Gallagher, Carol

Subject: FW: [External_Sender] Comments from Nye County, NV on the NRCs Draft SEIS for Yucca Mountain

Attachments: 15-0243DS.pdf

8/21/2015
80 FR 50875
(52)

From: Elizabeth Pittsley [mailto:epittsley@co.nye.nv.us]
Sent: Monday, November 16, 2015 5:10 PM
To: YMEIS_Supplement Resource
Cc: Pamela Webster; Lewis Lacy; Daniel Schinhofen
Subject: [External_Sender] Comments from Nye County, NV on the NRCs Draft SEIS for Yucca Mountain

Attached, please find the comments from Nye County, Nevada on the NRC Draft Supplement to the U.S. Department of Energy's Environmental Impact Statement for Yucca Mountain.

If you have any questions, please contact Commissioner Schinhofen at 775-513-8491.

Thank you,

Liz
Elizabeth (Liz) Pittsley
Administrative Secretary
Nye County Administration
2100 E. Walt Williams Dr. #100
Pahrump, NV 89048
775/751-7075
775/751-7093-Fax
epittsley@co.nye.nv.us

SUNSI Review Complete
Template = ADM – 013
E-RIDS= ADM-03
Add= A. Fredd (CLS1)

Board of County Commissioners
Nye County
Pahrump, Nevada

Pahrump Office
2100 E. Walt Williams Drive
Pahrump, NV 89048
Phone (775) 751-7075
Fax (775) 751-7093

November 13, 2015

Ms. Cindy Bladey
Office of Administration
U.S. Nuclear Regulatory Commission
Mail Stop: OWFN-12-HO8
Washington, DC 20555-0001

Re: Comments from Nye County, NV on the NRC Draft Supplement to the U.S. Department of Energy's Environmental Impact Statement (SEIS) for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada and NUREG 2184.

Dear Ms. Bladey,

The ability of Affected Units of Local Governments (AULGs) to fully participate in the EIS process is limited by the availability of funding authorized in the Nuclear Waste Policy Act. This fact in and of itself gives cause to question the validity of this current review process.

The conclusions reached in the Draft SEIS appear consistent with the extensive body of scientific research and studies for Yucca Mountain. The environmental impacts of the proposed geologic repository at Yucca Mountain are negligibly small, well within all national and international regulatory environmental standards for up to one million years. Thus we urge the NRC and DOE to move forward with completion of the Yucca Mountain licensing process.

Our detailed comments are attached.

Sincerely,

Dan Schinhofen, Commissioner
District 5, Nye County, NV

DS/ep

Attachment: General/Detailed Comments

Cc: Pam Webster, Nye County Manager
Darrell Lacy, Director of Planning

Nye County, Nevada
November 2015

General/Detailed Comments from Nye County, NV on the NRC Draft Supplement to the U.S. Department of Energy's Environmental Impact Statement (SEIS) for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada and NUREG 2184.

General Comments:

NRC staff did a thorough job in completing the Draft SEIS. It includes all elements, and meets all requirements from NRC's adoption review to allow NRC to adopt the Yucca Mountain FEIS, as supplemented.

The Yucca Mountain Project received much criticism for adopting too much conservatism in its total system performance assessment models that addressed 1-million-year time frame. Subsequent to the docketing of the Yucca Mountain License Application, a number of papers related to the Yucca Mountain repository have been compiled.[1] Two papers that are relevant to the concerns about conservatism in the unsaturated zone flow and seismic hazard analysis models are relevant to the additional modeling presented in the draft supplemental Environmental Impact Statement.

While the draft SEIS is adequate in all respects to show that post closure groundwater impacts at all offsite locations would be SMALL, one unnecessary ultraconservative assumption was made that should be revised in the final. In particular, the assumption that 100% of any radioactive contaminants in groundwater would always be retained at the receptor location, makes no sense. When coupled with faulty assumptions regarding groundwater recycling, the results, while resulting in SMALL impacts, are overstated by several times. Page specific comments on the specifics of these topics follow our general comments.

New Information on the Hydrology of the Deep Vadose Zone at Yucca Mountain

The hydrologic response of deep vadose zones to climate-induced changes in surface water is an important aspect of understanding travel times, recharge rates, and potential water fluxes in arid environments, especially at sites chosen for isolating wastes over long times, such as Yucca Mountain. As such, it is relevant to the modeling of surface discharges of radionuclide carrying water originating in the repository. considering a reduced value for the deep percolation flux strengthens the argument for miminal impacts presented in the draft supplemental Environmental Impact Statement. The parameter cannot be measured directly and must be inferred from other information. For the Yucca Mountain total system performance assessment models, conservative assumptions about water movement in future climates were made.

In a publication after the License Application was submitted, Pleistocene climate-change–induced hydrologic responses in the deep vadose zone at Yucca Mountain were evaluated by Uranium series dating of finely layered opal using secondary ion mass spectrometry.[2] Opal was observed to be present in centimeter-thick secondary hydrogenic mineral crusts coating floors of lithophysal cavities in fractured volcanic rocks at depths of 200 to 300 meters. The results indicated that the chemical compositions of percolating solutions varied in response to near-surface, climate-driven processes. However, micrometers per thousand years, relatively uniform, slow growth rates of secondary opal, and calcite deposition

spanning several glacial-interglacial climate cycles implied that water fluxes in the deep vadose zone remained low and generally buffered from the large fluctuations in available surface water during different climates.

The accepted paradigm of a direct correlation between effective surface moisture and deep fracture flow was shown to be questionable at Yucca Mountain. Instead, data from secondary hydrogenic minerals indicated that water fluxes through the deep vadose zone were at least partly decoupled from surface moisture and shallow infiltration, both of which have experienced large fluctuations over the past million years. Data supporting that conclusion were obtained from detailed geochronological studies of Uranium-rich opal formed in natural cavities at depths of 200 to 300 meters below land surface. The uniform, linear rates of opal growth indicated that hydrologic conditions in the deep vadose zone remained stable throughout the Pleistocene despite multiple climate cycles, including the particularly cold and wet penultimate glacial episode. Long-term hydrologic stability also was implied by similar growth rates for older parts of the same coatings despite the fact that Miocene and Pliocene climates were warmer and wetter than Pleistocene conditions. These results implied that seepage fluxes in the deep vadose zone were decoupled from effective surface moisture and buffered from large variations in shallow infiltration. A number of hydrogeologic processes likely contributed to this long-term hydrologic stability, including runoff and down-slope diversion at contacts between soil and bedrock and between nonwelded and welded tuffs, changes in evapotranspiration rates, evaporation and upward flux of shallow fracture water, storage and uniform releases of percolation from nonwelded tuffs, and reduction of deep-fracture flux by evaporation and imbibition.

The importance of this conclusion is best understood in light of the assumed effects of climate change in total system performance assessment models. For the Viability Assessment,[3] climate states were modeled by simply turning on increased infiltration rates. This effectively washed available radionuclides out of the system, resulting in peaks in the dose curves at each climate change. Eventually, with the Yucca Mountain specific standard[4] required by the Energy Policy Act of 1992,[5] the Nuclear Regulatory Commission directed that the nature and degree of climate change was to be represented by constant-in-time climate conditions, commencing at 10,000 years after disposal and extending through the period of geologic stability. The values to be used to represent climate change were to be the spatial average of the deep percolation rate within the area bounded by the repository footprint; the deep percolation rates were to be based on a log-normal distribution with an arithmetic mean of 41 millimeters per year and a standard deviation of 33 millimeters per year. The log-normal distribution was to be truncated so that the deep percolation rates varied between 10 and 100 millimeters year.

The fact that this is roughly ten times the nominal infiltration rate used in the Safety Analysis Report illustrates the conservatism in the performance assessment results, if, as shown by this United States Geological Survey study, deep infiltration is decoupled from surface effects. These results should be mentioned in the draft supplemental Environmental Impact Statement.

New Information on Extreme Ground Motions and Yucca Mountain

Assumptions used in the License Application regarding extreme ground motions significantly influenced the results of the total system performance assessment, particularly the estimated amount of radionuclides released over time. Extreme ground motions — extremely large-amplitude ground motion that arises at very low probabilities of exceedance— became an apparent issue for Yucca Mountain when the 1998 probabilistic seismic hazard analysis was extended to a hazard level of 10^{-8} per year. For the License Application, the Department of Energy empanelled an expert group to address this issue.[6] Unfortunately, the results of their effort were not available in time for inclusion in the License Application.

Applying guidelines primarily devoted to the theory and practice of expressing, aggregating, and quantifying expert opinion in the presence of uncertainty turned out to be a complicated and time-consuming process. Analysis and inclusion of both aleatory and epistemic uncertainty were significant and time-consuming aspects of the 1998 probabilistic seismic hazard analysis. The history of probabilistic seismic hazard analysis is linked heavily to nuclear power plant design, where probabilities several orders of magnitude higher than the repository features, events, and processes cut off of 10^{-8} per year are the norm.

Extreme ground motions, the consequence of untruncated ground motion distribution functions taken to very low probability levels, generated considerable consternation in the scientific, engineering, and regulatory communities. The upper end of these peak ground accelerations and peak ground velocities have never been recorded for earthquakes. They present exceptional challenges to the design and construction of underground facilities, and are regarded by most qualified seismologists as physically unrealizable.

The expert group noted that assessing seismic hazard at probabilities of exceedance for 10^{-6} to 10^{-8} per year requires thinking about probabilistic seismic hazard analysis differently from the familiar ways. Their approach was to compile a preponderance of evidence that pointed in similar directions. Within the basic framework of physical limits to ground motion, unexceeded ground motions, and the frequency of occurrence of various things, the research program followed a dozen distinct lines, as well as subsidiary paths related to them. The principal theme to be drawn collectively from all of the work was that the 1998 probabilistic seismic hazard analysis, when extended to hazard levels of 10^{-6} to 10^{-8} per year, significantly overstated the true seismic hazard for Yucca Mountain; they also found this to be true at hazard levels of 10^{-5} and 10^{-4} per year.

The expert group's results illustrated physical limits to earthquake ground motion, unexceeded ground motions represented by the lithophysal units and precariously balanced rocks on the west face of Yucca Mountain, and two simplified hazard models for Yucca Mountain. The results addressed a point on an east-west cross section of Yucca Mountain through the repository horizon, located approximately 300 meters beneath the Yucca Mountain crest. The 1998 Yucca Mountain probabilistic seismic hazard analysis was calculated for a reference rock outcrop at the repository elevation because insufficient material property data were available for calculations at a site at the repository horizon.

In general, the expert group's results included points and curves that fall well below the mean hazard curve used for the Yucca Mountain License Application and therefore are inconsistent with it, indicating that the mean hazard curve is too high. For a given low probability of earthquake occurrence, it was clear that the peak ground velocities suggested by the expert group's analyses are significantly lower than those developed in the 1998 probabilistic seismic hazard analysis, and are also meaningfully lower than those used in the License Application. Because the seismic ground motion scenario case dominates the releases in the total system performance assessment for the License Application, a lowering of the peak ground velocity has a concomitant effect in lowering the calculated doses. These calculated doses would be lower still when the decreased infiltration rates for Yucca Mountain developed post License Application are considered. These results as well should be mentioned in the draft supplemental Environmental Impact Statement.

While listening to public comment sessions, there were several comments regarding the adequacy of the draft SEIS that were incorrect. The following comments address why those other comments are wrong and should not affect the finalization of the SEIS.

- A comment stated that since President Obama had made a decision to separate SNF and HLW streams for ultimate disposal, DOE's FEIS is inadequate and must be further supplemented. First, that comment has nothing to do with the topics of the SEIS and is out of scope. Further, there is no inadequacy related to waste inventory in the FEIS. DOE evaluated a representative quantity of SNF and HLW in its proposed action. In the cumulative impacts section, they evaluated much greater quantities of SNF and HLW that could exist in the future. They also evaluated a range of burnup specifications for the commercial SNF. Since **currently there is no real alternative to Yucca Mountain**, that approach continues to make sense. The FEIS, as supplemented, more than covers the 70,000 MTHM in DOE's proposal that matches the limits on the first repository until a second repository is in operation as specified in the Nuclear Waste Policy Act. Any concerns regarding appropriateness of the radioactive inventory evaluated by DOE should be handled as a license condition (limiting disposal to the inventory evaluated) when NRC issues the operating license for Yucca Mountain, not in a constant re-evaluation of the waste stream.
- A commenter suggested that because of a new wilderness area designation in Nevada, the FEIS rail transportation evaluation is defective. Again, the comment is out of scope for this supplement. Even if in scope, the actions proposed by DOE and the environmental impacts have not changed because of a designation on a map. Such issues are better handled in the licensing process rather than constant tinkering with environmental assessment documents.
- A commenter suggested that the no-action alternative in the FEIS is defective since in NRC's Continued Storage EIS, it was stated that NRC staff believed the scenario assuming no institutional controls was not reasonable. Again, this is out of scope for the supplement. Even if in scope, NRC staff has not changed their position regarding this scenario as public comments were made by NRC at the time of DOE's draft EIS. NRC staff knew this when they completed their FEIS adoption review and did not make it an issue. Further, DOEs other no-action scenario in the FEIS and NRC's evaluations in the waste confidence EIS adequately deal with Yucca Mountain no-action scenarios. No further evaluation of no-action is necessary. We seem to be living it anyway.

Page Specific Comments

1. Page xi, lines 43,44 – It is noted that conservative assumptions are used in the analysis. This is appropriate when the assumptions simplify the analysis, the results are not unreasonably altered, and when other more reasonable simplifying assumptions are not available. This will be a recurring theme of the following comments.
2. Page xii, lines 13-32 – It is agreed that the final conclusion in the SEIS is correct, that all impacts are SMALL. However, if certain simplifying assumptions were not overly conservative, the impacts be so small as to be most likely nonexistent at any location beyond Amargosa Farms. Specifics to support this comment are in the following comments.
3. Page 1-4, lines 34-40 – NRC appropriately considered human-induced climate change as discussed in this section. No additional analysis beyond that discussed would be useful or necessary.
4. Page 2-3, lines 21-25 – These lines describe two conservative simplifying assumptions.
    - Lines 22 and 23 assume all contaminate releases are captured by pumping wells at the regulatory compliance location. Presumably this assumption was made because in 10 CFR 63.312(c), the applicant is required to calculate the radionuclide concentrations in the plume using the stated 3,000 acre-feet volume (the average volume of recharge of the valley fill aquifer at the compliance point for the first 10,000 years). 10 CFR 63 does require, for regulatory compliance calculations, that the contaminant concentrations be calculated in this manner. This makes sense for a one year calculation of expected dose to the reasonably maximally exposed individual (RMEI). However, it does not require the assumption that the RMEI use 3,000 acre-feet of water every year in perpetuity to water

the same field and create a condition that both DOE and NRC have labeled "recycling." This is a particularly absurd assumption when considering that the RMEI is a hypothetical subsistence farmer drawing water at a location where the depth of groundwater is much greater than near the Amargosa River flow path a short distance away (e.g., Amargosa Farms). It is recognized that it is not up to NRC to tell DOE that they cannot use conservative assumptions, but NRC should not perpetuate DOE's conservatism in its own analyses. This comment will be expanded in sections where NRC discusses its unreasonably conservative assumption regarding recycling.

- Lines 24 and 25 state the NRC assumption of zero pumping upstream when considering the impacts of surface discharges. There is no indication that pumping will ever be reduced. A more reasonable and just as simplifying, but still conservative assumption, would be that the pumping would be at the low end of recent historical estimates. NRC presents that information, but chooses to ignore it in the analysis of surface discharge impacts. This assumption and the impact calculations should be amended to be more reasonable.

5. Page 2-16, lines 31-43. It is agreed that reconstruction of past climates is the best indicator of future climates, even with the recent knowledge of human-induced climate change.
6. Page 2-17, lines 38-47 and page 2-18, lines1-2. The treatment of human-induced climate change is reasonable in NRC's analysis. It is within the range of impacts calculated and no additional analysis is warranted.
7. Page 2-29, lines 18-36. This section notes that future flow paths would not substantially change when climate changes occur. It also notes that during future cooler, wetter climates long stretches of the Amargosa River and other channels would become perennial streams. NRC should recognize in its analyses that much higher volumes of water will exist at potential receptor locations and flow to and beyond those locations. This knowledge of greater water volume makes the NRC staff assumption regarding 100% capture of contaminants at any one location much too conservative.
8. Page 3-3, lines 7-14. This section discusses pumping assumptions at Amargosa Farms. NRC's two analysis cases suggest no pumping or a volume that is close to recent actual pumping. The simplifying assumption of zero pumping is too conservative for calculating downstream impacts and implies the possibility of no residents near Amargosa Farms in the future – far too speculative for an EIS. An assumption on the low end of recent annual averages would make more sense and would be just as simple to use in impact calculations.
9. Page 3-5, lines 1-9. This section discusses DOE's calculation of dose to the RMEI at the compliance location. It is stated that NRC staff has found that calculation, which shows the dose to be at least 50 times less than the safety limit, to be acceptable. It is agreed that calculation is acceptable, although conservative, as noted in the comment regarding page 2-3, lines 21-25, above.
10. Page 3-6, lines 25-30. NRC is to be commended in making a more reasonable (compared to the DOE 2008 assumption), yet conservative assumption, regarding the volume of water pumped at Amargosa Farms. This SEIS calculation is not a compliance location and the regulation regarding 3,000 acre-feet at the compliance location was based on annual recharge estimates at the compliance location. An even more reasonable estimate would also consider the average annual recharge estimate since we know that some water continues to flow past Amargosa Farms. The practice of over irrigation as noted in Section A.2.1 should also be factored into modeling how much water flows beyond Amargosa Farms.
11. Page 3-6, lines 36-46, and page 3-7, lines 1-3. This section discusses the concept of "recycling" as applied by NRC to dose calculations at Amargosa Farms. Such a concept makes more sense at Amargosa Farms than at the hypothetical RMEI location (see comment above regarding page 2-3, lines 21-25), but needs to be as reasonable as possible without making the calculation overly complex. NRC's assumption regarding 100% contaminant capture, while making sense for any

one particular year, is so unreasonably conservative when applied to recycling recapture for decades, centuries, millennia, or a million years as to be absurd.

There is likely no year that 100% of the contaminants would ever be captured since it is well known and recognized elsewhere in the SEIS that some down gradient flow from Amargosa Farms exists. In years where recharge exceeds flow, it should be assumed that at least the percentage of flow that continues downstream has its prorated share of contaminants included in that flow. A simple way to implement a more reasonable assumption would be to look at each climate state individually. During the hot dry interglacial climate state (e.g., now), assume recharge exceeds pumping (percentage of years) based on recent historical data. For example, if a review of rainfall data showed that the annual recharge at Amargosa Farms over the last 50 years exceeded NRC's pumping estimate of 16,828 acre-feet 10 times, and the average recharge during those years of exceedance was 25,000 acre-feet, the following calculation would result. 25,000/16,828=1.49 or an average flow out of the system during the exceedance years of 49%. So, on average, the groundwater contaminant concentrations would be assumed to be reduced by 49% every 5 years. In cooler wetter climates (surface flow exists in Amargosa River as noted in the SEIS), recharge would exceed pumping almost every year, so little or no recycling should be assumed. Such a concept as outlined above makes much more sense than assuming that every contaminant atom magically comes up in the same well in perpetuity.

12. Page 3-8, lines 36-39. This statement refers to Table 3-2 where sometimes it is shown that some contaminants show higher concentrations during cooler/wetter climate states because some contaminants move faster during those climate states. This result is an artifact of the faulty recycling assumptions as discussed in the comment regarding pages 3-6 and 3-7 and NRC staff treatment of "recycling." As noted in that comment, recapture and recycling of contaminants would be very small, if it existed at all, during climate states when groundwater recharge routinely exceeds pumping.
13. Page 3-35, Section 3.4. Table 3-18, incorrectly cites the minority population of Nye County, where Yucca Mountain is located, as 72%.
14. Page 4-5, lines 1-21. This section discusses DOE's assessment of additional "inventory modules" beyond the 70,000 metric-ton limit. Whether or not disposal of the inventory modules are reasonably foreseeable, DOE has completed an environmental assessment of disposal of that additional material with additional impacts being essentially proportional to the increased radionuclide inventory – still small in all categories. Further, DOE's assessment of impacts to the commercial spent nuclear fuel inventory (both proposed and expanded inventory) considered a range of burnup for the commercial spent nuclear fuel. Updates to the analysis are not required for changes in the disposal inventory unless and until the quantities of radionuclides in the waste inventories already evaluated are significantly exceeded.
15. Page 4-6, Section 4.4.2. NRC staff is commended for the complete and thorough evaluation of activities that have occurred since DOE submitted its last FEIS, as supplemented, in 2008.
16. Pages A-12 and A-13, Section A.2.1 Groundwater Pumping, Recycling, and Irrigation. This gives further details on how and why NRC included "recycling" in its evaluation of impacts at Amargosa Farms. By reference to the comment above regarding Page 3-6, lines 36-46, and page 3-7, lines 1-3, it is reiterated how ultra conservative the NRC staff recycling assumptions are. To further show the absurdity of the NRC staff assumption, one only has to read Page A-12, lines 32-36. Here, the SEIS recognizes that it's common practice to over irrigate, "thus enabling the excess water to recharge the water table while carrying the salts (and in this modeling case, some of the contaminants) away from the upper soil layers. The water that reinfiltrates the aquifer then becomes available again for groundwater pumping." If the NRC recycling model was used for salts, then the soil would build up an abundance of salts from recycling. But, NRC recognizes that exactly the opposite happens -- the salts are washed from the system to avoid such a buildup.

It's not clear at all why NRC believes contaminants other than salts would behave differently. Even though the impacts are small, a more reasonable model should be developed that accounts for the contaminants to eventually flow downstream and out of the system – just as NRC already acknowledges happens to the salts in the system.

---

[1] J.C. Helton, C.W. Hansen, and P.N. Swift, eds., *Performance Assessment for the Proposed High-Level Radioactive Waste Repository at Yucca Mountain, Nevada.* Special Issue: Reliability Engineering & System Safety. Volume 122. February 2015.

[2] James B. Paces, James B., Leonid A. Neymark, Joseph F. Whelan, Joseph L. Wooden, Steven P. Lund, and Brian D. Marshall, "Limited Hydrologic Response to Pleistocene Climate Change in Deep Vadose Zones—Yucca Mountain, Nevada." *Earth and Planetary Science Letters,* 2010. Vol. 300, pp. 287–298.

[3] U.S. Department of Energy, *Viability Assessment of a Repository at Yucca Mountain.* DOE/RW-0508. December 1998. See, for example, Figure 4-21.

[4] U.S. Nuclear Regulatory Commission, *Implementation of a Dose Standard After 10,000 Years: Final Rule.* 74 FR 10811. March 13, 2009.

[5] Energy Policy Act of 1992, *Public Law 102-486.*

[6] T. C. Hanks, N.A. Abrahamson, J.W. Baker, D.M. Boore, M. Board, J.N. Brune, C.A. Cornell, and J.W. Whitney, *Extreme Ground Motions and Yucca Mountain.* U.S. Geological Survey Open-File Report 2013–1245. 2013.