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October 29, 2014

Air and Radiation Docket, Environmental Protection Agency
Mailcode: 2822T, 1200 Pennsylvania Avenue NW
Washington DC 20460

RE: DOCKET ID NO. EPA-HQ-OAR-2008-0218
COMMENTS ON PROPOSED REVISIONS TO 40 CFR PART 61 - SUBPART W, NATIONAL EMISSION STANDARDS FOR RADON EMISSIONS FROM OPERATING URANIUM MILL TAILINGS

Dear Sirs/Mesdames:

Energy Fuels Resources (USA) Inc. (Energy Fuels) has reviewed the U.S. Environmental Protection Agency's (EPA's) proposed revisions to 40 CFR Part 61 – Subpart W, *"National Emission Standards for Radon Emissions from Operating Mill Tailings"* (the "Proposed Rules"). Energy Fuels operates the White Mesa Uranium Mill in Utah, which is the only operating uranium mill in the United States. Energy Fuels is also in the process of permitting the Sheep Mountain project, which is a proposed uranium heap leach processing facility in Wyoming. This letter provides our company's comments on the Proposed Rules.

1. INTRODUCTION AND EXECUTIVE SUMMARY

It should be noted at the outset that Energy Fuels agrees with a number of the positions taken by EPA in the Proposed Rules. For example, we agree that evaporation and similar ponds should not be counted as one of the two impoundments that may be in operation at any one time under the proposed management practice standards. We also agree that there should be no limitation on the number and size of such ponds. In order to operate a uranium mill, a large evaporative capacity is necessary. Water balance is paramount at a zero-discharge facility such as the White Mesa Mill.

However, Energy Fuels has identified several provisions in the Proposed Rules that require comment. Those provisions are summarized below, along with Energy Fuels concerns and recommended modifications to the Proposed Rules. Each of the following matters is discussed in more detail in the main body of these comments.

1.1. Water Cover Over Evaporation Ponds

Energy Fuels believes that the proposed minimum of one meter of water cover over evaporation ponds at uranium recovery facilities will in many cases be prohibitively burdensome with little or no benefit. As EPA has noted, the radon emissions from saturated tailings are only approximately 2% of emissions from dry tailings, and adding one meter of water would result in a negligible reduction. However, there are significant costs associated with this proposed requirement:

- First, the cost of maintaining this one meter of water would be significantly greater than EPA has estimated, given the high evaporation rates and scarcity of water at facilities such as the White Mesa Mill;
- Second, this requirement will seriously impact, and may eliminate, a uranium mill's ability to recirculate tailings solutions back into the process, because the addition of fresh water will change the chemistry of the solutions;
- Third, a uranium mill will be prevented from reducing solution levels in evaporation ponds from time to time to inspect and, if necessary, perform maintenance activities; and
- Finally, evaporative and holding capacity at a uranium mill is at a premium, and adding fresh water to the system would displace needed capacity for process solutions. This would generally require construction of additional evaporative and holding capacity, at significant capital cost.

Energy Fuels fully supports added protections to public health, safety and the environment when required. However, in these circumstances, the added protections are negligible or non-existent and the cost of the added requirements are prohibitive and cannot be justified.

Energy Fuels recommends instead that the proposed rule be changed to require full saturation or water cover on evaporation and similar ponds, but not to require a minimum liquid level in the ponds. See Section 2 below for a more detailed discussion.

1.2. Definition of 11e.(2) Byproduct Material

The definition of 11e.(2) byproduct material in the existing 40 CFR Part 61, Subpart W (the "Existing Rules") and Proposed Rules is different from the definition in the Atomic Energy Act of 1954, as amended (the "AEA"). We don't believe EPA has the authority to promulgate a different definition of 11e.(2) byproduct material, and in any event a difference in such a key definition can lead to unnecessary confusion. That definition should be the same in the Proposed Rules as it is in the AEA and the regulations thereunder. The definition of "uranium byproduct material and tailings" in the Existing Rules and the Proposed Rules confuses the distinction between "tailings" and "other wastes", which are distinct subsets of 11e.(2) byproduct material as defined in the AEA. This distinction is important in order to clarify the definitions of "operation" and "closure period", discussed in Section 4 below. See Section 3 below for a more detailed discussion.

1.3. Definitions of "Operation" and "Closure Period"

There is confusion over the definitions of "operation" and "closure" in the Proposed Rules that needs to be clarified. The existing regulations at 40 CFR 192.32(a)(3)(iv) and (v) make it abundantly clear that 11e.(2) byproduct material may be disposed of in tailings impoundments during the closure process. It is therefore not appropriate to tie the definitions of "operation" and "closure period" to the disposal of 11e.(2) byproduct material in a tailings impoundment. Instead, operations for a conventional tailings impoundment should be tied to the disposal of tailings sands from process operations, not the broader category of 11e.(2) byproduct material.

We therefore propose revisions to the Proposed Rules such that a conventional tailings impoundment would be considered to be in operation so long as it is being used for the continued placement of tailings sands from process operations or is on standby for such placement. The closure period for a conventional impoundment would begin when the licensee provides written notice to EPA and the Unites States Nuclear Regulatory Commission (NRC) or NRC Agreement State that the impoundment is no longer being used for the continued placement of tailings sands from process operations and is no longer on standby for such placement.

Under our proposed revisions to the Proposed Rules, a non-conventional impoundment would be considered to be in operation so long as it is being used for evaporative or holding purposes or is on standby for such purposes, and the closure period for a non-conventional impoundment would start upon written notice from the licensee that the impoundment is no longer being used for evaporative or holding purposes and is no longer on standby for such purposes.

These revised definitions would be consistent with the existing regulations in 40 CFR Part 192 and would clarify when EPA jurisdiction over an impoundment under Subpart W ceases and when the schedule for milestones to be implemented by NRC or the applicable Agreement State under the impoundment's closure plan commences. See Section 4 below for a more detailed discussion.

1.4. Dual Jurisdiction

The removal of the phrase "as determined by the NRC" in 40 CFR 61.252(b)(1) and (2) and a number of the additional record-keeping requirements amount to dual jurisdiction over the construction and operation of uranium mill tailings impoundments. This is in contravention of Section 275(b)(1) of the AEA under which EPA is required to set standards of general application for the management of 11e.(2) byproduct material, and the implementation and enforcement of the standards is expressly stated to be the responsibility of NRC and Agreement States in the conduct of their licensing activities under the AEA. Section 275(b)(2) of the AEA also expressly states that no permit is required by EPA for the processing, possession, transfer, or disposal of 11e.(2) byproduct material.

Under the Proposed Rules, an operator would effectively need to simultaneously go through the entire design and permitting process for new tailings cells with the NRC or Agreement State and with the EPA. Otherwise, the facility would be subject to possible different implementation of the rules by EPA after the fact. There is no need for such dual jurisdiction in order to implement the NESHAPs requirements under the Clean Air Act, and it will unnecessarily burden the regulatory process. Such dual jurisdiction is tantamount to EPA requiring a permit for the disposal of 11e.(2) byproduct material, in contravention of the AEA. We propose that the phrase "as determined by the Nuclear Regulatory Commission" be retained in those and other sections of the Proposed Rules. See Section 5 below for a more detailed discussion.

1.5. Proposed Application of Subpart W to Heap Leach Facilities

We also have concerns relating to the proposed application of Subpart W to heap leach facilities. A conventional heap leach pile is not a tailings impoundment or 11.e.(2) byproduct facility while in operation. Heap leaching is part of the milling process, and the proposed rules would interfere with such processing operations. For example, the requirement to maintain a 30% moisture content would have the effect of diluting process solutions and impacting operations. This is in stark contrast to a tailings impoundment at a uranium mill, where Subpart W does not apply to process operations, but only to tailings that have been finally disposed of after processing, and hence cannot impact processing. Subpart W should apply only to tailings impoundments and 11.e.(2) byproduct material and not extend to regulating process operations. Once process operations have ceased at a conventional heap leach facility, the fully leached ore would become 11e.(2) byproduct material, but the facility would then go into closure in place and be subject to the requirements of 10 CFR Part 40 Appendix A. Hence, there is no place for regulation under Subpart W at conventional heap leach facilities, other than any non-conventional impoundments that may exist at those facilities. The radiological protection programs required under 10 CFR Parts 20 and 40 include adequate protections and monitoring for radon at such facilities. However, fully leached ore from the final operating stages of an on-off or vat heap leach facility that is permanently disposed of in a separate waste repository would be 11e.(2) byproduct material and could be regulated under Subpart W after disposal in the repository, in the same manner as tailings from ore processing at a uranium mill are regulated after disposal in a conventional impoundment. See Section 6 below for a more detailed discussion.

1.6. ISR Facilities

The Proposed Rules should expressly exclude one type of waste water storage and disposal method currently used at in situ recovery (ISR) operations. This method involves discharge of treated waste water into reservoirs and disposal via land application. Prior to discharge, the waste water is treated for the removal of radium-226 to meet the NRC's 10 CFR Part 20, Appendix B, Effluent Concentration Limits and, as such, poses an insignificant risk of radon flux. Further, certain of these reservoirs do not meet, nor were they designed, licensed or constructed to meet, the requirements of 40 CFR 61.252(c).

Although the treated water in these reservoirs could be considered to contain 11e.(2) byproduct material and hence could be considered to be subject to the requirements of Subpart W, we do not believe that such treated water reservoirs should be subject to Subpart W requirements. See Section 7 below for a more detailed discussion.

1.7. Burdens and Costs of Proposed Rules

EPA has underestimated the economic burdens and costs on industry that would result from implementation of the Proposed Rules. See Section 8 below for a more detailed discussion.

1.8. Other Issues Generated from our Review of the Proposed Rules

A number of other issues generated from our review of the Proposed Rules are discussed in Section 9 below.

2. WATER COVER OVER EVAPORATION PONDS

EPA proposes that there be no maximum area requirement for the size of evaporation or holding ponds since the chance of radon emissions is small, and that there be no limit on the number of such ponds. We agree with EPA on these positions. There should be no maximum limit on the total number of acres of evaporative/holding capacity at a uranium recovery facility, as these ponds emit very low levels of radon. The number and sizing of evaporation and holding ponds needs to be based on a number of factors including the mill production rate, the amount of solution that can be recycled, and the annual net evaporation rate.

However, Energy Fuels' believes that the proposed minimum of one meter of water cover over evaporation and holding ponds at uranium recovery facilities will in many cases be prohibitively burdensome with little or no benefit. As EPA has noted, the radon emissions from saturated tailings are only approximately 2% of emissions from dry tailings, and adding one meter of water would result in a negligible reduction (Fed. Reg. Vol. 79, No. 85, Friday, May 2, 2014, page 25398). In its October 1984 *"Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Response to Comments"* EPA concluded:

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rates. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

EPA has cited no new evidence that would bring into question these conclusions.

However, there are significant costs associated with this proposed requirement, as discussed below.

2.1. Impact on Process Operations

The requirement to maintain one meter of solutions over evaporation and holding ponds will seriously impact, and may eliminate, a uranium mill's ability to recirculate tailings solutions back into the process, because the addition of fresh water will change the chemistry of the solutions.

Uranium mills frequently recirculate tailings solutions from the tailings impoundments or evaporation ponds back into the process. This allows the Mill to conserve fresh water usage, to free up some evaporative/solution holdings capacity in the tailings management system, to reduce the amount of acid that is required to be added to the process, and to recover some of the uranium that has been left in the tailings solutions. How frequently and to what extent tailings solutions are added back into the process, will be dictated by a number of processing and cost considerations, including the makeup and suitability of the tailings solution for recirculation. Any requirement that will result in the addition of fresh water into the tailings solutions will raise the pH of those solutions which will impact or eliminate the suitability of the solutions for recirculation into the process. This would impact process decisions, costs of processing, the amount of acid that must be added to the process and the amount of uranium that can be recovered from the re-circulated tailings solutions.

2.2. Impact on Evaporative and Holding Capacity

Evaporative and holding capacity at a uranium mill is at a premium, and adding fresh water to the system would displace needed capacity for process solutions. This would generally require construction of additional evaporative and holding capacity, at significant capital cost.

Evaporation ponds, as their name implies, are designed to evaporate solutions. In designing these ponds, the ponds are sized to evaporate all of the solution that is not recycled for processing by the end of the evaporative season so that there is minimal solution in the pond going into the non-evaporative season. During the non-evaporative season, the ponds need to have enough capacity to accumulate and store process solutions as they are generated from milling operations. The evaporative season typically extends from late spring to early fall, with the non-evaporative season extending from late fall to early spring. If a uranium mill were required to maintain an additional meter of water at all times, a new mill would have to build the ponds a meter deeper. For a 40-acre evaporation pond, this would require excavating approximately 200,000 cubic yards of additional material during construction, and installing approximately 18,000 square feet of additional liner at a combined additional cost of approximately $750,000. An existing uranium mill would not be able to meet this requirement unless it curtailed production operations or constructed additional evaporative capacity, because its existing evaporative capacity would have been sized on the assumption that the ponds could be evaporated to low levels by the end of the evaporative season. The cost of an additional 40-acre evaporation pond would be similar to the cost of an additional tailings impoundment, which EPA has estimated in Fed. Reg., Vol. 79, No. 85, Friday, May 2, 2014 (the “Preamble”), page 25401 to be approximately $15.3 million for the liner alone. In addition, establishing a one-meter minimum water pool may force an operator to shut down an evaporation pond much earlier, to the extent the pond fills with sediment, and build a new evaporation pond with the associated additional costs.

2.3. Unnecessary Use and Cost of Scarce Water Resources

The Proposed Rules seemingly ignore the fact that water is in short supply in the western United States, where most uranium recovery facilities are located. Water conservation is an integral part of western culture, and various users from ranchers, natural resource industries, and municipalities employ practices designed to limit water consumption. In contrast, the Proposed Rules require the use of a substantial amount of water to maintain deep water covers over relatively low radioactive materials.

For example, a 40-acre evaporation pond, such as Cell 4B at the White Mesa Mill, would require the addition of 43.6 million gallons of water per year to maintain one meter of liquid cover during the entire year. This estimate is based on a net evaporation rate of 36 inches per year, which is fairly common in the uranium producing states. The 43.6 million gallons is approximately equal to a pumping rate of 83 gallons per minute (gpm). Given that the White Mesa Mill has a second evaporation pond of 55 acres (Cell 1), the total increase in water needed would be equal to about 103 million gallons or a pumping rate of approximately 200 gpm. Two new 2,000-foot deep wells and associated pipelines would need to be installed at a cost of approximately $800,000 to provide the necessary water cover. The cost to operate and maintain the new water system would be approximately $200,000 per year. This analysis would apply when the mill is on standby and not processing ores, which historically has been a significant portion of the time. It would also apply when the mill is processing ores, to the extent the net evaporation rate exceeds the rate of inflow of process solutions to the evaporation ponds or the evaporation ponds do not have the required one meter of liquid cover. The capital expenditures described above would therefore be required.

The added capital and operating costs necessary to maintain the one meter of water cover are not only substantial, but do not make any sense given that water is in such short supply in the western United States, and evaporation ponds typically have very low radioactivity levels compared to tailings impoundments. For example, bench-scale testing conducted during the design of the Piñon Ridge Mill showed that the precipitants in the evaporation pond would contain about 7.9 pCi/g of radium-226 (EFRC 2010b), which is almost two orders of magnitude lower than the 647 pCi/g (EFRC 2010a) calculated for the tailings solids in the tailings cell.

2.4. Impact on Maintenance Activities

Requiring a constant one meter of solutions in evaporation and holding ponds would not be achievable during startup. It would take some time to increase solutions to the required level, during which the facility would not be in compliance with the requirements. Also, and more importantly, this requirement would prevent a mill from reducing solution levels in evaporation or holding ponds from time to time to inspect and, if necessary perform maintenance activities on the ponds. For example, if there is a leak in a pond liner, it may be necessary to lower the water level to a point below the leak so that repairs can be made. Another example would occur when collected sediment needs to be cleaned out of a pond and shipped elsewhere for disposal or uranium recovery. In this case, all of the solution would typically need to be removed prior to removal of the sediments.

2.5. Difficulty in Measurement

There is no clear-cut manner to estimate the depth of liquids in evaporation or holding ponds since there is usually no clear demarcation between precipitated materials and solution. The precipitants are totally saturated and of low density while the solution contains relatively high levels of suspended and dissolved solids. The two materials essentially merge into each other. There are also safety concerns about measuring liquid levels, unless the measurements are simple and limited to a small number of well-defined and accessible areas of the pond.

There is also no reasonable method for monitoring radon emissions from a low radioactive source when the emission levels are only slightly elevated above background.

2.6. Increased Potential for Liner Leakage

On Page 25408, Section C. of the Preamble, EPA states that: *"… the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water …"* However, given that the Proposed Rules would require a meter of additional hydraulic head to be maintained on "non-conventional" impoundments and many tens of feet of additional hydraulic head on heap leach facility liners (see the discussion in Section 6 below), the net effect of the Proposed Rules would be to increase the potential for leakage of liner systems in non-conventional impoundments. This would be contrary to NRC's regulations at 10 CFR Part 40 Appendix A, Criterion 5E:

"In developing and conducting ground-water protection programs, applicants and licensees shall also consider the following:

- "… Mill process designs which provide the maximum practicable recycle of solutions and conservation of water to reduce the net input of liquid to the tailings impoundment."
- "…Dewatering of tailings by process devices and/or in-situ drainage systems (at new sites, tailings must be dewatered by a drainage system installed at the bottom of the impoundment to lower the phreatic surface and reduce the driving head of seepage… "

2.7. Summary and Suggested Revised Language for the Proposed Rule

Energy Fuels fully supports added protections to public health, safety and the environment when required. However, in these circumstances, the added protections are negligible or non-existent and the cost of the added requirements, to the licensee, the environment and the community, are prohibitive and cannot be justified.

Energy Fuels agrees that a liquid cover, or full saturation, can be used effectively to reduce radon emissions from facilities containing 11e.(2) byproduct material. However, Energy Fuels recommends instead that the Proposed Rules be changed to require full saturation or water cover on evaporation and similar ponds, by requiring that any tailings solids in the impoundment shall be covered with a layer of liquid, but not to require a minimum liquid level in the ponds. Specifically, Energy Fuels recommends that Section 40 CFR 61.252(b) of the Proposed Rules be revised to read as follows (see the discussion in Section 5 below relating to the addition of the phrase "as determined by the Nuclear Regulatory Commission" in the following provisions):

> "(b) *Non-conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1), as determined by the Nuclear Regulatory Commission. During operation and until commencement of the closure period for the impoundment, any solids in the impoundment shall be covered with a layer of liquid, as verified by daily inspection. Any failure to meet this standard shall be rectified within seven (7) days after detection, or within such other time as the Administrator may approve."

In addition, proposed 40 CFR 61.255(b) should correspondingly be revised to read as follows:

> "(b) The owner or operator of any uranium recovery facility with non-conventional impoundments in operation must maintain records of daily inspections confirming that a layer of liquid has been maintained over any solids in the non-conventional impoundments at the facility in accordance with the requirements of 40 CFR 61.252(b)."

This requirement will ensure that any tailings solids in the non-conventional impoundment will be either fully covered by liquid, or fully saturated. If, as a result of a daily inspection, it is observed that a layer of liquid has not been maintained over all solids in the non-conventional impoundment, this must generally be rectified within seven days. Any solids that remain exposed during that seven day period would typically be expected to continue to be fully saturated. The recommended wording also allows the Administrator to approve a longer time to rectify the failure, such as may be required due to unusual circumstances or if the need to conduct maintenance inspections or perform repair work would require reducing solutions to levels that would expose solids for a more prolonged period of time.

In addition, it should also be made clear in the Proposed Rules that impoundments which are designed and constructed as conventional impoundments can be operated as non-conventional impoundments prior to the placement of tailings in the impoundment. This is required in order to maintain enough replacement evaporative capacity in new impoundments to offset the reduction in evaporative capacity in operating conventional impoundments as they are filled with tailings. Accordingly, we recommend that the third sentence in the definition of "non-conventional impoundment" in the Proposed Rules be changed to read as follows: "They are removed at facility closure, or can become conventional impoundments upon placement of tailings into the impoundment." Or, that sentence can be deleted from the definition.

3. DEFINITION OF 11E.(2) BYPRODUCT MATERIAL

The definition of byproduct material in the Existing Rules and Proposed Rules is different from the definition of 11e.(2) byproduct material in the AEA. We don't believe EPA has the authority to promulgate a different definition of 11e.(2) byproduct material than the definition in the AEA and the rules promulgated thereunder. That definition should be the same in the Proposed Rules as it is in the AEA and the regulations under the AEA. A difference in such a key definition can lead to unnecessary confusion. In fact, as will be discussed in detail in Section 4 below, the improper definition of byproduct material in the Proposed Rules is one of the reasons that there is confusion relating to the definitions of "operations" and "closure period" in those rules.

The term "byproduct material" as it relates to uranium recovery facilities[1] is defined in Section 11e.(2) of the AEA (42 USC 2014) as:

> "The tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content."

That definition has been clarified by the NRC in 10 CFR 40.4, to specifically address the application of the AEA definition to ISR facilities. The definition of 11e.(2) byproduct material in 10 CFR 40.4 reads as follows:

> "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. Underground ore bodies depleted by such solution extraction operations do not constitute 'byproduct material" within this definition."

[1] The definition of "byproduct material" in the AEA also extends to other forms of byproduct material that are not relevant to uranium recovery facilities. The category of byproduct material relevant to uranium recovery facilities and the Proposed Rules is 11e.(2) byproduct material discussed above.

These definitions are clear as they relate to uranium mills. They make a distinction between tailings and other wastes and include both in the definition of 11e.(2) byproduct material. As EPA has noted, "Uranium mill tailings are sand-like wastes that result from the processing of uranium ore. Tailings are stored in large surface impoundments called piles. . ."[2] The "wastes" referred to in the definition are all the other wastes generated in connection with uranium milling operations and site closure. These include: on-site generated trash, discarded piping and equipment, containers, drums, laboratory waste, used personal protection equipment, construction debris, and any potential groundwater restoration liquids and residues etc., that are generated during milling operations as well as closure activities. Such "wastes" also include dismantled buildings, facilities and other structures, contaminated surface soils, any un-milled ore remaining at the site and all other contaminated materials that require permanent disposal upon site reclamation. All of these "wastes", whether generated during operations or site closure, along with all "tailings" generated from mill operations are 11e.(2) byproduct material and *must* be permanently disposed of on-site in tailings impoundments licensed to receive 11e.(2) byproduct material.

The regulatory regime applicable to uranium recovery facilities revolves around this definition of 11e.(2) byproduct material. The definition is intended to be very broad, to ensure that it captures all mill-related wastes, and that all such wastes are permanently disposed of in 11e.(2) tailings impoundments. Further, upon site closure, all 11.e.(2) impoundments must be transferred to the US Department of Energy or the State for perpetual care and ownership. All of these regulatory requirements under the AEA revolve around the definition of 11e.(2) byproduct material as set out in the AEA and as clarified by NRC in its regulations.

These are the official definitions of 11e.(2) byproduct material. The definition of 11e.(2) byproduct material in the AEA may only be changed by Congress by an amendment to the AEA. The definition of 11e.(2) byproduct material in the regulations promulgated under the AEA may only be changed by the NRC in accordance with its rulemaking authority (which does not extend to changing the fundamental definition of 11e.(2) byproduct material in the AEA). Note that the NRC definition of 11e.(2) byproduct material in 10 CFR 40.4 does not change the AEA definition; it merely clarifies its application to ISR facilities.

The Clean Air Act (1970), as amended (42 USC §7401) refers to the AEA defined terms of "source material", "special nuclear material" and "byproduct material", but does not attempt to redefine those terms. The Clean Air Act states in section 302(g) that:

> The term "air pollutant" means any pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air. . . ."

In contrast "Uranium byproduct material or tailings" is defined in the Existing Rules at 40 CFR 61.251(g) as follows:

[2] Fed. Reg., Vol 58, No. 218, Monday, November 15, 1993, page 60340.

> "*Uranium byproduct material or tailings* means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction and which remain underground do not constitute byproduct material for the purposes of this subpart."

The Proposed Rules do not contemplate any changes to that definition.

This definition is different from the definition of 11e.(2) byproduct material under the AEA and the regulations promulgated thereunder. The definition under 40 CFR 61.251(g) purports to equate byproduct material and tailings as the same thing and defines them both as the wastes produced by the extraction or concentration of uranium ore etc. This blurs the distinction in the AEA between "tailings" and other "wastes". Clearly on-site generated trash, discarded piping and equipment, containers, drums, laboratory waste, used personal protection equipment, construction debris, any potential groundwater restoration liquids and residues etc. are not "sand-like wastes that result from the processing of uranium ore", and are therefore not "tailings". Also, much of the other "wastes" are only mildly contaminated, such as office trash, dismantled buildings etc., and are distinct from tailings. The definition also uses different language relating to 11e.(2) byproduct material created at ISR operations.

As 11e.(2) byproduct material impoundments are licensed to receive 11e.(2) byproduct materials, any regulations that apply to materials disposed of in an 11e.(2) byproduct material impoundment must use the AEA definition for those materials. There is no good reason to do otherwise, and using a different definition adds unnecessary confusion. Further, as will be discussed in more detail in Section 6.2(a) below, EPA derives its jurisdiction to regulate air pollutants from uranium mill tailings under the Clean Air Act by virtue of Section 275(d) of the AEA, which is tied to the AEA definition of 11e.(2) byproduct material. EPA's rules in Subpart W must therefore be tied to that same definition.

As will be discussed in more detail in Section 6 below, the failure to use the AEA definition of 11e.(2) byproduct material in the Existing Rules has led to confusion on the part of EPA as to the definitions of "operation" and "closure period" and how those definitions must correspond to the way uranium recovery facilities are regulated under the AEA and the regulations promulgated thereunder.

Energy Fuels therefore recommends that the definition of "Uranium byproduct materials or tailings" in the Existing Rules and Proposed Rules be replaced with the following:

> "Uranium Byproduct Material means the tailings or wastes produced by the extraction or concentration of uranium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute "byproduct material" within this definition."

As will be seen below, we do not believe that replacement of the existing definition with the foregoing definition, in conjunction with the other recommended changes discussed below, will result in any deviations from the objectives of the Proposed Rules, but will lead to less confusion for both licensees and regulators on an on-going basis.

4. DEFINITIONS OF “OPERATION” AND “CLOSURE PERIOD”

The definitions of “operation” and “closure period” are not very well spelled out in the existing 40 CFR 61.251, and the proposed changes to those definitions in the Proposed Rules are inconsistent with the current regulatory regime in 40 CFR Part 192 and 10 CFR Part 40 Appendix A.

In order to see this, it is worthwhile to review how uranium mill tailings impoundments are operated and regulated. A mill facility could have one tailings impoundment, likely along with one or more evaporation/holding ponds, or it could have several tailings impoundments, along with several evaporation/holding ponds. In the case of a mill with one tailings impoundment and one or more evaporation ponds, the tailings impoundment and evaporation ponds will be reclaimed at closure of the entire site. In the case of a mill with more than one tailings impoundment, it is likely that one or more of those tailings impoundments will be reclaimed while the Mill site as a whole is still in operation and prior to final site closure. In that case, any un-reclaimed tailings impoundments at the time of closure would be reclaimed as part of final site closure. Indeed, the concept of “phased disposal” in the Existing Rules and in the Proposed Rules, by definition, contemplates that tailings impoundments will be limited in size and in number, on the assumption that tailings impoundments will be put into closure and reclaimed when they have been filled to capacity, to be replaced by new impoundments when necessary during the operational life of the Mill facility.

It is therefore important to distinguish between site closure and the closure of a particular tailings impoundment, and to distinguish between a tailings impoundment ceasing to be in operation, as distinct from the entire Mill facility ceasing to be in operation.

4.1. <u>Activities that Take Place at a Tailings Impoundment When in Operation and During Closure</u>

It is instructive to walk through the various activities that take place at a tailings impoundment, when in operation and during closure.

a) Tailings Impoundment Activities While the Impoundment is in Operation

During operations, the primary function of the tailings impoundment will be to receive or be on standby to receive mill tailings sands for disposal. As discussed in Section 3 above, during operations the mill will also be required to dispose of on-site generated trash, discarded piping and equipment, containers, drums, laboratory waste, used personal protection equipment, construction debris, and any potential groundwater restoration liquids and residues etc., all of which are considered to be 11e.(2) byproduct material and must be permanently disposed of on site. Many uranium mills will also be licensed to directly dispose of 11e.(2) byproduct material generated at third-party ISR facilities, and some mill facilities may also be licensed to directly dispose of non-11e.(2) byproduct materials (“Non-11e.(2) Byproduct Material”) from third-party facilities in accordance with NRC’s *Revised Guidance on Disposal of Non-Atomic Energy Act of 1954, Section 11e.(2) Byproduct Material in Tailings Impoundments* (NUREG 1620, Appendix I).

b) During Final Site Closure

Upon final Mill facility closure, all Mill buildings and facilities, contaminated surface soils, any residues in evaporation ponds and the evaporation pond liners themselves, and any un-milled ore on the ore pad etc. will be cleaned up and permanently disposed of in one of the previously un-reclaimed tailings impoundments at the time of final site closure. In fact, all uranium mill reclamation plans require that adequate capacity be left in the un-reclaimed tailings impoundments at all times to be able to accommodate all of these final site closure wastes. As discussed in Section 3 above, all final site reclamation wastes are considered to be 11e.(2) byproduct material and must be disposed of in a licensed 11e.(2) tailings impoundment.

In the case of a facility with one tailings impoundment, and one or more evaporation ponds, the tailings impoundment would be placed into closure at the time the entire Mill facility is put into closure. Final closure will not begin until processing operations have stopped and tailings are no longer deposited into the tailings impoundment. Once processing operations have ceased and no further tailings will be disposed of in the impoundment, interim cover will be placed over the portions of the impoundment that are filled up, to the extent such cover has not already been placed on the impoundment. This will allow the radon flux from the impoundment to be 20 pCi/m^2-s or less averaged over the entire impoundment during the closure process, and will prepare the impoundment for the dewatering process. The remainder of the impoundment will remain open to receive site trash etc. as well as decommissioning wastes, such as building demolition, liners from the evaporation ponds, surface soils etc. As the remaining areas of the impoundment become filled with site trash and decommissioning wastes etc., interim cover will be advanced over those areas. Once all site clean-up has been completed and all contaminated materials have been disposed of in the tailings impoundment, interim cover will be placed over most of the impoundment. Once interim cover has been placed over most of the impoundment, dewatering activities can commence. As the EPA is well aware, placement of a final cover cannot be started until the tailings consolidate to the point where further subsidence is minimal. This is accomplished through dewatering operations and placement of an interim cover that places a surcharge on the tailings. Survey monuments are also established on top of the tailings cover to determine the rate of subsidence. Depending on the water content and drain-down characteristics of a tailings impoundment, it may take many years to achieve an asymptotic subsidence state where construction of the final cover can be placed.

The total closure process would typically take several years to complete. During that time, on-site generated trash, discarded piping and equipment, containers, drums, laboratory waste, used personal protection equipment, construction debris, any potential groundwater restoration liquids and residues etc., all of which would still be considered to be 11e.(2) byproduct material, would need to be disposed of in a tailings impoundment, so a small portion of the impoundment would typically be left open for such disposal. Also during this process, disposal of 11e.(2) byproduct material from ISR facilities and, if licensed, Non-11e.(2) Byproduct Material could continue to be disposed of in the impoundment. If there were any groundwater contamination at the site, that contamination would also be considered to be 11e.(2) byproduct material and may have to be pumped into a tailings impoundment or evaporation pond for evaporation. Capacity or other accommodation would be required to be reserved in the tailings impoundments or evaporation ponds for such evaporation and the final disposal of any evaporation pond linings and residues.

All of these activities are contemplated by existing regulations, and have been practiced by industry for at least the last twenty five years. 40 CFR 192.32(a) sets out the *"Standards for application during processing operations and prior to the end of the closure period"*. These standards have been adopted by NRC in 10 CFR Part 40 Appendix A Criterion 6 and Criterion 6A. 40 CFR 192.32 (a)(3)(iv) provides that:

> The Nuclear Regulatory Commission or Agreement State may, in response to a request from a licensee, authorize by license or license amendment a portion of the site to remain accessible *during the closure process* to accept uranium byproduct material as defined in section 11e.(2) of the Atomic Energy Act, 42 USC 2014(e)(2), or to accept materials similar to the physical, chemical and radiological characteristics of the in situ uranium mill tailings and associated wastes, from other sources. No such authorization may be used as a means for delaying or otherwise impeding emplacement of the permanent radon barrier over the remainder of the pile or impoundment in a manner that will achieve compliance with the 20 pCi/m^2-s flux standard, averaged over the entire pile or impoundment." (emphasis added)

Similar language can be found in 10 CFR Part 40 Appendix A Criterion 6A.

40 CFR 192.32(a)(3)(v) and 10 CFR Part 40 Appendix A Criterion 6A, similarly allow for a portion of a tailings impoundment to remain accessible after placement of the permanent radon barrier to accept the disposal of 11e.(2) byproduct material (but not Non-11e.(2) Byproduct Material).[3]

c) During Phased Closure of One Cell at a Time Prior to Site Closure

In the case of a facility with more than one tailings impoundment, and one or more evaporation ponds, which follows the phased disposal work practice standard in the Existing Rules and Proposed Rules, tailings cells may be placed into closure once they have been filled to their capacity, even though the entire Mill facility remains in operation and is not in closure. In that case, closure of the impoundment will not begin until tailings are no longer deposited into the tailings impoundment. Once tailings will no longer be deposited into the impoundment, interim cover will typically be placed over the portions of the impoundment that have been filled up, to the extent such cover has not already been placed on the impoundment. Once interim cover has been placed over most or all of the impoundment, dewatering activities can commence. The impoundment must be dewatered sufficiently prior to placing the final

[3] In the preamble to its 1993 amendments to the standards set out in 40 CFR Part 192, EPA acknowledged this as follows: "Under the existing regulatory scheme, NRC and the affected Agreement States may have the authority to allow, at a licensee's request, a portion of a site to remain accessible, during the closure process to accept byproduct material as defined in section 11e.(2) of the AEA, (e.g., wastes from in situ mining operations, or from groundwater corrective action programs), or to accept materials from other sources that are similar to the physical, chemical and radiological characteristics of the in situ uranium mill tailings and associated wastes. In addition, NRC and the affected Agreement States may authorize a portion of a site to remain accessible to accept section 11e.(2) byproduct material after placement of a permanent radon barrier over a portion of a pile or impoundment. Nothing in today's action alters, ratifies, or otherwise affects this authority." (Fed. Reg. Vol. 58, No. 218, Monday, November 15, 1993, page 60347). It should be noted that wastes from groundwater corrective action programs are just one example of on-site generated 11e.(2) byproduct material during the closure process that must be disposed of and/or evaporated in the mills tailings impoundments or evaporation ponds.

reclamation cover over the impoundment, to ensure that subsequent settlement does not impact the integrity of the final radon barrier.

This closure process would typically take several years to complete. During that time, on-site generated trash, discarded piping and equipment, containers, drums, laboratory waste, used personal protection equipment, construction debris, any potential groundwater restoration liquids and residues etc., all of which is 11e.(2) byproduct material, as well as 11e.(2) byproduct material from ISR facilities and, if licensed, Non-11e.(2) Byproduct Material, would need to continue to be disposed of in a tailings impoundment at the site.

In many cases, however, new tailings impoundments are not suitable for the direct disposal of these types of materials, because the new impoundments may have insufficient tailings sands or volume to allow access to or to accommodate such direct disposal. Consolidated tailings are needed to form a cushion around these materials and to prevent them from damaging the liner system. A good example of this occurs at the White Mesa Mill where 11e.(2) byproduct material from ISR facilities is disposed of in Cell 3, which is no longer receiving tailings and has an interim soil cover over most of the impoundment. By contrast, disposal of the same materials in Cell 4A, which is being actively used for tailings disposal, would be difficult and could potentially damage the liner at this stage of operations. There are currently very little consolidated tailings in Cell 4A to provide the required cushion for disposal, and there is no safe means of access to the tailings beach area. It will therefore be necessary to retain a small area of Cell 3 open during the closure process for that cell, in order to receive those wastes until Cell 4A becomes suitable for such disposal. As discussed above, this practice is expressly contemplated by 40 CFR 192.32 (a)(3)(iv) and 10 CFR Part 40 Appendix A Criterion 6A.

4.2. Differences Between "Operation" and "Closure"

It is clear from the foregoing that the main differences between the operational period and the commencement of the closure period is that during the operational period tailings sands from operations are disposed of in a tailings impoundment or the impoundment is on standby for such disposal, whereas once an impoundment commences the closure period it no longer accepts such tailings for disposal and is no longer on standby for such disposal. Other non-tailings 11.e.(2) byproduct materials, such as on-site generated trash, discarded piping and equipment, containers, drums, laboratory waste, used personal protection equipment, construction debris, any potential groundwater restoration liquids and residues etc. are disposed of in tailings impoundments while in operation and during the closure process.

40 CFR 192.31(h) defines "Closure Period" to mean "the period of time beginning with the cessation, with respect to a tailings impoundment, of uranium ore processing operations and ending with completion of requirements under a closure plan". 40 CFR 192.31(p) defines "operational" to mean that "a uranium mill tailings pile or impoundment is being used for the continued placement of uranium byproduct material or is in standby status for such placement. A tailings pile or impoundment is operational from the day that uranium byproduct material is first placed in the pile or impoundment until the day final closure begins." Byproduct material should be read to mean tailings in these definitions, because tailings are the only byproduct material placed in the tailings impoundment that result from "ore processing operations" and because "other waste" byproduct material is expressly contemplated to be disposed of in impoundments during the closure period under 40 CFR 192.32(a)(3)(iv) and (v). EPA properly makes this distinction in the definition of "Operations" in 40 CFR 61.251(e) of the Existing

Rules by substituting "tailings" for "byproduct material" in the same definition, *which is absolutely the correct approach*. Although the use of different words for the same concept is confusing, it should be clear from these definitions, particularly when read in conjunction with 40 CFR 192.32(a)(3)(iv) that the intent of the current regulatory regime is that mill tailings impoundments are in operation so long as tailings sands are being disposed of in the impoundment or the impoundment is in standby for such placement.

These definitions have been established by EPA and are intended to delineate when the schedule begins for key radon closure milestone activities, such as wind-blown tailings retrieval and placement on the impoundment, interim stabilization (including dewatering or the removal of freestanding liquids and re-contouring) and emplacement of a permanent radon barrier. These milestone activities were intended to obviate the need for Subpart T, *National Emission Standards for Radon Emissions from the Disposal of Uranium Mill Tailings*, which has been rescinded. This same delineation should apply to the determination of when Subpart W ceases to apply to a uranium recovery facility, and the closure milestone activities, regulated by NRC or an Agreement State, begin. We agree with the current regulations, although we believe the wording should be made clearer, as discussed in Section 4.3 below.

On page 25405, Section B of the Preamble, the EPA presents a case where an operator asserted that its tailings impoundment was in closure, but the EPA disagreed with this interpretation because the company continued "to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc.) but not "new tailings." For the reasons stated above, EPA's interpretation is clearly wrong. Those activities are expressly contemplated by 40 CFR 192.31(n) as part of the Tailings Closure Plan and by 40 CFR 192.32(a)(3)(iv) and (v), all of which occur during the closure process and not while the tailings impoundment is in operation. Subpart W should be considered to cease to apply once the facility ceases to receive tailings and is no longer on standby to receive future tailings, and the schedule for the performance of the key milestones under NRC or Agreement State jurisdiction should begin at that time.

4.3. Recommended Definitions of "Operation" and "Closure Period"

The current definition of "Operation" in the Existing Rules is as follows:

> "*Operation* means that 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."

In the Proposed Rules, EPA proposes the following new definition for "Operation" and proposes adding a new definition of "Standby" as follows.

> "*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 materials or tailings are first placed in the impoundment until the day that final closure begins."

"Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period."

For all the reasons stated above, the definition of "Operation" in the Existing Rules is correct, although it could be clarified as discussed below. However, the proposed new definitions of "Operation" and "Standby" in the Proposed Rules are not appropriate. They are inconsistent with the existing regulations and the way uranium recovery facilities have been regulated to date. Specifically:

- The definition of "Operation" uses the wrong definition of "byproduct material", which unnecessarily adds confusion by suggesting that "tailings" are not a subset of "byproduct material", as discussed in Section 3 above;

- Both definitions would extend "Operation" to include the entire closure period, because of the need to dispose of non-tailings byproduct material (on-site generated trash etc., ISR 11e.(2) byproduct material and Non-11e.(2) Byproduct Material) in the impoundment through the entire closure process, which is clearly contrary to existing regulations and practice; and

- Extending the operational period and Subpart W jurisdiction during the entire closure period could easily cause a milling facility to have two operating impoundments in the closure process and no ability to operate a third impoundment to receive tailings from operations, which would cause the facility to close, and which cannot be the intention of the Proposed Rules.

As stated above, we believe the existing definition of "operation" is correct; however, we believe it would be appropriate to add a requirement that both EPA and NRC or the Agreement State be formally notified by the licensee when the facility is no longer receiving tailings in the impoundment and is no longer on standby to receive tailings, and hence the closure period and schedule for closure milestones has commenced. This would require changes to the proposed definitions of "Operation" and "Standby" and the addition of new definitions of "tailings" and "Closure Period" into the Proposed Rules.

Also, as the Proposed Rules have added the concept of "non-conventional Impoundment", the closure period needs to be defined for those impoundments as well. We propose that the closure period for those impoundments would not commence until they are no longer being used for evaporation or holding purposes and the licensee has provided notices to that effect. Under this definition, Subpart W authority over non-conventional impoundments may continue during the closure period for conventional impoundments.

We therefore suggest that the definition of "Operation" in the Proposed Rules be changed to read as follows:

"*Operation.* Operation for a conventional impoundment means that the impoundment is being used for the continued placement of tailings or is on standby for such placement, and for a non-conventional impoundment means that the impoundment is being used for evaporation or holding purposes or is on standby for such purposes. A conventional impoundment is in operation from the day that tailings are first placed in the

> impoundment until the day that the closure period for the impoundment begins. A non-conventional impoundment is in operation from the day that it first becomes used for evaporation or holding purposes until the day that the closure period for the impoundment begins."

The proposed definition of "Standby" in the Proposed Rules should be changed to read as follows:

> "*Standby*. Standby for a conventional impoundment means the period of time that the impoundment may not be accepting tailings but has not yet entered the closure period for the impoundment, and for a non-conventional impoundment means the period of time that the impoundment may not be required for evaporation or holding purposes but has not yet entered the closure period for the impoundment."

The following definition of "tailings" should be added to the Proposed Rules[4]:

> "*Tailings.* Tailings means: (a) sand-like wastes from the processing of uranium ore; or (b) fully leached ore from the final operations stage of a heap leach facility upon permanent disposal in a conventional impoundment."

The following definition of "Closure Period", which is based on the definition of "closure period" in 40 CFR 192.31(h) with some modifications to align with the revised definitions of "operation" and "standby" discussed above, should also be added to the Proposed Rules:

> "*Closure Period*. Closure period for a conventional impoundment means the period of time beginning with the date that the owner or operator provides written notice to the Administrator and to the Nuclear Regulatory Commission or applicable NRC Agreement State that the impoundment is no longer receiving tailings and is no longer on standby for such receipt, and ending with completion of the requirements specified under the closure plan for the impoundment. Closure period for a non-conventional impoundment means the period of time beginning with the date that the owner or operator provides written notice to the Administrator and to the Nuclear Regulatory Commission or applicable NRC Agreement State that the impoundment is no longer required for evaporation or holding purposes and is no longer on standby for such purposes, and ending with completion of the requirements specified under the closure plan for the impoundment."

[4] Note, we propose that "tailings" be defined as tailings sands or fully leached ore, recognizing that "tailings" will include some process solutions in addition to the tailings sands or fully leached ore. However, the liquids portion of tailings will eventually be evaporated or pumped out of the impoundment into an evaporation pond or another active impoundment as part of the closure process. Therefore, we believe it would be less confusing to define "tailings" in this manner. If there are no tailings sands or fully leached ore, but just tailings solutions that are being discharged into a tailings impoundment, such activities would not impact the final reclamation of the impoundment and should be considered a part of the evaporative or closure process. Also, see Section 6.2 below for a discussion relating to the inclusion of the phrase "or fully leached ore from a heap leach facility upon disposal in a conventional impoundment" in the definition.

We believe that the foregoing changes to the Proposed Rules will accommodate the concerns of EPA by clarifying the point when EPA jurisdiction over the impoundments ends and the schedule for milestones under NRC or NRC Agreement State jurisdiction begins, thereby ensuring that there are no gaps in regulation over the impoundments.

4.4. <u>Cell 3 at the White Mesa Mill</u>

On page 25395 of the Preamble, EPA states that "We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells." Based on this information and assumption, EPA concludes that there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard, and since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, the Proposed Rules eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989.

Cell 3 at the White Mesa Mill was constructed prior to December 15, 1989 and would meet the work practice standards in the Proposed Rules in all respects except that its area exceeds 40 acres. As discussed in Section 4.1 above, it will be necessary to maintain a small portion of Cell 3 available to receive non-tailings 11.e(2) byproduct material, such as on-site generated trash etc., as well as 11e.(2) byproduct material from ISR facilities. Cell 4A does not currently have adequate tailings sands to be able to accept such non-tailings 11e.(2) byproduct material for disposal at this time and for the next several years, based on current production expectations at the mill. Cell 4B is currently being used as an evaporation pond and contains no tailings. Cell 3 has not received tailings sands for several years and is no longer on standby to receive tailings sands. For the reasons above, Cell 3 could be considered to have already commenced the closure period. However, EPA must appreciate that Cell 3 will need to continue accepting such non-tailings 11e.(2) byproduct material during the closure period, as contemplated by 40 CFR 192.32(a)(3)(iv). The other option is for EPA to maintain the existing distinction for conventional impoundments constructed prior to December 15, 1989 as set out in the Existing Rules.

5. DUAL JURISDICTION

The removal of the phrase "as determined by the Nuclear Regulatory Commission" in 40 CFR 61.252(b)(1) and (2) and a number of the additional record-keeping requirements amount to dual jurisdiction over the construction and operation of tailings impoundments, in contravention of Section 275 of the AEA.

Section 275(b)(1) of the AEA requires EPA to set standards of general application for the management of 11e.(2) byproduct material, but the implementation and enforcement of those standards is expressly stated in Section 275(d) to be the responsibility of NRC and Agreement States in the conduct of their licensing activities under the AEA. Section 275(b)(2) of the AEA also expressly states that no permit is required by EPA for the processing, possession, transfer, or disposal of 11e.(2) byproduct material.

EPA has set standards of general application for the management of 11e.(2) byproduct material in 40 CFR 192 Subpart D – *Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended.* As required by Section 275 of the AEA, NRC has established its own regulations in 10 CFR Part 40 Appendix A to implement and enforce those standards. There can be no dispute that NRC or the applicable Agreement State has the authority and responsibility to implement and enforce the EPA standards through their own regulations. In the preamble to EPA's 1993 amendments to such standards, EPA has expressly acknowledged this, as indicated by the following statements made by EPA:

> "UMTRCA also required that EPA promulgate standards for these licensed sites, including standards that protect human health and the environment in a manner consistent with standards established under Subtitle C of the Solid Waste Disposal Act, as amended. The NRC, or the licensing Agreement State, is responsible for implementing the EPA standards at licensed uranium milling sites." (Fed. Reg. Vol 58, No 218, Monday, November 15, 1993, page 60340)

and:

> "The legislative history for UMTRCA provides important additional insight into Congressional intent and the limits of this standard setting authority, stemming from the assignment of different responsibilities to EPA and the NRC. Congress intended that EPA's "standards and criteria should not interject any detailed or site-specific requirements for management, technology or engineering methods on licensee or on the Department of Energy." See H. Rep. No. 95-1480, 95th Cong., 2nd Sess. 17, reprinted in 1978 U.S. Code Cong. & Ad. News 7433, 7439. Also see the House Report at 46, 1978 U.S. Code Cong. & Ad. News 7473 ("The committee stresses that the EPA standards are not to be site-specific."). *From this, it is clear that EPA is to establish criteria or standards that are generally applicable, but should not promulgate requirements that dictate the specific management, technology, or engineering methods required at specific sites.*" (Fed. Reg. Vol 58, No 218, Monday, November 15, 1993, page 60351) (emphasis added)

It is clear from the foregoing, and EPA has acknowledged in no uncertain terms, that Section 275 of the AEA requires and Congress intended that EPA shall by rule promulgate standards of general application for the protection of public, health, safety and the environment from hazards associated with uranium mill tailings at active processing or disposal sites, which EPA has done through the promulgation of 40 CFR Part 192. It is also equally clear, and EPA has acknowledged in no uncertain terms that "Congress also required that the NRC conform its requirements to these standards, 42 U.S.C. 2022(b)(1), and assigned responsibility for the implementation and enforcement of EPA's UMTRCA standards to the NRC, in the licensing activities, and to the Agreement States, 42 U.S.C. 2022." (Fed. Reg. Vol. 58, Monday, November 15, 1993, page 60351), all of which has been done. From this it is clear that implementation and enforcement of the standards set out in 40 CFR Part 192 is the responsibility of NRC or the applicable Agreement State under their own regulations and licensing authority for the site.

The Existing Rules properly recognize this in 40 CFR 61.252(b)(1) and (2) which provide that:

"After December 15, 1989, no new tailings impoundment can be built unless it is designed, constructed and operated to meet one of the two following work practices:

(1) Phased disposal in lined tailings impoundments that are not more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) *as determined by the Nuclear Regulatory Commission*. The owner or operator shall have no more than two impoundments, including existing impoundments in operation at any one time.
(2) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and operated in accordance with §192.32(a) *as determined by the Nuclear Regulatory Commission.*" (emphasis added).

The inclusion of the highlighted phrases "as determined by the Nuclear Regulatory Commission" recognizes the fact that implementation and enforcement of the 40 CFR 192.32(a) standards are the responsibility of the NRC or applicable Agreement State and not EPA.

By deleting the phrase "as determined by the Nuclear Regulatory Commission" from those two paragraphs, EPA is proposing dual jurisdiction over the design and construction, and in the case of paragraph (b)(2) the operation of uranium mill tailings impoundments. This would be in contravention of Section 275 of the AEA and the intent of Congress, which EPA has acknowledged, by attempting to set standards and criteria that would interject detailed or site-specific requirements for management, technology or engineering methods on the licensee.[5]

Under the Proposed Rules, an operator would effectively need to simultaneously go through the entire design and permitting process for new tailings impoundments with the NRC or Agreement State and with the EPA. Otherwise, the facility would be subject to possible different implementation of the rules by EPA after the fact. There is no need for such dual jurisdiction in order to implement the NESHAPs requirements under the Clean Air Act, and it would unnecessarily burden the regulatory process. Such dual jurisdiction would be tantamount to EPA requiring a permit for the disposal of 11e.(2) byproduct material, in contravention of the AEA. Energy Fuels therefore proposes that the phrase "as determined by the Nuclear Regulatory Commission" be retained in Sections 61.252(a)(1)(i) and (ii) and 61.252(b) of the Proposed Rules.

Similarly, the proposed record keeping requirements set out in new Section 40 CFR 61.255(a) should be eliminated. The NRC or applicable Agreement State has the responsibility for implementing and enforcing the 40 CFR Part 192 standards through their own regulations and will impose their own recordkeeping requirements. Requiring additional records to be maintained for the benefit of EPA also amounts to dual jurisdiction over the implementation of the standards set out in 40 CFR 192.32(a)(i), which are also incorporated in NRC's regulations at 10 CFR Part 40 Appendix A. Such dual jurisdiction would be in contravention of Section 275 of the AEA.

[5] Section 275(e) of the AEA provides that "[n]othing in this Act applicable to byproduct material, as defined in section 11e.(2) of this Act, shall affect the authority of the Administrator under the Clean Air Act of 1970, as amended, or the Federal Water Pollution Control Act, as amended." However, given that EPA has set standards of general application in 40 CFR 192.32(a) to be implemented and enforced by NRC or the applicable Agreement State, there is no need and it would be inappropriate for EPA to also implement and enforce the same standards under the guise of the Clean Air Act. This would contravene the clear intent of Sections 275(b)(1) and 275(d) of the AEA.

6. HEAP LEACH FACILITIES

We also have concerns relating to the proposed application of Subpart W to heap leach facilities (HLFs). We do not believe conventional HLFs are the types of facilities eligible to be subject to Subpart W, and we believe that the proposed 30% moisture content requirement for HLFs is not practicable and raises numerous difficulties. These concerns are discussed in detail below.

6.1. Different Types of Heap Leach Facilities

Heap leaching of uranium ore can occur in several different types of facilities, with the following three types having been considered for currently-proposed uranium projects around the world: (a) conventional HLF; (b) on-off HLF; and (c) vat leach.[6]

a) Conventional Uranium Heap Leaching

Some ore, typically low-grade (below 0.1 percent U_3O_8), is treated by conventional heap leaching. Within an HLF, ore (crushed or run-of-mine) is stacked in lifts on an impermeable lined pad, where it can be irrigated with a leach solution (acid or alkaline) to dissolve the valuable minerals. While sprinklers are occasionally used for irrigation, drip emitters are used most frequently for irrigation to minimize evaporation and provide more uniform distribution of the leach solution. The solution then percolates through the heap and leaches the target minerals.

Standard practice for design and operation of conventional HLFs relies on minimizing solution (i.e., hydraulic) head on the liner system. Solution flow through the heap is collected via an overliner drainage system designed and constructed above the liner. The drainage system is typically comprised of coarse-grained gravel with a piping network, and a gravel thickness of two feet is common. After mineral extraction, the leaching solution is termed pregnant leach solution (or PLS). The PLS is collected and transported to a collection pond, which may be either external to the heap (most common) or internal to the heap.

The PLS is then transported to the process plant where it is treated to recover the uranium, and then recycled to the heap after reagent levels are adjusted. Either solvent extraction (SX) or ion exchange (IX) may be used to process the uranium-enriched PLS.

For solution collection external to the heap, which is most typically the case, ore is stacked above the liner in lifts at the angle of repose, with set-back benches to achieve the designed external slope based on stability considerations. For the case of external solution collection, the drainage system discussed above is designed to minimize head on the liner.

When the collection pond is internal to the heap, the area of the pond (i.e., pregnant solution storage area or PSSA) is typically small in comparison to the total area of the HLF, and the PSSA is typically double-composite-lined with an intervening leak collection and recovery system. The porosity of the ore within

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[6] The descriptions of the three types of heap leach facilities in Sections 6.1 (a), (b) and (c) has been excerpted from K.F. Morrison and F. Filas, *Conventional Heap Leaching of Uranium Ore in the Western United States*, 2014, paper presented at the Tailings & Mine Waste 2014 Symposium, Colorado State University, Fort Collins CO.

the PSSA must be high enough to support the anticipated solution storage volume (i.e., pond volume), and the strength of the ore must be sufficiently high such that the porosity does not decrease significantly under load. As such, internal pond storage is most typical for gold mines where the rock exhibits high strength under load. Uranium ore is typically considerably finer-grained than gold ore, lending to lower porosities and lower strength characteristics making an internal pond less desirable or achievable. Also, it is important to note that the saturated area within the PSSA is constructed fully below grade, as saturated ore exhibits reduced strength characteristics (i.e., reduced stability).

After the material ceases to yield significant further uranium, the HLF is rinsed and drained. Typically, a conventional HLF is closed in-place. However, the spent ore may be removed and placed into a separate waste repository for permanent disposal, as discussed below.

b) On-off Heap Leach Facility

An on-off HLF involves construction of a robust foundation that allows regular trafficability while protecting the liner system (e.g., concrete or sacrificial gravel drainage zone above the liner system). In this type of facility, ore is typically placed in a single lift, leached, and then removed and placed in a waste repository (similar to a tailings storage facility). Typically, an on-off facility is operated with a minimum of four cells, with each cell rotating through the following operations: (i) ore loading; (ii) ore primary leaching; (iii) ore secondary leaching or resting; and (iv) excavation and removal of ore to a separate permanent repository. Additional cells may be incorporated for curing, rinsing, and draining of the ore, if needed, for a total of six or more operational cells. An on-off facility may be selected for ore with low permeability characteristics and/or rapid leaching characteristics. At the end of operations, the on-off HLF is typically removed and reclaimed, while the spent ore remains in a separate permanent repository.

c) Vat Leaching

Vat leaching involves placing ore, usually after size reduction and classification, into large tanks or vats containing a leaching solution (acid or alkaline) and allowing the uranium to leach from the ore into solution. At completion of the leaching process, the spent ore is removed from the vats and placed in a separate waste repository (similar to a tailings storage facility) for permanent disposal. The vats are typically temporary structures associated with the plant (solvent extraction or ion exchange), while the spent ore remains in a separate permanent repository.

6.2. <u>Conventional Heap Leach Facilities are not 11e.(2) Byproduct Material Impoundments While in Operation and Hence Subpart W Should not Apply to Conventional Heap Leach Facilities</u>

a) EPA Jurisdiction Under Clean Air Act Limited to 11e.(2) Byproduct Material

EPA has limited jurisdiction over uranium recovery facilities under the AEA and under the Clean Air Act. As discussed in Section 5 above, under Section 275(b)(1) of the AEA EPA is required to set standards of general application, which are to be implemented and enforced by NRC or the applicable Agreement State, and not by EPA. EPA has set such standards through its rules at 40 CFR Part 192, which have been adopted by NRC in 10 CFR Part 40 Appendix A, and which are implemented and enforced by NRC and the applicable Agreement States through licensing actions.

EPA's authority under the Clean Air Act is limited to air emissions from 11e.(2) byproduct material. That authority derives from Section 275(e) of the AEA. Section 275(e) of the AEA provides that:

> "Nothing in this Act *applicable to byproduct material, as defined in section 11e.(2) of this Act*, shall affect the authority of the Administrator under the Clean Air Act of 1970, as amended, or the Federal Water Pollution Control Act, as amended." (emphasis added)

EPA's jurisdiction under the Clean Air Act is therefore limited to 11e.(2) byproduct material as defined in the AEA.

b) Conventional Heap Leach Facilities

A conventional HLF is not a tailings impoundment or 11e.(2) byproduct material facility while in operation. Heap leaching is part of the milling process, and the Proposed Rules would interfere with such processing operations. Once process operations have ceased at a conventional HLF, the fully leached ore would become 11e.(2) byproduct material, but the facility would then go into closure at that time and be subject to the requirements of 10 CFR Part 40 Appendix A. Hence, there is no place for regulation under Subpart W at conventional HLFs, other than with respect to any non-conventional impoundments at the facility[7]. The radiological protection programs required under 10 CFR Parts 20 and 40 include adequate protections and monitoring for radon at such facilities. For the reasons discussed in Sections 5 and 6.2(a) above, regulation by EPA of conventional HLFs would be in contravention of Section 275 of the AEA and the intent of Congress, by attempting to regulate under the Clean Air Act process operations prior to the creation of 11e.(2) byproduct material, and would be in contravention of 40 CFR Part 192 by attempting to regulate an 11e.(2) byproduct material impoundment after the commencement of the closure process.

> Section IV.D.4 of the Preamble states: "At the point of uranium movement out of the heap, what remains is uranium byproduct material as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the ore in the heap."

We strongly disagree with this statement. As long as the heap is being leached, the ore on the heap leach pad is being processed. It does not become 11e.(2) byproduct material until leaching is permanently discontinued. The heap leaching cycle is essentially no different in function than the successive leaching of uranium that occurs in the leach and counter current decantation (CCD) circuits of a conventional mill, where the ore pulp is successively leached in a series of leach tanks and thickeners. The material does not become tailings (i.e., 11e.(2) byproduct material) until it leaves the

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[7] Only impoundments that contain 11e.(2) byproduct material would be considered to be non-conventional impoundments and subject to Subpart W. A number of ponds at an HLF (i.e., collection pond and raffinate pond, also commonly referred to as the pregnant pond and barren pond) may contain process solutions and not 11e.(2) byproduct material and hence not be considered non-conventional impoundments. See the discussion in Section 6.10 relating to the various planned ponds at the Sheep Mountain project.

final thickener and is discharged to the tailings impoundment. If EPA's position were correct, then EPA jurisdiction under the Clean Air Act would extend to the entire uranium mill processing operation and not just to the tailings impoundments, because wastes (i.e., 11e.(2) byproduct material) would be considered to be generated at each stage of the process. This would not be consistent with Section 275(e) of the AEA, which is clearly limited to 11e.(2) byproduct material and does not include process operations.[8]

Given that the radon emissions from a future HLF would be regulated by the NRC or an Agreement State, there is no need for EPA to attempt to promulgate rules regarding the regulation of processing operations under the guise of the Clean Air Act.

c) On-Off Heap Leach Facilities

For the same reasons discussed in Section 6.2(b) relating to conventional HLFs, the leaching operations at on-off HLFs should be considered process operations and not the management of 11e.(2) byproduct material. Specifically, the following operations: (i) ore loading; (ii) ore primary leaching; (iii) ore secondary leaching or resting; and (iv) excavation of fully leached ore from the final operations stage to the permanent waste repository, should all be considered process operations and not 11e.(2) byproduct material management. As discussed in Section 6.2(a) above, regulation of such process operations by EPA would be in contravention of Section 275 of the AEA. However, the separate permanent waste repository would contain 11e.(2) byproduct material and could logically be regulated under Subpart W while in operation, in the same manner as a conventional tailings impoundment . As discussed in Section 4 above, the waste repository would be considered to be in operation while fully leached ore from the leaching operations is being continuously placed in the repository or the repository is on standby for such placement. EPA jurisdiction under Subpart W would end upon commencement of the closure period, which could be defined as the date that the facility operator provides notice to EPA and the NRC or applicable Agreement State that the repository is no longer receiving fully leached ore from process operations and is no longer on standby for such receipt.

d) Vat Leach Facilities

For the same reasons discussed in Section 6.2(b) relating to conventional HLFs, the leaching operations at vat leach facilities should be considered process operations and not the management of 11e.(2) byproduct material. Specifically, the following operations: (i) ore loading; (ii) leaching in one or more vats; and (iii) removal of the leached ore from the final vat leach stage to the separate permanent waste repository, should all be considered process operations and not 11e.(2) byproduct material management. As discussed in Section 6.2(a), regulation of such process operations would be in violation of Section 275 of the AEA. However, the separate permanent waste repository would contain 11e.(2) byproduct material and could logically be regulated under Subpart W while in operation, in the same manner as a

[8] The AEA makes a clear distinction in Section 275(b)(1) between "processing" and the "possession, transfer, and disposal of byproduct material", as evidenced by the following statement: ". . .the Administrator shall by rule. . . promulgate in final form standards, general application for the protection of the public health, safety, and the environment from radiological and non-radiological hazards associated with processing and with the possession, transfer, and disposal of byproduct material, as defined in section 11e.(2) of this Act, . . ." In contrast, Section 275(e) of the AEA refers only to "byproduct material, as defined in section 11e.(2) of the Act, . . ."

conventional tailings impoundment. As discussed in Section 4 above, the waste repository would be considered to be in operation while fully leached ore from the leaching operations is being continuously placed in the repository or the repository is on standby for such placement. EPA jurisdiction under Subpart W would end upon commencement of the closure period, which could be defined as the date that the facility operator provides notice to EPA and the NRC or applicable Agreement State that the repository is no longer receiving fully leached ore from process operations and is no longer on standby for such receipt.

e) Recommendations

For the reasons discussed above we do not believe the Proposed Rules should apply to conventional HLFs, other than to any non-conventional impoundments at the facility. However, the separate permanent waste repositories at on-off and vat leach facilities could be regulated in the same manner as conventional impoundments at conventional milling facilities. We therefore recommend the following changes to the Proposed Rules:

(i) Proposed §61.251(j), should be amended to read as follows:
"*Heap Leach Facility*. A heap leach facility means an engineered structure or pad upon which ore is placed. A leach solution is applied to the placed ore to dissolve the uranium in the ore. Typically, after completion of all leaching activities, the heap leach facility is used for in-place permanent disposal of the leached ore. At some heap leach facilities, the fully leached ore may be removed and permanently disposed of in a separate waste repository, allowing re-use of the heap leach facility."

(ii) Proposed §61.251(m) should be deleted in its entirety;

(iii) Proposed §61.252(c), should be deleted in its entirety;

(iv) If proposed §61.255(a) is retained, the phrase "and heap leach piles" should be deleted from that Section, although, as discussed in detail in Section 5 above, we recommend that §61.255(a) be deleted in its entirety;

(v) Proposed §61.255(c) should be deleted in its entirety;

(vi) Proposed §61.255(d) should be amended to reflect the other amendments to §61.255;

(vii) The following sentence should be added to the end of the definition of "conventional impoundment" in proposed §61.251(h): "A conventional impoundment includes a separate waste repository for the permanent disposal of tailings from heap leach facilities after the completion of all leaching activities, but shall not include a heap leach facility that is used for in-place permanent disposal of leached ore;"

(viii) The definition of "tailings" discussed in Section 4.3 above should include the phrase "or fully leached ore from the final operations stage of a heap leach facility upon permanent disposal in a conventional impoundment;" and

(ix) The words “or pile” should be deleted from the end of §61.251(l).

The following discussion in this Section 6 addresses HLFs, in the event EPA does not agree that Subpart W should not apply to conventional HLFs or to process operations at other HLFs. Energy Fuels provides the following discussion for completeness, to demonstrate the problems associated with the Proposed Rules as they apply to conventional HLFs. However, the inclusion of the following discussion should not diminish in any way Energy Fuels’ primary contentions in this Section 6.2 that Subpart W should not apply to conventional HLFs or process operations at other HLFs.

6.3. Proposed Rules on Conventional Heap Leach Facilities

Energy Fuels’ proposed Sheep Mountain Project is a conventional heap leach project located in Wyoming. We are not aware of any on-off or vat leaching projects in existence or proposed in the United States at this time.

Unless otherwise specified, all discussion in the following Section 6 comments will be addressed to conventional HLFs.

6.4. 30% Moisture Content Requirement Requires a Fully Submerged Heap and is Neither Practical nor Achievable for a Heap Leach Operation

In section III.B.3 of the Preamble, EPA states that *“We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out.”* Based on the context of this sentence, and other uses of the term “moisture content” throughout that section of the Preamble and in the background documentation, we assume that the EPA is referring to the gravimetric moisture content, or moisture content as a percent of the total weight. For the Sheep Mountain ore, we will demonstrate below that this requirement can only be met by having the heap totally saturated with a water pool on top of the heap. This is completely opposite to the requirements of other federal and state agencies that require heap leach operators to minimize the hydraulic head on the pad liners (see the discussion in Section 6.5 below).

Assuming that the moisture content, as discussed in the Proposed Rules, is to be the gravimetric moisture content as used by geotechnical engineers, whereby the weight of water (W_{water}) in the ore divided by the weight of the dry solids in the ore (W_{ore}) is equal to the moisture content (w_c):

$$w_c = \frac{W_{water}}{W_{ore}} \times 100\%$$

The proposed 30% water content, as referenced in the proposed standard, is neither practical nor achievable if the HLF is operated as intended. Specifically, a conventional HLF is operated in the following manner:

- Ore is stacked on the HLF at the “as-delivered” ore moisture content, typically ranging from 2 to 8 percent;

- Leach solution is applied to the ore on the HLF, typically via drip emitters, to leach the uranium from the ore. During this process, the ore under leach is brought to a higher moisture content, typically on the order of 10 to 20 percent. This "under leach" moisture content represents the highest moisture content that the ore on the pad would be exposed to during typical operation of the facility; and

- The solution application area is periodically rotated around the HLF (i.e., the entire HLF cannot be under leach simultaneously). In the process, the ore that has previously been leached, but is no longer under leach, drains down to a "field-capacity" or "after draindown" moisture content. This moisture content is numerically between the "as-delivered" and "under leach" moisture contents.

In development of the proposed standard, the EPA references the proposed Sheep Mountain Project and associated conventional HLF. Since Titan Uranium USA Inc.'s (Titan's) draft license submittal to the NRC in 2011 (Titan 2011) and after Energy Fuels' acquisition of Titan, Energy Fuels has performed significant work to advance the design of the proposed conventional HLF. Based on testwork completed to-date, the gravimetric moisture contents for the Sheep Mountain ore falls within the following ranges:

- "As-delivered" moisture content – Range of 4 to 9%, with nominal value of 7.2%;

- "Under leach" moisture content – Average tested value 18.3%; and

- "After draindown" moisture content – Nominal value of 15.1%.

These moisture contents represent the range of moisture contents anticipated within the ore stacked on a conventional HLF at the Sheep Mountain Project during normal leaching operations. It is important to note that all of these moisture contents are well below the proposed 30% moisture content.

To put the proposed 30% moisture content into perspective, we have calculated the associated ore saturation. Based on testing completed to-date, the initial measured porosity (n) of the Sheep Mountain ore when stacked is approximately 30% (a common value for uranium ore). Assuming a specific gravity of ore solids of 2.65 (G_{ore}), the saturation (S) of the ore at a moisture content (w_c) of 30% is calculated using the following relationship:

$$G_{ore} w_c = S\left(\frac{n}{1-n}\right)$$

$$S = \left(\frac{1-n}{n}\right) \cdot G_{ore} w_c = \left(\frac{1-0.3}{0.3}\right) \cdot 2.65 \cdot 0.3 = 185\%$$

A saturation (S) of 100% indicates that the volume of water is equal to the volume of void space (i.e., that all pore or void space in the ore is full of water). As such, through the above relationship, it can be demonstrated that the proposed standard would require that the Sheep Mountain ore be not only fully saturated, but *submerged* at all times in order to achieve a moisture content of 30%. As a result, the proposed 30% moisture content is neither practical nor achievable for a heap leach operation.

Energy Fuels reviewed the "Heap Leach Radon Flux" section of the EPA document titled *Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250)* dated February 2014 (i.e., the "Background Information Document" or "BID") in an attempt to shed some light on the background documentation used by the EPA to suggest that a 30% moisture content might be appropriate for a uranium HLF. Based on our review, we found the following discrepancies with the EPA's evaluation of the data:

- The terms "moisture saturation" and "moisture content" are used interchangeably in the document, though they have fundamentally different meanings. Moisture saturation (*S*) represents the "volume" of water filling the available void space, and is typically represented by a maximum of 100%. As discussed above, moisture content is a function of the "mass" of water contained within a mass of solids, and, assuming a moisture saturation of 100%, the potential maximum moisture content of a soil decreases with decreased porosity.

- Research presented by Rogers & Nielson (1991) and NRC (1984) show that above about 30% moisture saturation, the radon emanation coefficient is unchanged by increasing moisture, while the radon diffusion coefficient continues to decrease. The EPA used the Rogers & Nielson (1991) empirical relationship for the diffusion coefficient, combined with an assumed porosity of 0.39 and an approximation of the Vitro Sand emanation coefficient to calculate the total effect of moisture on the radon flux, shown below:

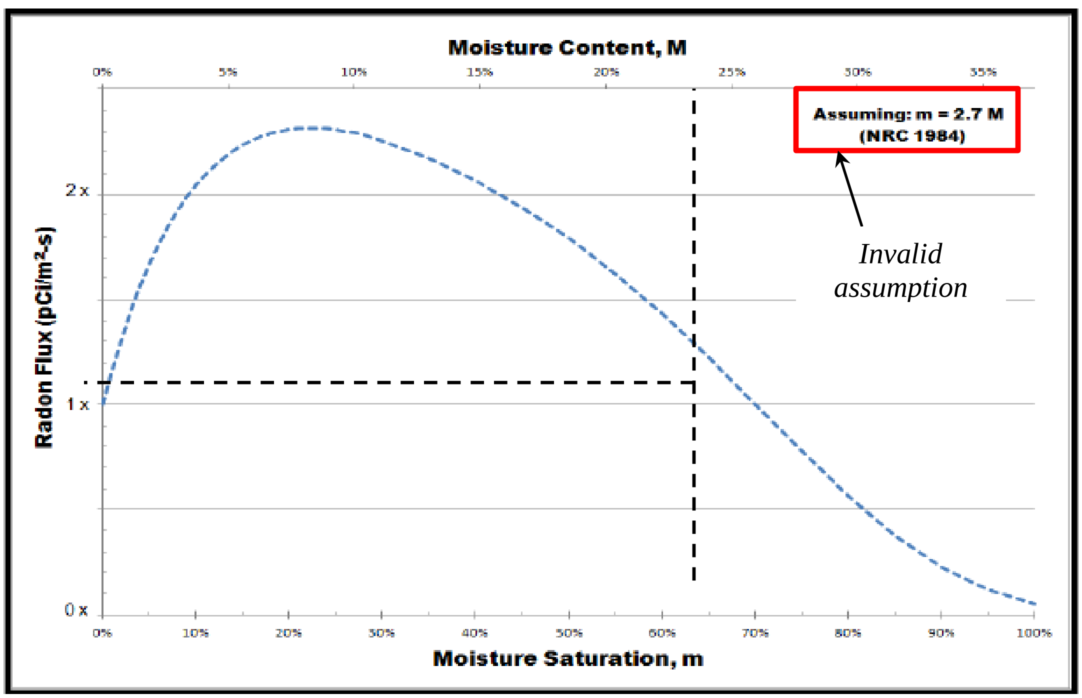
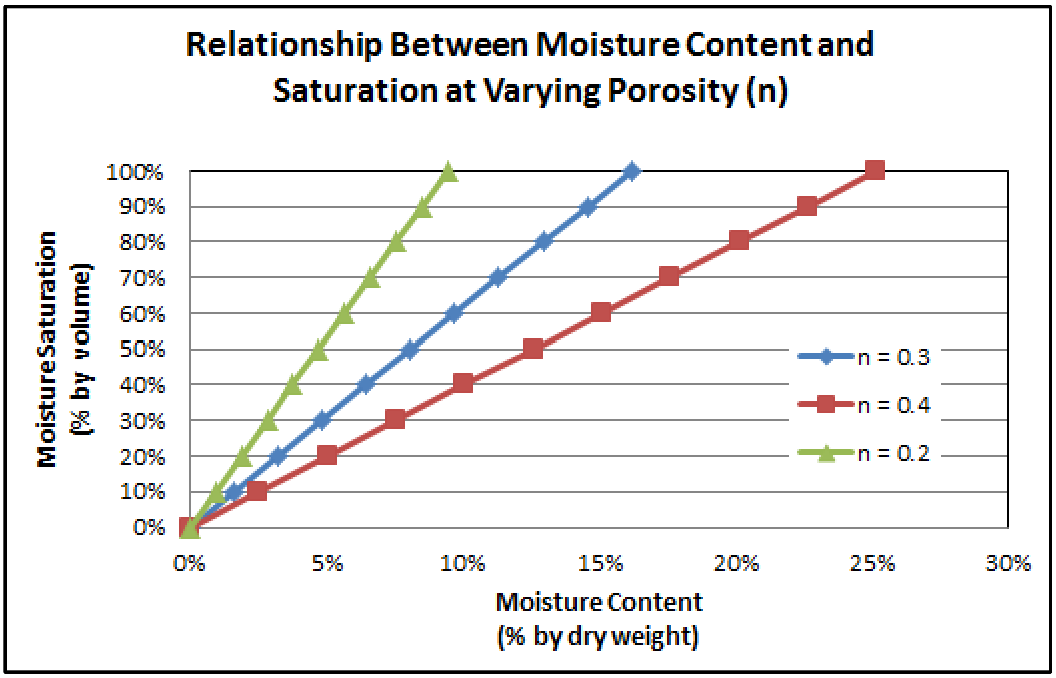


Figure 15: Radon Flux as a Function of Moisture Saturation and Moisture Content

- Based on the above evaluation, the EPA indicates that a moisture saturation of 70% or greater is less than the flux at zero moisture, and that at a porosity of 0.39, the corresponding moisture content (by weight) is 27%. Using this relationship, the EPA states that a moisture content of 30% by weight would therefore result in a radon flux significantly below the zero moisture flux. On the graph, the EPA references NRC (1984), noting that the moisture saturation (m) is assumed to be equal to 2.7 times the moisture content (M). This is an invalid assumption. For the example of the Vitro Sand presented, assuming a specific gravity of 2.65, the moisture content (by weight) at a moisture saturation (by pore volume) of 70% is actually only 17%. Similarly, a moisture content of 27% would correspond to a saturation on the order of 112%.

- Assuming a specific gravity of 2.65, Energy Fuels developed the following graph to illustrate how the moisture content (by weight) varies as a function of porosity (*n*) and as a function of saturation. At the typical range of expected ore porosities (i.e., 0.2 to 0.4), a moisture content of 30% exceeds 100% saturation, and hence represents a submerged condition:



Based on this analysis, Energy Fuels believes that the EPA's approach to determination of a prescriptive 30% moisture content by weight is not appropriate. It should not be included as a standard in the Proposed Rules.

6.5. <u>30% Moisture Content Requirement Will Cause Excess Head on the Liner</u>

As discussed above, standard practice for design and operation of a conventional HLF relies on minimizing solution (i.e., hydraulic) head on the liner system. Solution flow through the heap is collected via an overliner drainage system designed and constructed above the liner. The drainage system is typically comprised of coarse-grained gravel with a piping network, and a gravel thickness of two feet is common. After mineral extraction, the leaching solution is termed pregnant leach solution (or PLS). The PLS is collected and transported to a collection pond, which may be either external to the heap (most common) or internal to the heap.

When the collection pond is external to the heap, which is most typically the case, ore is stacked above the liner in lifts at the angle of repose, with set-back benches to achieve the designed external slope based on stability considerations. As such, for the case of external solution collection, the drainage system discussed above is designed to minimize head on the liner.

In 1998, a consultant (JBR Environmental Consultants [JBR]) prepared a report for the Utah Department of Environmental Quality titled *"Design and Construction Guidance Document for Precious Metals Heap Leach Extraction Facilities."* In this document, JBR (1998) states "unless otherwise justified based upon site specific criteria and other heap leach pad design components, the system should be designed with a hydraulic head of no more than 12 inches." Standard of practice, however, typically includes design of the overliner drainage layer to minimize solution head 'above' the drainage layer to about 12 inches, for a total hydraulic head on the order of 3 feet above the liner system.

As discussed above, when the collection pond is internal to the heap, the area of the pond (i.e., pregnant solution storage area or PSSA) is typically small in comparison to the total area of the HLF, and the PSSA is typically double-composite-lined with an intervening leak collection and recovery system. Also, it is important to note that the saturated area within the PSSA is constructed fully below grade, as saturated ore exhibits reduced strength characteristics (i.e., reduced stability).

Requiring that all of the ore on a HLF be saturated, or even worse submerged, is contradictory to other regulations and guidance on design of 11e.(2) byproduct storage facilities. Specifically, limiting the driving head on the liner system is a key factor contributing to reduced seepage potential and hence limiting risk of groundwater contamination. As mentioned in Section 2.6 above, NRC is clear in its regulations at Criterion 5E in Appendix A to 10 CFR Part 40, which are applicable to all tailings impoundments:

> "In developing and conducting ground-water protection programs, applicants and licensees shall also consider the following:
>
> - "… Mill process designs which provide the maximum practicable recycle of solutions and conservation of water to reduce the net input of liquid to the tailings impoundment."
> - "…Dewatering of tailings by process devices and/or in-situ drainage systems (At new sites, tailings must be dewatered by a drainage system installed at the bottom of the impoundment to lower the phreatic surface and reduce the driving head of seepage…"

6.6. <u>Impact on Process Operations</u>

The requirement to maintain a 30% moisture content would have the effect of diluting process solutions and impacting operations. The additional dilution of the PLS would necessitate construction of a considerably larger processing plant, able to handle the increased flow rates and dilute solution. This would have a significant impact on the project's economics, as discussed in Section 6.10 below.

It is worth noting that current industry standards for designing and operating HLF ponds are based on being able to evaporate excess solutions and contain the probable maximum precipitation (PMP) storm event. Requiring a large water cover over these ponds would require building larger ponds, evaporating substantially more water, and prolonging the closure time for these facilities due to an extended drain-down period.

This is in stark contrast to a tailings pile at a uranium mill, where Subpart W does not apply to process operations, but only to tailings that have been finally disposed of after processing, and hence cannot impact processing. As discussed in Section 6.2(a) above, Subpart W should not extend to regulating process operations.

6.7. Monitoring

On page 25398, Part B, 3 of the Preamble, EPA asks for comment *"on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective."* It also asks for comments *"on precisely where in the heap leach pile this requirement must be met."* As discussed in Sections 6.4 and 6.5 above, Energy Fuels believes that the EPA's approach to development of the prescriptive 30% figure is based on incorrect assumptions, and is counter to liner integrity and how HLFs are typically operated. In addition, monitoring of water content would also be inappropriate. Instead, a more appropriate approach would be to calculate the average moisture content by weight (or moisture saturations by pore volume) using a water balance approach, because solution inflows and outflows, and tons of material under leach are closely monitored by the operator. Solution levels will vary substantially within the heap, with the lowest levels being present along the sides of the heap. Utilizing probes to monitor moisture content would result in extremely variable results.

6.8. Alternatives to 30% Moisture Content Requirement

Instead of moisture requirements on an HLF while in operation, which, as discussed in Section 6.2(a) above, Energy Fuels believes cannot be imposed under Subpart W, Energy Fuels recommends that, radon emissions be controlled by conditions in the facility's NRC or Agreement State license.

For a conventional HLF as well as an on-off HLF, ore is stacked on the liner in a relatively continuous manner, and the as-delivered ore moisture content is typically relatively low. The following is an example of an alternative to the proposed minimum moisture content approach that could be imposed by NRC or the applicable Agreement State by license condition:

- During operations, each lift of ore placed on a conventional HLF could be covered with a nominal thickness of non-mineralized gravel to limit dusting and radon emissions from the ore.

- Leach solutions would be applied through the gravel layer, and hence the gravel may be placed relatively soon after ore placement on the HLF (i.e., prior to leaching).

- The gravel layer would be several inches thick, and the gravel permeability would be equivalent to, or higher than, the ore permeability.

- The size of the uncovered ore area at any one time for each lift could be limited in size, similar to dewatered tailings (i.e., 40 CFR 61.252(1)(ii) of the Proposed Rules).

Energy Fuels commissioned Two Lines, Inc. to estimate radiation doses for the proposed Sheep Mountain HLF operation using the *MILDOS-AREA* model. The model included the HLF, assuming placement of a gravel layer over stacked ore within a few weeks of ore placement, as well as inclusion of the associated solution ponds. The modeling results indicate that the calculated doses to the public from the proposed Sheep Mountain HLF are low and well within regulatory limits (i.e., 10 CFR 20 and 40 CFR 190). The results of this report (Two Lines 2013) can be made available to the EPA, upon request. Based on this analysis, we believe that aggregate covers over each lift with standard leaching practices would adequately minimize radon emissions to safe levels. This could be demonstrated through modeling and risk-based assessments on a project-by-project basis. However, any such process operations requirements should properly be imposed by NRC or the applicable Agreement State as conditions in the facility's license, and not by EPA under Subpart W.

In addition, if required for the protection of public health, safety and the environment, Energy Fuels would not oppose NRC or an Agreement State limiting conventional HLFs by license condition to two 40-acre operating heaps at any one time, provided that this limitation is not linked to other uranium recovery facilities. In the past, some of the conventional mill operators placed lower grade ore on heap leach pads located near their mill and tailings impoundments. Energy Fuels believes that any restriction on conventional HLFs should not affect the number of tailings impoundments at a mill site. In other words, a mill facility should be allowed to have two active tailings impoundments and two active conventional HLFs at or near the same location, provided that the facility satisfies the radiation monitoring requirements in its NRC or Agreement State license, including the application of the *MILDOS-AREA* code. As conventional HLFs should not be considered tailings impoundments, but, rather, part of the processing operations at a uranium recovery facility, having two conventional HLFs in close proximity to a uranium mill should not cause the mill to violate the phased disposal management practice in Subpart W. Low grade ore is typically processed by heap leach methods, and the low grade ore contained within an HLF emits less radon than a conventional (i.e., tailings) impoundment of a similar size assuming similar physical conditions. For example, the proposed ore grade at the Sheep Mountain HLF is approximately 0.10% uranium (i.e., 0.12% U_3O_8) while ore grades of about 0.20% to 0.70% uranium have been processed at the White Mesa Mill over the past three years. Accordingly, limiting the size of the heap at a conventional HLF to 40 acres by license condition would be a conservative approach.

Any operating standards, such as those suggested in this Section 6.8, applicable to the operation of a conventional HLF or to process operations at other types of HLFs would, in our opinion, have to be promulgated by EPA as general standards under a revision to 40 CFR Part 192. Those standards would be implemented by NRC or an applicable Agreement State through revisions to their regulations, and not as a revision to Subpart W under the Clean Air Act. Alternatively, EPA and NRC could enter into a Memorandum of Understanding, under which NRC could commit to certain of these matters.

6.9. Operational Life of a Heap Leach Facility

> On Page 25404, Part B, 4 of the Preamble, EPA states that: "We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse."

As stated above, Energy Fuels does not believe that conventional HLFs or process operations at other HLFs can be regulated by EPA under Subpart W (other than any non-conventional impoundments at those facilities). Only fully leached ore that is permanently disposed of in a separate waste repository should be regulated under Subpart W while the repository is in operation. There is no need to define an "operational life" for an HLF, and as discussed in Section 6.2(e) above, Energy Fuels recommends deletion of that definition from the Proposed Rules. In response to EPA's comment, however, the definition of "operational life of a heap leach facility" in the Proposed Rules is not an unreasonable definition for the operational life (i.e., processing life) of a conventional HLF. After the final rinse, the closure period would begin. The closure period may last for several years, as the final cover probably cannot be placed until the heap approaches full drain-down conditions, which may take a number of years. During that time, re-grading of the material and placement of an interim cover could occur. A fully saturated heap would also take a much longer period to drain down after application of solution is discontinued, perhaps on the order of many years.

6.10. Economic Burden Underestimated by EPA

> With regard to economics, section IV.B.4 of the Preamble states that: "The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to non-conventional impoundments."

As discussed previously, the unit costs estimated by the EPA for evaporation ponds at uranium recovery facilities are, in some cases, only a fraction of the actual costs that would be incurred. The same is true of HLFs and is largely dependent on the site's location vis-à-vis an adequate water resource. Water in the American Southwest is not plentiful, and acquisition of water resources often represents a major capital expense for mining operations. In the case of the proposed Sheep Mountain Project, most of the water needed for processing would come from dewatering the open pit mine, and would not represent a large incremental cost. However, if the water table were below the deposit or not present at all, substantially higher costs would be incurred to import the additional water needed to maintain higher moisture content in the heap.

However, the true cost associated with requiring a higher moisture content in the heap is the capital cost associated with building larger holding ponds and process facilities to be able to store and process the much larger volume of solutions generated from the HLF. These costs are examined in more detail below.

Table 3 of section IV.B.4 of the Preamble, Heap Leach Pile Annual Makeup Water Cost, states that the annual maximum cost of makeup water required to maintain the 30% moisture content is $13,318. However, the analysis fails to take into account the additional storage capacity that would need to be constructed to store the additional solution produced from the higher application rate. A good example of what this might entail and the associated cost can be provided by analyzing the current plans for the Sheep Mountain HLF. The HLF design, which is based on a detailed water balance, includes the following components:

- A lined heap leach pad with a total footprint area of 40 acres, designed to contain approximately four million tons of uranium ore, and drain PLS via gravity to an adjacent Collection Pond;

- A Collection Pond for containment of uranium-rich aqueous solution collected from the heap drainage system, with a footprint area of approximately 1.5 acres and a storage volume of approximately 6.5 million gallons (Mgal) (note: this pond would not contain 11e.(2) byproduct material and would not be considered a non-conventional impoundment);

- A Raffinate Pond, joined to the Collection Pond via a spillway, with a proposed footprint area of approximately one acre and a storage volume of approximately 2.8 Mgal. The Raffinate Pond is a process solution storage facility for uranium-depleted aqueous solution to be used as leach solution make-up for re-circulation on the pad (note: this pond would not contain 11e.(2) byproduct material and would not be considered a non-conventional impoundment); and

- A Holding Pond designed for temporary storage of uranium-depleted aqueous process waste streams, evaporation of waste streams, and containment of runoff from the entire HLF footprint area under the design storm event. The Holding Pond is designed with a footprint area of approximately 5 acres and a storage capacity of approximately 34 Mgal (note: this pond would contain 11e.(2) byproduct material and would be considered a non-conventional impoundment).

  In the BID documentation supporting the proposed rule, the EPA states that "during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2)" and that "this rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30 percent by weight."

However, this is not the case for the following reasons:

- The solution application rate is not a constant rate for all heap leach operations, but instead the maximum solution application rate is a function of ore permeability. And, the permeability of the ore decreases under load (i.e., under placement of subsequent lifts). For instance, for the Sheep Mountain Project, a nominal solution application rate of 0.003 gpm/ft^2 is currently being proposed based on the results of ore geotechnical testwork, which is 60% of the rate indicated by the EPA;

- Solution is only applied to a portion of the HLF at any given time, as other areas of the pad are necessarily being loaded or resting. As a result, the active leach block area (i.e., where solution is being applied) is typically limited to a maximum of 40% of the total surface area of the heap. However, realistically, it is controlled by the process plant flow rates. For the Sheep Mountain Project, preliminary design of the process plant considers a barren leach solution application rate of about 300 gallons per minute (gpm), which equates to an active leach block area of only about 2.3 acres at the nominal solution application rate of 0.003 gpm/ft^2. As such, for the Sheep Mountain Project, a maximum of about 6% of the total proposed HLF footprint (i.e., 40 acres) would be under leach at any given time; and

- Barren leach solution is percolated through the ore loaded on the heap leach pad, and uranium is dissolved to form pregnant leach solution (PLS). The PLS is removed from the HLF (or Collection Pond), typically at a rate only slightly reduced from the solution application rate due to ore moisture uptake. The PLS is then transported to the process plant where it is treated to recover the uranium, and then recycled to the heap (after reagent levels are adjusted). The process of solution recirculation assists in minimizing the volume of make-up water required.

Assuming that ore at the Sheep Mountain Project is loaded on the pad at a rate of about 1,500 tons per day, approximately 40 gpm of additional make-up water would be required to increase the ore moisture content to 30 percent. This make-up rate excludes the volume of water removed via evaporation, which, for the Sheep Mountain Project, is on the order of 41 to 44 inches per year of lake evaporation. Assuming that the 40 acre HLF is covered with a water pool (i.e., the case required to achieve in excess of 100% saturation), and assuming an annual lake evaporation rate of 42.5 inches, an additional 90 gpm of make-up water is required. The total additional make-up requirement to achieve the proposed ore moisture content of 30 percent for the Sheep Mountain Project would therefore be on the order of 130 gpm.

Assuming that the HLF at the Sheep Mountain Project operates continuously for 8 years, the additional solution storage volume required to contain the additional solution flowing into the facility's ponds at an ore moisture content of 30 percent is approximately 156 Mgal (excludes evaporation, which is removed from the system). This storage volume is approximately five times larger than the proposed Holding Pond storage volume. For purposes of quantifying the additional cost required to contain this solution volume, we have assumed construction of an additional 25-acre, 20-foot-deep, lined pond that meets 40 CFR 192.32 criteria. We estimate that the cost of this facility would be in the neighborhood of $5 million. In addition, the closure time for these facilities would be prolonged to the extent any moisture content requirements extended the drain-down period.

The additional dilution of the PLS would also necessitate construction of a considerably larger processing plant, able to handle the increased flow rates and dilute solution. The additional cost is estimated to be as large as, or larger than, the cost of the 25-acre pond and have a significant impact on the project's economics.

In addition, current industry standards for designing and operating HLF ponds are based on being able to evaporate excess solutions and contain the probable maximum precipitation (PMP) storm event. To the extent any ponds are considered non-conventional impoundments, requiring a large water cover over these ponds would require building larger ponds and evaporating substantially more water.

6.11. Radon Emissions from Heap Leach Piles Compared to Radon Emissions from Conventional Tailings Impoundments

> On Page 25405 of the Preamble, EPA states that: "We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption."

As discussed in Section 6.8 above, the radon emissions would be proportionally lower if the physical conditions at the permanent HLF were the same as within the tailings impoundment. Typically, the ore grades in an HLF would be 50% or less than those processed in a conventional mill. However, the physical conditions of the processed material would not be the same if a permanent HLF is operated in accordance with current industry and regulatory standards, where the moisture content would likely average about 10 to 15% by weight. By contrast, the solids in an operating tailings impoundment are at saturation levels or very close to full saturation until the impoundment is closed and the process of removing excess water and placing an interim cover is started.

We believe that the HLF and tailings impoundment would have similar radon emissions, especially if a layer of gravel is placed over each HLF lift to prevent dust emissions from the ore. However, it would require a modest modeling effort to determine the radon emissions assuming different grades and moisture contents.

6.12. Other Concerns

6.12.1. On Page 25403, Part B.4 of the Preamble, the description of heap leach piles contains the phrase *"…as the acid drips through the ore …"* It should be noted that alkaline leach solutions could also be used. We recommend changing the description to "… as the leach solution percolates through the ore …" This section limits its description to permanent or conventional HLFs and does not include descriptions of other types of HLFs, such as on-off and vat leach HLFs. We recommend that these other types of HLFs be addressed here or within an "Other Uranium Recovery Facility" section.

6.12.2. On Page 25392, D. (3), Heap Leaching, of the Preamble:

a) Under Item B, it is stated that *"An acidic solution is then sprayed over the ore to dissolve the uranium it contains."* Depending on the chemical characteristics of the ore, it may be more economical to leach the ore with an alkaline solution. It is recommended that "or alkaline" be inserted after "acidic";

b) Under Item C, it is stated that *"The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system."* Depending on the ore grade and leaching characteristics, it may be more economical to use a solvent-extraction (SX) system. It is recommended that "ion-exchange system" be deleted and replaced with "extraction system, typically either ion exchange or solvent extraction";

c) Under Item E, Energy Fuels recommends changing this sentence to read "The extraction system removes the uranium from solution …"; and

d) Under Item H, the word "Finally" is fairly vague and could be misinterpreted. A better description might be "After leaching of the ore has been completed, there is a final drain down …" Also under Item H, it is stated that "*The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32*." As mentioned previously, this is not the case with an on-off HLF, where the leached ore is removed and placed in a separate permanent disposal facility.

7. ISR FACILITIES

Energy Fuels has the following comments relating to the application of Subpart W to ISR facilities:

7.1. <u>Treated Waste Water Should Not be Subject to Subpart W</u>

> With respect to waste water management practices that are commonly used at ISL production operations, it is stated on Page 25291, Part D. (2) In-Situ Leach/Recovery that "This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep disposal well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W."

This statement does not acknowledge one other type of waste water storage and disposal method currently used at ISR operations. This method includes discharge of treated waste water into reservoirs and disposal via land application. Prior to discharge, the waste water is treated for the removal of radium-226 to meet the NRC's 10 CFR 20, Appendix B, Effluent Concentration Limits and, as such, does not pose a significant risk of radon flux. It should also be noted that certain of these reservoirs do not meet, nor were they designed, licensed or constructed to meet, the requirements of 40 CFR 61.252(c). The same argument would apply equally to reservoirs of similarly treated waste water used in connection with other disposal methods.

However, the treated water in these reservoirs could be considered to contain 11e.(2) byproduct material and hence be subject to the requirements of Subpart W. We do not believe that there is any need to include such treated water reservoirs as "non-conventional impoundments" at ISR facilities.

> On page 25401, Part B, 1 of the Preamble, the EPA further states "Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or non-conventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

Because these reservoirs that contain treated water were not designed or constructed to meet the liner requirements of 40 CFR 192.32(a)(1) during NRC licensing and approval, regulation of such reservoirs under the Proposed Rules may result in additional costs "above and beyond" what was required to license them under the NRC.

As a result, we recommend that proposed 40 CFR 61.251(i) be changed to read as follows:

> "(i) *Non-Conventional Impoundment*. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and /or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure. Non-conventional impoundments do not include any impoundments used solely for the holding or evaporation of liquids that have been treated to meet the 10 CFR Part 20, Appendix B,

Effluent Concentration Limits for radium-226 or that meet any other applicable regulatory requirements for disposal by land application or other disposal method."

7.2. Radon Attenuation and Control at ISR Facilities

In regard to radon attenuation and control attributed to the proposed GACT measure of maintaining one meter of water in non-conventional impoundments, the EPA states on Pages 25402 and 25403, Part B, 3 of the Preamble: "The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the non-conventional impoundment, but across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%."

It is perplexing as to how a 93% decline was attributed to this control measure. In Table 46 of the BID, for example, a radon attenuation factor of 0.07 (i.e., 93% reduction) was applied to the calculated "maximum" radon release of 36,500 curies per year from an operating ISR facility. As described in Section 4.4 of the BID, this calculation was based on either theoretical or actual release values and, as such, should be representative of radon releases from both processing facilities and impoundments. It is also assumed that the majority of the calculated radon release from ISR facilities is associated with the processing facilities, not impoundments. The fact that non-conventional impoundments are not a significant source of radon is acknowledged by the EPA in the Preamble, the BID and the *Risk Assessment Revision for 40 CFR 61 Subpart W – Radon Emissions from Operating Mill Tailings, Task 5 – Radon Emission from Evaporation Ponds* dated November 9, 2010, in which the EPA states "…the evaporation pond contribution to the site's total radon release is small (i.e., <1%)."

Considering that the EPA has acknowledged that radon release from evaporation ponds is small and, in some cases, <1% of the total site radon release, Energy Fuels questions the appropriateness of applying the 0.07 attenuation factor to the ISR site's total radon release based on the information presented in the BID. Assuming that the 36,500 curies per year radon release for the aforementioned facility in Table 46 of the BID is from both processing facilities and impoundments and that 1% of this amount is attributed to impoundments, the annual radon release associated with the impoundment would be only 365 curies. A 93% reduction in radon releases at the impoundment would only result in a site-wide reduction of 340 curies per year, not the 33,100 curies per year that is presented in Table 46 (i.e., from 36,500 Ci/yr to 2,590 Ci/yr). This represents a radon release reduction of less than 1% for the overall facility vs "…a decline of approximately 93%" as stated by EPA in the Preamble.

8. BURDENS AND COSTS OF PROPOSED RULES ON INDUSTRY

On page 25406, Section A, of the Preamble, the EPA states that: "The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources."

As discussed below, the actual costs for implementing many of the proposed measures is orders of magnitude higher than estimated by the EPA. Energy Fuels does not believe that reducing or eliminating already very low radon emissions can be economically justified.

8.1. <u>Costs of One Meter of Water Requirement for Non-Conventional Impoundments</u>

> On Page 25403, Part B, 3, the EPA states that: "The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the non-conventional impoundments during operation and standby." The EPA goes on to say that: "… we estimate that this requirement will cost owners or operators of non-conventional impoundments between $1,042 and $9,687 per year."

This number is not representative of the additional costs that would be incurred for an evaporation pond at a conventional mill. As discussed in Section 2 above, Energy Fuels estimates the incremental capital cost to build additional non-conventional impoundment capacity for a new facility would be $750,000 per 40-acre cell or $1.5 million for an 80-acre cell. For an existing facility, the additional required evaporation/holding capacity would cost approximately $15.3 million for the liner alone per 40-acre additional non-conventional impoundment. The estimated capital cost to build additional water supply capacity at the White Mesa Mill is $800,000, and the additional annual operating cost for the water supply system was estimated at $200,000.

The costs associated with maintaining a one-meter cover could be even greater at other conventional milling facilities. For example, the proposed Piñon Ridge Mill relies on an aquifer that is shallower than the aquifer at the White Mesa Mill, but has less productivity. If the one-meter water cover requirement was implemented, the Piñon Ridge Mill would likely have to construct a pump station and water line from rivers located 7 to 13 miles from the site. The estimated capital cost for constructing these facilities ranges from $4 to $6 million with operating costs of approximately $200,000 per year. These costs do not include the cost to acquire water rights or purchase the water from existing water right owners.

Based on the above referenced information, Energy Fuels believes that EPA has not considered all the potential costs associated with maintaining a one-meter water cover on evaporation ponds at conventional mill facilities. We believe that the proposed rule, as currently written, would add substantial cost to our operations with very little reduction in radon emissions.

8.2. <u>Costs Associated with 30% Moisture Requirement at Heap Leach Facilities</u>

> Page 25404, Part B, 4 states that: "The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to non-conventional impoundments."

As discussed in Section 6 above, the unit costs estimated by the EPA for evaporation ponds are, in some cases, only a fraction of the actual costs that would be incurred. The same is true of HLFs and is largely dependent on the site's location vis-à-vis an adequate water resource. Water in the American Southwest is not plentiful, and acquisition of water resources often represents a major capital expense for mining operations. In the case of the proposed Sheep Mountain Project, most of the water needed for processing would come from dewatering the open pit mine, and would not represent a large incremental cost. However, if the water table was below the deposit or not present at all, substantially higher costs would be incurred to import the additional water needed to maintain higher moisture content in the heap.

However, the true cost associated with requiring higher moisture contents in the heap is the capital cost associated with building larger holding ponds and process facilities to be able to store and process the much larger volume of solutions generated from the HLF.

Table 3 of Section IV.B.4, Heap Leach Pile Annual Makeup Water Cost, states that the annual maximum cost of makeup water required to maintain the 30% moisture content is $13,318. The EPA also states on page 25407, Section B of the Preamble that: *"Baseline costs . . . for the leach pile liner construction will remain the same, since the imposed rule does not impose additional requirements."* However, the analysis fails to take into account the additional storage and process capacity that would need to be constructed to store and process the additional solution produced from the higher application rate. As previously discussed in Section 6.10, those costs are estimated at $5 million for a 25-acre evaporation impoundment and well in excess of $5 million for a redesigned mill that could accommodate the higher process flow rates that would be required.

9. OTHER ISSUES GENERATED FROM OUR REVIEW OF THE PROPOSED RULES

9.1. Application of Subpart W to Evaporation or Holding Ponds

> On Page 25402, Part B, 3, EPA states that: "Industry has argued in preambles to responses to the CAA section 114(a) letters and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment."

Energy Fuels agrees with the uranium industry's position as described above. When it promulgated its final Subpart W rules in 1989, the EPA clearly recognized that evaporation ponds emitted very little radon and, because of the low health risk associated with these ponds, chose not to regulate them.

> The EPA goes on to say: "EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W." and "Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments."

We also disagree with the statement that EPA has consistently maintained that evaporation and holding ponds meet applicability criteria for Subpart W. However, Energy Fuels does not object to the inclusion of evaporation ponds at uranium mills and HLFs within Subpart W, provided that the amendments to the Proposed Rules suggested in Section 2.7 above are adopted by EPA.

9.2. Comments to Office of Management and Budget Submitted Under Separate Cover

As provided for in paragraph two of Page 25409, Section B of the Preamble, Energy Fuels previously submitted comments to the Office of Management and Budget (with a copy to EPA) regarding the Information Collection Request (ICR).

9.3. Ownership of Proposed Pinon Ridge Mill

The EPA states on Page 25409, Section C that the proposed Piñon Ridge Mill is *"owned by Energy Fuels Inc."* The mill property and license are actually owned by Energy Fuels Resources Corporation, a Colorado company.

9.4. Energy Fuels is a Small Business

The EPA states that *"of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion."* Energy Fuels currently and historically has always had less than 500 employees. As of October 22, 2014, Energy Fuels had 122 employees. The proposed regulations, as currently written, would have a substantial financial impact on Energy Fuels as has been documented throughout this comment letter.

On Page 25410, Section C of the Preamble, EPA states that: *"However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses."* As stated above, Energy Fuels has never had 500 or more employees and is, therefore, a small business.

At the top of column 2, the error is repeated and compounded by the statement that *"No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs."* As stated above, Energy Fuels would certainly be impacted in a negative manner. We also believe that other small ISR operators could be potentially impacted by the Proposed Rules.

9.5. Impact on Productivity and Competition

On Page 25410, Section H of the Preamble, it is stated that: *"This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector."* Energy Fuels disagrees with this statement, as the rules as currently proposed would require the implementation of expensive (and unnecessary) measures on conventional uranium mills and HLFs that would make those facilities less competitive with ISR operations and other forms of energy available to consumers.

9.6. Other Recommended Changes to the Proposed Subpart W §61.251 Definitions

a) It is recommended that the words "trenches or other disposal areas" in §61.251(b) of the Existing Rules be replaced by "disposal facility." Also, we recommend that "dried tailings" in that subsection be replaced with "dewatered tailings", as the EPA's definition of dewatered tailings, which is tailings with a water content not exceeding 30 percent by weight, would not represent "dry" conditions. In tailings practice, dewatered tailings are typically considered tailings with a slurry density greater than 70 percent solids;

b) It is recommended that the word “immediately” in §61.251(f) of the Existing Rules be removed because the time frame for drying tailings will be set out in milestones established by the NRC or applicable Agreement State and may take several years to accomplish. It should also be understood that the use of the term “dried” should be interpreted to mean dried to the extent required for final closure of the impoundment. As the term “dewatered” is a defined term, it is not recommended that the term “dried” be replaced with “dewatered”, unless the definition of “dewatered” is changed to be less prescriptive for phased disposal than it is for continuous disposal;

c) It is recommended that the phrase “uranium mill tailings impoundment” in the definition of “Existing Impoundment” in §61.251(d) of the Existing Rules be changed to “conventional impoundment” for consistency of definitions and terms in the Proposed Rules, and to avoid the confusion that can arise from using undefined terms when a defined term would be appropriate in the context;

d) It is recommended that the word “conventional” be added before the word “impoundments” in the definition of “phased disposal” in §61.251(f) of the Existing Rules for consistency of definitions and terms in the Proposed Rules, and to avoid the confusion that can arise from using undefined terms when a defined term would be appropriate in the context; and

e) It is recommended that the term “tailings impoundments” in §61.252(a)(1)(i) of the Proposed Rules be changed to “conventional impoundments” for consistency of definitions and terms in the Proposed Rules, and to avoid the confusion that can arise from using undefined terms when a defined term would be appropriate in the context.

A copy of the entire Subpart W, as amended by the Proposed Rules, redlined to show all of the proposed changes recommended by Energy Fuels, is attached as Appendix A to this letter.

10. CONCLUSIONS

Energy Fuels agrees with EPA that evaporation and similar ponds should not be counted as one of the two conventional impoundments that may be in operation at any one time under the proposed management practice standards, and that there should be no limitation on the number and size of such ponds.

However, Energy Fuels has identified several provisions in the Proposed Rules that are of concern, and makes the following recommendations, as discussed in more detail above:

a) The definition of “non-conventional impoundment” should be revised to clarify that impoundments which are designed and constructed as conventional impoundments can be operated as non-conventional impoundments prior to the placement of tailings in the impoundment.

b) The proposed one meter of solution cover in non-conventional impoundments should be changed to require full saturation or water cover on evaporation and similar ponds, but not to require a minimum liquid level in the ponds, as discussed in detail in Section 2;

c) The definition of “uranium byproduct material” in the Proposed Rules should be the same as the definition in the AEA and the regulations promulgated thereunder, as discussed in detail in Section 3;

d) The definitions of “Operation”, “Standby”, “Tailings” and “Closure Period” should be changed or added to be consistent with applicable regulations in 40 CFR Part 192 and 10 CFR Part 40 Appendix A, and to make more clear when the jurisdiction of EPA under Subpart W ceases and the jurisdiction of NRC or the applicable Agreement State takes over with respect to each impoundment at a uranium recovery facility, as discussed in detail in Section 4;

e) The Proposed Rules should not result in dual EPA/NRC jurisdiction over the design, construction or operation of conventional or non-conventional impoundments. The responsibility for implementing standards on a facility-by-facility basis should remain solely with the NRC or applicable Agreement State, as discussed in detail in Section 5;

f) Conventional Heap Leach Facilities (HLFs) and process operations at other HLFs should not be considered to be 11e.(2) byproduct facilities when in operation, and after operation should be subject to the sole jurisdiction of the NRC or applicable Agreement State. We believe that Subpart W should not apply to conventional HLFs or process operations at other HLFs (other than any non-conventional impoundments at HLFs), and in any event, the 30% moisture content requirement should be eliminated, as discussed in detail in Section 6;

g) Fully leached ore from the final operations stage of an on-off or vat HLF that is permanently disposed of in a separate repository should be regulated after disposal in the repository in the same manner as tailings from processing ores at a uranium mill, as discussed in detail in Section 6;

h) Any evaporation or holding pond that contains water that has been treated to meet the effluent concentration limit for radium-226 in 10 CFR Part 20 Appendix B, or otherwise meets the regulatory requirements applicable to disposal by land application or other disposal method should not be considered to be a non-conventional impoundment and should not be subject to the requirements of Subpart W, as discussed in detail in Section 7;

i) EPA should re-assess the estimated costs for implementing its Proposed Rules and their potential impacts on small businesses; and

j) Several additional recommendations are made in Section 9 and elsewhere in these comments.

Thank you for the opportunity to comment. Energy Fuels would be happy to answer any questions you might have and provide additional information to assist the EPA in this rulemaking effort.

Sincerely

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Laura Lockhart (Utah Attorney General's Office)
J. Opila (Colorado Radiation Program)
D. Mandeville (NRC)

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APPENDIX A

Existing Subpart W Rules, as Modified by the Proposed Rules, Marked to Show Energy Fuels' Recommended Changes

Subpart W—National Emission Standards for Radon Emissions From Operating Mill Tailings

SOURCE: 54 FR 51703, Dec. 15, 1989, unless otherwise noted.

§61.250 Designation of facilities.

The provisions of this subpart apply to owners or operators of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings. This subpart does not apply to the disposal of tailings.

§61.251 Definitions.

As used in this subpart, all terms not defined here have the meaning given them in the Clean Air Act or 40 CFR part 61, subpart A. The following terms shall have the following specific meanings:

(a) *Area* means the vertical projection of the pile upon the earth's surface.

~~(b~~(b) *Closure Period.* Closure period for a conventional impoundment means the period of time beginning with the date that the owner or operator provides written notice to the Administrator and to the Nuclear Regulatory Commission (NRC) or applicable NRC Agreement State that the impoundment is no longer receiving tailings and is no longer on standby for such receipt, and ending with completion of the requirements specified under the closure plan for the impoundment. Closure period for a non-conventional impoundment means the period of time beginning with the date that the owner or operator provides written notice to the Administrator and to the Nuclear Regulatory Commission or applicable NRC Agreement State that the impoundment is no longer required for evaporation or holding purposes and is no longer on standby for such purposes, and ending with completion of the requirements specified under the closure plan for the impoundment.

(c) *Continuous disposal* means a method of tailings management and disposal in which tailings are dewatered by mechanical methods immediately after generation. The ~~dried~~ dewatered tailings are then placed in ~~trenches or other~~a disposal ~~areas~~ facility and immediately covered to limit emissions consistent with applicable Federal standards.

(~~c~~d) *Dewatered* means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight.

(~~d~~e) *Existing impoundment* means any ~~uranium mill tailings~~conventional impoundment which is licensed to accept additional tailings and is in existence as of December 15, 1989.

(~~e~~f) *Operation.* Operation for a conventional impoundment means that ~~an~~the impoundment is being used for the continued placement of ~~new uranium byproduct material or~~ tailings or is ~~in~~ on standby ~~status~~ for such placement~~. An~~, and for a non-conventional impoundment means that the impoundment is being used for evaporation or holding purposes or is on standby for such purposes. A conventional impoundment is in operation from the day that ~~uranium byproduct material or~~ tailings are first placed in the impoundment until the day that ~~final~~the closure period for the impoundment begins. A non-conventional impoundment is in operation from the day that it first becomes used for evaporation or holding purposes until the day that the closure period for the impoundment begins.

(~~f~~g) *Phased disposal* means a method of tailings management and disposal which uses lined conventional impoundments which are filled and then ~~immediately~~ dried and covered to meet all applicable Federal standards.

(~~g~~h) *Uranium Byproduct Material. Uranium* byproduct material ~~*or tailings*~~ means the ~~waste~~tailings or wastes produced by the extraction or concentration of uranium from any ore processed primarily for its source material content~~. Ore bodies depleted by~~ , including discrete surface wastes resulting from uranium solution extraction ~~and which remain underground~~processes. Underground ore bodies depleted by such solution extraction operations do not constitute uranium byproduct material ~~for the purposes of~~within this ~~subpart~~definition.

~~(h~~(i) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure. A conventional impoundment includes a separate waste repository for the permanent disposal of tailings from heap leach facilities after the completion of all leaching activities, but does not include a heap leach facility that is used for in-place permanent disposal of leached ore.

~~(i~~(j) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure, or can become conventional impoundments upon placement of tailings in the impoundment. Non-conventional impoundments do not include any impoundments used solely for the holding or evaporation of liquids that have been treated to meet the 10 CFR Part 20 Appendix B, Effluent Concentration Limits for radium-226 or that meet any other applicable regulatory requirements for disposal by land application or other discharge.

(~~j~~k) *Heap Leach ~~Pile~~Facility.* A heap leach ~~pile~~ facility ~~is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.~~is an engineered structure or pad upon which ore is placed. A leach solution is applied to the placed ore to dissolve the uranium in the ore. Typically, after completion of all leaching activities, the heap leach facility is used for in-place permanent disposal of the leached ore. At some heap leach facilities, the fully leached ore may be removed and permanently disposed of in a separate waste repository, allowing re-use of the heap leach facility.

~~(k~~(l) *Standby.* Standby for a conventional impoundment means the period of time that the impoundment may not be accepting tailings but has not yet entered the closure period for the impoundment, and for a non-conventional impoundment means the period of time that ~~an~~the impoundment may not be accepting uranium byproduct materialsrequired for evaporation or holding purposes but has not yet entered the closure period for the impoundment.

(l(m) *Tailings.* Tailings means (a) sand-like wastes from the processing of uranium ore; or (b) fully leached ore from the final operations stage of a heap leach facility upon permanent disposal in a conventional impoundment.

(n) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the Nuclear Regulatory Commission or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional Impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings conventional impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(i).), as determined by the Nuclear Regulatory Commission. The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of §192.32(a)(i), as determined by the Nuclear Regulatory Commission.

(b) *Non-Conventional Impoundments.*

Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(i).), as determined by the Nuclear Regulatory Commission. During operation and until final commencement of the closure begins,period for the liquid levelimpoundment, any solids in the impoundment shall not be less than one metercovered with a layer of liquid, as verified by daily inspection. Any failure to meet this standard shall be rectified within seven (7) days after detection, or within such other time as the Administrator may approve.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(i). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis and performed using generally

~~accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.~~

§61.253 [Removed]

§61.254 [Removed]

§61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility with non-conventional impoundments in operation must maintain records of daily inspections confirming that ~~confirm that~~a layer of liquid has been maintained over any solids in the ~~conventional impoundment(s), nonconventional~~non-conventional ~~impoundment(s) and heap leach pile(s)~~impoundments at the facility ~~meet~~in accordance with the requirements ~~in~~ of 40 CFR ~~192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.~~61.252(b).

~~(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.~~

~~(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.~~

(~~d~~b) The records required in paragraph~~s~~ (a)~~, (b) and (c)~~ above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

§61.256 Exemption from the reporting and testing requirements of 40 CFR 61.10.

All facilities designated under this subpart are exempt from the reporting requirements of 40 CFR 61.10.