw a boom in the 1940s and 1950s as a result of the realization of its energy potential in 1938.[32] Originally reserved exclusively for the federal government, its feasibility as a new energy source led to its boom in the private sector.[33] However, the price of uranium dropped steeply in the 1980s as a result of the Three Mile Island meltdown and other nuclear disasters.[34] As a result of declining prices, by 2003 there were only four operating uranium mines in the United States.[35] However, a dramatic price increase in the early 2000s has led

---

[24] *See id.*
[25] *See id.*
[26] Rosenberg, *supra* note 22, at 85.
[27] URANIUM PRIMER, *supra* note 10, at 226.
[28] Rosenberg, *supra* note 22, at 87.
[29] CITY OF VIRGINIA BEACH, A PRELIMINARY ASSESSMENT OF THE POTENTIAL IMPACTS OF URANIUM MINING IN VIRGINIA ON DRINKING WATER SOURCES 1 (2011) [hereinafter VIRGINIA BEACH REPORT], *available at* http://www.vbgov.com/government/departments/public-utilities/Documents/04.UraniumMiningReport_Final_Updated20110222_V2.pdf.
[30] *Id.*
[31] *Id.*
[32] *See* Rosenberg, *supra* note 22, at 91–92.
[33] *See id.* at 94 n.62.
[34] Theo Emery, *Uranium Mining Debate in Virginia Takes a Step*, N.Y. TIMES, Dec. 19, 2011, http://www.nytimes.com/2011/12/20/us/virginia-warned-of-hurdles-on-uranium-mining.html.
[35] *U.S. Uranium Mine Production and Number of Mines and Sources*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/cneaf/nuclear/dupr/umine.html (last visited Nov. 14, 2012).

to an increased interest in mining—specifically in pre-explored areas like Pittsylvania where uranium is known to exist.[36] Adding to the increased interest in uranium mining is its capability as a climate-neutral source of energy.[37]

II. THE HISTORY OF URANIUM IN VIRGINIA

A. Creation of the Moratorium

In 1977, the Marline Uranium Corporation ("Marline") looked to Virginia as a potential source of uranium.[38] In 1982, approximately 62,000 acres of land were leased for exploration in southwestern Virginia.[39] Most important to the Marline Corporation was the Coles Hill property in Pittsylvania, which was found to contain almost 110 million pounds of uranium.[40] This particular deposit could be large enough to power all of the nuclear reactors in the United States for a minimum of two years.[41] After the discovery, Marline practically abandoned their exploratory leases in other parts of the Commonwealth and focused exclusively on Coles Hill.[42] As such, Marline is unsure of how much uranium could be located at the other exploratory sites in which it originally expressed interest.[43]

In response to Marline's discovery at Coles Hill, the Virginia General Assembly determined that the environmental and safety hazards associated with Uranium Mining must be properly studied before the

---

[36] *See* Brett T. Bunkall, *The Uranium Mining and Milling Industry in Utah*, 26 J. LAND RESOURCES & ENVTL. L. 375, 383 (2006) ("As of the beginning of 2006, the global price of uranium is hovering around $37 per pound, a marked increase over the historic low prices (around $10 per pound) which have persisted since the mid 1980s."). This marked increase in price has sparked significant corporate interest in uranium mining and milling operations. For example, U.S. Energy Corp., a private energy firm, has acquired 12,000 acres of mining claims on land in southeast Utah. *Id.* Another corporate investor, International Uranium Corp., has announced plans to reopen several of its decommissioned mines in southeast Utah. *Id.*

[37] Slaughter, *supra* note 6, at 500.

[38] Slaughter, *supra* note 6, at 487.

[39] *See* PIEDMONT ENVTL. COUNCIL, URANIUM IN VIRGINIA: A STATEWIDE CONCERN 2 (1982) [hereinafter A STATEWIDE CONCERN].

[40] *See* BEHRE DOLBEAR & CO. ET AL., TECHNICAL REPORT ON THE COLES HILL URANIUM PROPERTY, PITTSYLVANIA COUNTY, VIRGINIA, UNITED STATES OF AMERICA 1–2 (2009), *available at* http://www.santoy.ca/i/pdf/43-101ColesHill.pdf.

[41] VIRGINIA BEACH REPORT, *supra* note 29, at 1.

[42] *See* A STATEWIDE CONCERN, *supra* note 39, at 2.

[43] *See id.* By 1984, proponents of a Virginia uranium industry claimed to have abandoned sites outside of Coles Hill on the grounds that they were not commercially viable. *Id.*

mining process could begin.[44] In furtherance of this belief, the Virginia General Assembly "approved House Joint Resolution 324, requesting the Virginia Coal and Energy Commission to evaluate the impacts of uranium production."[45] The Commission came back with a recommendation that mining be allowed in Virginia, but only if stringent restrictions were placed on the industry to regulate the creation and disposal of waste.[46] Despite this recommendation, there was strong dissent in the commission (12–8 vote to recommend mining).[47] The General Assembly did not take the Commission's recommendation and never lifted the moratorium.[48]

B. Virginia Uranium

In 2007, VUI was formed by Coles Hill residents seeking to mine the uranium and create jobs and income for southwestern Virginia.[49] One of the founders of VUI is Walter Coles, the primary landowner of the two ore sites.[50] VUI is a Virginia corporation that owns mineral leases for roughly 2940 acres in the Coles Hill area.[51] VUI stated that they plan to use the contiguous land for "exploration, mining, milling, waste, tailings management, and setback."[52]

VUI characterizes itself as a corporation geared towards financially supporting and growing the community of its primary stockholders.[53] However, VUI is a wholly owned subsidiary of a private Canadian corporation, Virginia Uranium Holdings ("VAUH").[54] VAUH, while fifty-two percent owned by local families in Pittsylvania, is still largely owned by private corporations.[55] Virginia Energy Resources ("VER") owns a thirty percent stake in VAUH, while the Sprott Resource Corporation owns eighteen percent.[56]

---

[44] *Id.*
[45] Slaughter, *supra* note 6, at 488; *see* COMMISSION REPORT, *supra* note 3, at 10.
[46] *See* COMMISSION REPORT, *supra* note 3, at 10–11.
[47] *Id.* at 8.
[48] *See* Slaughter, *supra* note 6, at 489–90.
[49] *See id.* at 491.
[50] *Id.*
[51] *Id.*
[52] *Id.* (citing BEHRE DOLBEAR & CO., TECHNICAL REPORT ON THE COLES HILL URANIUM PROPERTY, PITTSYLVANIA COUNTY, VIRGINIA, UNITED STATES OF AMERICA 15 (2009)).
[53] *See History of Virginia Uranium*, VIRGINIA URANIUM, http://www.virginiauranium.com/history-of-vui/?par=inv (last visited Nov. 14, 2012).
[54] Slaughter, *supra* note 6, at 492; *Investor Relations*, VIRGINIA URANIUM, http://www.virginiauranium.com/investor-relations/ (last visited Nov. 14, 2012).
[55] *Investor Relations*, *supra* note 54.
[56] *Id.*

VER is a Canadian owned corporation that specializes in uranium exploration and development in North America.[57] VER describes its stake in the Coles Hill site as its "most important asset."[58] Further, by possessing a right of first refusal on future financings, VER has the potential to further increase this stake in VAUH, giving them more control over the development of the uranium industry at the Coles Hill site.[59]

Since its formation, VUI has lobbied the Virginia General Assembly to lift the moratorium.[60] In 2008, VUI gave almost $100,000 to lobbyists to try to have a new uranium study conducted that could potentially introduce new facts and lead to the moratorium being lifted.[61] They continue to lobby in hopes that the moratorium will be lifted, in part based upon the results of a scientific study prepared by the National Academy of Sciences ("NAS").[62]

C. The Road to Uranium in Virginia

In 2008, a Senate bill was introduced to create the Virginia Uranium Mining Commission to assess the potential effects of uranium mining on Virginia.[63] The bill easily passed the Senate but was killed in the House.[64]

Proving only a minor hurdle, the failure of the legislative action prompted the Chairman of the Virginia Commission on Coal and Energy to propose that the Commission consider overseeing a study on the

---

[57] *Virginia Energy Resources, Inc.*, VIRGINIA ENERGY RESOURCES, http://www.virginiaenergyresources.com/s/Home.asp (last visited Nov. 14, 2012).
[58] *Id.*
[59] *See id.*
[60] Theo Emery, *A Big Uranium Deposit, and a Big Debate on Mining It*, N.Y. TIMES, Dec. 1, 2011, http://www.nytimes.com/2011/12/02/business/energy-environment/coles-hill-uranium-mine-proposal-divides-virginia-residents.html?pagewanted=all&_r=0.
[61] *Id.*
[62] *See* Anita Kumar, *Gov. McDonnell Opposes Lifting Ban on Uranium Mining in Virginia This Year*, WASH. POST, Jan. 19, 2012, http://www.washingtonpost.com/local/dc-politics/gov-mcdonnell-opposes-lifting-ban-on-uranium-mining-in-virginia-this-year/2012/01/19/gIQAjDP6BQ_story.html. Their lobbying efforts for the uranium project include speaking to more than one hundred legislators and flying more than twelve of them to France and Canada to visit uranium mines as examples of what could be done in Virginia. *Id.* In 2010, Virginia Uranium donated $110,000 to Virginia political campaigns. *See Va. Uranium*, THE VIRGINIA PUBLIC ACCESS PROJECT, http://www.vpap.org/donors/profile/index/148831?start_year=2010&end_year=2011&lookup_type=year&filing_period=all&period=2011-2012 (last visited Nov. 14, 2012).
[63] Slaughter, *supra* note 6, at 494.
[64] *Id.*

effects of uranium mining operations.[65] In 2010, NAS entered an agreement with Virginia Tech to conduct a study on the potential effects of uranium mining in Virginia.[66] This study does not make a recommendation on whether mining should be allowed.[67] The study merely presents the facts concerning uranium mining, not just in Virginia, but worldwide, to give a better indication of what it means to the community when uranium is mined nearby.[68] It is important to note, however, that there is some concern with the quality of the study because it was funded by VUI.[69]

No study this comprehensive has been done since the 1980 Commission study.[70] The lack of a more recent study is likely attributable to waning interest in Virginia mining operations after the 1985 General Assembly decision not to lift the moratorium.[71] The same factors that led to the decrease in uranium demand nationwide led to the decreased interest in Virginia. The subsequent rise in price has made mining in Virginia popular again; thus VUI's push to have the moratorium lifted, accompanied by their lobbying for a new, comprehensive study.[72]

The NAS study was released on December 19, 2011.[73] The report concluded that "[i]f the Commonwealth of Virginia rescinds the existing moratorium on uranium mining, there are steep hurdles to be surmounted before mining and/or processing could be established within a regulatory environment that is appropriately protective of the health and safety of workers, the public, and the environment."[74] It goes on to discuss the limited experience in the United States with both open-pit and

---

[65] *Id.* at 495.
[66] *Id.* at 527.
[67] *Id.* at 528.
[68] *See* Slaughter, *supra* note 6, at 528.
[69] *See* Paige Winfield Cunningham, *Canadian Company Expands Ownership of Virginia Uranium Deposit*, VIRGINIA WATCHDOG (Dec. 15, 2010), http://watchdog.org/37336/odw-canadian-company-expands-ownership-of-virginia-uranium-deposit/. While VUI funds the study, a spokesperson for VUI maintained that VUI has "nothing to do with how or when the funds are dispersed," and maintains that the study will remain objective despite its funding by a pro-mining/milling organization. *Id.*
[70] *See* Slaughter, *supra* note 6, at 529.
[71] *See History of Virginia Uranium*, *supra* note 53.
[72] *See supra* Part II.B.
[73] *See* Emery, *supra* note 34.
[74] NATIONAL ACADEMY OF SCIENCES, URANIUM MINING IN VIRGINIA: SCIENTIFIC, TECHNICAL, ENVIRONMENTAL, HUMAN HEALTH AND SAFETY, AND REGULATORY ASPECTS OF URANIUM MINING AND PROCESSING IN VIRGINIA 8 (2012) [hereinafter NAS REPORT], *available at* http://www.nap.edu/catalog.php?record_id=13266.

underground mining,[75] both of which could potentially be used at this site,[76] with emphasis on the entire lack of experience in Virginia.[77]

It does, however, say that "there exist internationally accepted best practices, founded on principles of openness, transparency, and public involvement in oversight and decision-making, that could provide a starting point for the Commonwealth of Virginia were it to decide that the moratorium should be lifted."[78] The report goes on to list these best practices and examine their applicability in Virginia.[79]

The report reaches the conclusion that the adoption and rigorous implementation of these best practices would be necessary if Virginia were to engage in uranium mining, processing, and reclamation.[80] The report estimates that should the moratorium be lifted, it would be five to eight years before mining operations could begin because it would be necessary to develop a "regulatory culture that promotes environmental and human health protection."[81]

In addition to the environmental study conducted by the NAS, VUI's lobbying resulted in the Uranium Subcommittee of Virginia's Coal and Energy Commission ordering a socioeconomic study.[82] The purpose of the study was to "broadly consider the net benefits from a mining and milling operation in the Commonwealth."[83] The Coal and Energy Commission charged Chmura Economics and Analytics ("Chmura") with completing the study.[84]

The study, released on November 29, 2011, concluded that a uranium mining and milling operation in Virginia would have a net positive economic impact of $135 million.[85] However, the study considers four

---

[75] *See id.*
[76] *See* CHMURA ECONOMICS AND ANALYTICS, THE SOCIOECONOMIC IMPACT OF URANIUM MINING AND MILLING IN THE CHATHAM LABOR SHED, VIRGINIA 15 (2011) [hereinafter CHMURA REPORT], *available at* http://www.chmuraecon.com/pdfs/Uranium.pdf.
[77] *See* NAS REPORT, *supra* note 74, at 8.
[78] *Id.*
[79] *See id.* at 211–25.
[80] *Id.* at 8.
[81] *Id.* at 212.
[82] CHMURA REPORT, *supra* note 76, at 6.
[83] *Id.*
[84] *Id.*
[85] *Id.* at 6–7. The net benefit comes after subtracting for various socioeconomic costs (like public health and environmental concerns) and negative effects based on public perception (in areas like tourism and agriculture), which Chmura believes will most likely be minimal in the most likely scenario. *Id.*

different scenarios with differing degrees of environmental impact.[86] Chmura "makes no determination as to the likelihood for each of these scenarios," but assumes for the purpose of the study that the scenario which will take place will be Scenario 2, described as "[m]oderate environmental impact in terms of the qualities of air, water, noise, and soil—all contamination remains within limits set by current federal standards."[87] However, while making no determination as to the likelihood of each scenario, Chmura states "the risks and rewards are not balanced,"[88] and the negative economic impact under the worst case scenario is almost double the corresponding positive economic gains under the best-case scenario.[89]

In contrast to VUI's push to have the moratorium lifted, many environmental and lobbying groups oppose the lifting of the moratorium.[90] Even the local governments of some of Virginia's cities and towns downstream have joined the opposition.[91] Local governments became involved based upon concerns about the potential of downstream contamination of their drinking water by a potential mill tailings containment malfunction.[92] Specifically, Virginia Beach has become a prominent voice in opposing the lifting of the moratorium.[93] There is great concern in Virginia Beach that Lake Gaston, their primary source of drinking water, could be contaminated for a period of up to two years in the event of a containment structure failure.[94] Virginia Beach conducted its own study on the potential impact of a uranium mine on their primary drinking water

---

[86] *Id.* at 7.
[87] CHMURA REPORT, *supra* note 76, at 7. The other three scenarios assume differing levels of environmental contamination, with "Scenario 1" being negligible environmental impact. *Id.* "Scenario 2," the baseline, is moderate environmental impact. *Id.* "Scenario 3" is significant environmental impact. *Id.* "Scenario 4" is severe environmental impact. *Id.*
[88] *See* CHMURA REPORT, *supra* note 76, at 7.
[89] *See id.*
[90] *See, e.g.*, *Virginia's Uranium Mining Moratorium*, THE PIEDMONT ENVTL. COUNCIL, http://www.pecva.org/index.php/our-mission/energy-solutions/Virginias-uranium-mining-moratorium (last visited Nov. 14, 2012).
[91] *See* Julian Walker, *Virginia Beach Officials Want Uranium Mine Ban Extended*, VA. PILOT, Oct. 13, 2011, http://hamptonroads.com/2011/10/virginia-beach-officials-want-uranium-mine-ban-extended.
[92] *See* VIRGINIA BEACH REPORT, *supra* note 29, at 1.
[93] *See* Walker, *supra* note 91.
[94] City of Virginia Beach, *Virginia Beach Uranium Mining Impact Study*, http://www.vbgov.com/government/departments/public-utilities/pages/uranium-mining.aspx (last visited Nov. 14, 2012).

supply, Lake Gaston, as well as water supplies along the Banister River, Roanoke River, and Kerr Reservoir.[95]

Under pressure from both sides concerning the moratorium, the Virginia General Assembly decided to review the moratorium in its 2012 meeting.[96] Based upon the information gained from environmental and socioeconomic studies, and after a suggestion from Governor Bob McDonnell, the General Assembly decided not to lift the moratorium.[97] However, Governor McDonnell did call for a draft regulatory scheme to be submitted, suggesting that the lifting of the moratorium will be up for reconsideration in 2013.[98]

III. THE EFFECTS OF A URANIUM PROCESSING OPERATION ON THREE DISTINCT AREAS OF CONCERN: THE ENVIRONMENT, THE PUBLIC HEALTH, AND THE ECONOMY

A. Environmental Effects

1. Southwestern Virginia

Many environmental concerns associated with uranium mining and milling are experienced by all mineral extraction industries: "(1) disruption of the rural life-style, (2) adverse impact upon vegetation, wildlife, and aquatic life, (3) aesthetic damage to the rural landscape 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."[99] Because of the radioactive nature of uranium, its mining and milling present a number of problems unique to uranium extraction.

In the mining process, radon-222 gas, a decay product of uranium mining, must be ventilated from underground mine shafts to protect miners from exposure to hazardous levels of radiation.[100] Because radon-222 is radioactive, uranium mines also pose a serious risk of leaving radioactive gas in the air of the surrounding community.[101]

---

[95] *See* VIRGINIA BEACH REPORT, *supra* note 29, at 1.
[96] *See* Emery, *supra* note 34.
[97] Roy Hoagland, *Roanoke River at Risk if Uranium Mined*, NORTH CAROLINA COASTAL FEDERATION, June 28, 2012, *available at* http://www.nccoast.org/m/article.aspx?k=8a5ffb20-00cc-4059-a065-70080a860b10.
[98] *See id.*
[99] Rosenberg, *supra* note 22, at 86–87.
[100] *Id.* at 87.
[101] *See id.*

The most unique and serious issue associated with uranium mining is long-term storage and disposal of the enormous quantity of mill tailings.[102] Tailings pose the greatest threat to environmental health and safety because nearly "eighty-five percent of radioactivity in the original ore is present in the tailings."[103] The negative effects of uranium tailing storage are not undocumented. There have been numerous reports of surrounding environmental damage throughout the Southwest where most uranium mining in the United States has taken place.[104] If milling operations were allowed in southwestern Virginia, there is the possibility that the tailings containment could burst due to the high level of rainfall.[105] If this happened, it could contaminate nearby groundwater and surface water for up to 1000 years.[106]

2. Effects Outside of Southwest Virginia

There is also concern that the uranium mill tailings could contaminate water supplies downstream from Pittsylvania.[107] VUI's proposed uranium mine would be the first mine to operate in a climate where the rainfall exceeds the evaporation rate.[108]

The particularly wet climate poses unique threats of carrying improperly stored mill tailings further downstream from the mining site.[109] Even properly stored tailings have been released into local water sources

---

[102] *Id.* ("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.").
[103] URANIUM PRIMER, *supra* note 10, at 227.
[104] *See id.* at 222. In 1979, a tailings containment facility at Church Rock, New Mexico burst and contaminated a river downstream, affecting the river flora and fauna. *Id.*; *see also* NAS REPORT, *supra* note 74, at 15 ("Documented environmental impacts from uranium mining and processing include elevated concentrations of trace metals, arsenic, and uranium in water; localized reduction of groundwater levels; and exposures of populations of aquatic and terrestrial biota to elevated levels of radionuclides and other hazardous substances."). However, these impacts have mostly been observed at mining facilities operating at standards of practice that would likely not be acceptable today. *Id.* It should be noted that it is not possible to determine the exact nature of any adverse impacts from uranium operations in Virginia, as they would depend heavily on the nature of actions taken to mitigate and control the effects. *Id.*
[105] *See* NAS REPORT, *supra* note 74, at 15–16.
[106] *Id.*
[107] *See* Slaughter, *supra* note 6, at 503.
[108] COMMISSION REPORT, *supra* note 3, at 21.
[109] *See* VIRGINIA BEACH REPORT, *supra* note 29, at 1.

due to a failure of the containment structure.[110] Some containment structures have failed specifically because of heavy rainfall.[111] In the event of a mill tailing containment failure due to heavy flooding, rivers downstream of the Coles Hill Site could be contaminated with radioactive materials above the maximum contaminant level for a period of up to two years.[112] Subsequent floods could cause the radioactive materials to remain in the rivers longer, prolonging contamination of drinking water sources.[113]

B. Public Health Effects

1. Pittsylvania

The primary concern to the Pittsylvania area is human exposure to radioactive materials released during uranium development.[114] There are documented adverse effects of radiation exposure on the health of uranium miners.[115] The United States Public Health Service conducted a number of studies in the 1950s and 1960s that found uranium miners were dying of lung cancer anywhere between five to twelve times the expected rate of lung cancer mortality for miners in the Southwest.[116] Another study that followed a group of white nonsmoking miners from 1950 to 1984 found that "miners died from lung cancer at a rate fourteen times the national expected rate for white nonsmokers."[117]

In addition to occupational exposure hazards associated with uranium mining, non-occupational exposure is also a threat.[118] The ventilation of radon-222 from the shafts of underground mines necessary to protect miners from the hazardous radiation concentration levels, leaves the potential for radioactive materials in the air.[119] Airborne uranium levels have been detected at amounts ten times higher than background levels

---

[110] *Id.*
[111] *Id.*
[112] *See id.* at 221.
[113] *Id.*
[114] Rosenberg, *supra* note 22, at 87.
[115] Bunkall, *supra* note 36, at 378.
[116] *Id.*
[117] *Id.* (citing Robert J. Roscoe et al., *Lung Cancer Mortality Among Nonsmoking Uranium Miners Exposed to Radon Daughters*, 262 J. OF AM. MED. ASSOC. 629, 629 (1989)).
[118] Rosenberg, *supra* note 22, at 87.
[119] *Id.*

near a mine in New Mexico.[120] In 1978, the Department of Energy estimated that people living in communities near uranium tailings were "twice as likely to acquire lung cancer compared to the general population."[121]

In addition to airborne radiation, residents who live close to the uranium mine and mill complex can be exposed to radiation through groundwater or surface water contamination.[122] While not representative of exactly what will happen in Virginia, in the 1990s a study was conducted by the Department of Health and Human Services Agency for Toxic Substances and Disease Registry ("ATSDR") on the effects of the uranium industry in Monticello, Utah.[123] It found that the uranium mill in that community, which shut down in 1960, left a legacy of contaminated water.[124] A legacy of contaminated water could lead to prolonged exposure to radiation particles in the surrounding area, which in turn could lead to increased cancer rates.[125]

2. Outside of Pittsylvania

In addition to contaminating the water of the surrounding area, a study shows that some communities downstream of Pittsylvania could have their water supplies heavily contaminated by an upstream milling operation.[126]

There is concern that "failure of the uranium tailings confinement structure could result in contamination of the downstream drinking water supply sources along the Banister River, Roanoke River, Kerr Reservoir, and Lake Gaston."[127] Virginia Beach, Chesapeake, and Norfolk are likely to be the most heavily populated areas that would be affected in the event of water contamination by mill tailings.[128] Those three metropolitan areas get most of their drinking water from Lake Gaston, which is supplied by tributaries stemming from the Pittsylvania area.[129] If this were to happen, the public health effects observed in communities surrounding a uranium operation would extend far past the immediate

---

[120] Slaughter, *supra* note 6, at 500 (referring to an unpublished study).
[121] Bunkall, *supra* note 36, at 378–79.
[122] *Id.*
[123] *Id.* at 379.
[124] *Id.*
[125] *See* NAS REPORT, *supra* note 74, at 14.
[126] *See* VIRGINIA BEACH REPORT, *supra* note 29, at 1.
[127] *Id.*
[128] *See* Slaughter, *supra* note 6, at 503.
[129] *Id.*

vicinity of the operation. The cancer rates in Virginia Beach would likely go up, as would the rates of any other areas supplied by Lake Gaston.

There is also some concern that the radiation in the air could be spread to areas outside of Pittsylvania. In the unpublished study concerning the elevated uranium levels near a mine in New Mexico, study conductors detected elevated levels of uranium and thorium as far as eight miles from the mine.[130] This led to speculation that windblown dust could spread uranium particles to areas that would not normally be directly affected by the mine.[131]

C. Economic Effects

1. Southwestern Virginia

a. Agriculture

Radiation and tailings could affect southwestern Virginia farmers' abilities to grow proper food and raise livestock.[132] The proposed mine would be within an impactful distance of farms growing "tobacco, corn, wheat, [and] soybeans," and raising livestock consisting chiefly of cattle and swine.[133] There are "data showing that uranium concentration in vegetation led to elevated uranium in the livers and kidneys of exposed cattle in New Mexico."[134] If this were to prove true in southwestern Virginia, it could strike a devastating blow to the primarily agricultural economy of the region.[135] In an area with approximately 1390 active farms in Pittsylvania producing "crops, livestock, and dairy products,"[136] any radioactive material adversely affecting the agricultural industry would likely devastate the surrounding area economically.

However, even absent a significant containment structure failure, economic damage to the agricultural industry could result from the

---

[130] *Id.* at 500.
[131] *Id.*
[132] Maggie J. Lewis, *Keeping Agriculture Alive in the Shadow of a Uranium Mine: Potential Effects and Regulatory Solutions for Virginia*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 615, 622 (2010).
[133] *Id.* (quoting Pittsylvania County & Danville Newcomers and Visitors Guide 31 (Chatham Star-Tribune) (2009)).
[134] Slaughter, *supra* note 6, at 500.
[135] Lewis, *supra* note 132, at 629.
[136] *Id.* at 621–22.

negative stigma associated with radioactive material.[137] Studies have shown that mill tailings can spread radionuclides to vegetation, which would then be consumed either directly by humans or by cattle and other livestock that produce products for human consumption.[138] While the radionuclides' effect on humans and cattle, in ideal mining and milling conditions, would be negligible, it is still possible that negative public perception would result in economic damage by reducing the amount of agricultural products purchased from the Pittsylvania County area, further damaging an already economically suffering area.[139]

b. Job Creation

Originally touting at least 900 new jobs in the Pittsylvania area should the Coles Hill project be approved, the number has since been reduced to roughly 400 jobs in Pittsylvania.[140] While this is significantly reduced, the uranium industry touts job creation across Virginia, not just in the area immediately surrounding the mining operation.[141]

During the roughly three-year construction phase, the Coles Hill project would support 323 jobs annually, with approximately seventy-five percent of these jobs being filled by residents of the surrounding area.[142] During the projected thirty-five-year operational phase, the Coles Hill project would support 1052 jobs in Virginia.[143] Approximately half of these jobs would be filled by residents of the surrounding area.[144]

c. Housing Market

There has been concern about the impact on real estate values of introducing uranium mining and milling operations to southwestern Virginia.[145] The concern is that the negative public perception of uranium

---

[137] CHMURA REPORT, *supra* note 76, at 64.
[138] *Id.*
[139] *Id.* ("For example, reclaimed water [from recycled sewage] sells for 40 percent less than water from other conventional sources in the Dallas–Fort Worth area of Texas, and is used primarily for irrigation and industrial use rather than for direct human consumption." (citing Kate Galbraith, *Can Sewage Help Solve Texas' Water Problems?*, TEXAS TRIBUNE, July 24, 2011)).
[140] A STATEWIDE CONCERN, *supra* note 39, at 3.
[141] *See* CHMURA REPORT, *supra* note 76, at 9.
[142] *Id.*
[143] *Id.*
[144] *Id.*
[145] *Id.* at 52.

mining will lead to lower property values.[146] The public generally associates uranium mining with "environmental degradation, water contamination, and increased health risks,"[147] and when asked if they would choose to live near mild radioactive waste, people generally respond "no."[148] The lack of desire to live nearby would result in lower property values. However, research has shown that the negative economic impact resulting from negative public perception is generally limited to the area in close proximity to the site and is only temporary.[149] It remains unclear whether the reduction would actually be temporary.

In regards to the Coles Hill site, housing markets within five miles of the site would feel a negative economic impact, while markets farther away could benefit slightly.[150] The benefit comes primarily from the increased economic output of the area and the influx of workers for new jobs being created by the mining and milling operation.[151]

2. Outside of Pittsylvania

Areas outside of Pittsylvania could potentially suffer damage to their economy as a result of the uranium mine.[152] It is unclear how far radioactive materials from uranium tailing could be carried via wind and water.[153] It is difficult to draw a substantive line marking where there is no longer the potential for adversely affected crops and livestock.[154]

The major benefit touted by the uranium industry—that a mine would create a significant number of jobs—is not geographically restricted to the area surrounding the mine.[155] The industry argues that a new uranium mine would create jobs outside of Pittsylvania County.[156]

---

[146] *Id.*
[147] CHMURA REPORT, *supra* note 76, at 52.
[148] *Id.*
[149] *Id.* The temporary nature of the negative stigma is dependent upon there being no accidents or evidence of contamination. *Id.* at 53 ("In short, Chmura judges that *if no accidents occur*, and *the mine and milling sites are properly maintained and reclaimed afterwards*, any negative effect on residential property value in Pittsylvania County is likely to [sic] short-lived, localized, and in most cases negligible." (emphasis added)).
[150] *Id.* at 52.
[151] *Id.*
[152] *See* Lewis, *supra* note 132, at 642.
[153] *See id.*
[154] *See id.*
[155] CHMURA REPORT, *supra* note 76, at 9.
[156] *See* Virginia Uranium, Inc., *Independent Study Finds 'Substantial' Economic Benefits from Uranium Mining & Milling in Virginia*, VIRGINIA URANIUM, Nov. 30, 2011, *available*

Further, there is potentially more uranium in other areas of Virginia.[157] If this uranium were to be mined, it would create jobs locally for the new miners. However, it is not clear that VUI would pursue these possibilities.

D. Balancing the Net Economic, Environmental, and Health Effects

While the socioeconomic study touts a net economic benefit,[158] the severity of environmental and health concerns related to a uranium operation currently outweigh the potential economic gain for Virginia. While economic benefit is important, especially for an area like Pittsylvania,[159] the General Assembly must first and foremost protect the environment and—more importantly—health.

This counterbalancing is further implicated in the event of a containment failure. If a containment failure were to occur, not only does the net economic effect go from positive to negative, but it would have negative effects twice as great as the positive effects.[160] Given that the "risks and rewards are not balanced,"[161] Virginia would be taking an unnecessarily large risk for economic gain if it were to lift the moratorium without first ensuring that uranium could be safely mined in Virginia, as well as establishing a strong regulatory structure *prior* to the lifting of the moratorium. To develop a reactive regulatory scheme would unfairly leave the public open to unnecessary health and environmental risks.

IV. ANALYSIS OF FEDERAL REGULATORY SCHEMES

A. Federal Regulations

Because radiation and its hazards were ignored early in the uranium mining process, there was a lack of regulation both on the federal

---

at http://www.virginiauranium.com/pdf/VUI%20Press%20Release%2011-30-11%20Final.pdf.

[157] *See* A STATEWIDE CONCERN, *supra* note 39, at 3.

[158] *See* CHMURA REPORT, *supra* note 76, at 6.

[159] "Due to the region's lower average income, the labor shed has a higher percentage of individuals living in poverty compared to the state." CHMURA REPORT, *supra* note 76, at 23.

[160] *See id.* at 7.

[161] *Id.*

and state levels.[162] After the radiation effects were studied, the federal government decided to regulate the industry more heavily.[163]

The Nuclear Regulatory Commission ("NRC") has the authority to license and regulate mining-milling operations under the Uranium Mill Tailing Radiation Control Act ("UMTRCA").[164] "States may apply to the NRC to become Agreement States," and assume the NRC's regulatory functions regarding mining and milling.[165]

1. Nuclear Regulatory Commission

Under the UMTRCA, the NRC regulates special nuclear material, source material, and byproduct material produced by the uranium fuel cycle.[166] The "uranium fuel cycle" begins "with milling of uranium ore and continues through the use of uranium in nuclear power and disposal after use."[167] As such, the states regulate mining operations, with the exception of in-situ mining-milling, while the NRC regulates milling and mill tailings disposal.[168]

2. Agreement State Program

The Atomic Energy Act allows states to form an agreement with the NRC that permits the state to take over licensing and regulatory authority from the NRC.[169] In order for a state to become an Agreement State, it must have in place a regulatory program that meets NRC requirements and is "adequate to protect the public health and safety with respect to the materials within the State covered by the proposed agreement."[170] The NRC further requires

> [c]ompliance with standards which shall be adopted by the State for the protection of the public health, safety, and the environment from hazards associated with such material which are equivalent, to the extent practicable, or more

---

[162] Rosenberg, *supra* note 22, at 98 n.88.
[163] *See id.* at 91–92.
[164] Slaughter, *supra* note 6, at 505.
[165] *Id.*
[166] *Id.* at 506.
[167] *Id.* at 507.
[168] *Id.*
[169] *Id.*
[170] Slaughter, *supra* note 6, at 507 (quoting 42 U.S.C. § 2021(b) (2006)).

> stringent than, standards adopted and enforced by the Commission for the same purpose, including requirements and standards promulgated by the Commission and the Administrator of the Environmental Protection Agency.[171]

Virginia became a partial Agreement State in 2009 with regards to "source material and all by-product materials except uranium mill tailings," but does not have the requisite regulatory structure for milling due to the moratorium.[172] As such, it is not an Agreement State for mill tailings. In its 1985 Report, the Virginia Coal and Energy Commission recommended that should the moratorium be lifted by the General Assembly, Virginia should apply for Agreement State status to regulate milling.[173] It is expected that should the moratorium be lifted, Virginia will become an Agreement State with regard to the entire mining and milling process.[174] If Virginia were to do this, it would take over regulation of the entire industry from the NRC.[175] This would allow Virginia to promulgate appropriate regulations, but because it lacks any experience with uranium mining, the General Assembly will need to look to other states' and countries' regulatory programs to determine how to structure its own. Two principal regulatory regimes upon which Virginia could rely are suggested by the NAS report: Colorado and Canada.[176]

B. Regulation in Colorado

Generally, state regulations are extensions of federal laws under the Agreement State Program—because the Agreement State Program requires that any regulatory scheme be as protective as the NRC's.[177] NAS notes that Colorado's regulatory scheme is of particular interest.[178] While recognizing that it is not an ideal model upon which Virginia should build, it does illustrate the "ongoing evolution of a regulatory environment that either recognizes or drives the continuing development of best practices in the industry."[179]

---

[171] *Id.* at 507–08.
[172] Robert G. Burnley, *How Will Virginia Regulate Uranium Mining?*, 60 VIRGINIA LAWYER, 41, 43 (2011), *available at* http://www.vsb.org/docs/valawyermagazine/vl0711-uranium.pdf.
[173] Slaughter, *supra* note 6, at 508.
[174] *Id.*
[175] *Id.* at 507.
[176] NAS REPORT, *supra* note 74, at 180.
[177] *See supra* Part IV.A.2.
[178] *See* NAS REPORT, *supra* note 74, at 180.
[179] *Id.*

Colorado, like Virginia, has a history of uranium ore mining.[180] Unlike Virginia, uranium mining began in Colorado in the 1940s.[181] The initial mining techniques were "very crude by today's standards," and "created a legacy of pollution."[182] It is this very lack of oversight and resultant pollution that led Colorado to develop a more comprehensive cleanup and licensing plan.[183] Having numerous sites that are listed on the National Priorities List by the U.S. EPA,[184] Colorado is a state that has felt the effects of poorly regulated uranium mining.[185] Because it has been subject to the most negative effects of radioactive mining, its regulatory scheme has evolved alongside technological developments and the understanding that a strong regulatory scheme is necessary to prevent a legacy of environmental destruction.[186] As such, the state is one upon which Virginia should base its future scheme. Using Colorado's legacy of poor regulation, and subsequent regulatory reform as a foundation for its own regulatory scheme, Virginia could position itself to avoid the environmental and public harm that Colorado endured as a result of poor regulation.

As an Agreement State, Colorado has licensing authority for uranium processing operations.[187] In order to obtain a permit for a uranium mine, an organization must obtain numerous permits from the county and the state's Division of Reclamation, Mining and Safety, perform an environmental assessment, provide an environmental protection plan, and obtain a financial guarantee.[188]

Companies that wish to process uranium in Colorado face a licensing application procedure that lasts a minimum of fourteen months.[189] Before an application is deemed complete, the company must "submit a Radioactive Materials License application and an Environmental Impact Assessment (EIA) to the Colorado Department of Public Health and Environment Radiation Management Unit."[190] After those documents have been filed, the company must hold two public comment sessions to afford the public the opportunity to comment on both the application for a

---

[180] *Id.* at 181.
[181] *Id.*
[182] *Id.* at 182.
[183] *See id.* at 182–83.
[184] NAS REPORT, *supra* note 74, at 183.
[185] *Id.*
[186] *Id.* at 184.
[187] *Id.*
[188] NAS Report, *supra* note 74, at 184.
[189] *Id.*
[190] *Id.*

license and the environmental impact assessment.[191] Further, the county in which the license application is pending may take formal action regarding the application.[192] Ultimately, Colorado's licensing program requires a company to show that the requested license would be a net benefit to the state, and allows numerous opportunities for public comment regarding the potential uranium processing operation.

C. Regulation in Canada

In addition to Colorado, the NAS Report cites Canada as a potential example for Virginia to follow in developing a regulatory framework for uranium mining and milling.[193] It cites Canada because Canada is a place where "there has been ongoing and recent development of laws and regulations applicable to uranium mining, processing, reclamation, and long term stewardship."[194] Like Colorado's regulatory scheme, it is not an "ideal 'model' regulatory environment," but it illustrates the evolution of a regulatory environment geared towards developing best practices in the industry.[195]

Under the Canadian Nuclear Safety and Control Act ("CNSCA"), practically all mining, processing and reclamation activities in Canada are subject to regulation by the Canadian Nuclear Safety Commission ("CSNC").[196] In addition to the CNSCA, there are other federal laws that apply to uranium mining, processing, and milling, such as the Environmental Assessment Act and Canadian Environmental Protection Act.[197] The resultant regulatory environment is a joint regulation.[198] The Canadian Nuclear Safety Commission involves both Health Canada and Environment Canada in its regulatory decision-making.[199]

The Canadian Environmental Assessment Act "requires that any project requiring a CNSC license must undergo an environmental

---

[191] *Id.*
[192] *Id.* ("The relevant county may comment formally about perceived impacts to the community and environment, and local government may also have land use or other regulations applicable to the project. County commissioners may request up to $50,000 from the applicant to review the EIA, and the commissioners' comments on the EIA must be submitted to the [Colorado Department of Public Health and Environment] within 90 days of the first public meeting.").
[193] *See* NAS REPORT, *supra* note 74.
[194] *Id.*
[195] *Id.*
[196] *Id.* at 180.
[197] *Id.*
[198] *Id.*
[199] NAS REPORT, *supra* note 74, at 180.

assessment."[200] The CNSC possesses the authority to define the scope of the environmental assessment.[201] The applicant bears the burden of performing the technical studies required during the assessment, as well as consulting with the public about the project.[202] After the environmental assessment is completed, the CNSC prepares the final report and has the option to hold a public hearing before making its final decision.[203] If the activity is likely to have a significant adverse effect on the environment, a public comment period is mandatory.[204] The comments filed must be taken into account by the Environment Minister, and if public concern is deemed substantial, the Minister has the discretion to refer the assessment to a review panel for a final decision.[205] This regulatory structure ensures that the environmental effects of a potential uranium processing operation undergo extensive review before a license is even issued for the operation. In addition to the environmental assessment requirement, a license agreement may contain a provision that the licensee will provide a financial guarantee "in a form that is acceptable to the Commission."[206]

After licensing, the operations are subject to additional regulations—some geared towards protection of the environment and others geared towards the protection of the public health.[207] To assure compliance with these regulations, the CNSCA authorizes an inspector to, at a reasonable time, enter and inspect any nuclear facility or any vehicle the inspector reasonably believes is transporting nuclear material.[208]

V. WHERE SHOULD VIRGINIA GO FROM HERE?

The Virginia General Assembly refused to lift the moratorium on uranium mining in the 2012 session.[209] However, Governor McDonnell

---

[200] *Id.* at 180; *see* Canadian Environmental Assessment Act, S.C. 1992, c. 37, s. 5 (Can.).
[201] Canadian Environmental Assessment Act, s. 15; NAS REPORT, *supra* note 74, at 180.
[202] NAS REPORT, *supra* note 74, at 181.
[203] Canadian Environmental Assessment Act, s. 18; NAS REPORT, *supra* note 74, at 181.
[204] Canadian Environmental Assessment Act, s. 21; NAS REPORT, *supra* note 74, at 181.
[205] Canadian Environmental Assessment Act, s. 29; NAS REPORT, *supra* note 74, at 181.
[206] Canadian Nuclear Safety and Control Act, S.C. 1997, c. 9, s. 24 (Can.).
[207] *See* NAS REPORT, *supra* note 74, at 181 ("[R]egulations have been promulgated to protect workers and the public from radiation and other hazards. Every licensee is required to implement a radiation protection program, and the annual limit on public radiation exposure is 1 milliseivert. Lower doses than this regulatory standard are commonplace because licensees are required to ensure that the radiation dose is 'as low as reasonably achievable' (ALARA). The CNSC has also established regulations regarding to [sic] the safe and secure transportation of radioactive materials such as yellowcake.").
[208] Canadian Nuclear Safety and Control Act, S.C. 1997, s. 30 (Can.).
[209] *See supra* Part II.C.

called for the proponents of uranium mining to submit a draft regulatory scheme, which is expected to be presented to the Governor in late 2012.[210] This suggests that the moratorium could be up for review again as early as the 2013 session of the General Assembly.[211] When this situation comes up, the General Assembly has a number of options available.

A. Keeping the Moratorium

The Virginia General Assembly could, and this Note argues should, keep the current moratorium in place. The moratorium should not be lifted because the regulations currently available may not be sufficient to outweigh the environmental, health, and economic harms that could result. As was stated in the NAS report, "[f]or a number of reasons, the laws, regulations, and policies governing uranium mining, processing, reclamation, and long-term stewardship activities in the United States are neither well integrated nor transparent," and "gaps in coverage [still] exist."[212] These gaps in coverage are substantial, and the environmental and public health effects of uranium mining have yet to be adequately covered by any United States regulatory regime.

The gaps in coverage are especially egregious in Virginia, because there is currently *no* coverage due to the moratorium.[213] To simply lift the moratorium and allow for the immediate beginning of mining would be a choice motivated by a desire to create comparatively minor economic benefit in exchange for a what could be a very large potential risk to the environment and the public health.[214]

The byproducts of uranium production can stay in the surrounding environment for thousands of years, long after the mine itself has shut down and the mill tailings have been disposed of or stored.[215] Thus, any adverse environmental effects of a uranium mine in southwestern Virginia could persist long after the benefits produced by the mine have waned or faded.[216] Additionally, while it cannot be linked directly to the uranium production process, there is evidence that tends to indicate that exposure

---

[210] Chris Griggs, *Uranium Working Group Meets in Virginia Beach*, THE WARREN RECORD (Sept. 5, 2012, 10:00 AM), http://www.vancnews.com/the_warren_record/news/article_6f8f0d1e-f755-11e1-9b58-001a4bcf887a.html.
[211] *See supra* Part II.C.
[212] NAS REPORT, *supra* note 74, at 185.
[213] *Id.* at 208.
[214] *See supra* Part III.
[215] *See supra* Part III.A.
[216] *See id.*

to uranium and its byproducts has an extreme adverse effect on the health of not only the miners, but also the surrounding community.[217]

Before lifting the moratorium, the General Assembly should assess whether the potential adverse environmental and health effects of the uranium production process are outweighed by the economic benefit the uranium at the Coles Hill Site promises to bestow upon the state.[218] This Note proposes that the General Assembly should not lift the moratorium. Furthermore, the moratorium should stay in place until the institution of a strong regulatory structure. However, given the potential for substantial economic benefits, it is very possible that the General Assembly could lift the moratorium.

B. Lifting the Moratorium

The moratorium could be lifted due to the overall net economic effect predicted by the Chmura Report.[219] Should the General Assembly allow for the issuance of mining permits and milling operations licenses, the legislature should impose stringent regulations on the mining and milling processes, with particular regard to protecting the environment and human health. If the General Assembly should choose to lift the moratorium, they should adopt regulations regarding these operations as soon as possible, preferably concurrent with the lifting of the moratorium. This regulatory structure presumes that Virginia will get Agreement State status with regard to the milling processes.[220]

Currently, there are no laws specifically addressing uranium mining in Virginia due to the moratorium.[221] However, there are currently active agencies that have authority over regulatory areas that could be applied to uranium mining, which could lead to thinly spread authority across multiple agencies.[222] Should Virginia decide to lift the moratorium,

---

[217] *See supra* Part III.B.
[218] *See supra* Part III.
[219] *See id.*; CHMURA REPORT, *supra* note 76.
[220] Slaughter, *supra* note 6, at 507.
[221] *See* NAS REPORT, *supra* note 74, at 200.
[222] *See id.* Currently, the regulatory agencies that could govern a uranium processing operation are: Department of Mines, Minerals, and Energy; Department of Labor and Industry; Department of Environmental Quality; Department of Conservation and Recreation; and the Department of Health. *See id.* at 201–206. This could lead to thinly spread authority over multiple agencies, which could lead to interagency strife. Accordingly, this Note recommends a primary oversight agency that works in conjunction with other state agencies to regulate the uranium industry.

the General Assembly should pass a law similar to CNSCA,[223] and create a primary regulatory agency that would work in conjunction with already established health and environmental agencies to create a joint-regulatory scheme similar to that of Canada.[224] Canada's current regulatory framework could provide significant guidance for Virginia's draft scheme, which could be presented to the General Assembly as early as 2013.

1. Licensing Regulations

a. Environmental Impact Assessment and Public Comment

Before granting a license for a mining or milling operation, the General Assembly should require that an environmental impact assessment be conducted with partial cost to the applicant. An environmental impact assessment would ensure that the regulating agency was provided with the appropriate amount of scientific evidence to make a well-informed decision on whether to grant a license.

Furthermore, there should be legislative provisions to allow for greater public comment on the proposed uranium operation. As the NAS Report found, "[u]nder the current regulatory structure, opportunities for meaningful public involvement are fragmented and limited."[225] Because of the limited amount of public involvement in the current regulatory structure, it is possible that a uranium mine could be erected without any input from those who would be most effective by the mining operations.

Since a uranium mine could have such a profound effect upon the health, economy, and environment of the surrounding region,[226] it is important that public comment be allowed before a license is issued. This would allow the mining company-applicant to meaningfully consider the needs of the surrounding community.

b. Bonding Requirements

Each licensing agreement should contain a provision requiring preemptive bonding of any company that seeks to operate a mining or milling operation in Virginia in an amount determined by the license-granting agency. The amount determined by the agency should be based

---

[223] *See* Nuclear Safety and Control Act, S.C. 1997, c. 9 (Can.).
[224] *See supra* Part IV.C.
[225] NAS REPORT, *supra* note 74, at 209.
[226] *See supra* Part III.

upon two factors: (1) the amount that would sufficiently cover the total environmental damages in the event of a tailings facility malfunction; and (2) the amount that would sufficiently cover the cost of decommissioning any mill facilities to levels which would allow unrestricted use.

The benefits to a bonding system are that it would equate to financial insurance in the event of a disaster occurring at one of the mill tailings facilities. While it would be inadequate as a cure for the environmental and public health damage that could occur in the event of a mill tailings facility failure,[227] it would provide some mode of recourse for those injured by the failure. Furthermore, the concept of bonding is one that has been considered previously when the regulatory agencies deem bonding necessary, and a bonding requirement is currently in place in both Canada and Colorado.[228] As has been noted:

> [t]he idea that "any applicant for a uranium mill license must establish financial surety arrangements adequate to assure (1) decontamination and decommissioning of the mill and mill site to levels which would allow unrestricted use of these areas and (2) reclamation of tailings and other wastes in accordance with applicable NRC regulations" is not new.[229]

A bonding requirement is not without its drawbacks.[230] It is difficult to estimate the true needs of a bond, and almost impossible to set a bond at a "worst-case" scenario value.[231] However, a bond could serve, at the very least, as a means of recourse for those who may suffer as a result of a mill tailings facility failure.

c. Decomissioning Plan

In addition to providing bonding for the future decommissioning of a mine, an applicant for a license should also be required to submit a comprehensive plan for facility decommissioning and ultimate reclamation. This is already in place in certain states, and should be included in

---

[227] *See id.*
[228] *See supra* Parts IV.B–C.
[229] Lewis, *supra* note 132, at 644 (citing comments on the "Study Plan for the Swanson Uranium Project, Pittsylvania County, Virginia," submitted by the Marline Uranium Corporation and Union Carbide Corporation, April 15, 1983 to the Uranium Administrative Group).
[230] *Id.* at 644.
[231] *Id.*

Virginia's regulatory framework.[232] For instance, Utah's Mined Land Reclamation Act requires that a proposed permit must include a comprehensive reclamation plan, as well as provide surety for reclamation.[233] A decommissioning plan, coupled with a bonding requirement, would demonstrate a company's willingness and desire to have no lasting adverse impact on the state where the mine is located.

2. Post-Licensing Regulations

After a uranium company has obtained its license, and provided a bond for the potential damage and ultimate reclamation of the area, the regulations should aim to promote the health of those involved in the mining and milling processes, as well as the residents of the surrounding area. There should also be regulations in place to ensure compliance. Because any regulations geared towards human health would be focused on keeping radioactivity in the environment to a minimum,[234] they would have the ancillary benefit of protecting the surrounding environment.

a. Health and Environment

In order to ensure that the environment and the public health are adequately protected, Virginia should require that facilities aim to achieve environmental radiation output that is "as low as reasonably achievable."[235] This would serve the purpose of limiting worker exposure to radiation, as well as ensuring that a minimal amount of radiation is released into the surrounding environment. A lower amount of ambient radiation could help protect against the adverse health effects that were discussed above.[236]

b. Ensuring Compliance

Similar to Canada's plan, Virginia should allow inspectors to enter a mining or milling facility at any reasonable time and investigate the facility to ensure that it complies with all relevant regulations,

---

[232] *See, e.g.*, Slaughter, *supra* note 6, at 522 (referring to Utah's Mined Land Reclamation Act requirements).
[233] *Id.*
[234] *See, e.g.*, NAS REPORT, *supra* note 74, at 181.
[235] NAS REPORT, *supra* note 74, at 181.
[236] *See supra* Part III.B.

particularly those regulations pertaining to radiation containment and output.[237] Any facility not in compliance should be fined and subject to license review. The possibility of an economic fine, as well as the potential of losing an operational license, would hopefully deter non-compliance. With successful compliance, the facility could have a minimal impact on the environment and health of the surrounding area.

CONCLUSION

Uranium mining could well be on the horizon for Virginia. Given the amount of time required to establish an adequate regulatory framework, this Note suggests that the General Assembly should extend the uranium mining moratorium until a strong regulatory structure is in place. Ideally, the moratorium would continue until technology has advanced to the point that the threat to human health and the environment are negligible.

However, this Note recognizes there are potential significant economic benefits that will result if the moratorium is lifted and uranium mining begins in the Commonwealth. These benefits could persuade the General Assembly to lift the moratorium. In the event that the moratorium is lifted, a strong regulatory structure would be required. A good starting point would be the regulations in Colorado and Canada. An ideal structure would include, at the very least, requirements for environmental impact statements, public comment periods, and bonding, as well as requirements for a decommissioning and reclamation plan before a company could even obtain a license. After licensing, there must also be regulations in place to protect both health and human safety, as well as ensure compliance. While this Note provides a potential starting point, the General Assembly will have much work to do if uranium mining is in fact in Virginia's future.

---

[237] Nuclear Safety and Control Act, S.C. 1997, c. 9, s. 30 (Can.).