GRAND CANYON TRUST

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July 31, 2017

By Electronic Mail

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Re: Comments on the Proposed Renewal and Amendment of Energy Fuels Resources (USA), Inc.'s Radioactive Materials License and Groundwater Discharge Permit for the White Mesa Mill

Dear Mr. Anderson:

Thank you for the opportunity to comment on the Division of Waste Management and Radiation Control's proposal to renew Energy Fuels Resources (USA), Inc.'s radioactive materials license and groundwater discharge permit for the White Mesa Mill. We appreciate the effort the Division has made over the last decade to review Energy Fuels' license and permit applications, to prepare the proposed license and permit, and to solicit public comments. Ours are enclosed.

If the Division has any questions about our comments, we'd be glad to answer them.

Sincerely,

Aaron M. Paul

Enclosure

GRAND CANYON TRUST

Comments on the Proposed Renewal
of Energy Fuels Resources (USA), Inc.'s Radioactive Materials License and
Groundwater Discharge Permit for the White Mesa Mill

July 31, 2017

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Exhibit 38 Energy Fuels Resources (USA) Inc., *Responses to Review of August 15, 2012 (and May 31, 2012) Energy Fuels Resources (USA) Inc. Responses to Round 1 Interrogatories on Revision 5 Reclamation Plan Review, White Mesa Mill Site, Blanding, Utah, Report Dated September 2011* (Aug. 31, 2015).

Exhibit 39 Utah Division of Radiation Control, "Groundwater Discharge Permit No. UGW370004" (Aug. 24, 2012).

Exhibit 40 Utah Division of Radiation Control, "Groundwater Discharge Permit No. UGW370004" (2017).

Exhibit 41 R. Rager et al., *Abstract: Effect of Freezing and Thawing on UMTRA Covers*, Remedial Action Programs Annual Meeting (Oct. 18, 1988).

Exhibit 42 Utah Division of Radiation Control, Denison Mines (USA) Corp's Revised Infiltration and Contaminant Transport Modeling Report: Interrogatories – Round 1 (Mar. 2012).

Exhibit 43 Lawrence J. Bruskin & Steve Tarlton, *State of Colorado Experience with Waste Repository Covers and Caps*, Proceedings of the Workshop on Engineered Barrier Performance Related to Low-Level Radioactive Waste, Decommissioning, and Uranium Mill Tailings Facilities (Aug. 3, 2010).

Exhibit 44 U.S. Environmental Protection Agency, *Fact Sheet on Evapotranspiration Cover Systems for Waste Containment* (Feb. 2011).

Exhibit 45 Technical Memorandum from J. Luellen and R. Baird, URS Professional Solutions, to J. Hultquist, Utah Division of Radiation Control, *Review of August 15, 2012 (and May 31, 2012) Energy Fuels Resources (USA) Inc. Responses to Round 1 Interrogatories on Revision 5 Reclamation Plan Review, White Mesa Mill Site, Blanding, Utah, report dated September 2011* (Feb. 13, 2013).

Exhibit 46	William H. Albright & Craig H. Benson, *Alternative Cover Assessment Program Report to Office of Research and Development, National Risk Management Research Lab, Land Remediation and Pollution Control Division* (2005).
Exhibit 47	U.S. Environmental Protection Agency, (Draft) Technical Guidance for RCRA/CERCLA Final Covers (Apr. 2004).
Exhibit 48	MWH, *Energy Fuels Resources (USA) Inc., White Mesa Mill: Preliminary Mill Decommissioning Plan* (Aug. 2016), Appendix B to Energy Fuels Resources (USA) Inc., Reclamation Plan: White Mesa Mill, Blanding, Utah – Radioactive Materials License No. UT1900479, Revision 5.1 (Aug. 2016).
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Exhibit 50	Craig H. Benson, *et al.*, Engineered Covers for Waste Containment: Changes in Engineering Properties and Implications for Long-Term Performance Assessment, NUREG/CR-7028 (Dec. 2011).
Exhibit 51	U.S. Government Accountability Office, *Uranium Mill Tailings: Cleanup Continues, but Future Costs Are Uncertain* (Dec. 1995).
Exhibit 52	U.S. Energy Information Administration, *Remediation of UMTRCA Title I Uranium Mill Sites Under the UMTRA Project, Summary Table: Uranium Ore Processed, Disposal Cell Material, and Cost for Remediation as of December 31, 1999* (Dec. 31, 1999).
Exhibit 53	U.S. Department of Energy, Office of Legacy Management, UMTRCA Title I Site Fact Sheets (Nov. 2016).
Exhibit 54	U.S. Department of Energy, *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project, Vol. I* (Oct. 1996).
Exhibit 55	Golder Associates Inc., *Alternatives Analysis of Contaminated Groundwater Treatment Technologies, Tuba City, Arizona, Disposal Site* (Feb. 20150.
Exhibit 56	U.S. Energy Information Administration, U.S. Department of Energy, *Decommissioning of U.S. Uranium Production Facilities* (Feb. 1995).
Exhibit 57	U.S. Environmental Protection Agency, *Cleanup of historic Uravan uranium mill completed* (Sep. 29, 2008).
Exhibit 58	Letter from S. Tarlton, Manager, Radiation Program, Colorado Department of Public Health and Environment, to J. Hamrick, Cotter Corporation (Arp. 22, 2010).
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Exhibit 61	U.S. Environmental Protection Agency, *Site Activities Update: Homestake Mining Company and Grants Mining District* (Aug. 2015).
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Exhibit 63	U.S. Nuclear Regulatory Commission, *Western Nuclear–Split Rock Uranium Recovery Facility* (undated).
Exhibit 64	U.S. Nuclear Regulatory Commission, *Environmental Assessment for Amendment to Source Materials License SUA-56 Ground Water Alternate Concentration Limits: Western Nuclear, Inc., Split Rock Uranium Mill Tailings Site, Jeffrey City, Freemont County, Wyoming* (Aug. 2006).
Exhibit 65	Lee Shenton, Grand County UMTRA Liaison, Moab UMTRA: Uranium Mill Tailings Remedial Action (May 2017).
Exhibit 66	U.S. Department of Energy, Inspector General, *Audit Report: Restoration of the Monticello Mill Site at Monticello, Utah* (Oct. 2004).
Exhibit 67	Division of Waste Management and Radiation Control, *Public Participation Summary for Comments Received Between October 14 and December 21, 2011*: *License Renewal for Radioactive Material License No. UT1900479, Energy Fuels Resources (USA) Inc. (EFRI), White Mesa Uranium Mill, San Juan County, Utah* (Mar. 2017).
Exhibit 68	U.S. Nuclear Regulatory Commission, *Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness* (Feb. 2012).
Exhibit 69	Division of Low-Level Waste Management and Decommissioning, U.S. Nuclear Regulatory Commission, *Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities* (Oct. 1988).
Exhibit 70	U.S. Department of Energy, Office of Inspector General, Office of Audits and Inspections, *Audit Report: Management of Long-Term Surveillance and Maintenance of Uranium Mill Tailings Radiation Control Act of 1978 Title II Sites*, OAS-L-15-02 (Oct. 2014).
Exhibit 71	Office of the Inspector General, U.S. Nuclear Regulatory Commission, Audit of NRC's Oversight of Decommissioned Uranium Recovery Sites and Sites Undergoing Decommissioning, OIG-12-A-06 (Dec. 13, 2011).
Exhibit 72	U.S. Department of Energy, *A Report to Congress Detailing DOE's Existing and Anticipated Long-Term Stewardship Obligations* (Jan. 2001).
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Exhibit 74	URS Professional Solutions, LLC, Safety Evaluation Report for Amendment Request to Process an Alternate Feed Material (the SFC Uranium Material) at White Mesa Mill from Sequoyah Fuels Corporation, Gore, Oklahoma (May 1, 2015).

Exhibit 75	Letter from John Ellis, President, Sequoyah Fuels Corp. to Clayton Eubanks, Oklahoma Attorney General's Office, and Sara Hill, Cherokee Nation Office of the Attorney General (July 24, 2015).
Exhibit 76	Utah Department of Environmental Quality, Divisions of Radiation Control and Water Quality, *Elements of a Utah Agreement State Program for Uranium Mills Regulation* (Aug. 26, 2000).
Exhibit 77	Amendment to Agreement Between the United States Nuclear Regulatory Commission and the State of Utah for Discontinuance of Certain Commission Regulatory Authority and Responsibility within the State Pursuant to Section 274 of the Atomic Energy Act of 1954, as Amended (Aug. 16, 2004).
Exhibit 78	Letter from J. Tischler, Director, Compliance and Permitting, Energy Fuels, to R. Lundberg, Director, Utah Department of Environmental Quality (Dec. 15, 2011).

I. Introduction and Executive Summary

The Utah Division of Waste Management and Radiation Control is proposing to renew the radioactive materials license and groundwater discharge permit that authorize Energy Fuels Resources (USA) Inc., to run the White Mesa uranium mill in southeast Utah and permanently bury radioactive wastes there.

The Division has no doubt made many improvements to the license and permit since they were first issued to Energy Fuels over a decade ago. We applaud those improvements, but our comments are directed at remaining shortcomings in these documents. Nearly all our comments are about the plan for reclaiming the mill and the surety bond that guarantees funding for doing so. That plan has several major flaws, particularly in the way that it handles reclamation deadlines. The surety doesn't guarantee enough funding for the possibility that reclaiming the mill won't go as planned. We also implore the Division to reject Energy Fuels' request to process and discard radioactive sludge from Sequoyah Fuels' defunct uranium-conversion plant in Oklahoma.

A point that deserves emphasis at the outset is that we are skeptical that a seven-year performance test of the proposed evapotranspirative cover needs to be completed before Energy Fuels reclaims impoundments at the mill. If the cover were to be improved to a state-of-the-art design, we doubt a performance test would yield especially useful information, given the risks posed by delay in reclaiming the mill's impoundments. This is particularly true because there is performance data available for the tailings repository built not far away in Monticello, Utah that can be considered in reclaiming the wastes at the White Mesa mill. Though we recognize that designing a tailings-impoundment cover is an exceedingly complex task that is fraught with uncertainty, we ask the Division to reconsider whether to require the company to make improvements to the evapotranspirative cover so that it reflects a state-of-the-art design and build the cover on Cell 2 at the mill promptly, without completing the performance test. Information and data gathered from the cover's performance on Cell 2 could be used to adjust the cover design for the remaining cells.

For ease of review, the other principal requests we make in these comments are listed below. This list isn't exhaustive and isn't meant to diminish the importance of other requests or critiques made elsewhere in these comments. We ask the Division to:

- Thoroughly and independently analyze the reclamation-cost estimates Energy Fuels has made and the probabilities that those estimates may prove inaccurate given the cost of closing other uranium mills throughout the country, and require a surety amount (including a contingency) that conservatively guards against the risk that reclamation costs greatly exceed the company's forecasts.

- Require Energy Fuels to forecast the cost of building the evapotranspirative cover proposed in Reclamation Plan Revision 5.1, in addition to the 1996 conventional cover design described in Reclamation Plan Revision 3.2, and base its surety on the more expensive plan.

- Complete a site-specific analysis of probable long-term costs at the White Mesa mill after reclamation, and establish a fund amount to be guaranteed in Energy Fuels' surety that is sufficient to cover long-term costs at an interest rate of one percent.

- Deny Energy Fuels' request to process the Sequoyah Fuels sludge.

- Require Energy Fuels to analyze alternatives for transporting the mill's radioactive wastes off site for permanent disposal.

- Revise the definition of "operation" that appears in Section 6.2.1 of Energy Fuels' Reclamation Plan Revision 5.1[1] to match the definition of "operation" in Appendix A to the Nuclear Regulatory Commission's uranium-mill-licensing rules.[2]

- Add the definition of "byproduct material" used in the Nuclear Regulatory Commission's regulations (that has been incorporated by reference under State law) to Plan Revision 5.1."[3]

- Clarify in Revision 5.1 that Appendix A's impoundment-closure requirements apply to all the cells at the mill, including Cells 1 and 4B, and will apply to any cells built in the future into which "byproduct material" is placed.[4]

- Include milestones in Revision 5.1 for closing all the mill's impoundments, including Cells 1 and 4B, as well as any other so-called "evaporation ponds" built in the future.[5]

- Change Revision 5.1's definition of "final closure" to match the definition in the U.S. Environmental Protection Agency's emissions standards for radon emitted from uranium-mill wastes, commonly called Subpart W.[6]

- Establish an absolute deadline in Revision 5.1 for removing freestanding liquids from cells that are no longer in operation, such as 180 days after final closure begins.

- Require Energy Fuels to stop adding liquids to impoundments as soon as final closure begins (rather than to "minimize" the addition of liquids) and to pump freestanding liquids into other operating cells, regardless of whether doing so will force the company to curtail mill operations.

- Eliminate the proviso in the impoundment-recontouring milestone that allows for more than 180 days to finish recontouring "as may be required if instability of the tailings sands restricts or hampers such activities."[7]

- Establish an absolute deadline for completing dewatering that is based on current modelling of how long it will take to meet the settlement-performance standard in the plan (e.g., for Cells 4A and 4B, 5.5 years after dewatering is commenced).

- Delete statements in Revision 5.1 that assert that deadlines cannot be established.[8]

- Establish reclamation deadlines as a condition of the radioactive materials license.

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[1] Ex. 1 at 6-1.
[2] 10 C.F.R. Part 40, App. A.
[3] 10 C.F.R § 40.4; Utah Admin. Code R313-24-4.
[4] Ex. 1 at 6-2.
[5] *See* Ex. 1 at 3-5 to 3-6 (discussing the planned closure steps for Cell 1).
[6] 40 C.F.R. Part 61, Subpart W.
[7] Ex. 1 at 6-4.
[8] Ex. 1 at 6-1.

- Revise the Stipulation and Consent Agreement executed in February 2017 to eliminate the provision in Section D.7.b.iii that automatically requires Energy Fuels to build the 1996 conventional cover if an impasse is reached on alternative evapotranspirative cover designs.

- Either rule out the possibility of building the 1996 conventional cover or update that design immediately to avoid future delay if the ET cover fails the performance test.

- Add a capillary break to the evapotranspirative cover design to minimize leachate that could contaminate groundwater unless the Division concludes that a capillary break would degrade the cover's performance.

- Add a composite barrier of compacted clay and a geomembrane beneath the evapotranspirative cover proposed in Revision 5.1 unless there is compelling evidence that including a composite barrier would diminish the cover's effectiveness.

- Require Energy Fuels to increase the top-slope inclination of the evapotranspirative cover design unless doing so would diminish the cover's performance.

- Add a biointrusion layer to the evapotranspirative cover that is specifically designed to deter burrowing unless Energy Fuels can demonstrate that including that layer would degrade the cover's overall performance.

- Require Energy Fuels to design the liner for the so-called "Cell 1 Disposal Area" to meet EPA's design standards for hazardous-waste impoundments, which appear at 40 C.F.R. § 264.221.

- Require Energy Fuels to develop and carry out a functional monitoring plan to measure percolation rates through whatever final cover is built and monitor other cover properties that would help diagnose infiltration problems.

II. Background

A. The Grand Canyon Trust

The Grand Canyon Trust is a membership-based, non-profit advocacy organization founded in 1985 that has over 3,000 members. It's headquartered in Flagstaff, Arizona, and has offices in Castle Valley, Utah, and Durango and Denver, Colorado. The mission of the Trust is to protect and restore the Colorado Plateau – its spectacular landscapes, flowing rivers, clean air, diversity of plants and animals, and areas of beauty and solitude.

The Plateau is a physiographic region that stretches south-to-north from roughly the Mogollon Rim in northern Arizona to the Uinta Mountains in northern Utah and east-to-west from the Great Basin in Utah to the western side of the Rocky Mountains in Colorado and northwestern New Mexico. The White Mesa Mill sits near the heart of the Plateau.

One of the Trust's goals is to ensure that the Plateau is a region characterized by vast open spaces and healthy ecosystems with which human communities maintain a sustainable relationship. In service of that goal, the Trust has worked for years to oppose irresponsible uranium mining and milling on the Plateau, and to see that the contamination around the Plateau that the uranium industry has repeatedly left in its wake is cleaned up.

B. The White Mesa Mill

The White Mesa Mill is an acid-leaching, uranium-processing mill that turns uranium ore and other uranium-bearing substances into a product called yellowcake, which is then enriched for use in nuclear reactors. Black flake, a substance used in other industrial processes, is also made at the mill by extracting vanadium from some feeds. Mostly what comes out of the mill, though, is radioactive waste. This waste, commonly called tailings, is discarded in big pits spanning about 275 acres next to the mill. There are five of these pits, or "impoundments," at the mill, named Cell 1, Cell 2, Cell 3, Cell 4A, and Cell 4B. They and the mill are about five miles north of the centuries-old Ute Mountain Ute tribal community of White Mesa and about six miles south of downtown Blanding.

A company called Energy Fuels Nuclear, Inc., built the mill in the late 1970s to process low-grade uranium ore from the surrounding region.[9] Back then, the company planned to run the mill for 15 years, then close and reclaim it.[10] The radioactive tailings were to be cleaned up in phases while the mill was operating.[11]

But that didn't happen. Instead, Energy Fuels Nuclear, fired up the mill in 1980, made yellowcake for about three years, and pumped the resulting radioactive tailings into Cells 1, 2, and 3.[12] Then, when the price of yellowcake plummeted, the company fired most of the mill's workers and let the mill go dormant.[13] This pattern has continued ever since. An ore-processing "campaign" is run when yellowcake is fetching a good price, and then the mill lapses into "standby" when the price of yellowcake falls.[14] Though 37 years have passed, not one of the mill's big waste pits has been reclaimed.

Ownership of the mill has been similarly tumultuous. Over the years, it has changed hands at least four times.[15] In the mid-1990s, after Energy Fuels Nuclear sold and rebought the mill, the company ran out of money. When it couldn't pay its employees, it fired them.[16] Within a month, the asset-holding parts of Energy Fuels Nuclear declared bankruptcy,[17] and the business was eventually liquidated.[18]

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[9] Ex. 2 at 1-3 (arguing that the mill has independent utility for the purpose of processing low-grade, regional ores); *id.* at 10-21 (observing that small mines with low-grade ore would not be economically viable without the mill); Ex. 1 at 2-1.
[10] Ex. 2 at iii (explaining that production will last for 15 years); *id.* at 1-1, 3-15 (same); id. at 3-18 (showing projected operating life of 15 years and phased reclamation schedule extending no more than 5 more years) *id.* at 4-3 ("Based on the capacity of the tailings cells, the mill has a potential to operate 15 years."); Ex. 3 at 1-2 ("The mill is planned to have a 2,000 tons-per-day capacity and a projected life of 15 years."); *id.* at 5-38 ("The area occupied by the proposed mill and tailing retention system (about 310 acres) would be committed until the life of the mill ends, about 15 years.").
[11] Ex. 2 at 3-17 ("The tailings ce1ls will be reclaimed sequential1y as each cell is filled, beginning after about the fourth year of operation and every four years thereafter until termination of project operations.").
[12] Ex. 4 at 11 (Table 3 showing "tailings placement period" beginning in 1980 for Cell 2, 1982 for Cell 1, and 1983 for Cell 3).
[13] Ex. 5 at 2–3; Ex. 6; Ex. 7.
[14] Ex. 4 at 5 (showing "standby" periods in 1984, 1991–1994, 2000–2004, with minimal production in 1998 and 2005).
[15] Ex. 1 at 2-1.
[16] *See* Ex. 8.
[17] Ex. 9 at Addendum to Permit Transfer Request (p. 37).
[18] Stephane A. Malin, The Price of Nuclear Power: Uranium Communities and Environmental Justice, 96 (2015) ("Malin").

Today, a company called Energy Fuels, Inc., owns and operates the mill through subsidiaries. Energy Fuels is careful to claim that it and Energy Fuels Nuclear are "unrelated entities," [19] perhaps to distance itself from any liabilities that Energy Fuels Nuclear could not discharge through bankruptcy. But Energy Fuels, Inc., was formed in 2005 by a prior owner of Energy Fuels Nuclear[20] and touts on its website that "much of our senior management team began their careers and learned about the U.S. uranium industry from the earlier successes of Energy Fuels Nuclear."[21]

The mill's business model has also changed over time, no doubt due to volatility in the uranium market. Around the early 1990s, Energy Fuels Nuclear began pursuing a new source of revenue by processing "alternate feeds" and discarding the resulting waste at the mill. These feeds include uranium-bearing wastes from other contaminated places around the country. In 1998, for example, Energy Fuels[22] was paid over $4 million to process and dispose of radioactive soil that was contaminated not only by the Manhattan Project, but also by other industrial and chemical ventures.[23] From these sorts of feeds, the waste pits at White Mesa now contain radioactive and contaminated wastes from rare-metals mining,[24] uranium-conversion plants,[25] and contaminated defense facilities,[26] among other sources. The sludge from Sequoyah Fuels' defunct uranium-conversion facility that the company is seeking permission to process would bring the list of materials that Energy Fuels has been licensed to process to seventeen.

By running its business, Energy Fuels has also fouled the groundwater beneath the mill. Exactly how some of that contamination got into the groundwater aquifers beneath the mill is a subject of debate. But it's undebatable that the groundwater is contaminated by pollutants like nitrate, nitrite, chlorides, and chloroform.

C. Wastes Generated by and Discarded at the White Mesa Mill

Two main waste streams are generated at the mill by processing ore and alternate feeds. The first is a radioactive slurry of crushed, watered-down, acid-soaked, leftover feed material that is pumped out of the mill from a series of eight big tanks called the counter-current-decantation circuit. The second is a uranium-depleted solution, sometimes called raffinate or "process solution," that is discharged from solvent-extraction circuits. Both waste streams are pumped into the waste pits next to the mill.

When the mill first started running in about 1980, Energy Fuels pumped the waste slurry from the counter-current-decantation circuit into Cell 2. Since about the same time, Cell 1 has been used to get rid of raffinate wastes. By the mid-to-late 1980s, Cell 2 was full, or nearly full, of tailings and the company stopped sending the slurry to that cell (though it may have eventually topped off the cell with tailings as late as the mid-1990s).[27] But the company did not close or reclaim the cell. Instead, it kept burying trash

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[19] Ex. 10 at 3.
[20] Malin at 95–96.
[21] Ex. 10 at 3.
[22] At the time, the mill was owned by a company called International Uranium (USA) Corporation. For simplicity's sake, these comments generally refer to the mill's prior owners as Energy Fuels.
[23] *See* Ex. 11 at 1 (observing that Energy Fuels would be paid a fee of $4 million to process and dispose of the material, an amount that far exceeded the value of the yellowcake to be produced).
[24] *See* Ex. 12 at 2–3.
[25] *See* Ex. 13 at 1.
[26] *See, e.g.*, Ex. 14 at 1–4.
[27] *See, e.g.*, Ex. 4 at 11 (Table 3); Ex. 15 (aerial photograph of the mill taken in 1983 showing Cell 2 to be mostly full of tailings); Ex. 16 at App. L p. 1 (asserting that "Cell 2 ceased receiving tailings in 1995").

and contaminated wastes in Cell 2 for about two decades.[28] Throughout that time, when the mill was running, Energy Fuels pumped the waste slurry from the counter-current-decantation circuit into Cell 3.[29] In October 2008, Energy Fuels rerouted the slurry into Cell 4A. Eventually, the company plans to pump that slurry into Cell 4B, which is now used to hold wastes siphoned from Cell 4A.

Wastes generated at operations that recover uranium by in-situ leaching are also buried in the mill's pits. Unlike alternate feed, these wastes aren't processed at the mill before being discarded. These wastes include, for example, barium sulfate sludge from treating waste solutions at an in-situ uranium leaching operation Wyoming.[30] Leaking shipments of that sludge have arrived at the mill twice since 2015.[31] In the past, similar wastes have been shipped, at a minimum, from Texas, Nebraska, and Wyoming to be buried at the mill.[32]

D. Source-Material and Byproduct Material Licensing

To mill uranium, Energy Fuels is required to get a license from the Utah Division of Waste Management and Radiation Control that authorizes the company to possess and process "source material"—generally meaning uranium ore—and to dispose of the waste "byproduct material" that the mill generates.[33] The Division is authorized to issue this license under state law, exercising authority delegated to the state by the U.S. Nuclear Regulatory Commission.

That delegation was made under the Atomic Energy Act of 1954, the fundamental federal law regulating source, byproduct, and other nuclear materials. That Act authorizes the Nuclear Regulatory Commission to issue regulations governing the possession and use of source and byproduct material "to promote the common defense and security or to protect health or to minimize danger to life or property…."[34]

The Commission has issued three main rules regulating uranium milling: (1) the agency's general standards setting radiation dose limits for the general public and mill workers (10 C.F.R. Part 20); (2) the Commission's rules for domestic licensing of source material (10 C.F.R. Part 40), which establish health, safety, financial, and other requirements that uranium-mill operators must meet to get a license; and (3) Appendix A to those licensing regulations, which establishes standards for managing and reclaiming mill tailings. The State of Utah has set its own radiation-dose standards and has adopted wholesale many, but not all, of the latter two Commission rules.[35]

The main requirements for managing and disposing of tailings originate from a federal law passed in 1978 called the Uranium Mill Tailings Radiation Control Act. Congress found in UMTRCA that "uranium mill tailings located at active and inactive mill operations may pose a potential and significant radiation health hazard to the public" and sought to regulate tailings in "a safe and environmentally sound manner … to prevent or minimize radon diffusion into the environment and to prevent or minimize other

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[28] *Id.*
[29] *Id.*
[30] *See* Ex. 17.
[31] *Id.*
[32] Ex. 18.
[33] Utah Code § 19-3-104.
[34] 42 U.S.C. § 2201.
[35] Utah Admin. Code R313-24-4 (incorporating much of 10 C.F.R. Part 40 and Appendix A by reference); Utah Admin. Code R313-15 (establishing standards that apply to the Division's licensees for protection against ionizing radiation).

environmental hazards from such tailings."[36] It was to comply with UMTRCA that the Commission issued Appendix A.[37]

An important feature of UMTRCA is that it assigns to the U.S. Environmental Protection Agency the authority and responsibility for setting general standards "for the protection of the public health, safety, and the environment from radiological and nonradiological hazards" posed by processing and disposing of tailings.[38] The Nuclear Regulatory Commission's rules for managing and disposing of tailings—namely, Appendix A—must conform to EPA's general standards.[39] EPA's standards for operating uranium mills are set out in 40 C.F.R. Part 192, Subpart D. We discuss those rules in more detail below.

E. Reclamation Requirements

To renew Energy Fuels' radioactive materials license, the Division must be satisfied that the company's plan for closing and reclaiming the mill meets numerous technical and financial criteria.[40] Those criteria are set out in two places: (1) Appendix A to the Commission's regulations for domestic licensing of source material, which the Division has adopted by reference; and (2) state groundwater-protection rules.[41]

In broadest terms, Appendix A's goal is to secure "permanent isolation of tailings and associated contaminants by minimizing disturbance and dispersion by natural forces, and to do so without ongoing maintenance."[42] To that end, it sets standards for where to put tailings-disposal sites, designing and building those sites, gathering baseline environmental data before milling operations begin, protecting groundwater, monitoring and inspecting tailings-disposal areas, closing and reclaiming those areas, and minimizing air-quality impairments from milling.[43] Two types of financial guarantees are also required.[44] First, mill operators must arrange a financial surety before they start milling uranium that guarantees enough money will be available to properly reclaim the mill and its wastes if the mill operator defaults on that obligation.[45] Second, mill operators must pay the state a fee that generates enough interest to pay for long-term site surveillance by the state or federal government after the mill closes.[46]

As soon as a tailings impoundment at a uranium mill "ceases operation," Appendix A requires mill operators to expeditiously build a "final radon barrier" over the impoundment "in accordance with a written, Commission-approved reclamation plan."[47] The final radon barrier must be designed to work for at least 200 years and to limit average releases of radon-222 to 20 picocuries per square meter each second

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[36] 42 U.S.C. § 7901.
[37] Uranium Mill Licensing Requirements, 45 Fed. Reg. 65,521 (Oct. 3, 1980).
[38] 42 U.S.C. § 2022.
[39] 42 U.S.C. § 2114.
[40] *See* 10 C.F.R. § 40.31(h) (requiring uranium-milling applications to include written specifications for the disposition of byproduct material to achieve the requirements and objectives of 10 C.F.R. Part 40, Appendix A); Utah Admin. Code R313-24-4 (incorporating 10 C.F.R. 40.31(h) by reference).
[41] *See* Utah Admin. Code R313-24-4 (adopting Appendix A by reference but replacing Criteria 5B(1) through 5(H), 7A and 13 with Utah's ground water quality protection rules).
[42] 10 C.F.R. Part 40, App. A, Criterion 1.
[43] *See* 10 C.F.R. Part 40, App. A, Criterion 1–8A.
[44] *See id.* at Criterion 9–10.
[45] *Id.* at Criterion 9.
[46] *Id.* at Criterion 10.
[47] *Id.* at Criterion 6A.

(20 pCi/(m^2-sec)).[48] Other hazards posed by tailings impoundments—such as contaminants leaching into the ground or groundwater—must be controlled, eliminated, or minimized.[49] And impoundments must be closed to minimize future maintenance, meaning that the cover must hold up to earthquakes, floods, freezing, precipitation, intrusion from animals and plants, erosion, and nature's other onslaughts.[50] Deadlines for finishing the final radon barrier, retrieving windblown tailings, and stabilizing the tailings impoundment (including dewatering the impoundment) are to be established in a reclamation plan and as conditions of each mill's radioactive materials license.[51]

F. Reclamation Plan Revision 5.1

In connection with the radioactive materials license renewal, the Division is proposing to approve Revision 5.1 of Energy Fuels' reclamation plan. Plan Revision 5.1 describes how Energy Fuels intends to go about closing and reclaiming the mill and its waste impoundments,[52] and it sets out the company's estimates of what carrying out that plan will cost.[53]

Energy Fuels is proposing to build a monolithic evapotranspirative cover—often called the "ET cover"—to serve as the "final radon barrier" over most of the mill's impoundments.[54] According to the company, the ET cover has four layers: (1) 2.5' of interim cover, which is fill that Energy Fuels is supposed to place over the mill's waste pits to help reduce radon emissions while those pits are in use; (2) a 3–4' primary radon-attenuation layer made of highly compacted loam and clay; (3) a 3.5' "growth medium layer" that is supposed to store water, deter biointrusion, protect the primary radon-attenuation layer from frost, and further reduce radon emissions; and (4) a 0.5' erosion-protection layer composed of topsoil or topsoil-gravel mixture.[55] The basic idea behind this design is to use vegetation to absorb and remove precipitation from the cover through evapotranspiration so that precipitation doesn't seep into the tailings and eventually contaminate groundwater.

This design departs from the one Energy Fuels proposed in the last version of its reclamation plan, which the State approved in January 2011.[56] That plan called for construction of a "conventional" cover that Energy Fuels designed in 1996. That cover design would use a compacted clay layer placed on top of the interim cover to repel water infiltration into the tailings. From the bottom up, the cover would have a one-foot clay layer, two feet of compacted random fill, and 3 to 8" of rock armor on the top and sides.[57]

Though, according to Energy Fuels, final closure of Cell 2 began in or before 2008, and though federal and state law require Energy Fuels to expeditiously build a final radon barrier over closed cells in accordance with an approved reclamation plan, [58] Energy Fuels isn't planning to build a final radon barrier

[48] *See* Appendix A, Criteria 6 & 6A. A picocurie (pCi) is one trillionth of one curie (Ci), which is a unit for measuring the intensity of radioactivity of a material. See U.S. Nuclear Regulatory Commission, "Curie (Ci)," "Picocurie (pCi)" available at http://www.nrc.gov/reading-rm/basic-ref/glossary.html.
[49] *Id.* at Criterion 6.
[50] *Id.* at Criterion 6.
[51] *See* Appendix A, "Reclamation Plan" and Criterion 6A.
[52] *See generally* Ex. 1 at 3-1 to 5-2.
[53] *See* Ex. 19.
[54] *See* Ex. 1 at I-2, 3-4.
[55] Ex. 1 at 3-4.
[56] Ex. 20.
[57] Ex. 20 at 3-7.
[58] 10 C.F.R. Part 40, App. A, Criterion 6A.

over Cell 2 for at least six or seven years.[59] The problem is twofold. First, Energy Fuels' currently approved reclamation plan—Revision 3.2—is subpar, at best. Though the plan's exact shortcomings are debatable, at the very least, the conventional-cover design it includes may allow more precipitation to seep through the cover and into the tailings, which increases the risk of groundwater contamination.[60] And in any event, Revision 3.2 is badly outdated. Second, the Division isn't convinced that the ET cover proposed in Plan Revision 5.1 will be effective either.[61]

So, rather than cover Cell 2 with Revision 3.2's conventional design or Revision 5.1's evapotranspirative design, the Division and Energy Fuels have agreed in a Stipulation and Consent Agreement to build two small test sections of the ET cover in the corner of Cell 2 and gather performance data from them for seven years.[62] If the test sections meet performance criteria (for how much precipitation seeps through the cover and how much vegetation grows on the cover), then Energy Fuels will finish building the ET cover on Cell 2.[63] If the test sections don't meet those criteria, Energy Fuels will have a chance to revise the design to the Division's satisfaction.[64] If the Division is ultimately unsatisfied with Energy Fuels' proposed design, then the Consent Agreement calls for Energy Fuels to build the conventional cover on Cell 2.[65] According to the company's plan, the cover selected for Cell 2 eventually would be built on Cell 3, Cell 4A, part of Cell 1, and on Cell 4B depending on what kind of wastes go in that cell.[66]

III. The Division should require Energy Fuels to revise Reclamation Plan Revision 5.1.

A. The Division should require Energy Fuels to evaluate off-site disposal alternatives.

The possibility of moving the mill's radioactive wastes away from the mill to an off-site repository has never been examined. Yet the Division's rules require applicants for amended radioactive materials licenses to evaluate alternatives to the proposed licensing action, "including alternative sites and engineering methods, to the activities to be conducted pursuant to the license or amendment."[67] Under that rule, the Division should require Energy Fuels to evaluate the relative environmental impacts and costs of moving radioactive wastes from the mill to an off-site disposal location.

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[59] *See* Ex. 21 at 5 (providing for a cover test section to be constructed and monitored for seven years to see how well it works).
[60] Ex. 22 at E-8; *see also* Ex. 23 at 8 (acknowledging that the ET cover may perform better than the conventional cover).
[61] Ex. 23 at 8 ("The [Division] staff had a number of concerns with the proposed cover system and has worked with [Energy Fuels] through several rounds of interrogatories to resolve those concerns. Unfortunately, [Energy Fuels] could not resolve all of staff's concerns from information available during the review process.")
[62] Ex. 21 at 4–5.
[63] Ex. 21 at 7. There are two performance metrics. The average measured percolation rate from the base of a lysimeter in what's called the "primary test section" must be 2.3 mm/year or less during the five-year performance period. Ex. 21 at 5–6. At least 40 percent of the primary and supplemental test sections must be covered by live vegetation with "acceptable vegetation diversity" by the end of the 5-year performance period. Ex. 21 at 6.
[64] Ex. 21 at 7.
[65] Ex. 21 at 7.
[66] Ex. 1 at 3-3 to 3-6.
[67] R313-24-3(1)(c).

In 2005, the Department of Energy analyzed off-site-disposal options for tailings that were discarded by the Atlas uranium mill's owner on the banks of the Colorado River outside Moab, Utah.[68] Moving those tailings to the White Mesa mill was an alternative the Department considered.[69] Ultimately, the Department rejected that alternative, concluding that a new repository in Crescent Junction was a better disposal location.[70] Among its reasons were that the Crescent Junction site had better geologic isolation than White Mesa (reducing the risk of groundwater contamination) and fewer conflicts about using that area for radioactive-waste disposal.[71] EPA echoed these observations in comments on the Department's analysis.[72]

This evaluation suggests that off-site disposal alternatives for the radioactive wastes at the White Mesa mill may well be superior to permanently burying those wastes at the mill. Accordingly, the Division should insist that Energy Fuels analyze those alternatives so that the public and the Division may assess the relative environmental impacts and costs of off-site-disposal options. Particularly if the Division adheres to its planned performance test for the ET cover, and the cover ultimately fails that test, having an analysis of off-site disposal options in hand would be valuable. And it would be helpful to understand the prospects for off-site-disposal alternatives even if the Division abandons the performance test and requires Energy Fuels to promptly build a final cover on Cell 2, for some (if not most) of the mills cells will not be reclaimed for many years and could be moved off-site rather than capped in place.

B. The definitions and standards used to establish reclamation milestones should be revised to be consistent with federal and state law.

Reclamation Plan Revision 5.1 uses several definitions and standards that are at odds with the impoundment-closure standards in federal and state law. The problem lies with how the plan redefines two regulatory terms of art—"operation" and "final closure"—that control when Appendix A's impoundment-cleanup requirements and deadlines are triggered. These inconsistencies should be eliminated to ensure that the company closes impoundments promptly and in compliance with the law.

1. Background

When a tailings impoundment "ceases operation," Appendix A requires uranium mill operators to expeditiously build a "final radon barrier" over the impoundment "in accordance with a written, Commission-approved reclamation plan."[73] Reclamation plans must have clear, enforceable deadlines, or as Appendix A puts it, "a schedule for reclamation milestones that are key to the completion of the final radon barrier…."[74] Milestones aren't flexible target timeframes or performance goals; they're "an action or event that is required to occur by an enforceable date."[75]

[68] Ex. 24 at S-2.
[69] Ex. 24 at S-9.
[70] *See* Record of Decision for the Remediation of the Moab Uranium Mill Tailings, Grand Junction and San Juan Counties, UT, 70 Fed. Reg. 55,358, 55,358–359 (Sep. 21, 2005).
[71] Ex. 24 at S-12.
[72] Ex. 25 at 4–5, 19 (observing that Energy Fuels' tailings-cover design may be inadequate).
[73] 10 C.F.R. Pt. 40, Appx. A, Criterion 6A; Utah Admin. Code R313-24-4 (incorporating Criterion 6A and other parts of Appendix A by reference).
[74] 10 C.F.R. § Pt. 40, App. A, "Reclamation plan."
[75] *Id.* at "Milestone."

The event that triggers the expeditious-closure requirement for any given impoundment is taking that impoundment out of "operation."[76] Appendix A defines "operation" to mean that an impoundment is "being used for the continued placement of byproduct material or is in standby status for such placement."[77] Impoundments are in "operation," the definition goes on, "from the day that byproduct material is first placed in the pile or impoundment until the day final closure begins."[78] So, there are two conditions that are essential for an impoundment to cease "operation." "Byproduct material" must have been placed into the impoundment to initiate an impoundment's "operation," and "final closure" must have begun to end the impoundment's "operation."

2. Problems with the Reclamation Plan's Definitions

There are two main flaws with the definitions Energy Fuels has put in Reclamation Plan Revision 5.1. First, the Plan defines the term "operation" so that its impoundment-closure requirements apply only to those impoundments used for disposing of "tailings sands," even though Appendix A's impoundment-closure requirements apply to impoundments used to dispose of any wastes produced by processing uranium. Second, the Plan defines the term "final closure" in a way that purports to allow final closure to begin under circumstances when it would not begin under federal and state law.

a. "Operation"

"Operation," according to Plan Revision 5.1, means a tailings impoundment that "is being used for the continued placement of *tailings sands* or is on standby status for such placement."[79] Under Appendix A, in contrast, impoundments are in "operation" when they're first used to dispose of "byproduct material," not just "tailings sands."[80] The term "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes."[81]

By its plain terms, Appendix A's definition of "byproduct material" includes everything that Energy Fuels puts in the cells at the mill: the mostly liquid raffinate wastes, semi-solid counter-current-decantation slurry, "tailings sands," and all the other uranium-milling wastes the company discards in the cells. Indeed, the radioactive materials license and groundwater discharge permit prohibit the company from disposing of anything other than "byproduct material" in the cells.[82] And in a pending Clean Air Act lawsuit, Energy Fuels has concurred that "byproduct material" under the Atomic Energy Act and UMTRCA includes all these wastes. "[B]yproduct material," the company argued, "is the broader category of waste produced at a mill and regulated under UMTRCA, while tailings"—by which Energy Fuels meant the same thing as "tailings sands"—"represent a form or subset of byproduct material."[83] Consequently, all the cells at the mill have been used for the placement of "byproduct material," and thus, all the cells have been put into "operation" under Appendix A. Any cell taken out of "operation" is therefore subject to the expeditious-closure and deadline requirements in Appendix A.

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[76] 10 C.F.R. Pt. 40, Appx. A, Criterion 6A; Utah Admin. Code R313-24-4 (incorporating Criterion 6A and other parts of Appendix A by reference).
[77] 10 C.F.R. § Pt. 40, App. A, "Operation."
[78] *Id.*
[79] Ex. 1 at 6-1 (emphasis added).
[80] 10 C.F.R. § Pt. 40, App. A, "Operation."
[81] 10 C.F.R. § 40.4; Utah Admin. Code R313-24-4 (incorporating 10 C.F.R. § 40.4 by reference).
[82] Ex. 26 at § 10.1.B; Ex. 39 at §§ I.C.2, I.D.7; *see also* Ex. 27 at § 10.1.B; Ex. 40 at §§ I.C., I.D.7.
[83] Ex. 28 at ECF p. 39–40.

By defining "operation" to refer only to impoundments that have received "tailings sands," Plan Revision 5.1 unlawfully purports to limit Appendix A's impoundment-closure requirements only to impoundments that have received "tailings sands." The Plan doesn't say what "tailings sands" are or which cells have received them, but Energy Fuels has argued in pending litigation that the slurry pumped over the years to Cells 2, 3, and 4A is the only source of "tailings sands" at the mill.[84] Thus, under the company's view of the facts, "tailings sands" have not been discarded in Cells 1 and 4B (even though part of the slurry from the counter-current-decantation circuit has been siphoned into Cell 4B). And that being so, under the company's tailings-sands-based definition of "operation," Cells 1 and 4B would not be subject to Appendix A's expeditious-closure requirements when they are no longer in use.

That outcome would be contrary to Appendix A, whose expeditious-closure requirements apply to all cells at the mill. The Division accordingly should require Energy Fuels to revise Plan Revision 5.1 to use a definition of "operation" that is identical to the definition in Appendix A and to clarify how it applies to the mill's cells. In particular, the Division should require Energy Fuels to revise Section 6 of Plan Revision 5.1 as follows:

- The definition of "operation" that appears in Section 6.2.1 should be changed to match the definition in Appendix A: "Operation means that a uranium or thorium mill tailings pile or impoundment is being used for the continued placement of byproduct material or is in standby status for such placement. A pile or impoundment is in operation from the day that byproduct material is first placed in the pile or impoundment until the day final closure begins."[85]

- The definition of "byproduct material" used in the Nuclear Regulatory Commission's regulations (that has been incorporated by reference under State law) should be added to the Plan. The pertinent part of that definition is: "Byproduct Material means the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes."[86]

- The Plan should clarify that Appendix A's impoundment-closure requirements apply to all cells at the mill, including Cells 1 and 4B, and will apply to any cells built in the future into which "byproduct material" is placed. Thus, for example, the plan's description of the existing "tailings management system at the Mill" should be revised to confirm that there are currently five waste impoundments at the mill: Cell 1, Cell 2, Cell 3, Cell 4A, and Cell 4B.[87]

- The Plan should include milestones for closing all the mill's impoundments, including Cells 1 and 4B, as well as any other so-called "evaporation ponds" built in the future. Thus, for example, the Plan should have deadlines for closing Cell 1 when it is taken out of operation and deadlines for closing Cell 4B if it is taken out of operation before Energy Fuels starts pumping "tailings sands" from the counter-current-decantation circuit into that cell. At a minimum, for closing "evaporation ponds," the Plan should have deadlines for removing freestanding liquids; excavating solids, contaminated soil, and the liner and burying those materials in an operating tailings cell; and

[84] Ex. 28 at ECF p. 15.
[85] 10 C.F.R. Part 40, App. A.
[86] 10 C.F.R § 40.4; Utah Admin. Code R313-24-4.
[87] Ex. 1 at 6-2.

building a final radon barrier over any section of those impoundments that will be covered in place.[88]

b. "Final Closure"

The second flaw in Plan Revision 5.1's impoundment-closure definitions is that the company has given the term "final closure" a meaning that is inconsistent with federal and state law. Neither Appendix A nor any other regulations adopted by the Nuclear Regulatory Commission define the phrase "final closure." EPA has, however, defined that phrase in a separate set of Clean Air Act rules, commonly called Subpart W,[89] that apply to tailings impoundments. And the State has incorporated Subpart W into state law by reference.[90]

For the reasons set out below, EPA's definition should control when "final closure" begins under Appendix A. Energy Fuels, however, has given the term "final closure" a different definition in Plan Revision 5.1. Final closure begins, according to the Plan, when an impoundment:

> (A) is no longer being used for the continued placement of tailings sands and [Energy Fuels] has advised the Director in writing that the impoundment is no longer being used for the continued placement of tailings sands and is not on standby status for such placement; or
>
> (B) is no longer being used for the continued placement of tailings sands, interim cover has been placed over the entire surface area of the impoundment, and dewatering activities have begun; or
>
> (C) the Mill facility as a whole has commenced final closure and a written notice to that effect has been provided to the Director in accordance with this Plan.[91]

There are three main problems with this definition: (1) it doesn't match the definition in Subpart W, which could muddle when "final closure" begins for differing regulatory purposes; (2) like the Plan's definition of "operation," it also improperly purports to apply the concept of "final closure" only to those impoundments that contain "tailings sands" and not all impoundments containing uranium byproduct material; and (3) it creates an internal inconsistency in the Plan by allowing, under Option B, for "final closure" to begin when interim cover has been placed over an entire cell and dewatering has begun even though the Plan has milestones for placing interim cover and dewatering *after* final closure begins.

For the reasons set out below, the Division should require Energy Fuels to update Plan Revision 5.1 so that the definition of "final closure" matches the definition in Subpart W.[92]

i. EPA's Regulation of Tailings Impoundments

When Congress passed UMTRCA in 1978, it directed EPA to establish general standards to protect public health and the environment from hazards posed by processing and disposing of uranium-

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[88] *See* Ex. 1 at 3-5 to 3-6 (discussing the planned closure steps for Cell 1).
[89] This refers to 40 C.F.R. Part 61, Subpart W.
[90] Utah Admin. Code R307-214-1.
[91] Ex. 1 at 6-2.
[92] 40 C.F.R. § 61.251(n).

milling tailings.[93] It also required the Nuclear Regulatory Commission's rules to conform to EPA's general standards.[94] For operating uranium mills, those standards are set out in 40 C.F.R. Part 192, Subpart D. EPA's initial version of those standards were issued in 1983 and included design, operating, and closure standards for the pits at uranium mills in which tailings are buried.[95] For example, these standards required impoundments to be closed so that radon releases would not exceed 20 pCi/(m^2-sec) for 1,000 years.[96] The Commission revised its own regulations (in Appendix A) in 1985 to conform to EPA's rules.[97]

By the late 1980s, EPA realized its rules had a flaw: They failed to set deadlines for closing tailings impoundments.[98] Though the rules had performance standards that closed impoundments must meet, there was no mandate for when mill operators, like Energy Fuels, had to meet those standards. EPA set out to fix this problem in a rulemaking under the Clean Air Act.

That story starts in late 1979, when EPA designated radionuclides as a "hazardous air pollutant" under the Clean Air Act after finding that exposure to radionuclides increases the risk of getting cancer and suffering genetic damage.[99] At the time, the Clean Air Act required EPA to set emission standards for hazardous air pollutants that would protect the public health from those pollutants with an "ample margin of safety."[100] In 1986, EPA concluded that radon emitted from tailings impoundments poses a significant enough health risk (particularly of lung cancer) to warrant establishing emission standards for those releases under the Clean Air Act.[101] Those standards—codified at 40 C.F.R. Part 61, Subpart W—required mill operators to phase out big, radon-emitting tailings impoundments and transition to using just two smaller impoundments that were to be cleaned up one-by-one as they filled up, ceased "operation," and "final closure" began.[102] This was the first use of the term "final closure" in regulating uranium-mill impoundments.

In 1989, EPA added a new rule to those standards—40 C.F.R. Subpart T—to set impoundment-closure deadlines and thereby fix the closure-limbo problem created by the agency's 1983 UMTRCA rulemaking.[103] EPA recognized that "[t]he existing UMTRCA regulations set no time limits for the

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[93] 42 U.S.C. §§ 2022, 2114.
[94] 42 U.S.C. §§ 2022, 2114.
[95] *See* Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites, 48 Fed. Reg. 45,926, 45,946–47 (Oct. 7, 1983).
[96] *Id.*
[97] *See* Uranium Mill Tailings Regulations: Conforming NRC Requirements to EPA Standards, 50 Fed. Reg. 41,852 (Oct. 16, 1985).
[98] *See* Health and Environmental Standards for Uranium and Thorium Mill Tailings, 58 Fed. Reg. 60,340, 60,341 (Nov. 15, 1993) ("Both the UMTRCA standards promulgated by EPA in 1983 and the implementing NRC standards promulgated in 1985, failed to require or otherwise establish compliance schedules to ensure that the tailings piles would be expeditiously closed, and that the 20 pCi/m^2-s standard would be met, within a reasonable period of time.").
[99] National Emission Standards for Hazardous Air Pollutants: Addition of Radionuclides to List of Hazardous Air Pollutants, 44 Fed. Reg. 76,738, 76,738 (Dec. 27, 1979).
[100] Pub. L. 91-604 § 4(a), 84 Stat. 1685.
[101] National Emission Standards for Hazardous Air Pollutants: Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings, 51 Fed. Reg. 34,056, 34,056–57 (Sep. 24, 1986).
[102] *See* 40 C.F.R. § 61.252(a) (1987) (requiring impoundments built after September 1986 to be closed in phases) and § 61.252(b), (c) (1987) (requiring impoundments existing as of September 1986 to be phased out of use).
[103] 54 Fed. Reg. 51,654, 51,683 (Dec. 15, 1989).

disposal of [tailings] piles" and "[s]ome piles have remained uncovered for decades emitting radon."[104] Setting closure deadlines in Subpart T, EPA asserted, would assure that impoundments "will be disposed of in a timely manner after they are removed from service," thereby reducing radon emissions and protecting public health.[105] To meet that goal, Subpart T gave mill operators two years to close impoundments after they ceased to be "operational."[106]

Protracted litigation over Subpart T ensued. Ultimately, a complex negotiation among EPA, the Nuclear Regulatory Commission, and affected states yielded an agreement to rescind Subpart T, but only after EPA amended its general standards under UMTRCA to require impoundments to be closed expeditiously according to deadlines, and only on the condition that the Commission amend Appendix A to conform to that change.[107] To define when those requirements would be triggered, EPA's revised general standards, adopted in 1993, borrowed a functionally equivalent version of the agency's own prior definition of "operation" from Subpart W, under which operation continues until "final closure" begins.[108] The Nuclear Regulatory Commission, as it is required to do, then conformed Appendix A to EPA's general standards, adopting EPA's definition of "operation" and its use of the term "final closure."[109] The upshot under these rules was that impoundments are subject to Subpart W's two-impoundment limit while they are in "operation," and they become subject to Appendix A when "final closure" begins and "operation" ends.

This history reveals three critical points about the term "final closure." First, EPA first coined that term for use in Subpart W in 1986. Second, Appendix A's mandate to close impoundments expeditiously and according to a deadline-driven reclamation plan after "operation" ceases and "final closure" begins was added at EPA's direction. Third, EPA used functionally identical definitions of "operation" in Subpart W and its general standards in Part 192 to establish a clear point at which impoundments were no longer subject to Subpart W's two-impoundment limit and had to be closed according to Appendix A.

In short, EPA is the architect of the impoundment-closure requirements and the author of the key regulatory language—including the terms "operation" and "final closure"—that trigger those requirements. EPA's definition of "final closure" should therefore control the meaning of that term under Appendix A.

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[104] *Id.*
[105] *Id.*
[106] *Id.* at 51,702.
[107] *See* National Emissions Standards for Hazardous Air Pollutants, 59 Fed. Reg. 36,280, 36,280–282 (July 15, 1994) (rescinding Subpart T and explaining the rule's history and other regulatory changes to 40 C.F.R. Part 192 and Appendix A that were made to ensure that closure deadlines were retained in those rules); Uranium Mill Tailings Regulations: Conforming NRC Requirements to EPA Standards, 59 Fed. Reg. 28,220, 28,220–221 (June 1, 1994) (conforming Appendix A to EPA's general standards and discussing the same rulemaking history).
[108] *Compare* 40 C.F.R. § 61.251(e) (1993) (defining "operation" to mean "an impoundment is being used for the continued placement of new tailings or is in standby status for such placement. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins") *with* 58 Fed. Reg. 60,340, 60,355 (adopting the same definition but using the phrase "uranium byproduct material" interchangeably with the term "tailings") (Nov. 15, 1993).
[109] 59 Fed. Reg. at 28,230 ("Operation means that a uranium or thorium mill tailings pile or impoundment is being used for the continued placement of byproduct material or is in standby status for such placement. A pile or impoundment is in operation from the day that byproduct material is first placed in the pile or impoundment until the day final closure begins.").

ii. Reclamation Plan Revision 5.1 should be revised to conform to EPA's definition of "final closure" as set out in Subpart W.

Earlier this year, EPA amended Subpart W. Among other revisions, the agency added a definition of "final closure" to that rule.[110] That definition says that "final closure" means "the period during which an impoundment … is being managed in accordance with the milestones and requirements in an approved reclamation plan." [111] It begins when:

> the owner or operator provides written notice to the [EPA] and to the Nuclear Regulatory Commission or applicable NRC Agreement State that:
>
> > (1) A conventional impoundment is no longer receiving uranium byproduct material or tailings, is no longer on standby for such receipt and is being managed under an approved reclamation plan for that impoundment or facility closure plan; or
> >
> > (2) A non-conventional impoundment is no longer required for evaporation or holding purposes, is no longer on standby for such purposes and is being managed under an approved reclamation plan for that impoundment or facility closure plan; ….[112]

The Division should require Energy Fuels to revise Plan Revision 5.1 so that the Plan's definition of "final closure" matches the definition in Subpart W. This is important for four reasons. First, EPA's definition makes clear that "final closure" begins only when the deadlines (a.k.a. "milestones") in the reclamation plan have been triggered.[113] That means, if deadlines don't start running, final closure can't begin, a critical condition to avoid delay. Second, EPA's definition leaves no doubt about when "non-conventional impoundments"—also called evaporation ponds—enter final closure and must be managed "in accordance with the milestones and requirements in an approved reclamation plan."[114] That fixes the problem that Energy Fuels' definition creates by referring only to impoundments used to discard "tailings sands," which are "conventional impoundments" according to Subpart W's definition of "final closure." Third, using the same definitions in Subpart W and the reclamation plan will ensure that the exact same event—proper notice to the Division and EPA—triggers "final closure," eliminating any possibility that Energy Fuels could claim that an impoundment is not in "operation" under Subpart W but also not in "final closure" under Appendix A. Fourth, adopting EPA's definition of final closure eliminates the internal inconsistency created by Energy Fuels' definition of that term when compared with the plan's milestones.

C. The reclamation deadlines in Revision 5.1 are inadequate.

1. Deadlines must be imposed for all key tasks for completing the final radon barrier.

Energy Fuels' reclamation plan lacks several deadlines the plan is required to have. Appendix A mandates that reclamation plans have "milestones that are key to the completion of the final radon

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[110] Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings, 82 Fed. Reg. 5,142, 5,179 (Jan. 17, 2017).
[111] 40 C.F.R. § 61.251(n).
[112] 40 C.F.R. § 61.251(n).
[113] *Id.* (final closure means the period when an impoundment is "being managed in accordance with the *milestones* and requirements in approved reclamation plan").
[114] *Id.*

barrier….”[115] At a minimum, milestones must be established for retrieving windblown tailings, stabilizing the impoundment (including removing freestanding liquids, recontouring, and dewatering), and finishing the final radon barrier.[116] Again, milestones aren't flexible goals. They're "an action or event that is required to occur by an enforceable date."[117]

Reclamation Plan Revision 5.1 has a handful of deadlines that run from the date "final closure" begins or from a prior reclamation step. For example, the plan commits Energy Fuels to recontour impoundments within 180 days after freestanding liquids are removed.[118] The interim cover must be finished anywhere from 19–33 months after recontouring is complete.[119] Other steps follow similar patterns.[120]

The plan sets no deadlines, however, for some key reclamation steps. Cell dewatering, for example, is subject to no time limit. Instead, the plan has a performance standard to determine when enough dewatering has occurred to allow for placement of the final-cover layers.[121] There is also no deadline for removing freestanding liquids.[122] Instead, the plan explains that, when final closure begins, Energy Fuels will "minimize" the addition of liquids to the impoundment, except for precipitation, and let liquids evaporate (unless they can be pumped elsewhere without interfering with mill operations).[123]

This doesn't comply with Appendix A. The "milestones" in reclamation plans must be actions or events that are "required to occur by an enforceable date."[124] The dewatering performance standard that Energy Fuels proposes thus doesn't qualify as a "milestone," nor does a commitment to "minimize" the addition of liquids to impoundments. Enforceable deadlines must be established for both tasks.

Energy Fuels asserts that the time needed to dewater and stabilize impoundments "depends on physical and technological factors beyond [its] control," and that it is thus "not possible to establish absolute deadlines or milestones" when the reclamation plan is approved.[125] This argument lacks merit for three reasons.

First, there are no exemptions from Appendix A's deadline-setting requirements, for factors beyond Energy Fuels' control or otherwise. Factors beyond the licensee's control are a failsafe for Appendix A's expeditious-closure standard, but they are not an excuse for leaving deadlines out of reclamation plans. Again, Appendix A requires impoundments to be closed "as expeditiously as practicable considering technological feasibility."[126] That is basically a performance standard—one that specifies how fast impoundments must be closed ("as quickly as possible") and what considerations may temper that

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[115] 10 C.F.R. Part 40, App. A, "Reclamation Plan" & Criterion 6A.
[116] 10 C.F.R. Part 40, App. A, "Reclamation Plan" & Criterion 6A.
[117] 10 C.F.R. Part 40, App. A, "Milestone."
[118] Ex. 1 at 6-3.
[119] Ex. 1 at 6-4.
[120] Ex. 1 at 6-5 (requiring vegetative cover to be planted in the first growing season after the final cover layers are built or, for the conventional cover design, that rock armor be placed 180 days after the final cover layers are built).
[121] Ex. 1 at 6-4 (settlement most slow to a rate of 0.1 feet for 12 months as measured in 90 percent of the settlement monitors installed in the impoundment).
[122] Ex. 2 at 6-3 to 6-4.
[123] *Id.*
[124] 10 C.F.R. Part 40, App. A, "Milestone."
[125] Ex. 1 at 6-1.
[126] 10 C.F.R. Part 40, App. A, Criterion 6A.

pace (physical characteristics of the site, technological limitations, compliance with other regulatory programs, and factors beyond the licensee's control).[127] So, when Energy Fuels points to "physical and technological factors beyond [its] control" as a reason not to set deadlines, it's borrowing language from Appendix A's definition of the phrase "as expeditiously as practicable considering technological feasibility."

But that language has nothing to do with Appendix A's deadline-setting requirements. Milestones must be established wholly apart from the expeditious-closure standard.[128] And there are no exemptions whatsoever from Appendix A's milestone requirements. Put differently, factors beyond a licensee's control may be an acceptable justification for missing a deadline, but they are not a justification for not setting one.

Second, there is a failsafe in Appendix A if deadlines cannot be met. Deadlines may be extended, but only after allowing public participation, only after finding that radon-222 releases from the impoundment are less than 20 pCi/(m^2-sec) on average, only if radon-222 emissions are monitored annually during the period of delay, and if an extension for placing the final radon barrier is sought based on cost, only after even more criteria are met.[129] By failing to include absolute deadlines in its plan, Energy Fuels is impermissibly attempting to bypass these requirements.

Third, it is possible to estimate how long it will take to stabilize an impoundment and set deadlines based on that estimate. For cell dewatering, in fact, Energy Fuels has already made those estimates for all the mill's impoundments. To develop Reclamation Plan Revision 5.1, Energy Fuels modelled the cell dewatering times for Cells 2 and 3 to be 10 years.[130] And the company has modelled the dewatering time for the cell design used for Cells 4A and 4B to be 5.5 years.[131] The company's reclamation plan also has comparable estimates of the time needed to dewater those cells, plus an estimate of two years to dewater Cell 1.[132] Comparable modelling can no doubt be completed for the time needed for evaporating the estimated volume of freestanding liquids at the time final closure begins.

The Division accordingly should insist that enforceable deadlines be established in Plan Revision 5.1 for all reclamation steps that are key to completing the final radon barrier, including removal of freestanding liquids and dewatering. It is essential that the schedule of milestones be structured so that the first deadline starts running the moment that "final closure" begins, and the time limit for each subsequent reclamation step is automatically triggered when the prior step is completed or the deadline for the prior step passes, whichever occurs first. And the Division should require Energy Fuels to eliminate all qualifications and caveats from the schedule, such as allowing for "such longer time as may be required [to recontour an impoundment] if instability of the tailings sands restricts or hampers such activities."[133] That

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[127] 10 C.F.R. Part 40, App. A ("As expeditiously as practicable considering technological feasibility, for the purposes of Criterion 6A, means as quickly as possible considering: the physical characteristics of the tailings and the site; the limits of available technology; the need for consistency with mandatory requirements of other regulatory programs; and factors beyond the control of the licensee. The phrase permits consideration of the cost of compliance only to the extent specifically provided for by use of the term available technology.").
[128] 10 C.F.R. Part 40, App. A, Criterion 6A and "Reclamation Plan" (expressing the expeditious-closure and deadline requirements separately).
[129] *See* Appendix A, Criterion 6A(2).
[130] Ex. 22, App. J at J-4.
[131] Ex. 29 at 9.
[132] Ex. 19 at "Cell 1Reclamation" (pp. 19 and 21 of 92); "Reclamation of Cell 2" (p. 24 of 92); "Reclamation of Cell 3" (p. 37 of 92); "Reclamation of Cell 4A" (p. 48 of 92); and "Reclamation of Cell 4B" (p. 59 of 92).
[133] Ex. 1 at 6-4.

is the only way to make sure that deadlines have teeth and can only be extended for a good reason after going through the process Appendix A demands.

A proper schedule would conceptually work as set out in the following table (though we don't pass judgment on whether the time limit listed below for each step is appropriate):

Reclamation Task	**Milestone**
Removing Freestanding Liquids	Freestanding liquids will be removed from the impoundment 180 days after final closure begins.
Recontouring	Recontouring of the impoundment will be complete 90 days after freestanding liquids are removed or 270 days after final closure begins, whichever occurs first.
Interim Cover Layers	Interim cover will be extended over the entire impoundment within 270 days after recontouring is complete or 540 days after final closure begins, whichever occurs first.
Dewatering	Dewatering of the impoundment will be complete within 5 years and 180 days days after interim cover is placed or 7 years after final closure begins, whichever occurs first.
Final Cover Layers	Final cover layers will be placed within 365 days after dewatering is complete or 8 years after final closure begins, whichever occurs first.
Reseeding Vegetative Cover	Seeding for revegetation will be complete within 270 days after the final cover layers are placed or 8 years and 270 days after final closure begins, whichever occurs first.

Composing the schedule this way is clear and establishes true "milestones" that are required to occur by an enforceable date. If Energy Fuels ends up needing more time for any task, it may request an extension as provided by Criterion 6A in Appendix A: after public participation, only if radon-222 emissions are monitored annually during the period of delay and stay below 20 pCi/(m^2-sec) on average, and if an extension for placing the final radon barrier is sought based on cost, only if the Division finds that Energy Fuels is "making good faith efforts to emplace the final radon barrier, the delay is consistent with the definition of available technology, and the radon releases caused by the delay will not result in a significant incremental risk to the public health."[134]

In addition to requiring Energy Fuels to modify the schedule of milestones in Revision 5.1 according to the structure illustrated above, the Division should require Energy Fuels to:

- Establish an absolute deadline for removing freestanding liquids, such as 180 days after final closure begins. Also, to meet Appendix A's requirement that impoundments be closed as quickly as possible considering technological feasibility, require Energy Fuels to stop adding liquids to the impoundment once final closure begins (rather than to "minimize" addition of liquids) and to pump freestanding liquids into other operating cells, regardless of whether doing so will force the company to curtail mill operations.

- Eliminate the proviso in the recontouring milestone that allows for more than 180 days to finish recontouring "as may be required if instability of the tailings sands restricts or hampers

[134] 10 C.F.R. Part 40, App. A, Criterion 6A.

such activities."[135] If Energy Fuels needs that deadline to be extended, it may apply for an extension as provided by Appendix A.

- Establish an absolute deadline for completing dewatering that is based on current modelling of how long it will take to meet the settlement performance standard in the plan (e.g., for Cells 4A and 4B, 5.5 years after dewatering is commenced). If the settlement performance standard is met before the deadline, then the deadline for the next reclamation task (placement of final cover layers) should be triggered. If the deadline cannot be met despite proceeding "as expeditiously as practicable considering technological feasibility," as that phrase is defined by Appendix A, then Energy Fuels may apply for an extension according to the process laid out in Criterion 6A. The same modification should be made to the Stipulation and Consent Agreement for completing the final cover on Cell 2.

- Delete the second paragraph in Section 6.1 of the plan, which inaccurately asserts that "it is not possible to establish absolute deadlines or milestones for reclamation at the time of approval of this Plan."[136] Delete comparable statements elsewhere in the Plan that deadlines cannot be established.[137]

- Set a deadline for establishing vegetative cover and diversity that meets the design criteria for the ET cover. This modification should also be made to the Stipulation and Consent Agreement for completing the final cover on Cell 2.

2. The schedule that applies if the mill is closed violates Appendix A.

If Energy Fuels decides to shut down the mill, Plan Revision 5.1 modifies the impoundment-cleanup deadlines that would apply to impoundments that are closed while the mill is running.[138] Rather than establish deadlines that run from the day final closure of each remaining impoundment begins (as required by Appendix A), Revision 5.1 says that Energy Fuels will submit a separate decommissioning schedule to the Division when the mill closes.[139] Only after the Division approves that schedule would any closure deadlines be triggered.[140]

Under this plan, Energy Fuels would start demolishing the mill and retrieving windblown tailings 180 days after the schedule is approved and "sufficient" solutions evaporate from the cell that the dismantled mill will go in.[141] Unreclaimed impoundments would be closed one-by-one, starting "as soon as reasonably practicable" after the Division approves the schedule.[142] So, if Energy Fuels closed the mill with five operating impoundments, until closure of the first impoundment was complete, the company wouldn't be required to start the first steps in its reclamation plan for the second impoundment—such as finishing placement of interim cover, recontouring, and dewatering (which could take years). And only after closing the second impoundment, would closure of the third impoundment have to begin, and so on. This could take decades.

[135] Ex. 1 at 6-4.
[136] Ex. 1 at 6-1.
[137] *See, e.g.*, Ex. 2 at 6-1 ("to the extent that they can be established at this time").
[138] *See* Ex. 1 at 6-5 to 6-6 (§ 6.2.4).
[139] *Id.*
[140] *Id.*
[141] Ex. 1 at 6-6.
[142] *Id.* at 6-6.

Impermissible delay taints this plan. The day "final closure" of an impoundment at the mill begins, the clock must start ticking on closure milestones—meaning enforceable deadlines—for that impoundment.[143] When mill closure begins, it's necessarily true that "final closure" of all operating impoundments will begin. Initiating closure of the mill, that is, necessarily means that the whole facility is being managed in accordance with the mill's reclamation plan, including all impoundments that were still in operation. And that means all operating impoundments will enter "final closure": namely, "the period during which [the] impoundment … is being managed in accordance with the milestones and requirements in an approved reclamation plan."[144] Thus, initiating mill closure must simultaneously trigger "final closure" of all operating impoundments. And under Criterion 6A of Appendix A, that must trigger closure milestones.

The upshot is twofold: (1) deadlines must be established for closing the last impoundment that account for decommissioning the mill and other structures and burying them in that impoundment before the final radon barrier is placed; (2) closure of all unreclaimed impoundments must proceed simultaneously, not one-by-one.

The reasoning behind the first point is simple. Energy Fuels plans to bury the mill and other leftover waste in the last open impoundment. Until that happens, it's impossible to place the final radon barrier on the last unreclaimed cell. And Appendix A requires a deadline to be set for completing the final radon barrier for that cell, like all others at the mill. Thus, to comply with Appendix A, a deadline must be established now for building the final radon barrier on the last unreclaimed cell that is based on a predicted decommissioning schedule for the rest of the mill.

The second point likewise follows from the standards in Appendix A. Closing impoundments one-by-one is impermissible under Appendix A because Criterion 6A insists that impoundments be closed "as expeditiously as practicable considering technological feasibility" after they stop operating.[145] That phrase means "as quickly as possible" considering physical site characteristics, technology, regulatory requirements, and uncontrollable factors.[146] Waiting to start reclaiming an impoundment until closure of another impoundment is complete, by definition, cannot amount to closing the idle impoundment "as quickly as possible." Energy Fuels hasn't identified any physical characteristics of the mill site, technological limitations, or regulatory requirements that would justify closing impoundments sequentially. And the Division should prohibit the company from doing so.

The Division accordingly should require Energy Fuels to revise the reclamation plan so that:

- Initiating mill closure also initiates final closure of all operating impoundments (including conventional and non-conventional impoundments alike, and triggers milestones for closing those impoundments;

- The plan includes a schedule for decommissioning activities that Energy Fuels must accomplish before completing the final radon barrier, such as dismantling the mill, digging up any non-conventional impoundments that won't be closed in place, and burying those materials in the last impoundment.

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143 *See* 10 C.F.R. Part 40, App. A, Criterion 6A; 40 C.F.R. § 61.251(n).
144 40 C.F.R. § 61.251(n).
145 10 C.F.R. Part 40, App. A, Criterion 6A.
146 10 C.F.R. Part 40, App. A, "As expeditiously as practicable considering technological feasibility."

3. Deadlines must be established as a condition of the radioactive materials license.

Criterion 6A in Appendix A is clear that "[d]eadlines for completion of the final radon barrier" and, if applicable, other interim milestones "must be established as a condition of the individual license."[147] The Division's draft radioactive materials license doesn't do that. It's completely silent on the subject.

The consequences of this lapse are more than ministerial. Under the Utah Radiation Control Act, civil penalties may be assessed for violating a radioactive materials license.[148] Thus, putting reclamation deadlines in the license, as the Division is required to do, will give Energy Fuels more incentive to meet them and the Division more clout if Energy Fuels doesn't.

The Division should correct this omission by stating as a condition of the license all milestones that are expressed in Plan Revision 5.1 (as revised according to our comments above).

D. Energy Fuels should not be allowed, let alone required, to revert to the cover design in Reclamation Plan Revision 3.2b.

If the ET cover test sections don't meet the performance criteria set out in the Stipulation and Consent Agreement, Reclamation Plan Revision 5.1 calls for Energy Fuels to build a cover that is "functionally equivalent to the Existing Cover Design presented in Reclamation Plan Revision 3.2b"—i.e., the "conventional cover" mentioned above.[149] That design was developed in 1996.[150] Calling it a conventional design means that compacted soil layers, rather than evapotranspiration, would be used to inhibit percolation of water through the cover. By all signs, this design would be far inferior at the mill to an evapotranspirative one.

Research since 1996 reveals that conventional designs often allow more water to permeate through the cover than the design was meant to allow, posing a risk of groundwater contamination. Indeed, the latest infiltration modelling for the 1996 conventional-cover design predicts that far more water will infiltrate through that cover than the ET cover. For that reason, installation of the conventional cover should not be an automatic backup plan if the ET cover doesn't meet the Consent Agreement's performance criteria. Only if the ET cover can't meet the Consent Agreement's performance criteria, and the conventional cover can, would it make any sense to revert to the conventional cover.

Regardless, the analysis supporting the conventional cover is badly out of date, casting serious doubt on whether that cover could possibly work as intended. For these reasons, the Division should not authorize contingent reversion to the conventional cover design. If the ET cover fails to meet the Consent Agreement's performance criteria, it would defy common sense and the law to allow Energy Fuels to build a *less* robust cover.

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[147] 10 C.F.R. Part 40, App. A, Criterion 6A.
[148] Utah Code § 19-3-109(1); see also Utah Admin. Code R313-14-15 (authorizing enforcement actions for violating legally binding "requirements") and R313-14-3(2) (defining "requirement" to include mandates such as license conditions).
[149] Ex. 1 at 5-1. *See also* Ex. 21 at 7 (§ D.7.b.iii).
[150] Ex. 30.

1. **In arid environments, conventional cover designs generally pose greater risk to groundwater than evapotranspirative designs.**

Performance evaluations from tailings and other waste covers built in the past several decades strongly suggest that evapotranspirative covers will outperform conventional covers in arid places, like White Mesa, Utah.

In addition to setting standards for cleaning up operating uranium mills, UMTRCA also created a program for cleaning up mills that were defunct by the time the law was passed in 1978. UMTRCA put the Department of Energy in charge of remediating these so-called "Title I" sites. Over the next 20 years,[151] the Department of Energy built 19 tailings disposal cells, mostly at uranium mills in the West, generally using a conventional design, though with a few vegetated covers.[152]

Research into how those and other tailings covers have fared reveals that these conventional designs often don't fend off water infiltration anywhere near as well as they were designed to. [153] Why? Deep-rooted plants, repeated freezing and thawing, desiccation, and construction defects, among other factors, can all degrade the cover.[154]

This research and other lessons learned from early Title I covers have led the Department of Energy to investigate evapotransipirative alternatives.[155] The cover built over the Monticello tailings site, which is about 25 miles from the White Mesa mill, is a leading example.[156] It's a composite design that has a traditional, compacted-soil layer on top of the tailings and an evapotranspirative cover on top of the compacted-soil layer, with a high-density polyethylene liner in between. The evapotranspirative cover has several elements. The top 8" are a gravel-soil mixture. Topsoil makes up the next 2'. Beneath that is about 16" of fine-grained soil to aid plant growth and provide frost protection. A foot of cobbles surrounded by soil are next to deter animals from burrowing into the cover. Another foot of fine-grained soil lies below that, then a geotextile separator. Last, a capillary break made of course sand sits above the liner as a place to store water until it's removed by evapotranspiration.[157]

Water-infiltration monitoring at the Monticello site (using a very large lysimeter) has revealed a rate of percolation through the cover of about 0.5 mm/year for the first thirteen years the cover was in service (through December 2012).[158] We've been unable to find directly comparable lysimeter data for conventional covers in the Title I program. But to provide some context, a percolation rate of 3.0 mm/year (often described in the literature as an EPA design target) corresponds to a saturated hydraulic conductivity of about 1×10^{-10} m/s. Measurements of saturated hydraulic conductivity from tests on some conventional covers have often yielded results showing far greater conductivity (with measurements as high as 2×10^{-6} m/s).

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[151] Ex. 31 at Table 1.
[152] Ex. 32 at 1.
[153] Ex. 33 at 4-6 ("Several studies have shown that [compacted soil layers] in conventional covers often fall short of low-permeability targets, often during or shortly after construction, and sometimes by several orders of magnitude."); Ex. 35 at 5.
[154] Ex. 34 at 2.
[155] Ex. 34 at 2.
[156] Ex. 35 at 3; Ex. 35 at 5.
[157] *See* Ex. 35 at 3–4; Ex. 34 at 2.
[158] Ex. 34 at 4; Ex. at Slide 15.

While it may be true that well-built conventional covers may be a defensible option under certain circumstances, the history of reclaiming Title I sites and recent research trends strongly suggest that evapotranspirative designs in arid environments will outperform conventional covers.[159]

2. **Modelling predicts the mill's 1996 conventional-cover design would put groundwater at more risk than alternatives.**

In Plan Revision 5.1, Energy Fuels abandoned the 1996 conventional-cover design principally because research and modelling show that more water is likely to infiltrate into conventional covers than ET covers.[160] In 2010, to help develop Revision 5.1, the company modelled infiltration and contaminant-transport for four possible cover types—three evapotranspirative designs and the 1996 conventional cover design.[161] Based on that modelling, Energy Fuels concluded without equivocation that the conventional cover should be eliminated from further consideration "because the model predicted much higher rates of infiltration."[162]

About 75 to 300 times more water would percolate through the conventional cover than the evapotranspirative alternatives, according to the model.[163] It that prediction were to pan out, over 200 hundred years (the minimum performance period under Appendix A), 22' of water would go through the conventional cover and into the tailings.[164] If the tailings have a porosity of 45% (the figure used in the company's updated infiltration modelling),[165] that would mean a water-level rise on the liner of about 49'.[166] At that rate, unless enough contaminated water goes through the bottom of the liner, it would overtop the liner edges near the surface. In comparison, the evapotranspirative cover with the best modelled performance would allow 0.066' through the cover over 200 years, if it works as expected.

The company's groundwater discharge permit (and the law on which it's based) requires Energy Fuels to reclaim the impoundments in a way that "minimize[s] infiltration of precipitation or other surface water into the tailings."[167] If the ET cover test sections prove to be too permeable and fail the Consent Agreement's performance test, the current modelling predicts that the conventional cover will perform even worse, and hence, cannot minimize infiltration into the tailings. It would violate this infiltration-minimization mandate to require Energy Fuels to revert to the conventional cover if the ET cover test does

[159] Ex. 37 at 3–4 (observing that, among the covers included in an EPA test program, conventional designs often allowed the most percolation, while ET designs performed better in arid regions).
[160] Ex. 22 at E-5 ("[R]ecent advances in cover design technology have emphasized the construction of vegetated, monolithic ET covers for minimizing infiltration through engineered cover systems, particularly in arid and semiarid regions.").
[161] Ex. 22 at E-1.
[162] Ex. 22 at E-8.
[163] Ex. 22 at E-7 (predicting an infiltration rate of 0.0092 cm/day for the conventional cover and a range of 0.00012 cm/day to 0.000031 cm/day for the evapotranspirative covers).
[164] Ex. 22 at Table E-2.
[165] Ex. 38 at 33.
[166] *See* Ex. 22 at ES-6, 3-2 (calculating water-level rise for the ET cover by dividing the total water flux by a tailings porosity of 57%).
[167] Exs. 39 and 40 at Part I.D.8(a); Utah Admin. Code R317-6-6.4 (allowing for discharge permits to issue if the applicant is "using best available technology to minimize the discharge of any pollutant"); 10 C.F.R. Part 40, App. A, Criterion 6(7) (requiring licensees to minimize leaching of contaminants into groundwater); *see also* Ex. 1 at 3-5 ("The key state and federal performance criteria for tailings cover design and reclamation include … [m]inimize infiltration into the reclaimed tailings cells."); *see also* Ex. 1 at 3-5 ("The key state and federal performance criteria for tailings cover design and reclamation include … [m]inimize infiltration into the reclaimed tailings cells.").

not meet performance expectations and the company doesn't come up with changes that satisfy the Division.

3. The 1996 analysis is outdated.

In 1996, Energy Fuels used modelling and other engineering assessments to evaluate how the conventional cover might perform. The key performance metrics the company considered were resilience from freeze-thaw cycles, radon attenuation, water infiltration, cover erosion, and slope stability.[168] That analysis is now over 20 years old and has many shortcomings. If the conventional cover or one similar to it were ever to be built at the mill, the analysis must be overhauled to justify adoption of that type of cover.

i. The freeze-thaw analysis uses obsolete data and modelling techniques.

When a tailings cover repeatedly freezes and thaws, its permeability can increase.[169] If that happens, the covered tailings may emit radon at a higher rate, and more water may infiltrate through the cover into the tailings, posing a risk of groundwater contamination.[170]

To determine whether freeze-thaw cycles would threaten the long-term durability of the conventional cover, Energy Fuels used a model in 1996 to forecast how deep frost would penetrate into the cover. The company fed a host of parameters—like average annual temperature, length of the freezing season, soil-freezing temperature, and soil-moisture content—into the model, which predicted that frost would form down to 6.8" into the conventional cover's 24" random-fill layer (the layer near the top, immediately beneath the rock armor).[171] Relying on that figure, the company concluded that freeze-thaw cycles wouldn't compromise the cover's ability to reduce radon emissions and surface-water infiltration (presumably because frost purportedly wouldn't get into the one-foot compacted clay layer beneath the 24" compacted random-fill layer).[172]

Those conclusions are no longer reliable, for there are post-1996 data and modelling techniques the company hasn't accounted for. In 2010, for example, Energy Fuels took new moisture-content measurements of the soil that is earmarked for the conventional cover's 24" random-fill layer.[173] Those measurements revealed the stockpiled soil to be drier than prior measurements.[174] As a result, Energy Fuels used a moisture content of 7.8% when it updated its freeze-thaw analysis in 2012 for the ET cover's 42" frost-protection layer, whereas it used a figure of 11.8% for the conventional cover's 24" random-fill layer,[175] even though the exact same soil stockpiles would be used for the main frost-protection layers in both cover designs.[176] The 2012 analysis for the ET cover also used a century's worth of temperature data from Blanding, Utah to predict the maximum depth that frost could be expected to reach over a 200-year

[168] Ex. 30 at 1–2.
[169] Ex. 41 (abstract of article reporting research results for tailings covers showing increases by an order of magnitude in hydraulic conductivity may occur from freeze-thaw cycles); Ex. 20 at 3-21 ("Repeated freeze/thaw cycles have been shown to increase the bulk soil permeability by breaking down the compacted soil structure.").
[170] *Id.*; Ex. 30, App. B, p. 1 of 32 (explaining that the upper cover layer subject to frost penetration "may not contribute to reductions of radon emanation from the tailings covers"); App. D, p. 3 of 34 (same for infiltration through the cover).
[171] Ex. 30 at 6–7, App. E at 2.
[172] Ex. 30 at 6–7.
[173] *See* Ex. 1 at 7–8 and Table 2-1.
[174] *Compare* Ex. 16 App. B. at Table A *with* Ex. 30 App. E at 3.
[175] *Compare* Ex. 16 App. B. at Table A *with* Ex. 30 App. E at 3.
[176] Ex. 16 at 2 ("The loam to sandy clay soil is the same material referred to in Titan (1996) as random/platform fill. This material is stockpiled at the site.").

period.[177] The 1996 model, in contrast, appears to have predicted only an average frost depth based on temperature, freezing-point, and frost-season data over some unknown period.[178]

Using updated modelling techniques and data, the 2012 analysis predicted a maximum frost-penetration depth of 32", which would extend through the ET cover's 6" erosion-protection layer and well into the 42" frost-protection and bio-intrusion layer.[179] That result suggests that the 1996 model understates the potential frost-penetration depth for the conventional cover.[180] And differences in cover design (such as differing degrees of compaction) cannot account for all of the difference between the 1996 and 2012 results.[181] Because frost-penetration depth increases as soil gets drier, for example, overstating the moisture in the 24" random-fill layer in the 1996 model, would have led the model to understate frost-penetration depth.[182]

Regardless, the 2012 analysis makes plain that new data and modelling methods are available that could yield a better frost-penetration estimate than produced by the 1996 model. Indeed, the Division (through its own expert) made that very point in its interrogatories examining Energy Fuels' reclamation proposal.[183]

ii. Similar deficiencies afflict other parts of the 1996 analysis.

It's not only the freeze-thaw analysis that's outdated. The results of that analysis, for example, were fed into the 1996 water-infiltration and radon-attenuation modelling.[184] So, inaccuracies in the frost-penetration estimate could cause inaccuracies in those other models.

Other analytical shortcomings pervade the 1996 radon modelling. Among the parameters put into that model to forecast long-term radon-emission rates were estimates of cover-moisture content, tailings and cover porosity, and tailings radium activity.[185] Each of these inputs is outdated, and others may be too. Like the freeze-thaw model, the radon model used a moisture value for the random-fill layer (9.8%) that has since been reduced based on new sampling.[186] Moisture data for the conventional cover's one-foot clay layer hasn't been updated since 1996.[187] New sampling data is available from which to calculate tailings and

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[177] *See* Ex. 16 App. B.
[178] Ex. 30 App E. at 2.
[179] *See* Ex. 16 at 16, App. B; Ex. 1 at 3-8 to 3-9.
[180] This is true even if some of the difference between the 1996 and 2012 results is due to differences in cover design.
[181] For example, the 24" random-fill layer in the Conventional Cover would be compacted more than the top layers of the ET Cover.[181]
[182] Ex. 16 App. B ("The depth of frost penetration is reduced when the soil-water content increases because frozen water insulates underlying soils, thus the drier the soil the greater the depth of frost penetration.").
[183] Ex. 42 at 5 ("The frost penetration depth estimate presented by TITAN Environmental (1996) is out of date and needs to be replaced with an updated frost penetration depth calculation.").
[184] Ex. 30 at App. D, p. 3 of 34 (explaining that 6.8" of frost-affected random fill were excluded from infiltration modelling); App. B, p. 1 of 32 (same for radon modelling).
[185] Ex. 30 at App. B, p. 2 of 32.
[186] *Compare* Ex. 30 at App. B, p. 5 of 32 *with* Ex. 16 at C-4 and Attach C.2 (using sampling conducted in 2010 and 2012 to derive a moisture content for the random-fill stockpiles of 6.7%). See also Ex. 16 at C-1 ("The loam to sandy clay soil used to construct the ET cover, referred to in previous reports (Titan 1996, Knight Piesold 1999) as random/platform fill, is stockpiled at the site.").
[187] Ex. 16 at E-3 (describing the "Section 16 clay" that was sampled in 1996 for the conventional cover design documents).

cover-material porosity.[188] Moisture and porosity, in turn, both affect the radon-diffusion coefficients used in the 1996 model for tailings and cover materials.[189] Energy Fuels has also updated its radium-activity estimates since 1996 based on the types of materials discarded in each cell.[190] Considering all these interrelated variables, it is plain the 1996 radon modelling is obsolete.

Similar deficiencies taint the 1996 water-infiltration model. The company predicted in 1996 that no precipitation would get through the conventional cover and into the tailings, but would instead all run off or evaporate.[191] This prediction is dead wrong according to the company's 2010 infiltration-and-contaminant-transport model, which again, forecasts that 22' of water would go through the conventional cover in the first 200 years.[192] Given these divergent model results, at least one model must be inaccurate, and the 1996 model is the more likely culprit, given its age, the inferior quality of the data, and other shortcomings in the model. According to the 2010 modelling report, for example, better models are available than the one used in 1996. [193] More precise data than that used in 1996 for precipitation and other variables is also available.[194] And the 2010 model rejected at least one important assumption used in 1996: that surface water would run off of the impoundments despite how flat they are.[195]

There are other shortcomings in the 1996 analysis. No vadose-zone contaminant-transport modelling was done to evaluate the likelihood that the cover will safeguard groundwater quality (though it was performed in 2010 for the ET cover).[196] And no analysis has ever been done of how much damage to the conventional cover is likely to be caused by biointrusion—from plant roots growing into the cover or animals burrowing into it. These are not trivial oversights. If 22' of precipitation goes through the conventional cover in its first 200 years of use (an amount 300 times that predicted to flow through the ET cover) it only stands to reason that the quantity reaching groundwater could be far greater than that predicted by the 2010 vadose-zone contaminant-transport modelling for the ET cover.[197] Root penetration, likewise, is a source of blame for deteriorated performance of conventional covers.[198]

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[188] Ex. 16 at C-3 (describing specific gravity and dry density testing of tailings and cover materials since 1996).

[189] *See* Ex. 16 at C-5.

[190] *See* Ex. 16 at Table C.1.

[191] Ex. 30 at 6 and App. D, p. 1 of 34.

[192] Ex. 22 at Table E-2.

[193] Ex. 22 at 3-2.

[194] *Compare* Ex. 22at E-6 (using a 57-year climate record (1932–1933) for precipitation and temperature input,) *with* Ex. 30 at App. D, p. 2, (explaining that the model used precipitation data from 1988 and 1990–93) p. 7 (using outdated, initial soil water content of 0.1180 (11.8%)).

[195] *Compare* Ex. 22 at 3-6 ("Given the flat nature of the cover (0.2 percent slope), no runon- or runoff-based processes were assumed to occur.") *with* Ex. 30 at App. D, pp. 1, 4 (explaining that model predicted precipitation would runoff soil cover or be evaporated and describing calculation of runoff curve).

[196] *See* Ex. 16 at 3 (explaining that ET cover design report "presents analyses not performed for the Titan (1996) design, including biointrusion, tailings dewatering, liquefaction, and settlement"); *compare* Ex. 30 (no analysis of these metrics) *with* Ex. 22 at 3-10 to 3-16, 4-5 to 4-16, App. L (explaining assumption that flux rates at the end of dewatering would presumably be equal to post-closure steady state because the increase in water levels is predicted to be minor, citing to infiltration modelling in Appendix E), and App. M.

[197] Ex. 22 at App. L at Figures L-2, L-3, L-4 (predicting the highest leakage through the cell liners when water levels in the tailings are the highest).

[198] *See, e.g.*, Ex. 35 at 1 ("Early cover designs rely on compacted soil layers to limit water infiltration and release of radon, but some of these covers inadvertently created habitats for deep-rooted plants. Root intrusion and soil development increased the saturated hydraulic conductivity several orders of magnitude above design targets."); Ex. 43 at 60 ("Numerous researchers, including Waugh and Richardson (1997),

Considering all these problems with the 1996 cover analysis, there's no disputing that the analysis is out of date and should be completely overhauled if the conventional cover is ever to be built. Sticking to the current Stipulation and Consent Agreement, which if all else fails, obliges Energy Fuels to build the conventional cover without updating the 1996 design would be reckless.

4. Recommendations

Years of delay in preparing a high-quality reclamation plan has caused a serious and complex problem. All the evidence suggests that the 1996 cover design is second rate, at best, and a reclamation travesty, at worst. Yet there are serious questions about whether the ET cover will also come up short. So, the solution the Division and Energy Fuels have reached is to delay reclamation of Cell 2 another six or seven years, build test plots, collect more data, and then either finish the cover or go back to the drawing board.

All the while, for Energy Fuels to mill uranium, the law requires the company to have an officially approved, deadline-driven reclamation plan that says how the company will clean up its radioactive wastes.[199] Since the cover design in Plan Revision 5.1 is in limbo, to nominally fulfill that requirement, the Division has signed a Consent Agreement with an ill-considered automatic-backup plan: to build the 1996 conventional cover without ever updating that design, analyzing it, or testing it out. If that plan isn't a pretense meant to satisfy the law's requirements on paper but never to be carried out, then it's a reckless commitment that could have disastrous consequences.

What should be done? That's a hard question. A first-rate reclamation plan should have been worked out long ago and then routinely updated as technology improves. But the Division should at least do the following:

- Revise the Consent Agreement to eliminate the provision (§ D.7.b.iii) that automatically requires Energy Fuels to build the 1996 conventional cover if an impasse is reached on alternative ET cover designs. Requiring Energy Fuels to build the 1996 conventional cover without updating that design could be a calamity. We imagine the Division has no desire to agree to that outcome. Yet, if the ET cover fails to meet the Consent Agreement's performance criteria, and Energy Fuels refuses to negotiate changes to the plan that are acceptable to the Division, the company can force the conventional cover to be built. The Division should prevent that outcome now by renegotiating the Consent Agreement to prevent automatic reversion to the conventional cover design.

- If the Division believes that a modified conventional cover design may outperform an evapotranspirative cover at the mill—a prospect that appears dubious without major changes to the 1996 design—then it should require Energy Fuels to immediately update the 1996 design. If there's any possibility that a conventional design will ultimately be used at the mill, then the Division should insist on working that design out now and avoiding future delay if the ET cover is a failure. If a conventional cover won't be built, it should be clearly ruled out now.

Smith (1999), Waugh (2004), and Breshears and others (2005) describe the negative effects on low permeability barrier layers due to root penetration or macropores left by decomposing plant roots.").

[199] *See* 10 C.F.R. § 40.31(h) (requiring uranium-milling applications to include written specifications for the disposition of byproduct material to achieve the requirements and objectives of 10 C.F.R. Part 40, Appendix A); Utah Admin. Code R313-24-4 (incorporating 10 C.F.R. 40.31(h) by reference).

- Reconsider whether the performance test for the ET cover is worthwhile in light of the risks that more delay may exacerbate groundwater contamination or forestall reclamation altogether. And consider instead requiring Energy Fuels to promptly update the ET cover to meet state-of-the-art standards and to proceed with constructing it on Cell 2 without completing the 7-year performance test.

E. The final radon barrier design is inadequate.

Energy Fuels likely could improve the performance or reliability of the proposed ET cover in several ways. A capillary break could be installed for enhanced water storage. A geomembrane could be placed beneath the water-balance section of the cover to prevent infiltration into the radon barrier. The top slope of the impoundments could be increased to improve runoff and minimize ponding. A layer of cobbles or similar materials could be included to deter animal burrowing.

Energy Fuels considered making each of these changes to the ET cover design but ultimately chose not to. The company's basic rationale was that these modifications to the ET cover probably wouldn't provide material performance gains. But even if that were true, that's not a persuasive reason for leaving these design elements out. The company's groundwater discharge permit requires Energy Fuels to minimize infiltration of precipitation through the cover, a mandate that ultimately helps protect groundwater by minimizing contaminated seepage through the tailings. A capillary break, geomembrane, and steeper top slope could all help minimize infiltration through the cover, and those design elements should be used unless further analysis shows that they will detract from the cover's performance.

A similar rationale applies to preventing animals from burrowing into the ET cover. The cover must be designed under Appendix A to control radiological hazards for 1,000 years and to minimize disturbance of tailings by natural forces without ongoing maintenance.[200] Thus, even if a burrowing-prevention layer may be only a small, extra deterrent to burrowing, it should be included to minimize tailings disturbance and future maintenance.

1. Enhancements that will minimize infiltration into the tailings should be made.

Energy Fuels' groundwater discharge permit requires Energy Fuels to reclaim the impoundments in a way that "minimize[s] infiltration of precipitation or other surface water into the tailings."[201] This permit requirement makes good sense if compliance with Appendix A's groundwater-protection standards is to be achieved. Those standards mandate that, among other requirements, licensees must "control, minimize, or eliminate post-closure escape of nonradiological hazardous constituents, leachate, contaminated rainwater, or waste decomposition products to the ground or surface waters or to the atmosphere" to the extent "necessary to prevent threats to human health and the environment."[202] Minimizing infiltration through an impoundment's cover minimizes the amount of water that could be contaminated by the tailings and escape into groundwater.[203]

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[200] 10 C.F.R. Part 40, App. A, Criterion 1, Criterion 6(1), Criterion 6(7).
[201] Exs. 39 and 40 at Part I.D.8(a); Utah Admin. Code R317-6-6.4 (allowing for discharge permits to issue if the applicant is "using best available technology to minimize the discharge of any pollutant"); *see also* Ex. 1 at 3-5 ("The key state and federal performance criteria for tailings cover design and reclamation include … [m]inimize infiltration into the reclaimed tailings cells.").
[202] 10 C.F.R. Part 40, App. A., Criterion 6(7).
[203] For this reason, EPA's regulations for in-place closure of surface impoundments containing hazardous waste mandate that final covers "[p]rovide long-term minimization of the migration of liquids through the closed impoundment." 40 C.F.R. § 264.228(a)(2)(iii).

a. A capillary break should be added unless it would degrade the cover's performance.

Capillary breaks can improve the ability of evapotranspirative covers to store water until it can be removed by transpiration or evaporation. They're created by placing a coarser-grained material beneath a finer-grained, water-storage layer. [204] Differences in the hydraulic properties of the two layers cause water to be wicked into unsaturated areas in the finer-grained layer, allowing that layer to retain more water than it otherwise would.[205]

In 2010, to develop revisions to its reclamation plan, the company modelled infiltration rates for four cover types—three evapotranspirative designs and the 1996 conventional cover design.[206] The evapotranspirative designs that were modelled included a monolithic design (much like the one proposed in Reclamation Plan Revision 5.1) and a comparable design that added a capillary break between the water-storage and radon-barrier layers.[207] The model predicted that the cover with a capillary break would achieve the greatest reductions in water infiltration and would allow four times less water to percolate through the cover than the monolithic design.[208] Nonetheless, Energy Fuels argued that the monolithic design was "preferred" because the capillary barrier might not work as well as the model predicted and would make building the cover more difficult.[209]

The Division disputed this conclusion, arguing that capillary breaks "can substantially reduce cover infiltration rates."[210] The Division also took issue with comparisons Energy Fuels had drawn with the final radon barrier built at the Monticello tailings repository, pointing to the absence of a capillary break in the proposed White Mesa cover as one of several differences in the White Mesa and Monticello cover designs that undermined comparisons between the two. The Division instructed the company to either include a capillary break in the cover design or "provide detailed analyses and additional infiltration sensitivity analyses demonstrating that a capillary break is not warranted."[211]

The only response Energy Fuels made, from what we can discern, was to defend the comparisons the company had drawn to the Monticello cover. It argued that the sand layer in the Monticello cover that was supposed to function as a capillary break isn't actually working that way, and as a result, the cover is functioning like a monolithic design.[212]

But even if that's true, it doesn't justify omitting a capillary break from the White Mesa cover design. Just because the capillary break hasn't worked at Monticello doesn't mean that the same would be true at White Mesa. If, for example, the capillary break at Monticello was compromised by infiltration of fine-grained materials during construction, as Energy Fuels postulates,[213] construction improvements might be made at White Mesa to prevent that outcome. More important, the company has made no argument that including the capillary break in the Monticello cover has been detrimental to that cover's performance, and we can find nothing to suggest that it would be detrimental at White Mesa. Thus, there

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[204] Ex. 44 at 5.
[205] Ex. 44 at 5.
[206] Ex. 22 at E-1.
[207] *See* Ex. 22 at E-3 to E-4.
[208] *See* Ex. 22at E-13 (predicting a water flux of 0.11 mm/year for the cover with a capillary break and 0.45 mm/year for the monolithic design).
[209] *See* Ex. 22 at E-9.
[210] Ex. 45 at 94.
[211] Ex. 45 at 13.
[212] *See* 38 at 49.
[213] *See* Ex. 38 at 50.

appears to be no downside to including a capillary break in the ET cover at White Mesa. And since a capillary break could help minimize infiltration into the tailings, it should be included to comply with the groundwater discharge permit and to minimize leachate that could contaminate groundwater.

b. A composite barrier installed beneath the water-balance cover would add redundancy and likely reduce infiltration.

Placing a compacted-clay or geosynthetic-clay liner and geomembrane beneath the proposed water-balance cover likely would provide additional protection against infiltration if the water-balance cover doesn't work as well as expected. The Monticello tailings repository uses this design.[214] And composite barriers standing alone can perform well at preventing infiltration.[215] Thus, it stands to reason that combining a composite barrier with a water-balance cover would provide for redundancy and enhance the odds that the cover at White Mesa will maintain low infiltration rates over its centuries-long performance period.

In our review of the available White Mesa reclamation documents, we have seen nothing to suggest that Energy Fuels considered using a compound design like this. The only discussion of a geomembrane that we have unearthed was about whether the proposed monolithic cover at White Mesa could properly be compared with the composite design built at Monticello. Energy Fuels argued that the performance of the Monticello cover provides a useful analogue because the measured infiltration rates at Monticello are for only the water-balance cover above the geomembrane.[216]

That may be true, but it doesn't justify omitting a geomembrane-topped composite barrier from the White Mesa cover design. Again, the Discharge Permit requires Energy Fuels to minimize infiltration through the cover and into the tailings. A redundant composite barrier, like that built at Monticello, would likely help meet that standard, even if the proposed monolithic ET cover performs relatively well. It is hardly far-fetched that the monolithic cover may deteriorate after centuries of service, and an underlying composite barrier would help guard against that risk. Regardless, absent compelling evidence that including a composite barrier in the cover design would diminish the cover's effectiveness it ought to be included.

c. Energy Fuels hasn't justified its refusal to increase the cover's top-slope inclination.

Energy Fuels has designed the ET Cover to have a top-slope angle ranging from 0.5 to 1.0%.[217] This is unusually flat.[218] During its review of Energy Fuels' revisions to its reclamation plan, the Division argued that the company should increase the top-slope inclination to a range of 2–3 percent or provide a detailed analysis of why doing so wouldn't improve the cover's performance.[219]

The company responded by asserting that most low spots would form early in the cover's service life, when settlement ranging from 0.88–1.56' would occur. The company promised to fill in these low

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[214] *See* Ex. 46 at 3-28 to 3-29.
[215] *See* Ex. 46 at Table 1.3 (generally showing lower infiltration rates for membrane-composite test covers in EPA's alternative cover assessment program than evapotranspirative counterparts).
[216] *See* Ex. 38 at 49.
[217] *See* Ex. 16 at 15.
[218] *See* Ex. 47 at 2-2 ("Most landfill cover system top decks are designed to have a minimum inclination of 2 to 5%, after accounting for settlement, to promote runoff of surface water. Slopes flatter than 2% may allow water to pond on the surface, if localized settlements occur, and are usually avoided.").
[219] *See* Ex. 45 at 14, 30–34.

spots.[220] After this "active maintenance" period, further settlement of the cover would range from 0.29–0.71', according to the company's analysis.[221] Having examined an area that Energy Fuels called the "critical case," the company asserted that "differential settlement is sufficiently low such that ponding and slope reversal is not expected to occur."[222] Yet the company never explains how much settlement would be expected to lead to ponding or slope reversal.

In contrast, Energy Fuels hasn't offered any explanation for not simply increasing the top-slope inclination. The company has not argued that increasing the top slope would diminish the cover's ability to shed water or cause other performance problems. Accordingly, the Division ought to demand a better explanation or insist that the top-slope inclination be increased.

2. A standalone barrier to deter burrowing should be added to the cover.

Unlike the Monticello cover, the ET Cover that Energy Fuels is proposing for White Mesa doesn't include a layer specifically designed to discourage animals from burrowing into the cover. Burrowing animals can cause all sorts damage to engineered covers. They can create pathways for water infiltration, roots, and other animals.[223] They can dig up waste and spread it into the environment.[224] They can increase erosion and soil-porosity.[225]

Several animals that may be present around the mill have burrowing depths that could penetrate into the radon barrier that begins 4' beneath the surface, such as badger, Gunnison prairie dog, red fox, northern pocket gopher, and the pocket mouse.[226] Badgers have burrowing depths up to 7.5', according to the company's data. That's deep enough to go through the primary radon barrier.[227]

The company has asserted that burrowing to this depth would be restricted by the highly compacted material in the primary radon barrier.[228] But it cites nothing to back up the claim that burrowing animals won't dig into soils as dense as the primary radon barrier. Energy Fuels otherwise asserts that the cover is thick enough to deter burrowing. But even if it's true that the cover is too thick to dig through, that says nothing about damage that can caused by many burrows going partway into the cover. And most importantly, it isn't a justification for leaving out a biointrusion layer, like the layer of cobbles used in the Monticello cover. Like many other elements of Energy Fuels' analysis, the company's arguments make no critique of how well a cobble layer would work as compared to its monolithic design.

Appendix A requires Energy Fuels to build the ET cover to control radiological hazards for 1,000 years and to minimize disturbance of tailings by natural forces without ongoing maintenance.[229] Even if a biointrusion layer is only a slight additional deterrent to burrowing, it should be included to meet that standard unless the company has demonstrated that it would degrade the cover's performance. The Division should demand that analysis or insist that a biobarrier be added to the cover.

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[220] *See* Ex. 38 at 5, F-6.
[221] *See* Ex. 38 at F-7.
[222] *See* Ex. 38 at F-7.
[223] See Ex. 47 at 2-40.
[224] *Id.*
[225] *Id.*
[226] *See* Ex. 16 at D-25.
[227] *See* Ex. 16 at 2 (explaining that the bottom of the primary radon barrier would range from 7–8' below the surface).
[228] Ex. 16 at D-25.
[229] 10 C.F.R. Part 40, App. A, Criterion 1, Criterion 6(1), Criterion 6(7).

F. The proposed long-term monitoring for the final radon barrier is inadequate.

Reclamation Plan Revision 5.1 calls for the final ET cover to be monitored in three ways: (1) for settlement; (2) to track revegetation rates; and (3) to evaluate erosional stability.[230] No monitoring of the cover-percolation rate is proposed, nor does the company plan to monitor changes in the cover properties. Though groundwater monitoring will presumably continue in some form to comply with the State's groundwater protection rules, it is unclear what monitoring will occur because neither the company's groundwater discharge permit nor its reclamation plan addresses that question.[231]

This defies common sense. Without monitoring percolation rates, there is no way to determine whether the cover is living up to its key performance benchmark. And without data about other changes in cover properties, it will be harder to diagnose problems. The expert in solid-waste containment that Energy Fuels has hired, Dr. Craig Benson, concurs. Groundwater wells aren't "always the best way to determine whether a system is functioning as designed," Dr. Benson has pointed out, because system failures are "detected too late and without enough information to fix the problem."[232] Added, to that engineered covers change over time, and the only way to make sure they're working as intended is to monitor them.[233] He therefore recommends adding "functional monitoring" to check whether the waste-containment system is working as designed.[234] A key parameter to monitor is percolation through the bottom of the cover, preferably using one or more large, pan lysimeters.[235] And guidance developed by Dr. Benson and others recommends monitoring other cover properties, such as water content and temperature, to evaluate changes over time and provide data should defects arise.[236]

The Division accordingly should require Energy Fuels to develop and carry out a functional monitoring plan to measure percolation rates through the cover and monitor other cover properties that would help diagnose infiltration problems. And so that the company has a complete strategy for evaluating whether the final cover is working, the Division should also require Energy Fuels to develop a post-closure groundwater monitoring program, understanding that it may be revised in the future to account for changes in groundwater contamination at the mill. In short, the Division should insist that Energy Fuels develop a complete program for evaluating the final cover's performance and fixing defects.

G. The liner design for the Cell 1 disposal area is inadequate.

Under Reclamation Plan Revision 5.1, Energy Fuels is planning to dig up Cell 1, its liner, and contaminated soil beneath the cell and place all that material in another cell.[237] After that, the plan gives Energy Fuels the option to use part of the pit left behind as a cap-in-place disposal area for other

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[230] Ex. 16 at 24–25.

[231] The groundwater discharge permit requires monitoring through the term of the permit "or as stated in an approved closure plan." Exs. 39 and 40 (Part I.E). Yet the permit will expire 5 years after its issued, see Utah Admin. Code R317-6-6.6, and the proposed closure plans in Revision 5.1 are entirely silent on the subject of post-closure groundwater monitoring, *see* Exs. 1, 16, and 48 at 4 (asserting that "[e]xisting environmental monitoring programs," like groundwater monitoring, will continue during reclamation and decommissioning but failing to address post-closure monitoring). So, although Energy Fuels will remain subject to the State groundwater protection rules after mill closure and should be required to monitor groundwater, it is unclear what monitoring will be performed.

[232] Ex. 49 at 118.

[233] See Ex. 50 at 10-4 to 10-5.

[234] Ex. 49 at 118–119; Ex. 50 at 10-1, 10-4 to 10-5.

[235] *See* Ex. 50 at 10-5 to 10-8.

[236] *See* Ex. 10-12 to 10-14.

[237] Ex. 1 at 3-5 to 3-6.

"contaminated materials and debris from the Mill site decommissioning and windblown cleanup."[238] If this happens, Energy Fuels plans to line this "Cell 1 Disposal Area" with a 1' clay liner, fill it with contaminated waste, and cap it with the ET cover.[239]

That plan flouts the law's design requirements for burying uranium-milling waste. The UMTRCA standards set by EPA require all surface impoundments to be built according to EPA's design standards for hazardous-waste impoundments,[240] which appear at 40 C.F.R. § 264.221. Under those rules, all impoundments built after 1992 must have "two or more liners and a leachate collection and removal system between [those] liners."[241] Utah's groundwater-protection rules similarly require waste-storage pits to be designed according to the "best available technology."[242] Under these standards, a clay liner doesn't cut it.

It's not clear why Energy Fuels' plan for the Cell 1 Disposal Area disregards these design requirements. The mill-decommissioning waste slated to go into the Cell 1 Disposal Area is undoubtedly "uranium byproduct material," as EPA (and the Nuclear Regulatory Commission and State of Utah) define that term: "the tailings or wastes produced by the extraction or concentration of uranium from any ore processed primarily for its source material content."[243] After all, if that waste weren't uranium byproduct material, Energy Fuels wouldn't be licensed to possess or discard it.[244]

Perhaps Energy Fuels believes that EPA's general UMTRCA standards don't apply to the company's operations at White Mesa when the Nuclear Regulatory Commission's rules don't conform precisely to EPA's standards, which is the case for the impoundment-liner standard. The Nuclear Regulatory Commission's liner requirements in Appendix A duplicate EPA's design standards for hazardous-waste impoundments built before 1992 but don't regurgitate EPA's standards for impoundments built after 1992.[245] Criterion 5A in Appendix A says that impoundments "must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, groundwater, or surface water at any time during the active life (including the closure period) of the impoundment."[246] Even under that standard, a geomembrane rather than a clay liner is almost always required.[247]

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[238] Ex. 1 at 3-5.
[239] Ex. 1 at 3-3.
[240] 40 C.F.R. § 192.32(a)(1).
[241] 40 C.F.R. § 264.221(c).
[242] Utah Admin. Code R317-6-6.1(A), R317-6-6.4(A)(3).
[243] 40 C.F.R. § 192.31(b). See also 42 U.S.C. § 2014(e)(2); 10 C.F.R. § 40.4; Utah Code Ann. § 19-3-102(3); Utah Admin. Code R313-12-3.
[244] Utah Admin. Code R313-19-2(1).
[245] 10 C.F.R. Part 40, App. A, Criterion 5A.
[246] 10 C.F.R. Part 40, App. A, Criterion 5A.
[247] *See* Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites, 48 Fed. Reg. 45,926 (Oct. 7, 1983) ("The primary standard, 40 C.F.R. § 264.221, can usually be satisfied only be using liner materials (such as plastics) that can retain all wastes. Exemptions permitting use of other liner materials (such as clay) that may release water or small quantities of other substances or, in some cases, permitting no liner may be granted only if migration of hazardous constituents into the ground water or surface water would be prevented indefinitely."); Uranium Mill Tailings Regulations; Ground-Water Protection and Other issues, 52 Fed. Reg. 43,553, 43,557–558 (Nov. 13, 1987) (when adopting Criterion 5A in Appendix A, deferring to EPA's decision to generally prohibit clay liners).

But even if Appendix A can be read to have a more lenient liner standard than EPA's standard for hazardous-waste impoundments, EPA's standard still applies. The language in EPA's general UMTRCA standards applies directly to uranium-milling operations. As those standards say at the outset:

> This subpart applies to the management of uranium byproduct materials under section 84 of the Atomic Energy Act of 1954 (henceforth designated "the Act"), as amended, during and following processing of uranium ores, and to restoration of disposal sites following any use of such sites under section 83(b)(1)(B) of the Act.[248]

There is no doubt that Energy Fuels is managing uranium byproduct materials at the mill. And the design standard in EPA's rule is phrased to apply directly to uranium-mill operators. It says that "surface impoundments subject to this subpart must be designed, constructed, and installed in such a manner as to conform to the requirements of § 264.221 of this chapter…."[249] That expresses a command that Energy Fuels must comply with, regardless of whether Appendix A has the same command.

Even assuming (for the sake of argument only) that EPA's general UMTRCA standards don't apply to Energy Fuels' when the Nuclear Regulatory Commission's rules don't conform to EPA's standards, the company is still required to comply with EPA's standards for two reasons.

First, Utah state law requires all waste pits that may discharge pollutants to be built using "best available technology," and that technology is to use double-liners with an interstitial leak-detection system.[250] That is at least one reason why Cells 4A and 4B at the mill were built to that standard.[251] And there's no reason the "best available technology" for discarding uranium byproduct material in the Cell 1 Disposal Area should be any different.

Second, EPA's radon-emission standards in Subpart W require surface impoundments used for discarding uranium byproduct material to comply with the agency's design standards for hazardous-waste impoundments.[252] That rule prohibits owners and operators of uranium mills from building a new "conventional impoundment" unless that impoundment is designed and built to "comply with the requirements of 40 CFR 192.32(a)(1)."[253] And, again, 40 C.F.R. § 192.32(a)(1) explicitly requires impoundments used for discarding uranium byproduct material to be built according to EPA's standards for hazardous-waste impoundments, which demand double liners and a leak-detection system for impoundments built after 1992.[254] The Cell 1 disposal area meets the definition of a "conventional impoundment" under 40 C.F.R. § 61.251 because it will be a "permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material or tailings from the extraction

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[248] 40 C.F.R. § 192.30.
[249] 40 C.F.R. § 192.32(a)(1).
[250] Utah Admin. Code R317-6-6.1(A), R317-6-6.4(A)(3).
[251] *See, e.g.*, Ex. 39 at 11–12 (Parts I.D.4 to I.D.6, I.D.12).
[252] 40 C.F.R. § 61.252.
[253] 40 C.F.R. § 61.252(a)(2)(i).
[254] 40 C.F.R. § 192.32(a)(1) ("Surface impoundments (except for an existing portion) subject to this subpart must be designed, constructed, and installed in such manner as to conform to the requirements of § 264.221 of this chapter…."); 40 C.F.R. § 264.221 ("The owner or operator of each new surface impoundment unit on which construction commences after January 29, 1992 … and each replacement of an existing surface impoundment unit that is to commence reuse after July 29, 1992 must install two or more liners and a leachate collection and removal system between such liners.").

of uranium from uranium ore.[255]" It therefore must be designed to comply with EPA's surface-impoundment design standards under UMTRCA that are codified at 40 C.F.R. § 192.32(a)(1).[256]

True enough, Subpart W states at the outset that it "does not apply to the disposal of tailings,"[257] and perhaps Energy Fuels is silently relying on that statement to sidestep the liner requirements for the Cell 1 Disposal Area. But the Cell 1 Disposal Area will be placed in "operation" within the meaning of Subpart W, and that makes the area subject to Subpart W's impoundment-design requirements, even if the rest of Subpart W's requirements cease to apply immediately. The term "operation" means "that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct material or tailings are first placed in the impoundment until the day that final closure begins."[258] So, as soon as uranium byproduct material is placed in the Cell 1 Disposal Area, it will go into "operation," even if "final closure" begins the same day. That is enough to make Subpart W's design standard for conventional impoundments applicable.

IV. The surety is inadequate.

Appendix A requires Energy Fuels to get a surety that secures enough money for the Division to clean up the mill if the company doesn't and that fully funds long-term surveillance and maintenance of the reclaimed mill site.[259] The surety amount is to be based on the estimated cost for a third party to: (1) clean up the milling site to levels that allow unrestricted use of that area; and (2) reclaim waste areas according to Appendix A's technical specifications.[260] These cost estimates must also include "an adequate contingency factor."[261]

Energy Fuels forecasts that it can complete every reclamation task and clean up groundwater contamination at the mill at a cost of about $14.5 million.[262] Various indirect costs add another $2.8 million to the total reclamation cost.[263] The company's estimates also include about $875,000 to fund long-term surveillance and maintenance.[264] Last, a contingency amount of $3.3 million is added to cover unforeseen costs.[265] The company's estimate of the total reclamation cost is about $21.5 million.

These estimates are deficient, and as a result, the company's surety is inadequate. The biggest problem is that the contingency factor is far too low, resulting in just a few million dollars to pay for every possible unforeseen cost that may arise. There are other problems too. Energy Fuels has improperly based its reclamation estimates on the cost of building only the 1996 conventional cover, rather than also forecasting the cost of the ET cover and securing a surety for the more expensive reclamation plan. And the long-term care fund is likely to be inadequately capitalized if the surety is exercised.

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[255] 40 C.F.R. § 61.251(h).
[256] *See* 40 C.F.R. § 61.252(a)(1).
[257] 40 C.F.R. § 61.250.
[258] 40 C.F.R. § 51.251(e).
[259] 10 C.F.R. Part 40, App. A, Criterion 9 and 10.
[260] 10 C.F.R. Part 40, App. A, Criterion 9(a).
[261] *Id.*
[262] Ex. 19 at 3, "Cost Summary" (estimating direct costs of $14,476,933).
[263] Ex. 19 at 3, "Cost Summary" (estimating indirect costs of $2,786,357 for a profit allowance, licensing and bonding, contract administration, engineering design review, contractors' equipment floater, and insurance).
[264] Ex. 19 at 3, "Cost Summary" (including $876,425 for the long-term care fund).
[265] Ex. 19 at 3, "Cost Summary" (including a contingency of $3,325,170).

The Division should fix these shortcomings. In particular, we urge the Division: (1) to independently and thoroughly evaluate the cost of closing uranium mills comparable to White Mesa and impose an adjusted contingency factor that accounts for the possibility that closure costs will far exceed Energy Fuels' estimates; (2) to require Energy Fuels to forecast the cost of building the ET cover, in addition to the 1996 conventional cover, and base its surety on the more expensive plan; and (3) to increase the amount set aside to fund long-term care.

A. Energy Fuels' contingency is too low.

Energy Fuels' reclamation-cost estimates include a contingency that is purportedly calculated at a rate of 25% of some other figure in the estimates, presumably the forecasted direct reclamation-costs. [266] The contingency that Energy Fuels includes is about $3.3 million.[267] That amount is far too low.

From what we can discern, cleaning up other uranium mills in the United States has cost far more on average than $21.5 million, the amount Energy Fuels would secure with a surety bond for reclaiming the mill. The expense of completing the Department of Energy's surface-decommissioning program under Title I of UMTRCA provides a rough starting point for measuring the potential inadequacy of Energy Fuels' cost estimates, and in particular, the contingency those estimates include.

In 1982, the Department forecasted that the surface cleanup of the 24 sites included in the Title I program would cost about $1.7 billion.[268] By 1995, the Department's forecast for total cleanup costs had grown 37%, to $2.3 billion, without accounting for cleaning up groundwater contamination.[269] All told, the average surface-reclamation cost for cleaning up and burying the 24 Title I sites in 19 repositories was about $60–90 million, depending on which source is consulted.[270] Put differently, using the low end of this range, it cost $32 on average to clean up each cubic yard of waste remediated in the Title I program.[271] At that rate, it would cost $250 million to clean up the White Mesa mill if Cells 2, 3, 4A, and 4B were filled to capacity.[272] Or put yet another way, each acre of contaminated land in the Title I program cost about $380,000 to clean up, again using the low-end cleanup estimates.[273] So, if remediating the roughly 345

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[266] The company's math doesn't look right. Twenty-five percent of the direct reclamation cost estimate of $14.5 million is roughly $3.6 million, not $3.3 million. If this is an error, it should be fixed. If it's not an error, it should be explained.
[267] Ex. 19 at 3, "Cost Summary."
[268] Ex. 51 at 7.
[269] Ex. 51 at 27.
[270] In 1995, the U.S. General Accounting Office projected total costs of the Title I cleanup program to be $2.3 billion, or $96.4 million per site on average. *See* Ex. 51 at 26. In 1999, the U.S. Energy Information Administration reported total costs for the Title I cleanup program of $1.45 billion, or an average of $61.5 million per site. *See* Ex. 52. The source of the discrepancy in these figures is unclear.
[271] Ex. 52. We've included the two sites in North Dakota in these calculations to avoid modifying the available data, even though they ultimately weren't remediated under the Title I program.
[272] *See* Ex. 4 at 6 (Table 2) (estimating capacity of Cell 2 to be 2,015,000 cubic yards and Cell 3 to be 2,345,000); Ex. 39 at 12, 17 (stating that capacity of Cell 4A is 1,600,000 cubic yards and capacity of Cell 4B is 1,900,000 cubic yards). Remediating 7,860,000 cubic yards of material at $32. per cubic yard would cost $251.5 million.
[273] *See* Ex. 51 at 26 (estimating that 3,894 acres of contaminated land were cleaned up as part of the Title I program). At a total cleanup cost of $1.48 billion, see Ex. 52 (1999 estimates from U.S. Energy Information Administration), the per-acre cost to remediate 3,894 acres would be about $380,000.

acres[274] occupied by the White Mesa mill site and its tailings cells is similarly expensive, the total cost would be around $130 million.

It is doubtless true that the expected cleanup for the White Mesa mill is distinguishable in some important respects from the cleanup of Title I sites. Several Title I sites involved costly cleanup efforts for neighboring properties that were contaminated by uranium-milling wastes.[275] We hope that won't be necessary at White Mesa. At about half the sites, tailings were moved at significant expense to a new disposal site,[276] which Energy Fuels doesn't plan to do at the White Mesa mill. Some of the disposal cells that the Department of Energy built were excavated from scratch,[277] whereas that work has already been done at White Mesa if the cells are capped in place as planned. And the Department blamed much of its Title I-program cost overrun on updates to EPA's groundwater protection rules in the 1990s, which required some disposal repositories to be redesigned and some wastes to be moved to new locations.[278]

But these distinctions don't make the expense of cleaning up Title I sites irrelevant. The Department of Energy has estimated that only about 22% of the Title I cleanup cost was for remediating neighboring properties.[279] Reducing the average site cleanup cost by that rate still yields a cleanup cost of about $45–70 million per site. Similarly, when on-site disposal was accomplished at Title I locations, cleanup costs still averaged around $37–$56 million, again depending on which cost data is used.[280] At some of those sites, like Mexican Hat, Tuba City, and Shiprock, the Department consolidated wastes in pre-existing tailings disposal areas, suggesting that remaining closure steps would resemble those at the White Mesa mill.[281] And regulatory changes that increase costs, like those made to EPA's groundwater rules in the 1990s, could always happen again in the future, increasing the cost of the White Mesa mill cleanup.

Added to all that, none of the Title I cleanup figures cited above include the cost to remediate groundwater, which is contaminated at nearly every Title I site.[282] Though the Department of Energy is actively remediating groundwater at only a few sites, the costs to do that can be staggering. In the mid-1990s, the Department of Energy estimated that actively restoring Title I sites to background levels would range from $86–162 million per site.[283] And natural attenuation, the chosen strategy at most Title I sites,

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[274] Ex. 19 at "Mill Decommissioning" (mill yard and ore pad area of roughly 60 acres); "Volume Calculation – Cell 1" (Cell 1 area of 60 acres); "Volume Calculation – Cell 2" (69 acres); "Volume Calculation – Cell 3" (74 acres); "Volume Calculation – Cell 4A" (41 acres); "Volume Calculation – Cell 4B" (41 acres).
[275] *See, e.g.*, Ex. 51 (showing that over 4,000 so-called "vicinity properties" were cleaned up in Grand Junction, contributing to total projected cleanup costs of $746 million).
[276] *See* Ex. 51 at Table 2.1 (showing that contaminated wastes were moved at about half the sites).
[277] *See* Ex. 53 (describing cells built at Canonsburg, Durango, Grand Junction, Gunnison, Lake View, Naturita and other sites).
[278] *See* Ex. 51 at 27–28.
[279] See Ex. 51 at 24.
[280] *Compare* Ex. 51 at 27 *with* Ex. 52 (averaging the total disposal cost for Ambrosia Lake, Canonsburg, Falls City, Green River, Lowman, Maybell, Mexican Hat, Shiprock, Spook, and Tuba City).
[281] *See* Ex. 53 (describing caps built over contaminated materials at Mexican Hat, Burrell, Falls City, Maybell, Shiprock, Tuba City and possibly other sites).
[282] Ex. 53 (asserting that groundwater is not contaminated at only four sites, Mexican Hat, Burrell, Ambrosia Lake, and Loman).
[283] Ex. 54 at 4-15. We've been unable to find updated, all-in cost estimates for sites with active groundwater restoration, like Tuba City and Monument Valley. A recent analysis of alternatives for replacing the aging and expensive groundwater treatment plant at Tuba City, estimated future life-cycle costs of $3.8–$12.5 million for various options, in net present value, assuming a 10-year operating timeframe. *See* Ex. 55 at 65.

isn't cheap, ranging in cost from $14–24 million according to the Department's estimates.[284] Those sites, of course, remain a liability that could eventually demand an expensive groundwater-restoration effort.

The critical lesson from the Title I decommissioning program is that cleaning up uranium-milling wastes has often cost two-to-tenfold more than Energy Fuels is setting aside through a surety bond. Only the two smallest, least-contaminated sites were remediated for less than $20 million, about half the sites cost more than $50 million, and the most expensive cleanup exceeded $500 million (all without accounting for inflation since the 1990s, the cost of groundwater restoration, or the cost of repairing or replacing reclamation solutions that haven't worked).[285] That history shows that costs to clean up the White Mesa mill may far exceed Energy Fuels' estimates, particularly if groundwater contamination is more expensive to remediate than the company is expecting. The contingency in the company's reclamation-cost estimates should guard against that risk. But at $3.3 million, the contingency comes nowhere close to the amount that taxpayers have incurred elsewhere to clean up uranium milling-wastes.

The cost of cleaning up uranium-recovery facilities that were still operating when UMTRCA was passed in the late 1970s—often called "Title II" sites because Title II of UMTRCA specifies how they must be managed—could provide another point of comparison. But comprehensive information about those costs doesn't appear to exist. The only program-wide estimate for Title II sites that we can find is a 22-year old report prepared by the Department of Energy.[286] That report includes forecasted costs for cleaning up 19 conventional uranium-recovery facilities under Title II.[287] In general, much like Energy Fuels' estimate for cleaning up the White Mesa mill, the cost estimates are far lower than those incurred for the Title I program, averaging about $14 million.[288]

One reason for that discrepancy may be that the cost estimates came from mill owners and the regulators overseeing them, both of whom had an incentive to forecast modest reclamation costs that don't call into question whether making yellowcake is worth the cost of cleaning up the resulting mess.[289] Energy Fuels, for example, reported that there would be no groundwater restoration costs at the White Mesa mill,[290] and that prediction has proved wrong to the tune of at least $1.2 million, and likely much more, if we understand the company's current groundwater-remediation estimates correctly.[291]

Regardless of whether the 1995 estimates for Title II sites were biased by their source, it's plain that many of them have proved to be far too low. When EPA declared the Uravan mill cleanup to be complete in 2008, for example, the agency reported a total cleanup cost of more than $120 million.[292] The estimate

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Those figures, of course, don't include the costs incurred to treat groundwater to date or the expense of engineering and design, pilot studies, regulatory oversight, monitoring, and the many other expenses of restoring groundwater.

[284] Ex. 54 at 4-21.

[285] Ex. 52 (the least expensive sites, Spook and Lowman, covered about 20–30 acres and involved remediating less than 500,000 cubic yards of contaminated material combined; ten sites cost more than $50 million; and Grand Junction exceeded $500 million).

[286] *See* Ex. 56.

[287] Ex. 56 at Table 3.

[288] Ex. 56 at Table 3.

[289] Ex. 56 at Table 3 (reporting the source of cost estimates as data from the Nuclear Regulatory Commission, state agencies, and licensees).

[290] Ex. 56 at Table 3.

[291] Ex. 19 at "Miscellaneous Items."

[292] Ex. 57.

given in 1995 was $38 million.[293] The forecasted cost for the Cañon City mill cleanup in 1995 was $12.8 million.[294] Yet state regulators in Colorado estimated in 2010 that the cost would run $43 million if the site is closed in place.[295] That figure would balloon to $895 million, according to the company that owns the mill, if the tailings are removed from the banks of the Arkansas River where they now sit.[296] The EPA's estimated cost to clean up the Church Rock mill site is $41.5 million,[297] another sizable increase over the mill owner's or regulator's estimate of $8.6 million in 1995.[298] Cleaning up the Homestake mill, which had a projected cost of $23 million in the Department's 1995 report,[299] had cost $50 million by August 2015 and was still ongoing.[300]

At the Split Rock mill, decommissioning costs have been kept down by leaving groundwater contamination in place rather than cleaning it up, even though it will eventually pollute drinking-water wells on nearby ranches.[301] After the company that owns the mill estimated that cleaning up groundwater would cost up to $117 million,[302] the Nuclear Regulatory Commission gave the owner permission to leave the contamination in place and close all the domestic water wells in the area.[303] We've been unable to unearth how much money the owner of the mill has spent on the cleanup so far, but it reportedly spent $18 million by 2006 just to operate its groundwater-treatment system before shutting it down.[304] In 1995, the estimate for groundwater remediation was $3.6 million.[305]

Two other defunct uranium mills near White Mesa have been similarly costly to remediate outside of the initial UMTRCA program. Because the tailings from the former Atlas mill outside Moab were leaching contaminants directly into the Colorado River, the Department of Energy has built a new disposal cell in Crescent Junction, Utah and is hauling the Atlas tailings to that repository to the tune of $1 billion.[306] And cleaning up the Monticello mill site had reportedly set the Department of Energy back $250 million by 2004.[307]

While we wouldn't be surprised if there are examples of some Title II milling sites that were reclaimed for roughly the amount forecasted in 1995 or less, that doesn't undermine the fact that the cost

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293 Ex. 56 at Table 3.
294 Ex. 48 at Table 3.
295 Ex. 58 at "Financial Assurance Evaluation," p. 2 (reporting an estimated total remediation cost of $43,754,099).
296 Ex. 59 at 9.
297 Ex. 60. This estimate may be for the surface-soil remediation only and not include the cost of remediating groundwater.
298 Ex. 48 at Table 3.
299 Ex. 48 at Table 3 (the Homestake mill appears under the label "Grants").
300 Ex. 61 at 2.
301 Ex. 62 at 3 (explaining that groundwater contamination will pollute domestic wells within 100–200 years).
302 Ex. 62 at Attach. 2 p. 15 (describing costs of proposed drinking-well closure alternative and costs to perform three other cleanup alternatives); Attach. 2, p. 17 (describing plan to ban domestic drinking wells in a 3,600-acre area).
303 Ex. 63 at 2.
304 Ex. 64 at 4.
305 Ex. 48 at Table 3.
306 Ex. 65 at Slide 5.
307 Ex. 66 at 2 ("Memorandum for the Secretary") ("Since these operations ceased, the Department's Grand Junction Projects Office has expended about $250 million to remediate and stabilize the Monticello Mill Site.").

to clean up Title II mills has in many cases far exceeded initial forecasts and far exceeded the amount of money Energy Fuels is setting aside for reclaiming the White Mesa mill. It is that possibility of substantial unforeseen costs that Energy Fuels' contingency should cover, not the chance that few unforeseen costs occur.

Energy Fuels calculated its contingency using a flat rate of 25% at the Division's direction.[308] The Division took that rate from decommissioning guidance published by the Nuclear Regulatory Commission, often called NUREG-1757 for short.[309] Though that guidance doesn't apply to uranium mills,[310] similar rates appear in the Nuclear Regulatory Commission's applicable technical guidance.[311] Both these documents have a critical common feature: The rate they suggest is a minimum.[312] The Division thus has discretion to demand a much higher contingency factor. And indeed, the Division is obligated by Appendix A to ensure that the contingency is "adequate."[313]

Applying a contingency rate of 25 percent to Energy Fuels' reclamation-cost estimates without any critical analysis is facile and risky given the long history of uranium-mill cleanups that far exceed the amount Energy Fuels plans to set aside. There is a present-day risk that it will cost far more than $21 million to clean up the mill, perhaps ten or twenty times more. If that happens, Energy Fuels might fund the cleanup as it's required to do. Or, it might go bankrupt, like its namesake, Energy Fuels Nuclear, did in the 1990s. And if that happens, in all likelihood, taxpayers will eventually pay to clean up the White Mesa mill. The Division has an opportunity through the surety to make sure that Energy Fuels, not the public, bears this risk that Energy Fuels' business creates. The Division should seize that opportunity and require a surety that will ensure that the mill gets cleaned up without calling on the public purse, whatever the cost.

We accordingly urge the Division to revisit the reclamation cost estimates, thoroughly and independently analyze the estimates Energy Fuels has made and the probabilities that those estimates may prove inaccurate, and require a surety amount (including a contingency) that conservatively guards against the risk that reclamation costs greatly exceed the company's forecasts.

B. Appendix A requires Energy Fuels to forecast the cost of both cover designs and secure a bond for the more expensive one.

The reclamation cost estimates in Revision 5.1 do not forecast how much it will cost to build the ET cover that Revision 5.1 proposes. Instead, the company has estimated the expense of building the 1996

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[308] Ex. 67 at 32.
[309] *Id.*
[310] Ex. 68 at 1-1 ("[This volume] applies to financial assurance requirements for licensees under 10 CFR Parts 30, 40, 70, and 72, with the exception of licensees (uranium recovery facilities) subject to Criteria 9 and 10 of Appendix A, "Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content," to 10 CFR Part 40, "Domestic Licensing of Source Materials."").
[311] Ex. 68 at xi (Table 2, n.4) (explaining that "[g]uidance on financial assurance for uranium recovery facilities under 10 CFR Part 40 is provided in the Branch Technical Position (BTP), 'Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities,' (issued October 1988)").
[312] Ex. 69 at 26 (requiring a minimum 15 percent engineering contingency and 10 percent contract-administration contingency); Ex. 68 at 4-11 (contingency factor must be "at least" 25 percent of all estimated costs); A-25 (explaining that a lower contingency may be allowed only under very narrow circumstances).
[313] 10 C.F.R. Part 40, App. A, Criterion 9(b)(1)(ii).

conventional cover. Only by examining each line item in the cover's design does this become apparent. The reclamation tasks for covering Cell 3, for example, include (among other elements) building a one-foot thick clay layer, a two-foot random-fill layer, and a half-foot rock armor,[314] which are elements of the 1996 conventional cover design, not the ET design.

Though we've found no explicit disclosure by Energy Fuels that its surety is based on building the 1996 conventional cover, the text of Revision 5.1 does promise an update to the reclamation cost estimates "when this Plan is approved and the Cell 2 cover performance test section … is verified [under the] Stipulated Consent Agreement…."[315] This ambiguous statement could be read in two ways. First, Energy Fuels might be promising to update its surety twice: once when Revision 5.1 is approved and again when the Cell 2 performance test section is verified under the Stipulated Consent Agreement. Or, the company might be promising to update the surety only after both Revision 5.1 has been approved and the test section has been verified. Either way, this delay in updating the surety flouts Appendix A.

Under Criterion 9 of Appendix A, the surety amount "must be based on Commission-approved cost estimates in a Commission-approved plan, or a proposed revision to the plan submitted to the Commission for approval, if the proposed revision contains a higher cost estimate."[316] That standard requires Energy Fuels: (1) to estimate costs both for the ET cover in its revised reclamation plan and for the 1996 conventional cover that the Division maintains is still an approved design,[317] and (2) to maintain a surety for the more expensive plan.

C. Energy Fuels' surety doesn't include enough money for the long-term care fund.

Under UMTRCA, the White Mesa mill is ultimately to be turned over to the Department of Energy or the State of Utah, at its election, for long-term care.[318] To fund the government's resulting perpetual monitoring and maintenance obligations, Appendix A requires Energy Fuels, when its license is terminated, to pay at least $250,000 (in 1978 dollars) to the United States or the State of Utah "to cover the costs of long-term surveillance."[319] At a minimum, the long-term care fund must be capitalized with enough money to cover annual site-surveillance costs using the interest generated at a rate of one percent.[320] The Division may also increase the funding requirement if it finds that long-term care of a particular site will cost significantly more than the annual-inspection costs contemplated by Appendix A.[321]

Experience with long-term care of sites already in government custody has suggested that the minimum funding required by Appendix A is not enough. For the six Title II sites already under long-term surveillance by the Department of Energy, there are serious inadequacies in the minimum long-term care charges assessed to licensees. These inadequacies stem from underestimated surveillance and maintenance costs,[322] failure to incorporate pre-transfer costs,[323] and unexpected technical challenges with sites that had groundwater and cover problems after reclamation was complete.[324]

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[314] Ex. 19 at "Volume Calculation – Cell 3."
[315] Ex. 1 at I-1.
[316] 10 C.F.R. Part 40, App. A, Criterion 9(a).
[317] *See* Ex. 21 at 7.
[318] 42 U.S.C. § 2113(b).
[319] 10 C.F.R. Part 40, App. A, Criterion 10.
[320] *Id.*
[321] *Id.*
[322] Ex. 51 at 42–43; Ex. 70 at 8.
[323] Ex. 70 at 5.
[324] Ex. 71 at 12–16.

The $250,000 minimum in Appendix A was set in 1980 before the government had any experience caring for remediated uranium mills.[325] That figure assumed that the annual cost of surveillance would be about $5,300 per site in 1995 dollars.[326] But by 1995, the Department of Energy estimated that the real cost of annual surveillance and maintenance at each Title II site would be $21,000 in 1995 dollars (or, about $34,000 today).[327] This number includes $5,000 per year in site-maintenance funds, whereas the minimum charge included in Appendix A in 1980 assumed that ongoing maintenance would not be needed.[328]

The annual interest on the long-term funding guaranteed in Energy Fuels' surety, about $875,000, would fall far short of these updated long-term maintenance estimates. At annually compounded interest rate of one percent, that fund amount would generate interest of $8,750 each year, assuming that the principal neither grows nor is spent. That would lead to a substantial shortfall if site maintenance costs were equivalent to an estimated $34,000 per year. And that may not scratch the surface. The Department of Energy estimated in 2001 that long-term stewardship costs (which include groundwater remediation) for the Monticello repository over the next decade would average about $386,000 per year and would rise to about $520,000 per year by the 2030s.[329]

Technical guidance for uranium-mill financial sureties published by the Nuclear Regulatory Commission in 1988 acknowledges that, in addition to inspections, long-term maintenance and groundwater monitoring, along with other measures, may be necessary at some sites.[330] The guidance explains that these costs "should be added to the basic cost of annual inspection of the site by government authorities, as required under Criterion 10."[331] The Division should follow that guidance, complete a site-specific analysis of probable ongoing long-term costs at the White Mesa mill after reclamation, and establish a fund amount to be guaranteed in Energy Fuels surety that is sufficient to cover long-term costs at an interest rate of one percent.

V. The Division should deny Energy Fuels' application to process the Sequoyah Fuels sludge.

A. Background

Beginning in 1969, the Sequoyah Fuels Corporation ran a uranium-conversion plant in Gore, Oklahoma that converted yellowcake into uranium-hexafluoride, which is used to create fuel rods for nuclear power plants. Following several tragic accidents, Sequoyah Fuels began decommissioning the plant in 1993.[332]

A long-running dispute ensued among Sequoyah Fuels, the State of Oklahoma, and the Cherokee Nation about how to get rid of some of the plant's most radioactive waste,[333] including a dewatered raffinate sludge containing thorium, uranium, arsenic, beryllium, and lead, among other things.[334] A

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325 Ex. 70 at 2.
326 Ex. 51 at 8.
327 Ex. 51 at 8.
328 Ex. 51 at 8, 43.
329 Ex. 72 at Table F-1.
330 Ex. 69 at 25–26.
331 Ex. 69 at 25.
332 Ex. 73 at 1.
333 Ex. 73 at 2.
334 Ex. 74 at Table 12. The concentrations of arsenic, lead, barium, and beryllium in the Sequoyah Fuels sludge are an order of magnitude more than the levels in typical Colorado Plateau-derived uranium ore.

settlement was reached in 2004 in which Sequoyah Fuels agreed to dispose of the sludge off site.[335] This is the waste that Energy Fuels wants permission to process and discard at the White Mesa mill.

For about the last decade, Sequoyah Fuels has searched for an off-site disposal location willing to get rid of the sludge, and it has at least $3.5 million earmarked to pay for the disposal costs.[336] But it hasn't found a taker so far. According to Sequoyah Fuels, the high Thorium-230 concentrations in the sludge made it unacceptable for disposal in the Pathfinder mill tailings impoundment.[337] High concentrations of Thorium-230 and Uranium-238 also prevented Waste Control Specialists in Texas from disposing of the sludge.[338] EnergySolutions, which runs a low-level radioactive waste and uranium byproduct disposal facility in Utah, turned down the sludge because it has more uranium in it than EnergySolutions is licensed to handle.[339] That limit on uranium concentration is one the Division imposed. Unlike the other potential disposal sites, Energy Fuels wants to process the sludge and discard it, but it hasn't yet gotten permission to do so.

Having so far come up empty handed, Sequoyah Fuels has recently renewed its effort to cap the sludge in place in Oklahoma.[340] That move prompted the State of Oklahoma and the Cherokee Nation to go to court to force the off-site-disposal plan.[341] They've argued that Oklahoma and the Cherokee Nation should not be blighted by the pollution the sludge may cause.[342] It is that prospect that the Division is proposing to export to White Mesa by approving Energy Fuels' request to process and discard the Sequoyah Fuels sludge at the mill.

B. The Division has authority to deny the Sequoyah Fuels license amendment to protect the environment and public health, and it should exercise that authority.

Energy Fuels' "alternate-feed" business has never been blessed by an act of Congress, nor a state law, nor any other publicly debated sort of lawmaking. Instead, it was sanctioned by a few technocrats who decided to make the nation's radioactive-waste-disposal rules more pliable and the uranium-milling business more plump. That has enabled Energy Fuels to argue that it can discard the Sequoyah Fuels sludge at White Mesa when everyone else is turning it down.

To lawfully make yellowcake and bury the resulting wastes at its mill, Energy Fuels must process "ore" primarily for its "source material" content.[343] Source material means uranium or thorium, or any ore containing one of those elements at concentrations established by the Nuclear Regulatory Commission.[344] In the 1990s, Commission staff released guidance that defined "ore" to mean anything from which uranium or thorium are extracted in a licensed mill.[345] This tautological definition had the effect of

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Id. The thorium activity and uranium-content of the Sequoyah Fuels sludge far exceed that of uranium ore. *See* id. at Table 7.
[335] Ex. 73 at 2.
[336] Ex. 75 at 1.
[337] Ex. 75 at 2.
[338] Ex. 75 at 3.
[339] Ex. 75 at 2.
[340] Ex. 75 at 4.
[341] Ex. 73.
[342] Ex. 73 at 3, 6, 9–11.
[343] *See* 42 U.S.C. § 2014(e)(2).
[344] 42 U.S.C. § 2014(z).
[345] Uranium Mill Facilities, Notice of Two Guidance Documents: Final Revised Guidance on Disposal of Non-Atomic Energy Act of 1954, Section 11e.(2) Byproduct Material in Tailings Impoundments; Final

allowing Energy Fuels to run anything from which it could extract uranium through the White Mesa mill and discard the resulting wastes on site, provided the feed wasn't a so-called "listed" hazardous waste.[346] Energy Fuels understood that to be true even if the company was paid to do so.[347]

The State of Utah balked at this idea and took the issue to the Nuclear Regulatory Commission.[348] The Commission ultimately decided against the State.[349] As a result, through a guidance document issued by Commission staff and an administrative appeal decided by five commissioners, Energy Fuels was given permission to make money disposing of radioactive waste at the White Mesa mill. That outcome bypassed any true public debate about how to get rid of a host of uranium-bearing wastes that have been discarded at the mill since the early 1990s. It also yielded just a few, mostly inelastic factors for determining what qualifies as an "alternate feed," leaving little room to constrain what uranium-bearing waste Energy Fuels may process.[350]

The Division appears to believe it is bound by the Commission's guidance and administrative ruling.[351] It observes that the State's application in 2003 to take over regulating uranium byproduct material as an "agreement state" included a "policy statement" recognizing that, for the White Mesa mill to be viable, Energy Fuels needed to be able to expand its business to include processing alternate feed materials.[352] But that's hardly a binding promise to allow Energy Fuels to process alternate feed according to the Commission's prior diktats. It's a statement of policy that the State may change. And the amendment that the Commission and the State of Utah ultimately signed to expand the State's agreement-state power, which reflects the binding commitments each party made, says nothing about allowing uranium mills to process alternate feed.[353]

The Division also observes that the State committed in its 2003 agreement-state application to apply the Commission's guidance for evaluating whether to license alternate feeds for processing.[354] But that description of the application omits an important caveat: The State agreed only to apply the Commission's guidance as a general matter "unless doing so will compromise protection of human health and the environment."[355] And again, the State did not commit to applying the Commission's guidance when those parties amended their agreement delegating authority to the State to manage uranium byproduct material.[356]

In short, the Division is not bound by any past promise to the Commission to apply the Commission's alternate-feed policies and sign off on Energy Fuels' request to process the Sequoyah Fuels sludge, or any other alternate feed. The State of Utah has the authority to re-examine the conditions on

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Position and Guidance on the Use of Uranium Mill Feed Materials Other Than Natural Ores, 60 Fed. Reg. 49,296, 49,296 (Sep. 22, 1995).

[346] 60 Fed. Reg. at 49,296–297.

[347] Ex. 11 at 1.

[348] Ex. 11 at 1.

[349] Ex. 11 at 1.

[350] *See* 60 Fed. Reg. at 49,296–297 (describing three conditions that allow materials to qualify as alternate feed).

[351] *See* Ex. 74 at 2.

[352] *See* Ex. 74 at 2. The policy statement talks about "uranium mills" generally, but in 2003, as now, White Mesa was the only operating uranium mill in Utah. *See* Ex. 76 at 1.

[353] Ex. 77.

[354] Ex. 74 at 2.

[355] *See* Ex. 76 at 2.

[356] Ex. 77.

which alternate feeds may be processed, if at all. And the Division, at a minimum, has the authority to disregard the Commission's alternate-feed guidance so as to protect "human health and the environment."[357] Indeed, that power is consistent with the Division's power to reject radioactive-material license amendments if they will be "inimical to the health and safety of the public."[358]

We urge the Division to exercise that authority and prohibit Energy Fuels from discarding the Sequoyah Fuels sludge at the mill. If the company is being paid to process the Sequoyah Fuels sludge, which seems likely under the circumstances, it is mostly an environmental liability—a radioactive waste that isn't worth processing for yellowcake unless it can also be discarded into Utah's environment. That fact alone should be enough for the Division to conclude that disallowing Energy Fuels from processing the sludge will protect the environment and public health. We ask the Division to make that finding.

C. The Safety Evaluation Report is deficient.

To determine whether to allow Energy Fuels to take the Sequoyah Fuels sludge, the Division hired URS Professional Solutions to prepare a "safety evaluation report" examining Energy Fuels' request. That report is deficient in several respects and should be revisited.

First, the report incorrectly assumes that the wastes from processing the Sequoyah Fuels sludge will go into Cells 4A and 4B only.[359] But in the past, Energy Fuels has pumped wastes among the mill's cells and has directed wastes from its solvent-extraction circuits into Cell 1. The company plans to use solvent extraction to process the Sequoyah Fuels sludge.[360] So, it stands to reason that at least some wastes from processing the sludge will end up in Cell 1. The safety evaluation report should disclose this possibility and analyze what the impacts on Cell 1 would be.

Second, the report makes numerous claims about how concentrations of various constituents in the mill's cells will change after disposal of the processed Sequoyah Fuels sludge.[361] But the data used to evaluate those pollutant-concentration changes is based, not on discarding the sludge in Cells 4A and 4B as planned, but on discarding it in Cell 3. As result, the data appear to be erroneous, causing other conclusions in the report to be questionable, if not wrong. The report relies on that data, for example, to conclude that discarding the sludge in Cells 4A and 4B won't damage the liners in those cells.[362] The report also reprises the company's assertion that no constituent's concentration will go up by more than 0.10% in the cells.[363] Yet there's no analysis of how the Sequoyah Fuels sludge would affect the concentrations of contaminants in Cells 4A, 4B, or Cell 1 for that matter. The contaminant-concentration analysis should be revisited to assess the concentration changes in the cells the processed sludge will go in.

Third, the report repeatedly evaluates the potential threats posed by the sludge by comparing it to other stuff Energy Fuels has processed in the past. For example, the report observes that the sludge has more thorium in it than typical uranium ores, but less radium, leading to the conclusion that it poses "an

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[357] *See* Ex. 76 at 2.
[358] Utah Admin. Code R313-22-33(d).
[359] Ex. 74 at 31, 37.
[360] Ex. 78 at 2.
[361] *See, e.g.*, Ex. 74 at 27 (describing Table 11 as a summary of "anticipated changes (e.g., percentage increase) in concentrations of metal and non-metal constituents in the tailings disposal area following disposal of the process residuals from processing of the [Sequoyah Fuels] Uranium Material"); 43 (discussing increased phosphate, aluminum, and iron concentrations); 46 (ammonia).
[362] Ex. 74 at 14.
[363] Ex. 74 at 31.

incrementally higher radiological risk" than Colorado Plateau-derived ores and tailings.[364] The report goes on to observe that, though there's more Thorium-230 and Thorium-232 in the sludge than most substances the mill has processed, there's less Thorium-230 than was present in the "Nevada Test Site Cotter Concentrate" and less Thorium-232 than in the "W.R. Grace alternate feed materials."[365] Phosphorous, the report says, is present in the sludge at a concentration of 19,600 mg/kg, but the "Cameco Calcined Product" had more.[366] At 44,100 mg/kg, fluoride levels are less than the "FMRI alternate feed."[367]

These comparisons are useless for evaluating the hazards the sludge poses. They say nothing about how hazardous the sludge is, only how hazardous it might be relative to other materials the mill has already been given permission to process. These comparisons are unintelligible absent some explanation of how the constituents of the Sequoyah Fuels sludge may affect the environment or public health at the concentrations at which they're present in the sludge.

Along the same lines, the only conclusion the report draws about how the Sequoyah Fuels sludge might affect the liners in Cells 4A and 4B was that it wouldn't "result in any *additional* detrimental impacts."[368] But that could be true if the caustic substances that are already in Cells 4A and 4B are already causing severe detrimental impacts to the liners. Without any understanding of what the existing damage to the liners may be, it is meaningless to downplay the "additional" impacts that may occur.

This sort of reasoning also predisposes the Division to approving ever-more-foul wastes for disposal at the mill. By comparing the Sequoyah Fuels' sludge ingredient-by-ingredient to the worst constituents of previously approved wastes, the Division can sanction its disposal on the reasoning that it's not much worse than the mixture that's already in the cells, even if standing alone it would be far more hazardous than any given waste previously processed.

These deficiencies in the report's analysis of the hazards the Sequoyah Fuels sludge may pose should be fixed, and the Division should make a new assessment of whether to license disposal of the sludge based on that revised analysis.

VI. Conclusion

Though the Division has made commendable improvements in regulating the White Mesa mill, deficiencies remain. We urge the Division to remedy them.

[364] Ex. 74 at 14.
[365] Ex. 74 at 14.
[366] Ex. 74 at 26.
[367] Ex. 74 at 26.
[368] Ex. 74 at 31.