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RULES AND DIRECTIVES
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COMMENTS

General Comment

62

See attached file(s)

Dear Sir,

Attached my comments Specifically document NUREG-2184

Dr. Jacob D Paz

Attachments

NRC Groundwater Comments Final Corrected version

SUNSI Review Complete

Template = ADM - 013

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Add= C. Pineda (CSLI)

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Comments to Groundwater Comments Supplemental Environmental Impact Statement Aug. 21, 2015.

I. BACKGROUND

On August 21, 2015¹ the U.S. Nuclear Regulatory Commission (NRC) issued a request for public comment the draft in the Code of Federal Regulations stated that Supplement to the U.S. Department of Energy's Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level for ground water¹. On August 14, (2015) the NRC released a draft for public comments of the Supplemental EIS for ground water, the NRC concluded that The NRC climes that:

*"The NRC staff concludes that the estimated radiological doses are SMALL because they are a **small fraction of the background radiation dose of 300 mrem/yr [3.0 mSv/yr] (including radon), and much less than the NRC annual dose standards for a Yucca Mountain repository in 10 CFR Part 63 {15 mrem [0.15 mSv] for the first 10,000 years, and 100 mrem [1 mSv] for one million years, after permanent closure}**. Based on conservative assumptions about the potential for health effects from exposure to low doses of radiation, the NRC staff expects that the estimated radiation dose would contribute only a negligible increase in the risk of cancer or severe hereditary effects in the potentially exposed population. **Impacts to other resources at all of the affected environments beyond the regulatory compliance location from radiological and non-radiological material from the repository would also be SMALL.**"*

On October 2014 the NRC published a document entitled "Safety Evaluation Report Related to Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada³."the NRC in their executive summary stated the following that: "The NRC staff has reviewed and evaluated the DOE's Safety Analysis Report, Chapter 2: Repository Safety After Permanent Closure and the other information submitted in support of its license application and has found that DOE submitted applicable information required by 10 CFR 63.212⁴.

The NRC staff has also found questionable, that (i) the proposed Yucca Mountain repository design meets the applicable performance objectives in Subpart E, including the requirement that the repository be composed of multiple barriers and (ii) based on performance assessment evaluations that are in compliance with applicable regulatory requirements, meets the 10 CFR Part 63, Subpart L limits for individual protection, human intrusion, and separate standards for protection of groundwater" **I question this conclusion.**

II. INTRODUCTION and COMENTS

1. Overview

In contrast to the NRC statement that "based on performance assessment evaluations that are in compliance with applicable regulatory requirements, meets the 10 CFR Part 63, Subpart L limits for individual protection, human intrusion, and separate standards for protection of groundwater⁵." **It is my scientific opinion based upon an extensive review of NRC documentations that the NRC License Application did not fully comply with NEPA Act of 1969 and its regulations, and 10 CFR Section 63 (a), as well as the U.S. Supreme Court decisions. There is a question as to why the NRC failed to address and comply with good science and regulations, even though they have the knowledge.**

- **Did the agency fail to consider an important aspect of the groundwater contaminations and health risks to groundwater from mixtures on what scientific data and legal bases?**
- **Did the NRC and DOE decisions run counter to scientific evidence submitted to the DOE and NRC showing possible/probable both synergism and additive health effects.**
- **Lack of credible scientific evidence.**
- **Effects of groundwater contaminations on endanger species**
- **Possible/Probable serious no-compliance with US NEPA Act of 1969, NEPA regulations, NRC regulation, and US Supreme Court ruling.**
- **The NRC is using an unapproved EPA model why.**
- **Lack of credible scientific data.**

1.0 Scientific issues

Specifically, certain scientific issues still should have been addressed by the NRC and doe concerning the proposed Yucca Mountain Project in the groundwater supplements.

The issue of contamination from mixtures of chemicals and radionuclides leached from spent fuel containers presents an important health hazard and was not addressed in the original SEIS. Data on potential groundwater contamination; metal corrosion rates; and partition coefficients for adsorption of contaminants in Yucca Mountain volcanic tuff. Next, what happened to the Cr in Armargosa groundwater, a potent carcinogen and why no scientific explanation was provided? This raises serious scientific and legal issues.

1.1 Metal Corrosion

In the Final Environmental Impact Statement (FEIS) of, submitted by DOE-YMP, the composition and the amount of various substances to be buried include 86,000 metric

tons of C-22 alloy, which contains 22.5% Cr, 14.5% Mo, 57.2% Ni, and 0.35% V; along with 140,000 tons of stainless steel, which is 17% Cr, 12% Ni, and 2.5% Mo, with Fe comprising the remaining percentage. This is in addition to the 77,000 metric tons of high-level nuclear waste to be buried at YMP.

The health risks posed by the potential releases of a fraction of this amount of heavy metals along with radionuclides remain unknown and must be further investigated. The state of Nevada stated that based upon their laboratory studies, they concluded that these metal canisters could corrode under various conditions (Staehele et al. 2003). In addition, the State of Nevada also stated that corrosion rates, which vary from 0.1 mm to 1.0 mm per year, may increase and reach a peak value of 10 mm per year (Pulveireti et al. 2003)

Payer and Paper (2005) indicated that in their experimental data showed that a protective layer is formed on the canisters. But they failed to address the possibility that the protective layer could break down due to physical mechanisms such as mechanical abrasion, vibration, rock falls, and seismic activity, which would accelerate the corrosion of canisters. Apted et al. (2005), analyzed the potential deliquescent development on canisters in chloride brine formations on the surface of an alloy 22 container designed to hold radioactive waste. They concluded that based upon their analysis pure brines will not form and therefore it will not lead to initiation of localized corrosion of canisters. In their presentation to the Nuclear Technical Review Board (NWTRB), it was stated that no corrosion was indicated based on exposure to reducing agents, such as NO_3^- and Cl^- . **But they excluded SO_4^{2-} , an important oxidizing agent present at Yucca Mountain, which introduced a very serious scientific error.**

In contrast, the state of Nevada presented experimental data: Jia et al. (2008 and Yang (2008) on C-22 alloy corrosion rates at various temperatures reported that all corroded in 1243xUZ pore water after being dry-wet cycled for 30 days at 90 °C, 120 °C, and 160 °C. Corrosion rates of C-22 alloy increase as the temperature increases. That is, corrosion behavior of C-22 alloy exhibited pronounced temperature effects under the conditions of dry-wet cycled in 1243xUZ pore water. Evaporation experiments showed that C-22 alloy is not corroded at 90°C and is slightly corroded at 105°C in 1xUZ pure water. The experimental design included both nitrate and chloride reducing agents as well as sulfate and oxidized agents. Why was the state of Nevada data ignored?

At the 2004 meeting of the Nuclear Waste Technical Review Board (NWTRB), the potential local corrosion of C-22 alloy in the Yucca Mountain environment was discussed. Some of the Board members reiterated their previous concerns about localized corrosion of the waste packages. However, the DOE had challenged the state of Nevada's scientific data on the grounds that calcium and magnesium chloride were unlikely to be present in the proposed high-level nuclear waste repository tunnels, claiming that the brine will immediately be transformed into non-deliquescent phases because of its natural instability at elevated temperatures. In addition, any corrosive gaseous environment formed will be modified and/or absorbed by the water held in the rock. This finding should raise a great deal of concern due to the high volume of heavy metals and radionuclides

to be stored at YMP. In addition, the NWTRB in (2004) also issued several recommendations dealing with corrosion issues that required additional analysis and research.

Why both the DOE and the NRC did not pay attention to NWTRB recommendations including state of Nevada test results of test results, and eliminating SO_4^{2-} .

1.2 Metals, Sorption Rate and Distribution Coefficients (K_d).

In order to assess the public health risk associated with the behavior of radionuclides in the environment, knowledge of the partitioning of each radionuclide between different phases is required. This requirement is based on the basic physicochemical properties of the radionuclides, soil/mineral surfaces, and colloids/particulates. A distribution coefficient (K_d) describes the partitioning of radionuclides between the solid and aqueous phases of a system and ultimately provides an estimate of each radionuclide's transport interactions and movement via the groundwater pathway. While, the authors of USDOE-YMP (2000) stated that "It is assumed that sorption parameters measured for a single radionuclide are applicable for the case where more than one radionuclide is present. It is assumed that competitive effects are negligible" why? Onn what scientific ground? Next, the zeolite breaking-point and sorption capacity of zeolite for both the near zone and the field are unknown for heavy metals & radionuclide. Why wasn't this issue tested and properly discussed in the NEC Groundwater Supplemental 2015?

1.3 DOE Sorption model

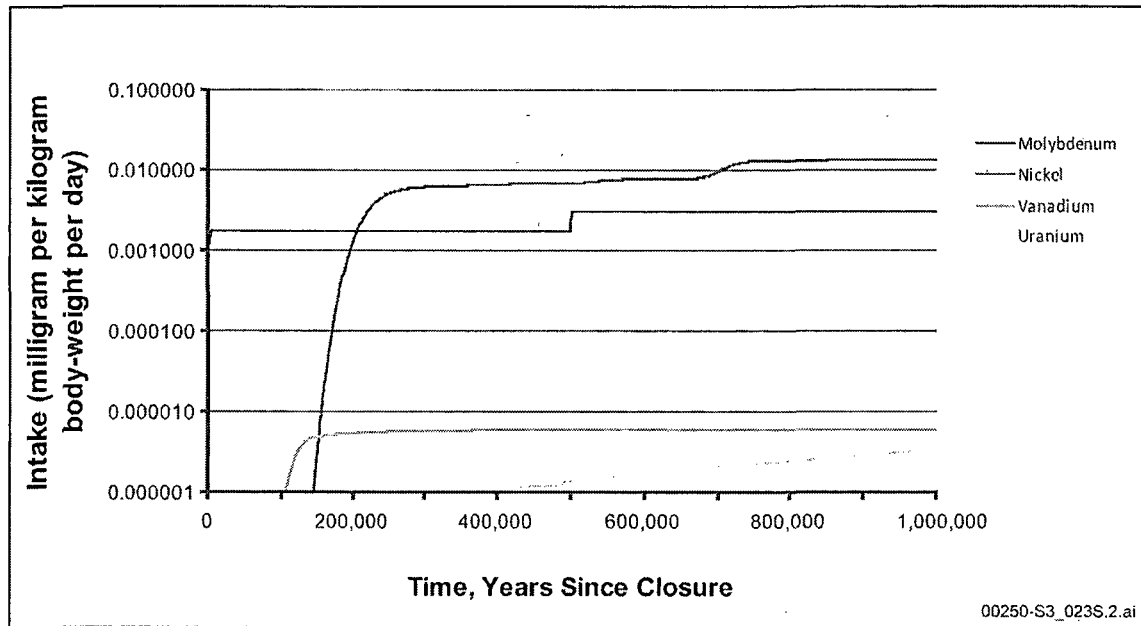
The DOE-YMP modeling sorption model did not consider the competing effects of radionuclides between heavy metals in the near-field and far-field. While sorption properties of individual radionuclides and heavy metals is unknown! What have not been completely studied are the variations in these properties when two or more radionuclides and heavy metals may or may not be present. For example, a canister must corrode before the radionuclides can be released. Therefore, a portion of the heavy metals such as Ni, Cr, V, Ti, and Mo will likely migrate from the site first and be adsorbed within the near field is unknown. Why not??

This limits the number of soil binding sites for subsequent radionuclide sorption. YMP assumed that competitive effects are negligible below EPA groundwater regulatory limits. No, credible scientific evidences were provided in the NRC Groundwater supplement of 2015. I believe that DOE and NRC should have done research and provided more credible scientific evidence to support their calculation. This requires additional large-scale testing confirmation near-field and far-field.

Furthermore, the NRC adopted a 2009 COE publication entitled "Analysis Post closer Groundwater Impact (2009). Upon reviewing the NRC document of 2009 Vol 3 which contain a major scientific errors as shone in **Figure 1. Illustrates Daily intakes of**

non-radiological contaminants at the Armargosa Farms area, present climate DOE (2009).

Table I. Shows Daily Intake of non-radiological contaminants at the Armargosa Farms area, present climate.



- **Why Cr, a potent carcinogen, and V excluded were excluded from daily intake?**
- Since, about 43,300 tons of chromium will be deposited at YMP Site (EIS 2002) in addition to the 70,000 tons of radionuclides what credible scientific explanation the DOE and the NRC can provide a scientific Justification since no data were provided for the near zone.
- Next, it is unclear if the sorption of zeolite followed the proper scientific order where light elements replaced heavy elements. This is **incorrect Mo>V>Ni>U** as showed in Figure 1.
- **There is lack of credible scientific evidence and data to support DOE and NRC conclusions that the impact of non-radiological elements on the human and groundwater environment would be minimal!**
- **Did the DOE and the NRC properly comply with the following regulations:**
- **Cumulative effect; Cumulative impact and Significant 40 CFR 1508.27 due to lack of credible scientific data (see items 1-4)? Hell no!**
- **Is the NRC conclusion based upon scientific new data or recycle of old data?**

2.0 NEPA & NRC regulations

2.1 Incomplete or unavailable information

Did the NRC and DOE in their evaluation of the scientific data in the EIS (2002), FEIS (2008) and the NRC groundwater SEIS (2015) explore or tested the probable adverse health effect as noted, That a reasonably foreseeable no significant adverse effects on the human in EIS BEA because of incomplete or unavailable information. Can the NRC provided credible scientific data (40 CFR 1502.22) be based solely on molding and calculations and comply with these sections of 40 CFR 1502.22?

- (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasonable choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.
- (b) If the information relevant to **reasonably foreseeable significant adverse impacts** cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include it within the environmental impact statement:
 - A statement that such information is incomplete or unavailable is missing;
 - A statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment not discussed;
 - A summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and,
 - The agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community."

Both the DOE and the NRC has knowledge on foreseeable significant adverse impacts on the human environment from mixtures of (metals Cr, Ni; and interaction with radionuclides ²³⁹(Pu), **as early as 1999** but failed to act. This information was presented to the US Technical Review Board and the sent to DOE and why the NRC has failed to properly investigate? The scientific data showing interactions between metal and radionuclides were not incorporated into the DOE EIS (2002), FEIS (2008), NRC Post Closure analysis of (NRC 2014), and NRC (2015) documents. Why is this relevant important information missing?

Cost, significant adverse impacts cannot be obtained because the overall costs" that the DOE had spent was about \$15 Billion on YMP. DOE and NRC chose not to study foreseeable significant adverse impacts of interactions even though they were presented by credible scientific evidence showing interactions!

Using the DOE Total System Performance Assessment (TSPA) a Mathematical model USED by DOE cannot predict interactions, zeolite capacity, or braking point because of lack of scientific data. This is a serious scientific deficiency in the DOE model due to lack of credible scientific data predications and the conclusion of metal migration is questionable. *Transport model of non-radiological elements is incomplete in the near-fields and possible/probable in the far-fields!*

3.0 NEPA Act of 1969

It is my opinion that the DOE-EIS did not fully comply with the National Environmental Acts of 1969 (NEPA) and its regulations. Since the DOE failed to properly discuss and scientifically address the possible/probable significant environmental impacts of radionuclides and heavy metals on the human environment and the groundwater in the EISs. The NEPA Acts of 1969 §101(b) (1) and (b) clearly mandate the "federal agency to report and to assure for all Americans safe, healthful, productive, pleasing surroundings; [and] attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.

The NEPA Acts sets forth a national policy to promote preservation of the environment. NEPA § 102(2)(c) "requires, in part, that all agencies of the Federal Government include in every recommendation or report on major Federal actions significantly affecting the quality of the human environment a detailed statement that addresses the environmental impact of the proposal."

In addition, the amendment to the Clean Water Act of 1996 § (b) mandates that the US EPA administrator executes biomedical research specifically [from§ (b)(3)] "develop new approaches to the study of complex mixtures, such as mixtures found in drinking water, especially to determine the prospects for synergistic or antagonistic interactions that may affect the shape of the dose-response relationship of the individual chemicals and microbes, and to examine noncancerous endpoints and infectious diseases, and susceptible individuals and subpopulations." However, the regulatory agencies did pay attention, and did not perform research on metal interactions as mandated in the amendment to (Clean Water Act of 1996 amendment), specifically regarding health risks related to YMP?

4.0 Best Available Science and the Endanger Species Act

Why the NRC Groundwater supplement not contain a discussion and analysis on impact of post closure on endanger species in Ash meadow, and the use of best available science to support their claims?

Further, the U.S. Environmental Protection Agency has emphasized the role of best available science in implementing the Clean Water Act (USEPA 1997). Determining what constitutes the best available science. The U.S. House of Representatives approved the Threatened and Endangered Species Recovery Act of 2005, H.R. 3824, 109th Cong. (2005), by a vote of 229-193 on September 29, 2005. Among other changes to the Endangered Species Act (ESA), H.R. 3824, would, in Section 3, include a definition of "best available scientific data" which is a key term in the context of EIS decision-making.

The new definition proposed by H.R. 3824 provides that the term "means scientific data, regardless of source, **that are available to the Secretary at the time of a decision or action for which such data are required by this Act and that the Secretary**

determines are the most accurate, reliable, and relevant for use in that decision or action.” The question is how the NRC planning to protect the Pup fishes at Ash Meadow which are on the endanger list using best available science i.e.to predict toxicity including the interaction between mixtures of metals and radionuclide?

5.0 NRC positions

5.1 Risk Assessment of Mixtures

In a reply to written comments (personal communication posted on the web) sent to the NRC on March 7, 2009, the NRC replied (in a written communication posted on the web dated March 30, 2009 and (2015) subsequently was posted by the NRC on the internet. Their response was as follows:

“With regard to your concern about DOE’s EISs, the NRC staff agrees that DOE’s analysis did not provide an adequate discussion of the cumulative amounts of radiological and non-radiological contaminants that may enter groundwater over time, and how these contaminants would behave in the aquifer and related environment. We found that this failure to adequately characterize potential contaminant release to groundwater and from surface discharge renders that portion of DOE’s EIS inadequate. DOE’s discussion of these impacts in its EIS’s is not consistent with NRC’s regulations for completeness and adequacy of the discussion of environmental consequences of the proposed action.”

The NRC also stated the following: *As was noted in a December 12, 2003, letter to you, NRC does not have the statutory authority to regulate chemical hazards or the combined health effects from radiation and chemical hazards associated with the facilities it regulates. The U.S. Congress gave authority for establishing public health, safety and environmental standards for the proposed repository at Yucca Mountain to the U.S. Environmental Protection Agency (EPA).*

On September 30, 2008, the EPA published final public health and environmental radiation protections standards for Yucca Mountain. Consistent with the Energy Policy Act of 1992, these are the only public health and safety standards that apply to the Yucca Mountain site. After careful consideration, and review of extensive public comments, NRC incorporated EPA’s final standards into our final Part 63 regulations for Yucca Mountain on March 13, 2009, as required by the Nuclear Waste Policy Act.

The NRC position was repeated several times in their private communications in 2009, and 2015 that the Nuclear Waste Policy Act of 1982 and its amendment of 1987 that the NRC dose have as an authority to established standard for environment and public health for YMP. And it is responsibility of the

Environmental protection Agency. The NRC ask me to contact the EPA. I had asked the NRC to investigate the interaction between Ni and Cr, and radionuclide as a part of the EISs and Supplemental which they failed. I never asked the NRC to regulated chemicals!

Next, Why my contentions were address legally and scientifically properly for example: I sent in a letter post mark May 8, 2015 a scientific abstract of recent paper published in 2015, 49 (11), ES&T pp 6474–6484 on radionuclides mobility in subsurface nuclear waste sites (become chemical speciation)? Very clearly stated **“Transport and toxicology. Understanding the behavior of uranium and plutonium contamination is imperative since not knowing the behavior is a significant impediment to environmental restoration at legacy nuclear weapons' production and testing sites plus reactor accident locations.”** How did it become chemical speciation? Why was this information not reviewed by NRC?

The action of the NRC raises a very serious legal question: Since the NRC prepared the Groundwater Supplemental for groundwater for YMP (2015) on what legal grounds are they excluded form NEPA Acts of 1969 Section (101(b)? and applicable regulations (cumulative effects, significant), risk assessment of complex mixtures and why not? It is apparent that the NRC position in their (private communication posted on the Web dated March 30, 2009& July 20, 2015) are in contrast to the NEPA Act Section 101(b) and US Supreme Court ruling.

Should have the DOE/and or NRC decision not to study or evaluate health risks posed to human health and to groundwater from complex mixtures at YMP why? Did the EISs and the License Application comply, and did the NRC Supplements of groundwater comply with 40 CFR §1508.27 (a) and (b), both in content and intensity (the effect of metal corrosion and subsequently health effects and impacts on groundwater due to the high levels of metals & radionuclide to be deposited at YMP (EIS 2002)?

For the NRC in the groundwater EIS of 2015 to proceed in the face of incomplete or unavailable information, the agency must show in its EIS groundwater supplement that they took hard look, as required by CEQ regulations, by following the regulations that address incomplete or unavailable information. The following recommendations are intended to ask NEPA analysts to be sure they meet the intent of CEQ regulations, and suggest questions to ask themselves based on how courts have responded to lawsuits. Which they have not done. They had the knowledge from the literature review on interactions between Ni and Cr, metals and radionuclides but they ignored it. Did the NRC look hard enough?

5.2 Supplemental EIS and DOE

The NRC in their Letter dated March 30, 2009 fathers stated the following *“With regard to your concern about DOE’s EISs, the NRC staff agrees that DOE’s analysis did not provide an adequate discussion of the cumulative amounts of radiological and non-radiological contaminants that may enter groundwater over time, and how these contaminants would behave in the aquifer and related environment. We found that this*

failure to adequately characterize potential contaminant release to groundwater and from surface discharge renders that portion of DOE's EIS inadequate. DOE's discussion of these impacts in its EISs is not consistent with NRC's regulations for completeness and adequacy of the discussion of environmental consequences of the proposed action.

"Given the importance of groundwater as a natural resource in the arid Yucca Mountain region, we concluded that supplementation is needed to ensure the 2002 EIS and the Repository Supplemental EIS are adequate. The NRC staff's review and findings about the adequacy of DOE's EIS are documented in a September 5, 2008 report, "U.S. Nuclear Regulatory Commission Staff's Adoption Determination Report for the U.S. Department of Energy's Environmental Impact Statements for the Proposed Geologic Repository at Yucca Mountain." This report is available on NRC's website at: <http://www.nrc.gov/waste/hlw-disposal/yucca-lic-app/nrc-eis-adr.pdf>. On September 8, 2008, the Director of NRC's Office of Nuclear Material Safety and Safeguards, Mr. Michael Weber, informed DOE that additional supplementation is needed to ensure the 2002 FEIS and the 2008 Repository Supplemental EIS are adequate (available at: <http://www.nrc.gov/waste/hlw-disposal/letter-to-doe.pdf>). On October 3, 2008, DOE replied, stating that it will provide the needed supplement no later than fall of 2009 (available at: http://adamswebsearch2.nrc.gov/nrcws/nrcdoccontent.aspx?Library=PU_ADAMS^PBN_TAD01&LogonID=9619198fec9c35737a25a29bdd5a6343&DocID=082820281."

The NRC Groundwater supplemental of 2015 which stating the following:

"Based on conservative assumptions about the potential for health effects from exposure to low doses of radiation, the NRC staff expects that the estimated radiation dose would contribute only a negligible increase in the risk of cancer or severe hereditary effects in the potentially exposed population. Impacts to other resources at all of the affected environments beyond the regulatory compliance location from radiological and non-radiological material from the repository would also be SMALL."

I can see a very serious inconsistency between my personal communication dated of March 30, 2009 and their position expressed in the Groundwater Supplemental of 2015. My questions are on what legal and scientific data the NRC changed their positions. Since, no credible new scientific evidence were provided why?"

6.0 NRC Radiation Model

6.1 The NRC is using an unproved EPA model for radiation groundwater in their analysis why at explanations do they have?

6.2 Can the NRC defined what the meaning of scientifically small quantities of is and non-radiological material from the repository would also be SMALL based upon scientific data? Since, the NRC did not provide any new data including bystander effects for radiation and metals (V and Cr are known to produce bystander effect) and hormesis. The data in the Groundwater Supplemental 2015 is a recycle of DOE old data.

7.0 US Supreme Court ruling

Why both the DOE and NRC not properly address the issue of "significant effects"?

The US Supreme Court in the case Hanly, Denis v. Richard G. Kleindienst, Attorney General of the United States (1972). "The court developed a two-pronged test for whether or not an EIS was required which included consideration of:

(1) the extent to which the action will cause adverse environmental effects in excess of those created by existing uses in the area affected by it; and,

(2) The absolute quantitative adverse environmental effects of the action itself, including the cumulative harm that results from its contribution to existing adverse conditions or uses in the affected area." Were those standards were used applied for: EIS (2002), SEISs (2008) and NRC Safety Analysis of 2014, and the Supplement groundwater Supplemental EIS (2015)?

The NRC position in a personal communication posted on the web 2009 stated "As a part of this process the NRC must determine whether DOE's proposal meets all **applicable NRC requirements. These requirements do not address the specific synergistic effects which are the subject of your concern.** The NRC statement is legally questionable. While the NRC is prepared a Supplemental for groundwater (2015) and EIS for Post Closure (2014). Did the NRC take into consideration U.S. Supreme Court's ruling not to address interactions and their health effects? This is an issue of their Safety analysis of 2014 and NRC Supplemental of (2015):

1. **Kloppe v. Sierra club 1976 which stated that:** "When a number of proposals for coal-related actions that will have cumulative or synergistic environmental impact upon the region are pending concurrently before an agency, their environmental **consequences must be considered together.**"
2. Citizens to Preserve Overton Park, Inc., et al., v. Volpe, Secretary of Transportation, et al. (1971), a Hard look decision to ensure that the agencies have genuinely engaged in reasonable decision making. A court is required to intervene if it "becomes aware, especially from a **combination of danger signals**, that the agency has not really taken a 'hard look' at the salient problems."
3. **Oregon Natural Resources Council v. Marsh and Oregon Natural Resources 1994 stated that** "Set forth what will trigger a court to find that an agency's decisions were arbitrary and capricious:
4. Did the agency follow & comply?
 - 1). **Fail to consider those factors Congress intended for it to consider i.e. in this case;**
 - 2). Rely on factors Congress has not intended for it to consider;
 - 3). **Fail entirely to consider an important aspect of the problem i.e. synergism or additive health effects, comprehensive studies completion between metals and long life radionuclide (²³⁹Pu, ²³⁷Np, ²³⁵I, and ²³⁵U) and Heavy metals (Ni, Cr, V and Mo). For example a publication by Glaviano et al. (2009) studied the effects of hTERT cells on genomic instability caused by either metal or radiation or**

by combined exposure. However, this genomic instability was more noticeable in hTERT-cells after radiation followed by Cr⁺⁶ and more distinct in hTERT+ cells after Cr⁺⁶ followed by radiation. Moreover, the biological effects provoked by combined exposure of Cr⁺⁶ and radiation to λ and x-rays resulted in a synergistic response at 0.5 Gy and an additive effect at 0.05 Gy, respectively.

- 4). The interactions between metal and radionuclides can increase the degree of genomic instability and pose a serious health hazard as well (Miller et al. 2003). In a similar report Glaviano (2003) noted that Cr⁺⁶ also induces genomic instability. In a more recent study (Glaviano et al, 2006) indicated that exposure of Cr⁺⁶ at a level of 0.04 and 0.4 μ M and V⁺⁵ concentration for 0.5, 5.0 μ M to human BJ fibroblasts cells induce acute chromosome damage and genomic instability of exposed cells up to 30 days following 24 hours of single exposure.
- 5). Did the DOE and the NRC offer an explanation for its decision that runs counter to the evidence before the Agency for example; the decision made that the disputed decision cannot be ascribed to a difference in opinion or be the product of an agency expert?

Should the NRC and DOE since in their analysis did include a discussion whether YMP will become a Superfund Site?

8.0 CONCLUSIONS

- The corrosion rates of metals is unsalted and need an additional scientific input. Due to conflicting data reports the State of Nevada Vs the DOE. The facts that SO₄⁻ was left out from DOE studies. Must be resolved scientifically.
- There is a lack of scientific test results or data to describe Zeolite caring capacity, braking point, and the Kd in the near field. How NRC will addressed these issues scientifically?
- Sorption Model did not consider the competing effects between radionuclide and metals why?
- Why Cr a potent carcinogen is absent in Armargosa ground water while Ni also a carcinogen is present?
- It is my opinion that Both DOE and NRC did not fully comply with NEPA Act of 1969 Section 101(a) and 9b), and its regulations: Cumulative effects, Cumulative Impact, and Significant. THE NRC and DOE analysis is lacking and are not supported by scientific data.
- Did the NRC and DOE use the best available science to describe the toxic effects of metal and radionuclides on Ash Meadow fish?

- Can the NRC provide legal ground as to why they are exempt for risk assessment analysis of synergism and interactions between metal and radionuclides? While, they are prepared a Supplement EIS to the groundwater.
- How NRC is going to address the issue of groundwater contaminations at Ash Meadow and fish using best available science?
- It is appeared that the NRC and DOE Environment Impact Statements and Supplements of 2002, 2008, 2015 and NRC Safety analysis did not comply with US Suprema Court rulings.
- Why were the NTRB recommendations ignored as to what temperature the YMP site should be operated?
- There is a need for an additional large-scale study to verify test results obtained in the laboratory and to reduce the scientific uncertainties associated with the YMP environment: Corrosion, Zeolite carry capacity, movement of metal and radio nuclides species, risk assessment of complex mixtures.
- There is inconsistence between NRC position of March 30, 2009 and the Groundwater Supplemental of (2015) why?
- Finally, how NRC will incorporate the new scientific data of ES&T pp 6474–6484 on radionuclides mobility in subsurface nuclear waste sites into the groundwater Supplemental and Endangers Spices At (Ash Medo and Devil Holes fishes population)?

9.0 REFERENCES

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