PR-20, 61
80FR16081
1

PUBLIC SUBMISSION

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Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0080
Comment on FR Doc # 2015-06429

Submitter Information

Name: Ellie Pinto

General Comment

I think it's great that the government has looked into how you can regulate radioactive waste. If radioactive waste isn't handle the right way it can cause so many health problems to many people.

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PUBLIC SUBMISSION

As of: 4/28/15 10:02 AM
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Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0081
Comment on FR Doc # 2015-06429

Submitter Information

Name: Trevor Lee Hall

General Comment

With LLRW being present regardless, this is a great way to improve on what is already established. The sensitivity of the materials require very long term care and disposal. The 1,000 year compliance policy would greatly benefit, especially the future generations. I specifically approve of the 10,000 year protective assurance policy. The very long term planning is so very important. Thank you.

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80FR16081 3

PUBLIC SUBMISSION

As of: 4/28/15 10:04 AM
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Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0082
Comment on FR Doc # 2015-06429

Submitter Information

Name: Anonymous Anonymous

General Comment

See attached file(s)

Attachments

NRC Comment

Catherine Haney
Director
Office of Nuclear Material Safety and Safeguards
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Low-Level Radioactive Waste Disposal (Docket ID: NRC-2011-0012)

April 23, 2015

Dear Administrator and Staff,

I am writing in response to the U.S. Nuclear Regulatory Commission's(NRC) proposed rule to amend the regulations that govern low-level radioactive waste (LLRW) from their disposal to long term storage to better provide comprehensive protection of public health and safety. By revising part 61 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Licensing Requirements for Land Disposal of Radioactive Waste adopted on December 27, 1982 (47 FR 57446), the FRC holds sites disposing of low level radioactive waste to higher safety performance standards. I commend the NRC for their commitment to safeguarding the public from harmful radioactive exposure through the provisions of the proposed rule and I would urge the commission to additionally take further steps and expand safety requirements into other identified classes of radioactive waste.

Implications of Proposed Ruling

The NRC, along with states, regulates the management, storage and disposal of commercial radioactive wastes from non-military uses of nuclear material[2]. Studies have demonstrated the harmful effects of radiation exposure from inadequate identification, disposal and storage of low level radioactive waste.

The benefits of this proposed rule are achieved by:

- Ensuring that low level radioactive waste separate from those identified in current regulations can be disposed of safely and meet waste site performance objectives[1]
- Using site-specific and updated dosimetry methodology for technical analysis to improve public health and safety outcomes[1]

Although the estimated costs of the proposed ruling are predominately assumed by industry, states and the NRC, the outlined benefits of the proposed regulatory initiative are significant in enhancing public health and safety by ensuring the safe disposal of LLRW not analyzed in the regulatory basis for the original part 61 of Title 10 already.

Health Concerns of Low Level Radioactive Waste

The proposed ruling revises existing technical analysis frameworks to allow for greater safety and to identify existing inept site design features. These reassessments indicate that the proper and safe disposal and storage of radioactive waste is an issue, even for low level radioactive waste materials[3]. Low level radioactive waste are items that have been contaminated directly or indirectly from radioactive exposure that have not been identified as high level or uranium and thorium milling wastes[1]. Ranging from clothing items such as protective body covers to laboratory equipment and nuclear equipment with broad ranges of radioactive contamination, low level radioactive waste account for over 90% of the total radioactive waste volume and if not properly disposed of safely, can result in harmful environmental and health effects[4]. Although some radiation occurs naturally, the NRC requires that its licensees limit maximum radiation exposure from sites to the public to less than 5 mSv per year and limit occupational radiation exposure to workers dealing with radioactive material to less than 50 mSv; levels beyond this are suggested to be mitigated because of their prescribed effect on human health[5]. This proposed rule on low level radioactive waste would limit that annual dose limit to less than 5 mSv and increase the site compliance period through 10,000 years. As states begin to designate their own low level radioactive waste storage sites within this proposed framework it is imperative to consider the health effects of exposure to radiation and the public health benefits of reduced exposure.

Health effects of radiation exposure[3]:

- Severe skin burns
- Hair loss
- Central nervous system damage
- Birth defects
- Cancer

Depending on the half-life of the radioactive isotopes in various low level and higher grades of radioactive waste, the more important secure disposal reveals to be. However, further expansion of safety measures regarding radioactive disposal sites across all radioactive waste levels are needed as well to further protect against site failures caused by land subsidence, human error or natural disaster[6]. Currently there are disposal and storage concerns with storage sites that range from inadequate protection of the general public from radioactive releases, protection of individual from inadvertent intrusion, long term site stability and testing and site inspection, all of which if corrected, will result in significant strides toward effective site management and public safety.

Call for further action

Although regulatory bodies suggest a radiation exposure annual dose limit, research suggests that due to the carcinogenic potential of radioactive potential at any level, that limiting exposure to levels far below these limits are advised[7]. This proposed ruling aims to limit

stochastic seepage from storage sites minimal detectable levels, almost a half of current advised levels. Further action should be taken to better dispose and secure radioactive waste in the future building on the concepts and standards of this proposed rule such as:

- Standardizing and consolidating standards regarding the transportation, design and operation of radioactive storage facilities.
- Enhancing measurement apparatus to accurately conduct radiological assessments to better detect and reduce stochastic radioactive seepage from storage sites.
- Enforcing effective site evaluation and management standards to construct a permanent high level nuclear waste disposal facility.
- Reducing the total volume of radioactive waste by converting to more sustainable alternatives.

Conclusion

In conclusion, LLRW and other grades of radioactive waste, without proper safeguard measures, pose significant risks to the public and I urge FRC to continue with the proposed rule while also considering avenues reduce public exposure from other higher grade radiation storage sites. The proposed measures implement a stronger risk management framework regarding protecting public safety and dually integrating both an analysis and design and control approach that strengthen these protection initiatives. Minimizing the dose threshold for the public, further detailing the waste criteria for low level radioactive waste and raising site specific standards to meet outlined performance objectives are significant and translatable radioactive waste management elements. Therefore, I recommend these same risk management principles be increasingly implemented as it relates to higher grades of radioactive waste as well to better ensure public health and safety.

Thank you for your consideration,

Sincerely,

O.M

References

1 U.S Nuclear Regulatory Commission. Fact Sheet: Proposed Rule for Low-Level Radioactive Waste Disposal. Available at

http://www.regulations.gov/#!documentDetail;D=NRC-2011-0012-0077

2 U.S. Draft Regulatory Commission. Draft Regulatory Analysis for Proposed Rule: Low Level Radioactive Waste Disposal(10 CFR Part 61). Office of Nuclear Material and Safeguards. February 2015

3 U.S. Agency for Toxic Substances and Disease Registry. Summary of Health Effects of Ionizing Radiation. Public Health Service 1999.

4 U.S. Environmental Protection Agency. Radioactive Waste: An Environmental Perspective . Available at

http://www.epa.gov/radiation/docs/radwaste/

5 U.S. Nuclear Regulatory Commission. NRC Regulations: 10 CFR Waste Classification. Available at http://www.nrc.gov/reading-rm/doc-collections/cfr/part061/part061-0055.html

6 Nuclear Energy Institute. Nuclear Waste Management: Low Level Radioactive Waste. Available at http://www.nei.org/Issues-Policy/Nuclear-Waste-Management/Low-Level-Radioactive-Waste

7 U.S Nuclear Regulatory Commission. Radioactive Waste: Production, Storage Disposal

Available at http://www.nrc.gov/reading-rm/doc collections/nuregs/brochures/br0216/r2/br0216r2.pdf

PR-20, 61
80FR16081

4

PUBLIC SUBMISSION

As of: 5/13/15 10:27 AM
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Comments Due: July 24, 2015
Submission Type: Web

Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0084
Comment on FR Doc # 2015-06429

Submitter Information

Name: Samson Lai
Address:
771 Ferst Dr
Rm 252
Atlanta, GA, 30332
Email: samsonium@gmail.com

General Comment

Dear United States Nuclear Regulatory Commission,

I am a Ph. D. student at the Georgia Institute of Technology and I would like to offer my comments on Docket ID NRC-2011-0012. Although I am not an expert in low-level radioactive waste, I have been educated at a broad level of the history and operation of the nuclear industry in the United States and have a keen interest in the future of nuclear power. Thus, while I cannot advocate as an expert, I would like to bring to your attention what I consider important points and other potential options that may not have been considered.
A necessary requirement to protect the future of the environment, given the stated concern over an unpredicted influx of depleted uranium from the renewed interest in uranium enrichment facilities. Even if current standards are considered sufficient, the action of more stringent regulations also serves a public relations purpose. Further, site-specific analyses are especially appropriate in light of the consideration of unique combination of challenges that faced Fukushima Daiichi. Such unique combinations of disasters require more careful precautions and considerations for safeguards.
Another key consideration of extending the compliance period to 1,000-year period is that this extends well into a period where climate change is certain to have negative effects. What exacerbates the situation is that as climate change accelerates, major positive and negative feedback loops, like methane in the permafrost, changes in albedo, and ocean acidification, are still dormant and poorly understood. What is likely is that extreme weather patterns will become more common as atmospheric CO2 continues to increase. Besides temperature, it would be important to consider that humidity and rainfall could change significantly, which would affect the

site-specific requirements. Corrosion and flooding are two major problems that could become more impactful as climate change progresses further.

Nuclear power was, and to some extent, still is a clean source of energy but, in my opinion, increasing the cost of nuclear is a long-term benefit. It has become clear recently is that more cost-effective, technological choices have emerged, primarily through higher efficiencies, solar, and wind power. Public support has faded since the Fukushima incident and recent failures of projects to control costs, such as Plant Vogtle in Georgia and South Carolina Electric and Gas's V.C. Summer reactor, have demonstrated that nuclear power needs to go back to the drawing board to prepare for a different future that competes with economically viable renewable technologies and plentiful natural gas. Although the forecasted cost to industry $4 million is small in comparison to an entire construction project, which is typically on the order of billions, higher costs will cause consumers to re-examine similar low carbon sources of electricity, ultimately to the benefit for a more competitive, less capital intensive, and most importantly, less government-reliant power source.

Nuclear power will remain a poor governmental choice until public support rebuilds and changes are made in the leadership and for national security so that refinement opportunities are viable in the U.S. once more. Without these major cultural shifts in policy and public perception, this will only be a stopgap measure. With nuclear power having such a volatile effect on public opinion, it may be necessary to prepare information for the public that explains the meaning of low-level radioactive waste and how low is low, but not distribute this information until the situation warrants, as the information may needlessly cause commotion.

Although I lack the pedigreed credentials to deem myself a nuclear waste expert, I hope that I have provided some thoughtful comments and stimulated new considerations. Based on the technical detail demonstrated by the NRC staff, an educated and concerned citizen like me has reason to trust that the NRC will make the right choices to maximize benefit and protection of the public.

urenco

JUN 0 3 2015

LES-15-00091-NRC

Ms. Annette L. Vietti-Cook
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Mail Stop O-16G4
Washington, D.C. 20555-0001

Louisiana Energy Services, LLC
NRC Docket No. 70-3103

Subject: Request to Participate as Panel Member for 10 CFR 61 Proposed Rule

Dear Ms. Vietti-Cook:

On March 26, 2015, the Nuclear Regulatory Commission (NRC) published a proposed rule that will significantly amend 10 CFR 61 (80 Fed. Reg 16082). Coincident with the publication, the NRC staff initiated a number of public meetings (which are still ongoing) to further inform stakeholders and interested parties about the bases for, and implementation of, the proposed rule. During one of the early meetings, responding to a stakeholder suggestion, the NRC agreed to introduce a panel discussion into one or more future public meetings to facilitate greater interaction between the NRC staff and stakeholders.

On June 25, 2015, in the Commissioners' Conference Room, there will be public meeting on 10 CFR 61 and Low-Level Radioactive Waste Disposal. Specifically, a panel of industry and NRC representatives will discuss the proposed revisions to Part 61. Louisiana Energy Services, LLC (dba URENCO USA(UUSA)) would like to be part of this panel discussion. Should this request be granted, Perry Robinson will represent UUSA. His bio is attached as Enclosure 1.

As discussed with Larry Camper, Director, Division of Decommissioning Uranium Recovery and Waste Programs, via telephone recently, UUSA believes, for a number reasons, that it is a critical stakeholder and thus, should be included as a panel member. Among the reasons is that UUSA is currently and for the reasonably foreseeable future the only operating enrichment facility in the US. Furthermore, the proposed rule arose out of a UUSA hearing and clearly any increases in regulatory burden and/or cost that are ultimately imposed on disposal site licensees will assuredly be passed onto waste generators such as UUSA. The cost of decommissioning and DUF6 disposal could significantly increase as a result of the rule change. Given the substantial probability of impact on UUSA that the Part 61 rulemaking will have, we believe it extremely important and relevant for us to be afforded an opportunity to participate in any panel discussions planned during future public meetings.

Therefore, UUSA formally requests to be a participating panel member in the Commission Briefing planned for June 25, 2015. Because of the critical nature of our interests related to the rulemaking and due to the limited opportunities to participate in an interactive manner, I request that you promptly confirm that UUSA will be among the panel members at this future public meeting.

We appreciate your attention to this matter. If you have any questions, please contact me at (575) 394-5599 or jay.laughlin@urenco.com.

Respectfully,

Jay Laughlin
Chief Nuclear Officer and Head of Operations

Enclosure: Perry Robinson Bio

cc: Commissioners
NRC/EDO
Deputy Executive Director, Materials, Waste, Research, State, Tribal and Compliance Programs
Director, Office of NMSS
Director, Division of Fuel Cycle Safety, Safeguards & Environmental Review
Director, Division of Decommissioning, Uranium Recovery & Waste Programs
Chief, Low-Level Waste Branch
Chief, Enrichment Branch
Janelle B. Jessie, DUWP, NMSS, NRC

ENCLOSURE

Perry Robinson Bio

Mr. Robinson currently acts as General Counsel for Louisiana Energy Services, LLC (dba UUSA). Prior to retiring from UUSA at the end of 2013, Mr. Robinson was the Vice President of Regulatory Affairs and General Counsel for the company. His organizational responsibilities include Legal, Licensing, Performance Improvement (which includes the corrective action program), State Permitting and Employee Concerns. His organization supports compliance with export control issues.

Prior to joining UUSA, Mr. Robinson was a partner in the Business and Finance Department at Ballard Spahr Andrews & Ingersoll, LLP and previously a partner at Winston & Strawn in Washington, D.C. In his private law practice, Mr. Robinson routinely represented clients before the Nuclear Regulatory Commission (NRC), Federal Energy Regulatory Commission (FERC), Department of Energy (DOE), and state utility commissions. Mr. Robinson's legal practice included representing a Regional Transmission Organization (RTO), investor-owned utilities, generation and transmission cooperatives, DOE contractors and vendors associated with the energy industry. His work with these clients covered a broad range of matters, such as utility restructuring, including sales and acquisition of nuclear generating plants before state agencies and the NRC; power purchase agreements; various NRC matters such as whistleblower issues, enforcement actions, licensing actions, and rulemaking activities; enforcement matters before other federal agencies such as the Department of Transportation, Federal Aviation Administration, Federal Highway Administration, and the DOE; and administrative litigation before NRC, FERC, public utility commissions and state agencies. Mr. Robinson also writes and speaks extensively on regulatory matters.

Prior to practicing law, Mr. Robinson served on the enforcement and licensing staff of the NRC from 1982 - 1987; worked on the technical staff of Battelle Memorial Institute—Pacific Northwest Laboratories from 1981 – 1982; and was part of the research staff at the Radiation Research Section, Department of the Army from 1976 - 1981.

A law graduate of the University of Baltimore (J.D., 1986), Mr. Robinson received his B.S. degree from Virginia Polytechnic Institute (1975) and his M.S. degree (Health Physics) from Rutgers University (1981). He is admitted to the bar in the District of Columbia and Maryland and is admitted to practice before the U.S. Court of Appeals for the District of Columbia.

NRCExecSec Resource

From: Romero, Veronica <Veronica.Romero@urenco.com>
Sent: Wednesday, June 03, 2015 5:17 PM
To: NRCExecSec Resource; Janelle.Jesse@NRC.gov; Smith, Brian; tom.grice@nrc.gov; Suber, Gregory; Camper, Larry; Bailey, Marissa; Haney, Catherine; Weber, Michael; Satorius, Mark; CMRBARAN Resource; CMROSTENDORFF Resource; CMRSVINICKI Resource; CHAIRMAN Resource
Cc: Johnson, Amy; Cowne, Stephen; Robinson, Perry
Subject: RE: Request to Participate as Panel Member for 10 CFR 61 Proposed Rule
Attachments: LES-15-00091-NRC Request to Participate as Panel Member for 10 CFR 61 Proposed Rule.zip; ATT00001.txt

Ms. Vietti-Cook,

Attached is URENCO USA's request to participate in the panel for the 10 CFR 61 proposed rule. Thank you for your prompt attention in processing our request.

Thanks,

Veronica Romero
Licensing & Performance Assessment
Administrative Assistant

URENCO USA
P.O. Box 1789
Eunice, NM 88231

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URENCO USA

RulemakingComments Resource

From: Julie Stewart <julie.stewart.pacenza@gmail.com>
Sent: Wednesday, June 10, 2015 2:17 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste, since so much of that waste is stored here.

I have some significant concerns about the proposed revisions to Part 61, but first wanted to express my support for one part: The proposed revisions appear to allow Utah to maintain its reliance upon classification tables, to enforce its long-standing ban on Class B&C wastes. Thank you for including that in the final rules. Utah must have the right to keep hotter wastes out of our state.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced this to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.

2. We are concerned that licensees (such as EnergySolutions) can choose to simple order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia.

4. Finally, I request that the NRC classify Depleted Uranium. As a unique waste stream that continues to grow more radioactive for 2.1 million years, it makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years. I urge the NRC to make finally classify this waste to accurately inform ongoing disposal efforts.

Thank you for the opportunity to comment.

Julie Stewart
443 Kensington Ave.
Salt Lake City, UT 84115

RulemakingComments Resource

From: Laura Schmidt <laura@healutah.org>
Sent: Wednesday, June 10, 2015 2:28 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

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Thank you for the opportunity to comment.

Laura Schmidt
1426 S 1100 E Apt 17
Apt 17
Salt Lake City, UT 84105

RulemakingComments Resource

From: Christopher Morgan <not.all.there13@gmail.com>
Sent: Thursday, June 11, 2015 3:38 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

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Thank you for the opportunity to comment.

Christopher Morgan
1405 s 1500 e
unit B
Salt Lake City, UT 84105

RulemakingComments Resource

From: Stephen Mossbarger <pub-mail@stephen-mossbarger.us>
Sent: Thursday, June 11, 2015 5:07 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

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Thank you for the opportunity to comment.

Stephen Mossbarger
868 E 500 S
Salt Lake City, UT 84102

RulemakingComments Resource

From: Amy Kopischke <amy@rocketgurl.com>
Sent: Monday, June 15, 2015 1:52 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste, especially since so much of that waste is stored here.

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Thank you for the opportunity to comment.

Amy Kopischke
412 E Truman Ave
South Salt Lake, UT 84115

RulemakingComments Resource

From: Sandy Cornell <moonwolf42@hotmail.com>
Sent: Monday, June 15, 2015 1:55 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

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Thank you for the opportunity to comment.

Sandy Cornell
168 N 100 E
Moab, UT 84532

RulemakingComments Resource

From: Barbara Wise <wise4755@msn.com>
Sent: Monday, June 15, 2015 4:05 PM
To: RulemakingComments Resource
Subject: Comment on Waste Rules (NRC-2011-0012)

We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste, especially since so much of that waste is stored here.

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There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.

2. We are concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia.

4. Finally, I request that the NRC classify Depleted Uranium. As a unique waste stream that continues to grow more radioactive for 2.1 million years, it makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years. I urge the NRC to finally classify this waste accurately to inform ongoing disposal efforts.

Thank you for the opportunity to comment.

Barbara Wise
4755 Pin Tail Ct
Salt Lake City, UT 84117

FORMAL COMMENT

DATE: June 10, 2015

TO: Catherine Haney
Director
Office of Nuclear Material Safety and Safeguards
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

FROM: American Nuclear Society University of Utah Student Chapter

SUBJECT: Low-Level Radioactive Waste Disposal
Docket ID NRC–2015–0003 and NRC-2011-0012

Introduction

One hundred years ago when Rutherford first discovered the nucleus, who knew that would send the world into the golden age of nuclear science? A golden age that, until Chernobyl in 1986, had given humanity unrivaled gifts and power. Since then, we have struggled to overcome many obstacles and have finally reached what my colleagues and I believe to be a second golden age for nuclear. As a student chapter full of young nuclear engineers we know that it is our duty to involve ourselves in the future of our industry, a future that is dependent on the rulemaking and policy of today. After our generation is long gone, this waste will remain and it is up to us to make sure it is secure with the right regulations. Today, we have read the rule changes and are here to provide feedback.

Feedback

Analyses timeframes

Depleted Uranium (DU) will be the primary source of radiation for this Low Level Radioactive Waste (LLRW) storage facility. DU has a lower activity than natural uranium. Natural uranium has been present on this planet since its existence and has never impeded the progress of civilization in its presence. The background radiation dosage of the average American amounts to 300 mrem/yr, well above the required dosage of the 1,000 year Compliance Period. This annual dosage for Americans is still much lower than many international regions which can exceed 700-900 mrem/yr. Even during the 1,000-10,000 Protective Assurance Period, society would not experience adverse health effects from the 500 mrem/yr dosage.

Nuclear technology has only existed for 6-7 decades and the advancement of said technology has been extraordinary. Safety in that industry has grown in parallel with technology and has surpassed the safety standards of other industries, thanks to organizations such as the Department of Energy and the NRC. This trend in safety, including the storage in the Clive facility, will only increase the capabilities of protection and safety.

Performance assessment (PA)

Using information from the surrounding area and facility, with accurate and benchmarked models the capabilities of the site can be determined with reasonable accuracy. Limitations of time are reasonable within the analysis timeframes. Using continuous assessment of the facilities, similar to this ongoing assessment, and ongoing increases in technological ability allow organizations and licensees to ensure the safety of the public and surrounding habitation.

Intruder assessment (IA)

Site intrusion scenarios are not solely based on material definition, but the site characteristics and expected activities. We support the enhancing of intruder assessment to be site specific and not based on the classification of stored materials. These assessments not only allow the protection of the general public, but allow planning for future catastrophes and even minor intrusions.

Protective assurance period analyses

Following a dosage optimization plan, as opposed to a dosage limit, allows the ongoing elimination of health risk. Keeping the dosage at a continuing minimum also decreases necessary effort in controlling this risk. Extending assessment and setting a target dosage limit that is well under producing any adverse health effects allows for this optimization to operate productively.

Performance period analyses

The analyses to assess site features beyond 10,000 years ensure limiting long term impact. Class A waste, as the least radioactive form of LLRW, is a useful trigger for these measures and the fractional concentration technique is well established and reputable.

Safety case / Defense-in-depth (DID)

Safety case and defense in depth, as defined, will provide long term protection and security for the general public and site for the necessary timeframe. Requirement of these measures is necessary and will provide the licensee be responsible for the site after closure.

Waste acceptance criteria (WAC)

Following proper waste characterization and certification and using site specific analyses to determine acceptable waste for a land waste storage facility will provide necessary protection for the site.

Conclusion

Providing the necessary safety and protection to ongoing generations is of the utmost importance for this industry to thrive. As young members of this industry, we need it to thrive. After reviewing these changes and policies we believe they will be a part of protecting this industry's future and help usher it into the new golden age of nuclear.

References:

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2. Cameron, C. (2015, May 11). PUBLIC MEETING ON THE PROPOSED LOW - LEVEL RADIOACTIVE WASTE DISPOSAL RULEMAKING. Retrieved June 3, 2015, from http://pbadupws.nrc.gov/docs/ML1512/ML15128A476.pdf
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RulemakingComments Resource

From: Mary Olson <maryo@nirs.org>
Sent: Thursday, June 18, 2015 9:46 AM
To: Grossman, Christopher
Cc: Dembek, Stephen; McKenney, Christepher; Yadav, Priya; Comfort, Gary; Esh, David; Tim Judson; Diane D'Arrigo
Subject: RE: Correction Regarding a Question at June 2, 2015 10 CFR Part 61 Public Meeting in Columbia, SC
Attachments: WaPo paducah articles 1999-2000.docx

Second Reply:

Mr. Grossman,
Cc above list; adding Diane D'Arrigo and Tim Judson at NIRS,

I would like this reply, and the attached document to be also posted with public access in ADAMs.

I asked NRC the question about whether it had considered DU (Depleted Uranium) originating from Paducah (and possibly other process sites) because of the history of the US Department of Energy sending uranium from plutonium separation (reprocessing) back through the enrichment phase as documented in the attached file by the "Paper of Record" the Washington Post. The uranium that was sent back through post-reprocessing was laced with fission products and activation products, including plutonium and other transuranics.

In its discussion of the proposed changes to Part 61, which anticipate the inclusion of DU in so-called "low-level" radioactive waste trenches, NRC has assumed that the DU is pure 238 and while somewhat radioactive itself would only contribute other radioactivity as decay products over time (a long time) to the inventory at the site.

The DU from Paducah is not pure DU. The enrichment process results in a more pure U235, not a more pure U238.

The attached file contains a series of 9 articles that together are the report of an independent investigation of the impact of the contaminated uranium on workers at Paducah. The impacts were not trivial. It is very important that NRC as a regulator not fall into the trap of using broad assumptions that are purely theoretical with no "process history."

A broad policy change such as proposing to call material with a 4.5 billion-year half-life "low-level," should not overlook the actual history of this material, nor the possible implications for the future since reprocessing is one of the reasons NRC cites for making changes at this time. An inventory of cesium, strontium and plutonium as well as the rest of the fission-product soup riding as "hitch hikers" on uranium must be factored since the impact would be today, not in the distant future of radioactive decay.

I am sure that the over-all plan to allow the dump-operator to make a "safety case" will compensate for any possible material that it wants to bury…but, on behalf of the drivers, waste handlers, dump workers, and the groundwater, please do not assume all DU is only U238.

Sincerely,
Mary Olson

Mary Olson
maryo@nirs.org
NIRS Southeast www.nirs.org

828-252-8409 / 828-242-5621 cell

From: Grossman, Christopher [mailto:Christopher.Grossman@nrc.gov]
Sent: Tuesday, June 16, 2015 2:56 PM
To: Mary Olson
Cc: Dembek, Stephen; McKenney, Christepher; Yadav, Priya; Comfort, Gary; Esh, David
Subject: Correction Regarding a Question at June 2, 2015 10 CFR Part 61 Public Meeting in Columbia, SC

Ms. Olson -

During the June 2, 2015 public meeting on the rulemaking for 10 CFR Part 61, you inquired about whether U.S. Nuclear Regulatory Commission (NRC) staff considered contaminated depleted uranium from U.S. Department of Energy (DOE) facilities in its analysis to support the Commission Paper, SECY-08-0147. In response at the meeting, I replied that we had considered contaminated depleted uranium. I have had some time to review our analysis and would like to correct my response to your question. While we considered the quantities of depleted uranium associated with DOE's facilities in the analysis, we, in fact, did not consider radionuclides associated that might result from contamination of depleted uranium with reprocessed materials at DOE facilities. Rather our analysis only considered radionuclides associated with clean depleted uranium. As indicated during the meeting, Enclosure 1 to SECY-08-0147 includes a description of our analysis including the specific radionuclides considered.

I apologize for any confusion my response may have created. NRC staff plans to correct the public record in the future, but I wanted to let you know personally as the originator of the question. In the near future, staff will also be placing this email in the NRC's Agencywide Document Access and Management System (ADAMS) and on the NRC's Low-Level Radioactive Waste Disposal public website for the 10 CFR Part 61 rulemaking. ADAMS is available at http://www.nrc.gov/reading-rm/adams.html. NRC's 10 CFR Part 61 rulemaking public website is available at http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html. You will be able to find it under "2015 Public Workshop Information", "Public Meeting 5 — June 2, 2015 (Columbia, SC)" once it is available. If you have any further questions about our analyses or the rulemaking, please feel free to contact me or any of the project managers for the rulemaking.

Respectfully,

Christopher J. Grossman
Risk Analyst
Division of Decommissioning, Uranium Recovery, & Waste Programs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
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1 of 9 DOCUMENTS

The Washington Post

August 8, 1999, Sunday, Final Edition

In Harm's Way, And in the Dark; Workers Exposed to Plutonium at U.S. Plant

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 4790 words

DATELINE: PADUCAH, Ky.

Thousands of uranium workers were unwittingly exposed to plutonium and other highly radioactive metals here at a federally owned plant where contamination spread through work areas, locker rooms and even cafeterias, a Washington Post investigation has found.

Unsuspecting workers inhaled plutonium-laced dust brought into the plant for 23 years as part of a flawed government experiment to recycle used nuclear reactor fuel at the **Paducah** Gaseous Diffusion Plant, according to a review of court documents, plant records, and interviews with current and former workers. The government and its contractors did not inform workers about the hazards for decades, even as employees in the 1980s began to notice a string of cancers.

Radioactive contaminants from the plant spilled into ditches and eventually seeped into creeks, a state-owned wildlife area and private wells, documents show. Plant workers contend in sealed court documents that radioactive waste also was deliberately dumped into nearby fields, abandoned buildings and a landfill not licensed for hazardous waste.

The sprawling Kentucky plant on the Ohio River represents an unpublished chapter in the still-unfolding story of radioactive contamination and concealment in the chain of factories across the country that produced America's Cold War nuclear arsenal. Opened in 1952 in an impoverished region, the 750-acre plant built a fiercely loyal work force of more than 1,800 men and women who labored in hot, stadium-sized buildings turning trainloads of dusty uranium powder into material for bombs.

Today, the Department of Energy contends that worker exposure was minimal and that contamination is being cleaned up. A lawsuit filed under seal in June by three current plant employees alleges that radiation exposure was a problem at **Paducah** well into the 1990s.

The Post's investigation shows that contractors buried the facts about the plutonium contamination, which occurred from the mid-1950s to the mid-1970s, in reports filed in archives. Plutonium, a core ingredient in nuclear bombs, is a highly radioactive metal that can cause cancer if ingested in quantities as small as a millionth of an ounce. The **Paducah** plant was designed to handle only uranium, a mildly radioactive metal.

"The community to this day has no idea of the kinds of contaminants they were exposed to," said James W. Owens, a **Paducah** lawyer representing residents whose water has been polluted by the plant.

Health consequences remain unclear. No comprehensive study of worker medical histories has been attempted at **Paducah**. In neighborhoods where older workers live, stories abound of cancer clusters and unusual illnesses. One 20-year veteran worker who died in 1980 compiled a list of 50 employees he worked with who had died of cancer.

"Everything was so safe, so riskless," the worker, Joe Harding, said in an interview just before his death. "Today we know the truth about those promises. I can feel it in my body."

Even though the plant's procedures and purpose have changed -- **Paducah's** enriched uranium is now used in commercial nuclear power plants -- problems have continued. Workers weave between makeshift fences that cordon off hundreds of radioactive "hot spots" scattered across the complex. In one corner of the plant, mildly radioactive runoff trickles from a nearly half-mile-long mound of rusting barrels that still contain traces of uranium.

"The situation is as close to a complete lack of health physics as I have observed outside of the former Soviet Union," Thomas Cochran, nuclear program director for the Natural Resources Defense Council, said in documents filed in the lawsuit.

The Department of Energy, which owns the plant, said it could not comment on allegations made in the suit because of the court-ordered seal. The agency is investigating the charges and dispatched a team to **Paducah** to determine if conditions posed an immediate threat to workers or the public.

Energy Secretary Bill Richardson said the agency's national security goals had "sent many of our workers into harm's way," but he said the agency must now live up to its responsibility to "right the wrongs of the past." Two weeks ago, Richardson pledged millions of dollars for medical monitoring of nuclear workers who were exposed to beryllium, a highly toxic metal.

"The Department of Energy will continue to take any actions that are necessary to ensure the protection of public health, the workers and the environment," he said.

Still, agency officials, in a written response to questions from The Post, strongly defended past safety practices at **Paducah** and said no workers are at risk today.

"The plant's monitoring data did not indicate an accumulation of [plutonium and other highly radioactive wastes] in the workplace or the environment that would be a health concern to workers or to the public," the DOE said.

That position is vigorously contested in more than 2,000 pages of documents filed in the lawsuit by two of the plant's health physicists, or radiation safety experts, and a veteran worker who had his esophagus removed after three decades of work inside contaminated buildings. Copies of the documents were obtained by The Post from government sources.

"The management line for years has been there was an insignificant amount" of plutonium at **Paducah**, said Mark Griffon, a health physicist at the University of Massachusetts at Lowell who is participating in a federal study of radiation conditions at nuclear weapons plants, including **Paducah**. Griffon reviewed plant documents provided by The Post.

"If the levels were this significant," he said, "it raises an important question: Why weren't workers ever monitored?"

The two health physicists suing the plant say in court documents they tried to call attention to the radiation problems but were confronted by a culture of unconcern.

"I was told by my superior . . . in so many words that 'this is **Paducah** -- it doesn't matter here,' " said one of the physicists, Ronald Fowler, 50, who came to the plant in 1991.

The suit was brought under a law that allows employees to collect payment for exposing fraud against the government. It was filed under seal to give Justice Department officials an opportunity to decide whether to join the suit or begin a criminal investigation.

The suit names Lockheed Martin and Martin Marietta, which managed the uranium enrichment plant during the 1980s and 1990s. It does not name the original manager, Union Carbide, which ran the facility for a 32-year period during which the bulk of the contamination occurred. None of the companies had been served with the suit and none would comment on the allegations.

The current plant operator, U.S. Enrichment Corp., a government-chartered private company that assumed management this year, concedes past problems but says safeguards are now in place. USEC, which sold

shares to the public last year, says it has fully disclosed the plant's environmental problems to regulators, workers and stockholders.

"It was acknowledged by all sides that contaminated conditions existed, . . . but USEC wasn't responsible for them," said Jim Miller, USEC executive vice president.

Paducah is the latest DOE facility to be rocked by lawsuits and revelations of contamination. Cleaning up the complex is expected to cost $ 240 billion and take at least 75 years.

Measured by the gram, the contamination at **Paducah** isn't nearly as extreme as that in plutonium production plants such as Washington state's Hanford Nuclear Reservation, where vast swaths of land have been sealed off from humans. But unlike the workers at those plants, employees at **Paducah** did not know of the risks in the uranium dust they breathed every day.

Worker exposure to such dust has cost the government in the past. The Energy Department paid a $ 15 million settlement five years ago to former workers who had breathed uranium dust at the Fernald Feed Materials Production Center near Cincinnati.

The difference between the dust at Fernald and that at **Paducah** comes down to one word: plutonium.

For 2 Decades, Freight Cars

Brought Unknown Danger

The **Paducah** complex was the second of three U.S. government plants designed after World War II to create enriched uranium. The plants were operated for the government by private contractors who over time were paid bonuses for running safe, efficient facilities.

In the beginning, uranium ore was scarce. The Atomic Energy Commission, forerunner of today's Energy Department, tried to fill the gap by "recycling" leftover uranium -- from nuclear reactors that made plutonium for bombs -- through the enrichment process at **Paducah**.

From 1953 to 1976, more than 103,000 metric tons of used uranium was shipped to **Paducah**, records show. It arrived in freight cars as a fine black powder. Unknown to workers, the powder contained dangerous substances left over from the plutonium-making process -- fission byproducts such as technetium-99 and heavy metals known as "transuranics": neptunium and plutonium.

"Plutonium is roughly 100,000 times more radioactive per gram than uranium," said Arjun Makhijani, president of the Institute for Energy and Environmental Research.

Over time, through spills and waste discharges, the contaminants accumulated in the miles of pipes used to gasify and enrich uranium, around loading docks and in ditches, documents show.

Plant officials were aware of the plutonium and other contaminants as early as the mid-1950s -- it made their recycled uranium less efficient. But they believed the amounts were too small to pose a health threat.

Today, the DOE is able to rely only on a contractor's estimate of the total amount of contaminants introduced in that period: 12 ounces of plutonium, 40 pounds of neptunium and 1,320 pounds of technetium-99.

The government today takes the same position as it did in the 1950s: The amounts were most likely not enough to harm workers. "The general protection provided to workers from the hazardous effects of uranium would have provided adequate protection" from the contaminants, the DOE statement said.

But documents obtained by The Post show that plant officials became increasingly concerned about the contaminants. A 1992 report by Martin Marietta concluded that they caused "significant" environmental problems and "also pose a radiation hazard to the workforce." A 1988 study done for the DOE by a private contractor said the plutonium could "represent a significant internal dose concern even at very low mass concentrations."

Plant records draw an instructive comparison that underlines the hazards posed by plutonium: The 12 ounces of plutonium in the black powder delivered more than twice as much radiation into the environment as the 61,000 pounds of uranium that flowed out of the plant in waste water into the Ohio River between 1952 and 1987.

Bosses Took Threat

With a Grain of Salt

In the noisy, cavernous buildings where uranium was processed, workers did not receive the warnings. The conditions there were "extremely dusty . . . sometimes to the point where it was very difficult to see or breathe," said Garland "Bud" Jenkins, 56, a 31-year-veteran uranium worker and one of the three employees involved in the lawsuit against Lockheed Martin.

To protect their skin from the uranium dust, workers wore cotton coveralls and gloves. But respiratory protection was optional -- old Army gas masks, which fit poorly and were seldom used, former and current workers said.

At lunchtime, workers brushed black powder or green uranium dust off their food. "They told us you could eat this stuff and it wouldn't hurt you," said Al Puckett, a retired union shop steward. To dramatize the point, he said, some supervisors "salted" their bread with green uranium dust.

The workers took the dust home at shift's end.

"We frequently discovered that our bed linens would be green or black in the morning, from dust that apparently absorbed into our skin," Jenkins said.

Exposure to uranium dust decreased after the late 1970s, when the plant stopped receiving the black powder and began processing a more refined form of uranium. In 1989, the DOE adopted more stringent worker safety rules.

By then the plutonium had permeated the land around the plant. In the 1960s and 1970s, when the powder spilled, workers would shovel it up and wash the remnants into the nearest ditch, Jenkins said. More than a dozen ditches flow directly from the plant onto state property and private lands.

There are no nationwide limits for plutonium in soil; cleanup standards depend on modeling the degree of public access to the contaminated spot. But the DOE has set cleanup limits at nuclear blast sites in the South Pacific of 15 picocuries of plutonium per gram of soil.

Contractors measured plutonium at levels up to 47 picocuries in ditches outside the plant and 500 picocuries on plant grounds.

Those measurements were made after the first evidence of environmental problems outside the plant surfaced in 1988, when a county health inspector found technetium and chemical carcinogens from the plant in a farmer's well. The discovery of the poisoned wells prompted a multimillion-dollar ground-water cleanup under the Environmental Protection Agency's oversight.

Although plant managers posted creeks and ditches with warning signs in the early 1990s, the signs do not refer to plutonium or any other radioactive contaminants. Some warn of possible contamination with cancer-causing chemicals; others merely caution against eating local fish.

Lawsuit Alleges

Deliberate Dumping

In addition to the substances that flowed or spilled out of the plant through the drainage ditches, the employees contend in their lawsuit that a wide variety of contaminated substances were deliberately dumped into the environment. Spilled black powder and empty radioactive waste containers allegedly were placed in dumpsters and trucked to a sanitary landfill on DOE property licensed only for trash and garbage. Rubble from demolished buildings and contaminated railroad ties allegedly were dumped in nearby woods and fields. Slag from uranium smelters was put in abandoned concrete bunkers in a state wildlife area outside the plant, according to the lawsuit.

"There was only one dumpster for all waste, whether radioactive, hazardous, toxic or ordinary," Jenkins said.

Plant records describe at least two dozen unlicensed radioactive debris piles on state lands outside the plant. Last year, ground-water tests turned up technetium directly beneath the sanitary landfill.

A 1990 DOE audit of **Paducah** found inadequate controls over waste disposal and a faulty system for tracking contamination that forced managers to rely on "word of mouth."

Charles Deuschle, 56, a health physics technician and the third employee in the lawsuit, said he was "shocked" when his surveys discovered radioactive contamination in such places as the plant's cafeteria.

"I saw conditions that would never have been tolerated in any other nuclear location where I have worked," Deuschle, who came to **Paducah** in 1992, said in court documents.

Internal plant surveys included in the suit found high levels of radiation on street surfaces, manhole covers and loading docks and in locker rooms as recently as 1996.

The plant's current managers maintain that all significantly contaminated areas have been addressed. "Hot" surfaces have been coated with absorbent paint, and warning signs have been posted, they said. Rope fences keep passersby away from radioactive equipment rusting in the open. Drain pipes and fire hydrants are coated with warning paint. Two dilapidated buildings where the black powder was once processed are padlocked. In 1997, regulatory oversight of the plant was transferred to the Nuclear Regulatory Commission, which declined to comment on allegations in the sealed lawsuit.

Even the employees involved in the suit concede that safeguards have improved recently. But they insist that problems remain. This spring, elevated radioactivity was found in a parking area near the administration building, plant documents show.

Soil collected from a ditch outside the plant's fence by The Post in June and analyzed at a commercial lab contained 2.6 picocuries of plutonium, slightly higher than the NRC's suggested guideline for cleaning up nuclear sites.

The Post, using two hand-held detectors, also found sharply elevated radiation levels in the debris piles on the state wildlife lands. One such area was an unmarked pile of rotting railroad timbers near fishing ponds and campgrounds.

Public Reports Tell

Only Part of the Story

Environmentalists, plant workers and neighbors claim that plant officials play down the hazards.

"They cloak it in jargon," said Mark Donham, a member of a citizens advisory board that meets monthly with plant cleanup officials. "You have to order the documents and then spend hours and hours looking at them to learn anything."

DOE officials say the facts and figures about the plutonium contamination inside the plant have been duly recorded since 1991 in thick inspection reports. But these are kept in archives rarely visited by the public.

In the annual environmental reports that circulate to the public, the contamination is described as "trace" amounts of "radionuclides," a catchall term that can include mildly radioactive uranium as well as highly radioactive plutonium.

A 1991 "site investigation" report, done by the plant's contractor and stored in the archives, shows much higher levels of plutonium than the annual environmental reports. The DOE said the reports use different methods and measure different things.

The result has been that the DOE can claim full disclosure about the contamination while plant workers and neighbors remain in the dark, said Owens, the attorney for the plant's neighbors.

"The company has engaged in a cynical disinformation campaign that centered on downplaying risks and presenting confusing and misleading information," he said.

Inside the plant, the first disclosure of plutonium to workers came around 1990 after managers summoned top union leaders to discuss the results of tests ordered after the state found the poisoned wells.

"They took it seriously," a union official, speaking on the condition of anonymity, said of Martin Marietta's presentation. But "the health effects weren't viewed as serious. We just vehemently stressed that the contamination should be cleaned up."

Plant managers insist that workers today are fully aware of the potential hazards. USEC cites worker training programs that it says include a briefing on plutonium and other radioactive hazards at the plant.

But officials with the union's Washington office contend workers still don't know a fraction of what they were exposed to. "What we're seeing now," said Daniel Guttman, former staff director of the federal Advisory Committee on Human Radiation Experiments, "is the outcropping of the glacier."

Deficient Monitoring

Compounded the Risk

The health effects for **Paducah** workers remain an open question.

The DOE said 442 **Paducah** workers were tested in 1997 and only 8 percent displayed measurable amounts of radiation. It said screening tests since 1992 have found no evidence of plutonium exposure in workers.

But the greatest exposure to workers would have occurred before the enhanced monitoring that began in the late 1980s.

In 1990, the DOE audited safety practices at **Paducah** and found scores of deficiencies in radiation monitoring and worker protection. The audit team said **Paducah** failed to properly monitor radiation to workers' internal organs -- even though plant managers had been repeatedly warned to do so.

Radiation-measuring equipment was either missing or not properly calibrated, the report said, and workers weren't being tested for the kinds of radiation known to exist at **Paducah**. Whether the plant's equipment and personnel were even capable of detecting exposure to plutonium and other transuranics was "questionable," the audit said.

Bolstering claims by workers that they had been left in the dark about radioactive hazards, the report found no mention of transuranics in plant safety procedures.

"Onsite environmental radiological contamination conditions are largely unknown," the report said. "A formal program with well-defined monitoring, sampling and analysis requirements does not exist."

Independent experts are investigating **Paducah** as part of two national studies of environmental and safety issues in the U.S. nuclear weapons complex. Both studies are relying primarily on data supplied by the plant. Officials brought in two years ago to review past radiation hazards told The Post they were not informed that **Paducah** workers may have been exposed to significant amounts of plutonium.

Neither was Harold Hargan, a plant worker for 37 years. Hargan was one of about six workers who he says were told in 1990 that a test had found plutonium in their urine.

"It surprised me. Hell, it surprised the doctor," Hargan said. "Everybody knew there was no plutonium at **Paducah**."

What Happened Inside the Plant

Uranium is a naturally radioactive element that comes mainly in two forms, or isotopes: uranium-238 and a small amount of uranium-235. Only U-235 is fissile, or capable of being split in a nuclear chain reaction. To make bombs or nuclear fuel, uranium must be "enriched" by increasing the proportion of U-235.

The Mission: Uranium Enrichment

1. Uranium ore from mines is milled in a process to extract uranium oxide, known as yellowcake. The yellowcake is sent to **Paducah**.

2. At the **Paducah** plant, yellowcake is burned with hydrogen to form uranium dioxide, a black powdery substance called "black oxide."

3. The black oxide is mixed with hydrofluoric acid to make uraniun tetrafluoride, known as greensalt.

4. The greensalt is burned with fluorine to make uranium hexafluoride

Since the late 1970s, **Paducah** has purchased uranium hexafluoride from other companies. Today, the enrichment process begins here.

5. Finally comes the gaseous diffusion process for which the plant is named: The liquid uranium hexafluoride is heated and passed through a series of barriers, which separate and concentrate the U-235 isotope. The low-enriched uranium is condensed to a solid and packed into drums for shipping.

The enriched uranium is shipped to another plant for further enrichment to make commercial nuclear fuel. In the past, some was converted to highly enriched uranium for bombs.

4%-5%U235 Nuclear fuel for power plants

90%U235 Nuclear weapons

Enormous amounts of uranium are left over after enrichment.

The processes used at **Paducah** also can move backward, turning uranium hexafluoride back into greensalt, or into depleted uranium metal for use in armor-piercing munitions or armor plating.

Uranium hexafluoride mixed with magnesium yields greensalt,uranium metal and slag.

Contamination Spreads

Beginning about 1953, uranium from spent nuclear fuel was sent to **Paducah** to be enriched. Each shipment contained small amounts of plutonium and other radioactive contaminants.

Worker exposure

Processing uranium generated large amounts of contaminated airborne dust inside the buildings. Also, radioactive material often was spilled, then swept up by hand, hosed into gutters or placed in regular trash receptacles, whistle-blowers say.

Workers carried uranium home on their skin and clothes.

Metals Recovery

Old nuclear warheads were dismantled at **Paducah**, where the radioactive material was extracted and gold and other precious metals were recovered.

The recovered gold was melted into bars. Whistle-blowers allege some was shipped away without being measured for radiation.

Tens of thousands of drums used to ship uranium are stored outdoors at the plant. Many drums still contain radioactive material.

This "depleted" uranium -- still radioactive -- is stored in tens of thousands of cylinders in open lots.

The plant continues to store significant amounts of various recovered metals deemed too contaminated to ship.

The concrete-like gray slag, a contaminated

byproduct of the process, allegedly was trucked to sanitary landfills and dumped in public areas near the plant. Large amounts of contaminated slag remain on the site.

Hazards Inside the Plant

For decades, plutonium and other radioactive hazards quietly spread through this Kentucky uranium plant, exposing unsuspecting workers to an invisible and potentially lethal threat. Red areas on this diagram denote contamination that was detected around the main work areas in 1992.

'Barrel Mountain': A nearly half-mile mound of large piles of rusted metal scrap and other waste materials, some of it contaminated.

Classified burial ground: This landfill contains nuclear weapons components. Workers who dismantled weapons may have been exposed to beryllium, a highly toxic metal.

Burial pits: Enormous amounts of radioactive material lie in shallow landfills on plant grounds, and some are believed to be leaching into ground water. One pit contains hundreds of barrels of a highly flammable form of uranium stored in PCB-tainted oils.

Waste-water discharges: Company documents acknowledge the release of tens of thousands of pounds of uranium into creeks. Toxic chemicals and metals also were discharged in waste water.

Dirty runoff: Rain washes uranium and other hazards into ditches that flow past outdoor scrap yards. Some of the ditches are posted as radioactive inside the plant fence, while just outside the fence there are no such warnings.

Fouled ditches: Uranium, plutonium and other radioactive materials were flushed into ditches, such as this one, that flow into tributaries of the Ohio River. A test commissioned last month by The Washington Post found plutonium here. Earlier tests of the ditch inside plant grounds found plutonium at a level 100 times above what the government certifies as safe.

One of the most contaminated buildings still in use, C-400 contained chemical solvent tanks for cleaning radioactive equipment. Workers this year found an old canister that contained radioactive technetium at levels millions of times above the safety standard.

Outdoor hazards: Plant officials recently discovered radioactive contamination in this gravel parking lot near the main administration building. Dozens of "hot spots" around the plant grounds mark the sites of old spills or dumps.

Buildings 410 and 420: Hundreds of workers were exposed to radioactive dust in these buildings, which were used to process uranium before enrichment.

Contaminated buildings: Elevated radiation levels have been found in hundreds of areas frequented by workers, including a cafeteria.

Tainted wells: Two large plumes of contaminated ground water extend more than a mile north of the plant into residential neighborhoods. The water is contaminated with chemical and radiological wastes.

Cylinder piles: More than 30,000 metal tanks containing a toxic mix of depleted uranium and fluorine are stacked in open lots. Until recently, some were stored in a nearby residential neighborhood.

Process buildings: The heart of the plant, these stadium-sized buildings now enrich uranium for commercial nuclear fuel. The truck alleys along the sides of each building are contaminated from spills during deliveries.

Chemical spills: Thousands of gallons of toxic chemicals -- including suspected carcinogens -- were released into the environment in a series of leaks and spills. Some ended up in nearby creeks.

Airborne releases: Exhaust fans vented radioactive dust into the atmosphere. Workers say the biggest releases were always at night.

Switchyards: The plant requires enormous amounts of electricity -- two generating plants are dedicated to its needs. As recently as 1996, the plant also was the nation's largest single emitter of freon, the coolant blamed for damaging the Earth's ozone layer.

SOURCES: "Radiological Survey of Selected Outdoor Areas, **Paducah** Gaseous Diffusion Plant, **Paducah**, Kentucky," prepared by Oak Ridge Associated Universities, April 1992; Washington Post research. Satellite photo from U.S. Geological Survey.

Spreading Toxins

Radioactively contaminated slag and rubble from demolished buildings was dumped outdoors in more than two dozen places around the plant. For decades, waste water containing uranium, plutonium and cancer-causing chemicals was discharged into ditches and creeks that flow into the Ohio River, three miles away.

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The Washington Post

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Richardson Orders Probe Of Uranium Plant in Ky.

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

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Energy Secretary Bill Richardson ordered an immediate investigation yesterday into reports that thousands of unsuspecting employees at a Kentucky uranium plant were exposed on the job to cancer-causing plutonium.

Richardson said he would meet with workers at the **Paducah** Gaseous Diffusion Plant and would request a National Academy of Sciences study to probe the links between worker illnesses and exposure to radioactive materials that occurred over decades at the federally owned plant.

He also called for expanding a newly created program to bring health screening and medical treatment to thousands of workers who may have been put in harm's way at **Paducah** and similar facilities that were part of the government's nuclear weapons complex.

"I have long maintained that we must correct the sins of the past by compensating workers who have been medically damaged," Richardson said in an interview. "I don't want this to be known as the department of excuses for not dealing with workers who have been harmed."

His remarks came after The Washington Post reported that workers at the **Paducah** plant had been unwittingly exposed to plutonium and other radioactive metals that entered the plant over decades in shipments of used uranium from military nuclear reactor fuel. The report was based in part on sealed court documents filed as part of a lawsuit by workers and an environmental group, the Natural Resources Defense Council. The suit alleges that government contractors concealed evidence of the exposure for decades while allowing plutonium and other hazards to spread into the environment.

The workers also allege that former plant managers allowed contaminated waste to be dumped into a state-owned wildlife area and a landfill not licensed for hazardous waste. They further contend that radioactively contaminated gold and other valuable metals may have been shipped out of the plant without being properly tested.

Thomas Cochran, a nuclear expert with the NRDC who reviewed conditions at the plant, said health and safety practices there were the worst "outside the former Soviet Union." Former plant operators had not been served with the suit and declined to comment. The whistleblowers and their Washington attorney, Joseph Egan, said they also could not comment because of the judge's seal on the case.

Energy officials sent a team to **Paducah** for an initial probe after the documents were first filed in June, Richardson confirmed. "They did not uncover any imminent threats . . . but we are continuing to investigate these concerns," Richardson said.

The expanded investigation he announced yesterday would seek to uncover "what actually occurred, who was responsible and what must be done to assure that it never happens again," he said.

Among the specific measures:

Top Energy Department officials will be dispatched to **Paducah** this week to check compliance with environmental and safety regulations. The agency's Office of General Counsel will assess whether former contractors, including Lockheed Martin Corp. or Union Carbide Corp., had fulfilled their responsibilities to protect workers and the environment.

Besides the health study by the National Academy of Sciences' Institute of Medicine, the Energy Department will institute a medical surveillance and screening program for employees. A screening of former **Paducah** workers is just beginning as part of the Former Worker Program, a congressionally ordered study of past exposures of employees in the U.S. nuclear complex.

The department's fiscal 2000 budget request will be reassessed and revised as necessary to include money to probe and rectify environmental and health concerns at the government's uranium enrichment plants.

Richardson will ask the White House to expand a newly created program to provide millions of dollars in medical screening and other benefits to Energy Department workers who were exposed to beryllium, a highly toxic metal used in nuclear weapons. "These actions are warranted given the concerns raised . . . and I will not rest until these issues are fully dealt with and any injured workers are fairly compensated," Richardson said.

Paducah workers were exposed to plutonium through shipments of contaminated uranium that arrived at the plant from 1953 to 1976, a period when national security priorities often surmounted concerns over risks to workers and the environment. The plutonium shipments stopped, but contaminants remain spattered over hundreds of acres of buildings and grounds. Workers did not learn of the problems until at least 1990, and some contend they were never told.

The U.S. Enrichment Corp., a government-chartered private corporation that took over management of the plant this year, contends that all significantly contaminated areas have been cleaned up or marked with warning signs.

Although no comprehensive study of worker medical histories has been conducted, current and former workers at the plant have linked past exposures to a string of cancers and other diseases.

Richardson said although many of the exposures at **Paducah** were historical, the government bears responsibilities for those who may have been injured.

"Even though it was the 1950s and everyone was gung-ho," he said, "it doesn't mean that you can forget about workers who have been made sick."

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A Deathly Postscript Comes Back to Life; After Being Rejected, Warnings of Paducah Atomic Worker Now Hailed as Heroism

Joby Warrick, Washington Post Staff Writer

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DATELINE: PADUCAH, Ky.

Stricken with cancer, his body mottled with painful sores, uranium worker Joe Harding picked up a pen for a final postscript to his nine-year struggle against the U.S.-owned factory he blamed for his fatal illness. "It is absolutely futile," he wrote just before his 1980 death, "like fighting a tiger with a toothpick."

Two decades later, Harding is being proclaimed a "Cold War hero" by the same government that brushed aside his claims of dangerous radiation inside the **Paducah** Gaseous Diffusion Plant in western Kentucky.

Revelations this week of worker exposure to plutonium at the **Paducah** plant have rekindled interest in the Harding case, which was championed briefly by anti-nuclear groups in the early 1980s as an example of the human cost of building America's nuclear arsenal. Although experts at the time linked Harding's ailments to radiation, the Department of Energy in 1981 dismissed Harding's reports of dangerous working conditions and declared the plant to be safe. Harding's disability pension and medical insurance were dropped and he was left nearly penniless.

Energy Secretary Bill Richardson, who has launched a probe into worker exposures at **Paducah**, said yesterday the government owed Harding and other workers a thorough investigation into whether their service in the nation's nuclear weapons complex had placed them in harm's way.

"Joe Harding was a hero of the Cold War," Richardson said in statement to The Post. "But in the past, I believe that the government basically said -- without any review -- that there is no established linkage between the exposure these workers had and their illness. The Clinton administration is saying that's not our policy. We're going to make sure these workers are taken care of."

The renewed interest in Harding came amid a flurry of calls for an expanded probe into environmental and safety problems at the plant. Sen. Mitch McConnell (R-Ky.) Monday demanded a congressional hearing into reports that contaminated material was dumped outside the plant. Kentucky Gov. Paul E. Patton (D) has appointed a state task force to examine claims of environmental damage. And Rep. Ted Strickland (D-Ohio) has asked the Department of Energy to account for contaminated uranium from **Paducah** that was shipped to a sister plant in Portsmouth, Ohio.

David Michaels, the department's assistant secretary of environment, safety and health, told workers at **Paducah** the agency had let them down in failing to inform them about contaminants in the workplace. "There's been a real communications problem here," he told a news conference Monday.

The Washington Post reported on Sunday that plutonium and other highly radioactive metals slipped into the plant over 23 years in shipments of recycled uranium from U.S. plutonium production factories.

Sealed documents filed as part of a lawsuit against the plant's former operators allege that workers were exposed to plutonium-laced dust through the 1970s in the hot, smoky buildings where uranium was turned into fuel for bombs and nuclear power plants.

One of those workers was Joe Harding, whose case has emerged as a powerful symbol of environmental and bureaucratic ills that allegedly plagued the facility. Although no comprehensive medical studies have been done of the health effects on plant workers, union officials and others have been tracking cases of cancer at the plant. Harding himself kept a list of more than 50 cancers among 200 people who began working with him at the plant in the early 1950s.

Richardson has ordered a comprehensive medical review of current workers and an investigation of links between radiation exposures and illnesses.

Union officials said yesterday the government not only failed to protect Harding, but also fought vigorously to prevent the worker and his widow from receiving a pension or medical insurance.

"The DOE took the Joe Harding case very seriously: No dollar was spared in seeking to deny his claims," said Richard Miller, a policy analyst for the Paper, Allied-Industrial, Chemical & Energy Workers International Union,

which represents workers at the plant. "No effort was spared in their scorched-earth campaign to deny what was overwhelmingly obvious."

In the months before succumbing to cancer at age 58, Harding meticulously documented environmental problems at the plant in tape recordings and in letters and journal entries obtained by The Post.

It was "important, patriotic, secret work," Harding wrote of the job he started in 1952, the year the plant opened. "Brainwashing started in training school: 'Don't talk to anyone. Never mention radiation. The public is stupid about radiation.' "

Soon Harding was put to work as a "process operator," mixing powdered uranium with fluorine and other chemicals. Inside the buildings, he wrote, the air was "heavy" with uranium dust, which is mildly radioactive and toxic if ingested or inhaled. Unknown to workers at the time, it also contained small amounts of plutonium and other radioactive metals that are thousands of times more dangerous than uranium.

"I spent all those years breathing uranium hexafluoride gas so thick and heavy that you could see the haze in the air," Harding said in a hand-written account in 1979. "You could taste it coated on your teeth and in your throat and lungs. . . . Powder on the floor was thick enough that you would leave tracks."

If workers worried about radioactive exposure from the dust, their concerns were brushed aside, Harding said. He said the official line from supervisors was: "You will not get any more radiation in this work than you would get from wearing a luminous dial wristwatch."

Harding had worked at the plant less than a year when the first medical symptoms appeared, according to records made available by his widow. Lesions appeared on his legs, and slowly spread through the rest of his body. His weight dropped from 175 to 125 pounds. Searing pain radiated from his stomach and he vomited so frequently his co-workers mockingly called him "Joe Erp."

Later, fingernail-like calcium growths began emerging from his finger joints, elbows and knees. X-rays of his lungs turned up odd-looking pockmarks. He lost most of his stomach to cancer.

Physicians were mystified by Harding's ailments, though privately, he recalled, some suggested a possible cause: Radiation exposure. Harding didn't believe it.

"Radiation? Hell, no!" he remembered saying. Later, though, as the symptoms worsened, Harding began to doubt assurances by Union Carbide, the plant operator, about safety. He remembered feeling nervous about maintenance jobs that required him to crawl inside large pipes used to carry radioactive uranium gas between buildings.

"Pitch dark, full of UF6 [uranium hexafluoride] smoke and powder," he said of the pipes. "Felt like saying 'Goodbye, world,' on entering."

Eventually Harding's increasingly vocal complaints about working conditions earned him a reputation as a troublemaker, and he bounced around from one section of the plant to another. Finally, in 1971, the plant offered him a full-disability pension, citing a leg injury that Harding had received on the job.

Harding accepted the offer and went home to wait for his first check. It never came. He later learned that his disability claim had been rejected, and along with it his pension and medical insurance.

"This left me 50 years old with no job, and a crippled leg to get worse," he wrote. "No stomach. Bad lungs. No way to get a job, no way to make a living."

Months after his death from stomach cancer in 1980, Harding's medical records were reviewed by Karl Z. Morgan, an internationally known radiation expert who concluded Harding's health problems were "strongly suggestive" of radiation exposure from chronic inhalation of uranium dust. Later, Harding's body was exhumed for testing, and uranium was found in his bones.

Meanwhile, Energy Department officials were conducting their own investigation, at Harding's request. After 18 months and a two-day visit to **Paducah**, the department concluded that Harding's illnesses were more likely caused by smoking and by the fact he "frequently ate country ham," according to the 1981 report. Based on computer modeling, the report's writers said the radiation exposures at **Paducah** were not sufficient to cause illnesses.

"The presence of thick dust in the air which Mr. Harding stated occurred . . . is not consistent with the mode of operation," the report said.

The department's findings are now contradicted in court documents and interviews with current and former workers who also describe high exposures to uranium dust in the plant. Workers say the dust clung to their hair and skin and even contaminated the food they ate.

Whether the new evidence from whistleblowers will ultimately vindicate Harding is unclear. If it does, it will provide little consolation for his widow, Clara, who lost both a husband and the financial security that was supposed to see her into twilight years.

Clara Harding sold her house and moved to a small duplex on the outskirts of town. She continued to fight for the pension in court for several years before finally settling the case for $ 12,000.

For her, the battle was clearly over from the first hearing, when Harding and her lawyer arrived in court to find a phalanx of attorneys and experts from the plant and the Energy Department representing the other side.

"There were 14 of them and only two of us," she remembered. "So that was pretty much that."

NAME: JOE HARDING

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Paducah's Silent Witness; Excessive Uranium Level Found in Worker's Bones

Joby Warrick, Washington Post Staff Writer

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The exhumed bones of a long-dead uranium worker have given a powerful boost to current employees' claims of dangerous exposures inside a government-owned Kentucky plant that supplied radioactive fuel for the nation's nuclear bombs.

The long-overlooked medical evidence from the case of Joseph Harding suggests that for some workers radiation doses at the **Paducah** Gaseous Diffusion Plant were far higher than previously believed, and may have been dozens of times above federal limits, according to one analysis of the data.

The hazards for uranium workers are further underscored by unpublished research from a sister plant in Tennessee. A draft study of workers at the K-25 plant in Oak Ridge shows unusually high death rates for former uranium workers, as well as sharply higher rates of lung and bone cancers.

The results of Harding's posthumous tests, conducted as part of a lawsuit in 1983 but never published, offer the strongest corroboration to date of hazardous conditions inside the **Paducah** plant, where workers labored for decades in a haze of radioactive dust that was sometimes laced with deadly plutonium.

"Uranium content of the bone was far in excess of normal expectations," wrote Alice Stewart, an internationally known British researcher who reviewed the results of laboratory tests of Harding's remains for his estate. "The terminal finding overrules all earlier impressions [from U.S. government officials] of NO internal depositions of uranium."

Lab technicians were unaware of the presence of plutonium at the plant and did not test for it. Plutonium is about 100,000 times more radioactive per gram than uranium and can cause cancer if inhaled in microscopic amounts. Workers only recently learned that plutonium and other highly radioactive metals entered the plant in contaminated uranium shipments from the early 1950s to the mid-1970s.

The Department of Energy has launched an extensive investigation into claims of worker exposures at the **Paducah** plant as well as the K-25 plant and a third facility in Ohio. While the department had not evaluated the results of Harding's bone tests as of last week, agency officials said it is now clear that uranium workers were not properly protected until at least 1990, when new safety guidelines were implemented.

"This reaffirms our decision to get out of the business of fighting sick workers," David Michaels, assistant secretary for environment, safety and health, said in an interview Friday. "This case is an example of how the DOE placed mission and secrecy in a paramount position in the past. Right now, we should be bending over backward to help those workers who helped win the Cold War for us."

Both the **Paducah** and K-25 plants were owned by the federal government and operated by the same group of corporate contractors: Union Carbide from the 1950s to the early 1980s, followed by Martin Marietta and Lockheed Martin Corp.

The latter two are the targets of a lawsuit filed by a group of current employees who allege unsafe working conditions and environmental contamination. Former workers also have alleged that radiation monitoring equipment at the **Paducah** plant was defective; in some cases, they say, "film" badges used to monitor exposures contained no film.

"The dose evidence corroborates our allegations that the health physics program at **Paducah** has been essentially nonexistent," said Thomas Cochran, nuclear program director at the Natural Resources Defense Council, which joined workers in the lawsuit. "The contractors have been operating in callous disregard for the health and safety of the work force."

Harding, an 18-year veteran plant worker who died of cancer in 1980, was hailed last week by Energy Secretary Bill Richardson as a "hero of the Cold War." But for the nine years before his death his claims of radiation exposure were vigorously challenged by contractors and Energy Department officials, who said conditions in the plant were safe.

The department disputed Harding's allegations -- verified years later by other workers -- of a dense fog of uranium dust and smoke that would cling to workers' skin and coat their throats and teeth. A department study in 1981 attributed Harding's death to a combination of smoking and eating country ham.

Eventually Harding developed stomach cancer along with an array of unusual maladies that are sometimes linked to radiation exposure, including perforations in his lungs and strange fingernail-like growths on his palms, wrists and shoulders. But after being discharged from the plant in 1971, Harding was denied a disability pension and lost his medical insurance. His widow's efforts to reclaim the pension were opposed by lawyers for Union Carbide and the Energy Department, and she eventually settled her claim for $ 12,000.

The exhumation of Harding's remains in 1983 was a final attempt by Harding's widow to verify his assertions of exposure to radioactive uranium dust in the plant. His bones were analyzed by a Canadian lab for uranium, but for reasons now unclear the results were never published.

The lab report -- obtained last week by The Post -- not only supported Harding's claims of radiation exposure but also suggested hazards at the plant were far greater than previously believed: More than a dozen years after Harding left the plant, his body contained uranium at levels up to 133 times higher than is normally found in bones.

Moreover, the type of uranium found was "not from natural sources," and apparently came from the plant's uranium enrichment process, the report said.

Because uranium is slowly purged by the body over time, the levels in Harding's bones would have been "several-fold higher" during the time he was employed, the lab report stated.

Exactly how much higher is unclear. But Carl Johnson, a Colorado physician and radiation consultant who analyzed the test results for Harding's widow in 1983, said Harding's uranium "bone burden" in the 1970s would have been between 1,700 and 34,000 times higher than normal. Based on those levels, the annual radiation dose to Harding's bone tissue would have been 30 to 600 rems a year. Under current standards, U.S. nuclear industry workers are allowed a maximum full-body dose of 5 rems a year.

Radiation experts who reviewed the data for The Post said the results could have been skewed by a number of factors, including the possible presence of plutonium in Harding's bone tissue. But by any measure, the exposure was certainly high.

Arjun Makhijani, president of the Institute for Energy and Environmental Research, said conditions at **Paducah** appear to have been similar to an Energy Department site at Fernald, Ohio, where concentrations of radioactive particles in the air are now known to have far exceeded then-allowable limits, in one instance by 97,000 times.

"The DOE and its contractor Union Carbide committed a gross injustice on Joe Harding," Makhijani said. "The DOE is perpetuating that injustice upon the half-million people who worked in the nuclear weapons complex since it has not yet provided the vast majority of the survivors among them with medical monitoring and medical help."

Energy Department officials are now pledging increased medical tests and possibly compensation to thousands of men and women who were exposed to chemical and radiological hazards at **Paducah** and other facilities in the U.S. nuclear weapons complex. The department's investigative team at **Paducah** in coming weeks will attempt to determine exactly what the hazards were, and who was exposed.

The task is fraught with obstacles, including a dearth of monitoring data from the early years when radiation exposures were likely to be highest. Unlike the K-25 plant, no comprehensive study of worker histories has been attempted at **Paducah**.

The draft study of uranium workers at the K-25 plant appears to offer further support for concerns about hazards inside such facilities. The mortality study of about 11,000 former workers at the plant was conducted by the Oak Ridge Institute for Science and Education. Although the research essentially was completed in 1994, funding for the study was dropped before it could be peer reviewed and published in a scientific journal.

The draft report, obtained by The Post, shows higher rates of death for all causes among former workers, a finding that is significant in itself, given that government workers are typically healthier than the general population because of higher salaries and access to health care.

The study also shows higher rates of cancers of the lung (19 percent) and bone (82 percent) among white male workers compared with the general population. Both cancers are sometimes linked to radiation exposure.

Researchers point to several factors that could have skewed the results, including the inclusion in the survey of a sample of thousands of people who worked at the K-25 plant for a relatively brief period during World War II.

Since many able-bodied men were in the military during that period, the remaining work force may have been less healthy than the general population, the authors said.

A new study is underway to track death rates among K-25 workers who were exposed to the highest amounts of radiation. Similar mortality studies at the Portsmouth Gaseous Diffusion Plant in Ohio have shown relatively low rates of cancer.

Another possible problem in evaluating risks for **Paducah** workers is the reliability of the data. Previous Energy Department audits of the plant's safety records cited extensive problems with monitoring programs and equipment. And former and current workers at the plant say they believe radiation monitoring was shoddy in the past.

Al Puckett, a retired union shop steward who worked at the gaseous diffusion plant in the 1960s and 1970s, said workers would sometimes open their "film" badges only to find no film inside. Suspecting that no one ever examined workers' radiation monitors, Puckett and his colleagues sometimes exposed the badges to radiation by leaving them for hours on top of barrels of enriched uranium.

"We turned the badges in and that was the last we heard of it," he said. "No one ever said anything to us."

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The Washington Post

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U.S. Will Propose Payments to Sick Paducah Workers; $20 Million Fund Eyed For Radiation Cancers

Joby Warrick, Washington Post Staff Writer

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The Clinton administration today will propose spending tens of millions of dollars to compensate ailing workers at the government's **Paducah** Gaseous Diffusion Plant in what is described as a step toward acknowledging abuses committed against thousands of men and women who helped build America's nuclear arsenal.

The proposed pilot program, which eventually could be expanded to encompass other Energy Department facilities, will be unveiled by Energy Secretary Bill Richardson during a visit to the plant, department officials confirmed to The Washington Post.

If approved by Congress, the program would compensate current and former employees who have developed specific cancers related to radiation after working at the western Kentucky plant, which has made enriched uranium for nuclear weapons and power plants since 1952. In addition, Richardson will propose $ 21.8 million in new spending to pay for cleanup and for expanded medical monitoring of workers at **Paducah** and at sister plants in Ohio and Tennessee.

"I'm going to **Paducah** to hear firsthand from the community and workers," Richardson said in an interview.

The visit to **Paducah** comes two days after the release of preliminary findings from a month-long investigation of safety practices at the plant. A team of Energy Department inspectors cited numerous weaknesses in environmental programs and criticized federal managers and cleanup contractors for a "lack of discipline, formality and oversight" in the plant's management of radiation risks.

The team found no evidence of imminent health threats to workers or the public but said radiation controls should be strengthened. In response, Richardson ordered immediate upgrades in safety practices, including enhanced training for workers.

A separate investigation is examining alleged illegal dumping of radioactive waste, as well as claims of worker exposure to harmful levels of plutonium and other radioactive metals before 1990.

Energy Department inspectors were due to report additional findings at a House Commerce subcommittee hearing on the **Paducah** plant, scheduled for today but canceled because of Hurricane Floyd's approach toward Washington. The hearing was rescheduled for Wednesday.

Details of the proposed compensation package for **Paducah** workers had not been completed, but Energy Department officials said the cost of the program could exceed $ 20 million, depending on how many workers qualified.

But the program's initially narrow limits have drawn criticism from the plant's union. The critics noted that workers at other plants were exposed to similar hazards and also deserved to be compensated.

"You've got a worker population at risk, but the administration wants to triage this thing," said Richard Miller, a policy analyst with the Paper, Allied Chemical and Energy Workers International Union who was briefed on details of the plan. "How do you justify compensating workers at one plant, while saying another plant across the river doesn't merit the same compensation?"

Limits on compensation for exposed workers have been the subject of debate in the administration for weeks. Earlier in the summer, the Energy Department announced plans to separately compensate workers who had been exposed to beryllium, a highly toxic metal that was widely used in making nuclear weapons components. The White House also has launched an interagency review that will look at a wide range of workplace hazards at Energy Department plants, especially uranium plants in Piketon, Ohio, and Oak Ridge, Tenn.

Richardson ordered the probe at the **Paducah** plant on Aug. 8 after a Washington Post investigation highlighted radioactive contamination at the plant, including worker exposure to plutonium. Documents filed in a worker lawsuit accuse the plant's former operators of failing to protect workers from -- or even to warn them of -- radioactive hazards.

The **Paducah** plant is owned by the Energy Department but has been managed by a series of corporate contractors. In May, management of uranium processing passed to U.S. Enrichment Corp., a government-chartered private company that is regulated by the Nuclear Regulatory Commission. The Energy Department's investigation at **Paducah** has focused mainly on policies and practices of department managers, as well as separate government contractors charged with cleaning up contamination.

The $ 21.8 million that Richardson will announce includes $ 7 million for environmental health programs to analyze past safety risks and current health hazards. The information will be provided to the National Academy of Sciences' Institute of Medicine to help determine compensation for worker illnesses.

Yesterday, an Ohio newspaper reported that workers at the **Paducah** facility's sister plant in Piketon also handled a greater amount of the type of plutonium-laced uranium oxide that caused widespread problems in **Paducah** than was previously acknowledged.

Like the **Paducah** facility, the Portsmouth Gaseous Diffusion Plant in Ohio received shipments of contaminated recycled uranium directly from nuclear power plants, the Columbus Dispatch quoted Energy Department officials as saying. The uranium contained small amounts of plutonium and other radioactive material normally not present at gaseous diffusion plants.

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Radiation Risks Long Concealed; Paducah Plant Memos Show Fear Of Public Outcry

Joby Warrick, Washington Post Staff Writer

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Managers of the government's **Paducah**, Ky., uranium plant knew for decades of unusual radiation hazards inside the complex but failed to warn workers because of fears of a public outcry, according to documents to be released by a congressional panel this week.

Faded memos unearthed by workers and federal investigators shed new light on what early plant officials knew about the presence of plutonium and other highly radioactive metals in the plant -- knowledge that was kept from the workers for nearly four decades.

In one 1960 document, a government physician wrote that hundreds of workers should be screened for exposure to "transuranics" -- radioactive metals such as plutonium and neptunium -- but he said plant officials feared such a move would cause alarm and lead to higher labor costs.

"They hesitate to proceed to intensive studies because of the union's use of this for hazard pay," says the memo, discovered by Energy Department officials investigating the plant.

The documents from government archives have been turned over to a House Commerce Committee panel, which is holding hearings Wednesday into allegations of unsafe conditions at the **Paducah** Gaseous Diffusion Plant. The Washington Post obtained advance copies of the documents and prepared testimony of some current and former plant officials.

Accounts of plutonium contamination and illegal waste dumping at the facility have triggered an Energy Department investigation and a class action suit by employees who believe the plant put them at risk.

Energy Secretary Bill Richardson toured the plant on Friday and formally apologized to workers for the government's failure to fully inform them about the risks. He pledged millions of dollars in new spending to compensate ailing workers and to accelerate the cleanup of the plant. And he presented an award to the family of the late Joe Harding, an employee who had tried vainly for years to convince Energy officials that hazards in the plant had caused his fatal illness.

"On behalf of the government I'm here to say I'm sorry," Richardson said. "The men and women who have worked in this facility helped the United States win the Cold War and now help us keep the peace. We recognize and won't forget our obligation to them."

Plant officials, while acknowledging the presence of plutonium at **Paducah**, have said the amounts were small and were likely of little threat to workers.

Government contractors who ran the plant over the last 47 years have declined to comment because of pending litigation. A Union Carbide Corp. spokesman, in a statement last month, said the alleged acts at **Paducah** occurred long ago, and none of the current managers had any detailed knowledge of what had happened. Union Carbide operated the plant from 1952 to 1983.

The documents and testimony to be presented at the congressional hearing suggest that the federal government and private contractors running the plant ignored decades of warnings to protect workers from plutonium, a man-made metal that can cause cancer if inhaled in amounts as small as a millionth of an ounce.

"What is clear is that the [government] contractors knew of the need to protect workers from plutonium and other transuranics . . . as early as 1952," Jim H. Key, the ranking environmental and safety official for the plant's unionized employees, states in prepared testimony to be delivered Wednesday.

Key, who has not yet spoken publicly about the allegations of workers' exposure, alleges "widespread, systematic and documented failures" by the government and its contractors to control the spread of radioactive hazards. He describes smoky, radioactive fires inside the plant and thick clouds of radioactive uranium dust -- workplace hazards for which workers were neither trained nor equipped.

Former workers also have come forward with evidence suggesting that past managers viewed the contamination as a practical and economic problem. John Tillson, a hydrologist who analyzed early operations at the plant while working for a cleanup contractor, said **Paducah** managers tried to recover the transuranics from the plant's waste stream in the 1950s and 1960s, when the metals were in high demand for nuclear materials research.

By 1970 the prices had dropped, and the recovery programs were halted, he said.

Plant officials even began processing sewage sludge from the plant after it was found to contain high levels of uranium. Harold Hargan, a 37-year employee who was detailed to the recovery program, said the uranium in sludge came exclusively from the plant's sanitary system, which included lavatories, wash rooms and laundry facilities. "All that uranium was either on workers' clothes or bodies -- or inside their bodies," he said.

Although no formal epidemiological study has been completed for **Paducah**, some workers have long raised questions about what they believe are unusual rates and types of cancers in their communities. Those fears have risen sharply in the wake of reports that plutonium and other highly radioactive metals were also present in the workplace, Key, the union safety officer, says in his statement.

"The majority of current and former workers are afraid that they may have been exposed to substances like plutonium without proper protection and that they will, as a result, be stricken with a fatal disease," Key wrote. "I myself have this fear from my 25 years at **Paducah**."

Hired by the plant's original contractor, Union Carbide, in 1974, Key said he began witnessing safety problems almost immediately. During his first year on the job, he was engulfed in radioactive smoke after helping dump drumloads of highly flammable uranium metal into an open pit on the plant's grounds.

"The uranium spontaneously ignited . . . and a pungent and irritating smoke enveloped us," said Key, an hourly worker and officer in the local chapter of the Paper, Allied-Industrial, Chemical and Energy Workers International Union. "To my knowledge this dumping ground has never been characterized."

Workers inside the building where powdered uranium was processed were not required to wear respirators, even though the dust at times was so thick it was difficult to see, Key said.

"I recall having to hold my breath to get through clouds of unknown fumes," he said.

In the 1970s, Key would observe workers cleaning up spills of "black powder," which he later learned consisted of recycled uranium from the government's plutonium production facilities. Not until 1990 did plant officials tell the union that the powder contained small amounts of "transuranics" -- a class of highly radioactive metals that includes neptunium and plutonium. Plutonium is 100,000 times more radioactive per gram than uranium.

Key cited a 1952 Union Carbide memo that suggests the need for special labeling of "plutonium contaminated locations."

Years later, in a 1985 memo, Energy officials advised **Paducah's** managers to test workers who handled the recycled uranium for exposure to transuranics. Key notes, "We have no evidence that these recommendations were acted upon or communicated to the workforce."

In 1991, Martin Marietta Energy Systems, which was now operating the plant, began a voluntary program to test workers for exposure. Thirty workers participated, but the test results were "invalidated" due to what the company termed "concerns and discrepancies" regarding the testing lab, Key said.

He said the company refused to release the results to the union, explaining in a memo that "management is reluctant to release this information due to concerns about how it would be used."

Concerns about public reaction were echoed in the 1960 memo from H .D. Bruner, a physician, to Union Carbide and Atomic Energy Commission medical officials. He expressed concerns about relatively large

amounts of neptunium in recycled uranium delivered to the **Paducah** plant. "But I am afraid the policy of the plant is to be wary of the unions and any unfavorable public relations," the memo states.

Although workers in some buildings were furnished with gas masks, Bruner said the respirators were not used and did not appear to be effective against the tiny uranium particles in the air.

"The human factor in handling [the recycled material] should be considered a source of potential exposure," he wrote.

LOAD-DATE: September 21, 1999

LANGUAGE: ENGLISH

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The Washington Post

October 21, 1999, Thursday, Final Edition

Energy Dept. Faults Paducah Contractors; Deficient Plant Hazard Warnings Cited

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A02

LENGTH: 540 words

The Energy Department, ending the first phase of its investigation of the troubled **Paducah**, Ky., uranium plant, faulted contractors yesterday for failing to properly warn the public about radioactive hazards, including "relatively high" levels of plutonium in ditches outside the plant.

Investigators zeroing in on the plant's current environmental and safety problems also pointed to the "theoretical" risk of an accidental nuclear chain reaction at the plant, citing large quantities of "uncharacterized" radioactive material stored there.

The problems were among dozens uncovered in the first of two department probes of current and past hazards at the **Paducah** Gaseous Diffusion Plant, one of two U.S.-owned facilities that produce enriched uranium. Yesterday's report gives the plant's managers 30 days to come up with a plan for addressing problems ranging from lax safeguards to radioactive seepage from a half-mile-long pile of contaminated scrap metal.

"We have concerns about exposure, but we don't think any of them reach the level of imminent danger," said David Michaels, assistant energy secretary for environment, safety and health.

Michaels promised quick action to eliminate any risk of a "criticality"--an inadvertent nuclear reaction similar to last month's serious accident at the Tokaimura uranium plant in Japan. Agency officials said the chances of such a reaction were remote.

Energy Secretary Bill Richardson launched investigations at **Paducah** in August after reports of worker exposure to and sloppy handling of radioactive waste. Preliminary findings released last month faulted the agency and its contractors for weaknesses in identifying and cleaning up contaminants--hazards that included highly radioactive plutonium.

Yesterday's report contained the first results from independent laboratory tests that confirmed the presence of plutonium and other radioactive metals in ground water as well as in ditches and streams outside the plant fence. The agency's tests found new areas of off-site contamination and also documented "relatively high levels" of plutonium, thorium and cesium in two ditches that feed a tributary of the Ohio River.

The contaminated areas had not been properly controlled or marked with signs, the report said. Plutonium can cause cancer if inhaled in minuscule amounts.

Although plant officials discovered off-site plutonium contamination in the early 1990s, most public reports listed plutonium levels at near zero. The discrepancy has been a sore point with lawmakers who have grilled former contractors as part of their own **Paducah** probe.

Rep. Thomas J. Bliley Jr. (R-Va.), chairman of the House Commerce Committee, expressed dismay yesterday after one former contractor, CH2MHill, insisted in a letter that the plutonium problem was contained within the plant's security boundaries.

"For many years the **Paducah** community has been plagued by misinformation and outright deceit," Bliley said. He vowed to press for "full accountability and the highest level of safety" for **Paducah** workers and residents.

Energy Department investigators pointed to the "theoretical" risk of an accidental nuclear chain reaction at the **Paducah** Gaseous Diffusion Plant.

LOAD-DATE: October 21, 1999

LANGUAGE: ENGLISH

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The Washington Post

December 23, 1999, Thursday, Final Edition

Plant Hid Risk From Workers; Paducah Bosses Knew Some Had High Radiation Levels

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 2883 words

DATELINE: PADUCAH, Ky.

One worker collapsed on the factory floor, his body ravaged by lymphoma. Two others died within 105 days of different forms of leukemia. By the time Challie Freeman came down with a rare bone disease in the fall of 1979, questions had morphed into suspicions:

Was something at the U.S. government's uranium plant making workers sick?

One possible answer--radiation exposure--seemed persuasive to Freeman's doctor. He fired off a letter to the **Paducah** Gaseous Diffusion Plant. "It is imperative," he wrote, "that we learn as soon as possible the extent, nature and type of radiation to which he was exposed."

The reply--"no significant internal exposure"--was brief and emphatic. It was also false.

While the plant was denying knowledge of significant hazards to Freeman's doctors, confidential records showed the opposite: Freeman had tested positive multiple times for exposure to radioactive uranium and had even been restricted from working around uranium, an internal company memo shows.

In August, The Washington Post reported that **Paducah** workers were unwittingly exposed to highly radioactive plutonium and neptunium on the job from the 1950s to the 1970s. A subsequent four-month Post investigation has found additional evidence that plant officials kept employees uninformed about chemical and radiation hazards. In some cases, such as Freeman's, the plant withheld accurate medical information on radiation exposure--even while it privately tracked cancer deaths among workers.

A limited review of **Paducah** employee death records also turned up rates of leukemia among workers that appear higher than normal, based on government mortality statistics. Epidemiologists who reviewed the findings described the data as intriguing but cautioned that a much more intensive scientific study was needed, involving investigators with full access to employee records and medical histories, to establish whether a pattern existed. Such a study has not been done at **Paducah**.

The 48-year-old uranium plant is the subject of an Energy Department investigation into worker health and safety practices. Union Carbide Corp., which allowed its operating contract to expire in 1984, declines to comment, saying its **Paducah** managers are long gone from the company. Energy Secretary Bill Richardson, whose agency owns the facility, has apologized for the failure to disclose plant hazards and has promised compensation for sick workers.

Any outside attempt to review medical issues at **Paducah** is complicated by a lack of complete information. The Energy Department, citing privacy laws, declined to release lists of workers and their assignments. But The Post obtained company rosters listing more than 200 **Paducah** employees who were hired to work in some of the plant's most dangerous uranium-handling areas between 1951 and 1971. Scores of death certificates were examined and more than 120 surviving employees who worked in those areas were interviewed.

Professional help was retained to categorize deaths, and a software program developed by the National Institute for Occupational Safety and Health was used to compare incidences of cancer to national rates.

The result: The incidence of leukemia at **Paducah** appeared elevated, according to epidemiologists who reviewed the data. Of the 211 people on the lists who could be located--about 13 percent of the plant's work force in an average year--10 died of cancers of the blood and lymphatic system, including six of leukemia. By comparison, government mortality statistics suggest that only a single leukemia death would be expected in a group of adults of that size.

Cancer clusters are difficult to document, and cancers are not necessarily caused by radiation. Some studies at other Energy Department plants have suggested links between workplace hazards and cancers; others have not. Whether chronic exposure to low doses of radiation causes cancer has been hotly debated for decades.

Still, several epidemiologists who reviewed the results said the unusual incidence of leukemia and other rare diseases suggests the need for a closer look.

"The findings are interesting and noteworthy and are grounds for a more complete study of the question," said David Richardson, an epidemiologist who is researching radiation health effects for the World Health Organization.

Senior Energy Department officials said the findings highlight a major policy dilemma for the agency: whether to pursue more studies or to expand pilot programs to directly compensate workers who get sick. Yesterday, the department announced that it had shifted spending priorities in its fiscal 2000 budget to increase money for health studies and medical monitoring at **Paducah**. However, officials worry that studies may not be the right approach.

"Epidemiology is not going to answer the questions precisely enough," said David Michaels, an epidemiologist and the assistant energy secretary for environment, safety and health.

Energy Secretary Richardson said he has proposed legislation to change the way his agency deals with its sick workers.

"Instead of fighting claims, we're actually helping workers without the debate about the rates of illness," he said. "The legislation we sent to Congress takes the burden of proof off those who are sick."

Documents obtained in October under the Freedom of Information Act show that Union Carbide began tracking the repeated cancer cases in its work force in the 1970s.

The first to die was Wade McNabb, a 20-year veteran who succumbed to chronic leukemia in 1972. That same fall, another worker died of multiple myeloma, a bone marrow disease.

Alton Henson died of leukemia in 1976. Two years later, three workers--Arvil Bean, Leonard Lindblad and David Wilson--died of leukemia or bone marrow diseases within a span of six months.

By 1982, the company had counted 13 fatal cancers of the blood or lymphatic system out of a relatively stable work force that ranged from 1,200 to 2,000 people. The list appears on a single sheet of paper--stamped "confidential" and copied to senior plant officials--identifying workers sometimes by initials. How Union Carbide intended to use the list is unclear, but the plant's records show no attempt by contractors to investigate possible links between the deaths and workplace hazards.

Meanwhile, plant workers were told everything was fine. When Challie Freeman fell ill with his deadly bone marrow disease at 59, plant officials offered a lot of sympathy but little truth, family members say.

Responding to a hematologist's queries about possible radiation exposure, a plant physician in a letter described Freeman as a "very fine man" whose exposure to hazardous materials had been near zero. Medical records produced by the plant showed "no significant internal exposure," based on years of weekly urine tests for uranium.

Not until 15 years after his death in 1984 did family members obtain his medical records from the Energy Department and learn the full story: Company tests had indeed found high levels of uranium in his body in the 1950s--so much, in fact, that Freeman once had to be moved to a different work area. His widow, Sue, recalls that he was transferred to a different job in the 1950s after being told simply that his urine was "hot."

Freeman's physician, Nashville hematologist John Flexner, remembered that the company's response "downplayed the exposures."

"They made you think there was no way this could be a case of cause-and-effect," Flexner said. "I guess I was naive to think they were telling the truth."

Union Carbide said that it did not have the ability to respond in the Freeman case because of the 20-year passage of time.

Plant policies required that workers exposed to certain amounts of radiation be moved to other, less hazardous jobs. But new records show this was ignored in some cases in which workers received up to twice the maximum dosage.

One who never got the word was A.B. Burris, a 74-year-old retiree who learned of his past exposures when he asked the Energy Department for his medical files this fall.

"They say I was put on 'strict restriction,' but I never found out about it until weeks ago," he said. "I can tell you they never changed my job or said anything to me about it."

Workers knew even less about potentially deadly plutonium and neptunium that spread through the plant in shipments of recycled nuclear reactor uranium fuel from the 1950s to the 1970s, plant documents show.

Confidential, 40-year-old memos released by the Energy Department in September showed that Union Carbide officials had decided against testing workers for exposure to the radioactive metals because of fears that workers would "use it . . . as an excuse for hazardous-duty pay."

Newly released memos show that senior managers were aware of the plutonium and neptunium problem as early as 1959 but concluded in classified studies that contaminants were not a health hazard because the amounts in each shipment were small--a maximum of 10 parts per billion of plutonium in each uranium shipment.

But over the years, the two metals began accumulating in soil and waste materials.

In a survey of **Paducah** plant buildings conducted in the early 1990s, more than half of the work areas sampled exceeded the plant's safety limits for plutonium and neptunium--in some cases by a factor of 10. A survey of a men's locker room found high levels in shower stalls and even on toilet seats.

Workers did know enough about radiation hazards to formally request additional safeguards.

When Union Carbide decided to stop providing mechanics with coveralls, the plant's union demanded in 1986 that the company take responsibility for "radiation carried into our homes, autos and other areas." Union Carbide denied the request, although in 1975 the union negotiated the right to protective clothing on demand.

The union was less successful in efforts to secure workers' rights to take regular breaks in a radiation-free lunchroom. In a written grievance in 1979, the union said workers "should not have to eat in a contaminated area."

The company denied the request.

Ailing workers in the past have had difficulty proving harm because they lacked accurate monitoring data, David Fuller, president of the **Paducah** chapter of the Paper, Allied-Industrial, Chemical & Energy Workers Union, testified at a Senate hearing on **Paducah** in October.

While applauding government promises to financially aid ailing **Paducah** workers, Fuller and other union officials called for a compensation program for all workers that "reverses the burden of proof onto the government" while expanding medical monitoring for those most at risk.

"Monitoring is imperative," Fuller said, "but without any other remedy, monitoring is simply a process to watch people get sick and die."

Director of computer-assisted reporting Ira Chinoy, database editor Sarah Cohen, and staff researchers Alice Crites, Nathan Abse and Nancy Shiner contributed to this report.

Challie Freeman

Job: Cascade worker, security officer

Age at death: 64

Illness: Myelofibrosis

Did radioactive exposure on the job make Challie Freeman sick? His doctor suspected a link, but plant managers said no. Asked by doctors to provide details of Freeman's work history, a Union Carbide memo described light exposure to the skin but "no significant internal exposures."

Fifteen years after Freeman's death, the family obtained confidential plant memos that showed the opposite: Freeman had been restricted from uranium work in the 1950s because of "repeated positive urine samples" for radioactive uranium. The uranium remained high after weekends away from the job, the memo said.

Freeman became sick from a slowly progressing bone marrow disease in the 1970s and died in 1984. Near the end his weight plummeted from 190 pounds to 100 and he was in constant pain, said his wife, Sue, who quit her job to care for him. 'We always wondered if it was the plant that made him sick,' she said. 'Now I have no doubt.'

David R. Wilson

Job: Cascade operator

Age at death: 54

Illness: Lymphosarcoma

Like most **Paducah** workers, Wilson said little about his job, though sometimes he'd confide to his wife when he was exposed to unusually high levels of radiation. "He would say just he had been 'hot,'" remembers his widow, Winnie. One day in early 1978 he was rushed to the hospital after becoming ill at work. Tests confirmed he suffered from a form of lymphoma, which ended his life just four months later.

Wade McNabb

Job: Cascade operator

Age at death: 55

Illness: Leukemia

The doctor's eyes spoke volumes. After breaking the awful news to McNabb -- a diagnosis of leukemia at age 40 -- he asked the ailing man where he worked. The reply, "Atomic Energy Plant, **Paducah**," prompted a nod and a knowing look. "Oh, yes," the hematologist said, "I'm treating several patients from Oak Ridge," **Paducah's** sister plant in Tennessee. McNabb began treatment and returned to the same job to preserve his salary and health benefits. "We didn't know what else to do," Dove, his widow, says. "You couldn't even talk about it at work, not if you wanted to keep your job."

Jack Owens

Job: Cascade operator, emergency crew

Age at death: 36

Illness: Rare blood/bone marrow disease

Owen's emergency crew job brought him into some of the most dangerous areas to clean up spills of chemicals and radioactive material. "Some days he'd come home with chemical burns at every orifice," remembers his widow, Norma Rebik. "Later, when his doctor asked what he had been exposed to, he said, 'Everything.'" In 1961, at 36, he died of a form of thrombocytopenia, a condition sometimes linked to environmental exposures. "He went from perfectly well to dead in a week," his widow said.

Leon Lindblad

Job: Cascade supervisor

Age at death: 62

Illness: Leukemia

An avowed believer in **Paducah's** "mission," Lindblad was ambivalent about whether the plant posed risks. "He'd say the radiation levels were not that high," remembers his widow, Virginia, and yet, he always "took his shoes off at the door because he didn't want to bring that stuff inside the house." Lindblad's suspicions multiplied after he became sick with leukemia. He drew up a list of accidents and dates. "If I die, you can sue them," Lindblad explained to his wife, "because they're the ones who did this to me." Virginia never got the chance: On a Friday in 1976, Linblad stashed the list in his desk, never suspecting that he would become gravely ill over the weekend. He never returned to work.

C. Arvil Bean

Job: Process maintenance

Age at death: 64

Illness: Leukemia

Bean's retirement plans included firing up the '49 Cadillac he was restoring and taking his wife on a trip to the Dakotas, where he was once stationed with the Army. Those ambitions faded the day he was diagnosed with acute leukemia at age 55. He replayed in his mind the times he had been exposed to radiation -- like the day he worked 16 hours cleaning up radioactive debris from a 1962 explosion. Despite his illness, Bean clung to his vacation dreams to the end. "Every few days he'd go out there and crank up that old car," daughter Nita said, "even in the snow."

Charles Edward Harris

Job: Machinist

Age at death: 62

Illness: Cancer, multiple organs

For 25 years, Harris worked in the plant's machine shop, grinding down and repairing the nickel-plated pipes and gear used to convert uranium powder to nuclear fuel. Unknown to Harris and most other workers at the time, the metals were contaminated with small amounts of plutonium and neptunium, radioactive elements far more dangerous than ordinary uranium. His son, David, may have been exposed to the same hazards during summer jobs at the plant: College students mowed grass and cleaned up pond sludge in areas now known to be contaminated with the highly radioactive metals. "At the time they told us point-blank there was nothing there but uranium," David said.

Eugene Ragland

Job: Chemical operator

Age at Death: 49

Illness: Lung cancer

The accident and Ragland's death will always be connected, at least in the mind of his widow, Marie. She still remembers his worried voice the night in March 1978 when he called to say he wouldn't be coming home from work. Ragland had been exposed to radiation during a mishap and had been asked to stay overnight for testing. Four months later, a separate medical test found "something wrong" with his blood, she said -- a result that led to the discovery of a rapidly spreading cancer in his lungs and chest. His death on Aug. 4 came so suddenly that Ragland had little time to ponder his illness, or the possible causes. "He always thought he was safe at the plant," Marie said. "They never let him know differently."

When Challie Freeman got sick, **Paducah** managers claimed he had suffered "no significant" radiation exposure, above, even though years earlier they had restricted his work near uranium, as noted below, because his urine had tested "hot." The body of **Paducah** plant worker Joe Harding was exhumed in November for tests. He had feared that the cancer that eventually killed him in 1980 was caused by radiation exposure.

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LANGUAGE: ENGLISH

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Bomb Part Storage at Ky. Plant Disclosed; Nuclear Agency Is Told of Hazards In Secret Program

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 1290 words

More than 1,600 tons of nuclear weapons parts reportedly lie scattered around the Energy Department's **Paducah**, Ky., uranium plant, a safety manager informed regulators yesterday in a new disclosure of potential hazards unknown to workers or civilian plant supervisors.

Some of the bomb parts are stored in above-ground shelters and could pose a risk of exposure or even an accidental nuclear reaction at the plant, if the components are contaminated with radioactive substances such as enriched uranium and plutonium, the official reported in a signed statement to the federal Nuclear Regulatory Commission.

The U.S. Enrichment Corp. (USEC), the government-chartered private company that now runs the plant, acknowledged yesterday that its senior officials recently discussed the issue with the Department of Energy.

"USEC has been assured that DOE is not aware of any conditions that create a radiological hazard to USEC personnel at the site beyond those already known and controlled," company spokeswoman Elizabeth Stuckle said.

Energy Department officials involved with the country's classified nuclear weapons program apparently were aware of the shipment of bomb components to **Paducah** over many years, but the department did not until recently inform the plant's civilian overseers and safety officials who were in charge of evaluating threats to workers.

The statement by Raymond G. Carroll, a senior manager of health and safety programs at the plant since 1992, quotes a conversation with another senior civilian plant official who reportedly told Carroll he was worried about the bomb parts after hearing of their existence from a DOE official.

Carroll also said he was told that DOE officials recently began hauling away documents related to weapons dismantlement.

A DOE spokesman confirmed that the department is investigating "classified national security programs" conducted at **Paducah** in the past, along with the Justice and Defense departments.

"This review includes the examination of potential worker exposures and any safety, health and environmental issues associated with these national security programs," the official said.

Carroll's statement was obtained by The Washington Post yesterday as the government was making its most detailed acknowledgment to date of historically unsafe practices at the **Paducah** Gaseous Diffusion Plant, a hulking industrial complex that has produced enriched uranium for nuclear bombs and power plants since 1952.

The 77-page DOE report faults a "climate of secrecy" for keeping workers and neighbors uninformed and unprotected while radioactive contaminants spread through factory buildings and surrounding areas. A few volunteers were deliberately exposed to uranium in a series of previously undisclosed human experiments, the report said.

The DOE report does not mention nuclear bomb parts. A worker lawsuit against plant contractors last summer revealed that some weapons parts had been melted down at the plant to recover gold and other metals. But details of the scope and purpose of the bomb program have remained shrouded in secrecy.

Both DOE and Justice are investigating whistleblower allegations of improper handling of radioactive waste at the plant.

Yesterday's disclosure by Carroll suggests the bomb program may have introduced yet another unknown hazard at a facility where workers had been lulled by assurances that their jobs were virtually risk-free.

"Personnel could conceivably encounter highly enriched uranium or plutonium (or even tritium) without even knowing it," said Carroll, a 30-year veteran of the nuclear safety field who now works for USEC. Tritium is a radioactive component of the hydrogen bomb.

Carroll, in a five-page memo filed with NRC and DOE officials, said he learned about the bomb parts from a senior USEC supervisor, radiation protection manager Orville Cypret. Carroll wrote that Cypret said he learned about the bomb parts from Dale Jackson, the former DOE manager of the **Paducah** site.

Carroll said Cypret told him that 1,600 tons of weapons components had been shipped to **Paducah** since the 1950s. Although some parts were buried, others were dispersed in various storage areas across the sprawling complex, according to Carroll's statement.

Cypret became alarmed after a Justice Department investigator told him "he would not ask about a 'classified tritium project' or past nuclear weapons handling at **Paducah**," Carroll wrote in his statment.

In keeping with security policy, the weapons parts were not labeled, though "DOE thinks it knows where most of the material is," Carroll wrote.

Cypret and Jackson did not return phone calls from The Post. A Justice Department official in Louisville said he could not comment on the department's investigation into whistleblower complaints at the plant.

Carroll said he was told that "large quantities" of plutonium and highly enriched uranium had been brought into the plant, and "not just in reactor tails." Last summer, following allegations by current and former workers, DOE acknowledged for the first time that radioactive plutonium and neptunium had entered the plant in uranium "tails," recycled uranium metal from military reactors that produced plutonium.

Carroll said in his statement that Cypret said a team of DOE officials had been assembled to investigate the matter but their findings "would not be voluntarily shared" with the plant's civilian managers. Instead, as records relating to the bomb program were found, they were held in a special vault for classified material.

"Someone from [the DOE's Oak Ridge, Tenn., site] would drive down each night to pick them up," Carroll wrote, quoting Cypret.

Carroll said the new disclosures had left him deeply concerned about the safety of the plant's workers. Besides the risk of radioactive contamination, improperly stored nuclear material could trigger a lethal "criticality," an accidental nuclear reaction.

"A decision had apparently been made that national security would take precedence over personnel radiological safety," Carroll wrote. "I find this situation to be unconscionable."

The risk posed by weapons parts could range from high to minimal, depending on the materials and how they are stored.

DOE's report on historical practices at **Paducah** wraps up the second of two major probes ordered by Energy Secretary Bill Richardson in August. DOE officials described it as one of the most thorough in the department's history.

The report concludes that the plant's lapses in worker safety in many ways reflected the culture of the time. "The Cold War was a reality," and federal oversight of the plant "was primarily directed at cost, schedule and production," the report said.

Although the "intention to protect workers was apparent," plant managers frequently failed to meet even the relatively lenient safety and environmental standards of the day, the report states.

The risks posed by plutonium and neptunium were "neither fully understood or appreciated," the report states. "The presence of these materials, the increased risks involved and the rationale for additional controls was not shared with workers."

In addition, radioactive and chemical wastes were routinely discharged into the water and air. Investigators documented nighttime smokestack emissions--dubbed "midnight negatives"--involving tens of thousands of pounds of uranium dust and smoke.

Richardson said the findings underscore his efforts to win compensation and other aid for ailing workers.

"I'm going to continue to be up front with the **Paducah** workers and the community about environmental, safety and health conditions at our sites during the Cold War," he said.

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LANGUAGE: ENGLISH

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RulemakingComments Resource

From: mary eddy <maryjensen@copper.net>
Sent: Wednesday, June 24, 2015 3:49 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules (NRC-2011-0012)

We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste.

I have some significant concerns about the proposed revisions to Part 61.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period.

2. i am concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream.

3. I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered.

This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling.

4. I request that the NRC classify Depleted Uranium. It makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years.

I urge the NRC to finally classify this waste accurately to inform ongoing disposal efforts.

Thank you for the opportunity to comment.

mary eddy
776 emerson ave
salt lake city, UT 84105

RulemakingComments Resource

From: Bob Brister <bbrister@q.com>
Sent: Wednesday, June 24, 2015 5:10 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules (NRC-2011-0012)

As a resident of Salt Lake City, I do a lot of recreating in the West Desert of Utah. In am very unhappy that the West Desert has become a dump for the nation's toxic and radioactive waste.

Please make sure that your proposed revisions allow Utah to maintain its reliance upon classification tables to enforce its long-standing ban on Class B&C wastes. Utah must have the right to keep hotter wastes out of our state.

I am very concerned that the new regulations irresponsibly reduce the compliance period. At first staff, chose a 10,000 year period, but that's been reduced to only 1,000 years. What could be more immoral than to subject future generations for thousands of years to the threat of radioactive waste exposure?

We live in an age of state terror and retail-scale terror. A very wide range of intruder scenarios to be considered. New types of threats that may develop in the future must be considered.

Because of depleted uranium's qualities that cause it to grow more radioactive for 2.1 million years, depleted uranium needs to be reclassified to reflect its most radioactive stage.

It is tragic that depleted uranium continues to be produced. Its production should be ended and existing waste should be held in secure, retrievable storage at the point of production.

Thank you for the opportunity to comment.

Bob Brister
1102 S 800 E #A
Salt Lake City, UT 84105

RulemakingComments Resource

From: Suzanne Stensaas <suzanne.stensaas@hsc.utah.edu>
Sent: Wednesday, June 24, 2015 5:37 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules: Docket ID NRC-2011-0012

Please listen to the experts who study the effects of radiation and its life span. I am a Utah resident, but care should be given to our entire country not just here. Why is the government listening to lobbyists for the industry and not scientific data and advisers?

Suzanne Stensaas
2460 E Lynwood Dr
Salt Lake City, UT 84109

RulemakingComments Resource

From: Richard Kanner <richard.kanner@hsc.utah.edu>
Sent: Wednesday, June 24, 2015 5:41 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules: Docket ID NRC-2011-0012

If you permit Energy Solutions to bury depleted uranium in the west desert of Utah I and my fellow residents of Salt Lake City will be downwind from the dust from this dangerous material. It may start out as being underground but changing lake levels can bring it to the surface.

We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste, especially since so much of that waste is stored here.

I have some significant concerns about the proposed revisions to Part 61, but first wanted to express my support for one part: The proposed revisions appear to allow Utah to maintain its reliance upon classification tables, to enforce its long-standing ban on Class B&C wastes. Thank you for including that in the final rules. Utah must have the right to keep hotter wastes out of our state.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.

2. We are concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia.

4. Finally, I request that the NRC classify Depleted Uranium. As a unique waste stream that continues to grow more radioactive for 2.1 million years, it makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years. I urge the NRC to finally classify this waste accurately to inform ongoing disposal efforts.

Thank you for the opportunity to comment.

Richard Kanner
2460 Lynwood Dr.
Salt Lake City, UT 84109

RulemakingComments Resource

From: Steven Haycock <jelliclespcat@hotmail.com>
Sent: Wednesday, June 24, 2015 9:43 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules: Docket ID NRC-2011-0012

It's discouraging to hear that the US Government seems to be siding with profiteers (like Energy Solutions) who will poison the State of Utah forever for their own short-term gain. Please do not weaken or compromise your regulations and traditions - stand up for the health of the people.

Thank you for the opportunity to comment.

Steven Haycock
136 Braewick Rd
Salt Lake City, UT 84103

RulemakingComments Resource

From: SUSAN MICHETTI <SUNLIGHTRISING@GMAIL.COM>
Sent: Wednesday, July 08, 2015 12:44 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules: Docket ID NRC-2011-0012

I am very interested in the rules that the NRC makes to govern low level nuclear waste, especially since so much of that waste ends up in our backyards.

I have some significant concerns about the proposed revisions to Part 61, but first wanted to express my support for one part: The proposed revisions appear to allow states to maintain their reliance upon classification tables, for example to enforce bans on Class B&C wastes. Thank you for including that in the final rules. States must have the right to keep hotter wastes out, if they violate state laws.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.
IT IS IRRESPONSIBLE TO NOT USE THE FULL TIME SPAN IN WHICH THE RESULTS OF DECISIONS MADE NOW WILL ADVERSELY IMPACT THE FUTURE GENERATIONS. IT IS SAYING TO FUTURE GENERATIONS THAT IF YOU CANNOT BEAR CHILDREN AND ARE STERILE BECAUSE WE WERE NEGLIGENT, TOO BAD AS IT IS IRREVERSIBLE. THAT COULD HAPPEN TO THE ENTIRE POPULATION OF HUMANS AND WIPE HUMANITY OFF THE FACE OF THE EARTH DUE TO RECKLESS, CARELESS, DECISIONS MADE WITH HUBRIS AND LACK OF SUFFICIENT CONCERN FOR ALL LIFE NOW AND IN THE FUTURE. STERILITY IS A KNOWN FACT AFTER 4 GENERATIONS. WE HAVE YET TO SEE THE IMPACTS OF THREE MILE ISLAND, CHERNOBYL, AND FUKUSHIMA ON HUMAN REPRODUCTION, AND THE EFFECTS OF SMALLER EXPOSURES HAS ALSO NOT BEEN SUFFICIENTLY STUDIED FOR REPRODUCTION SAFETY INTO FUTURE GENERATIONS AFTER GENETIC DAMAGE. HOWEVER, IT IS PREDICTABLE, JUST NOT FULLY OBSERVED YET IN HUMANS DUE TO THE TIMEPERIOD REQUIRED TO PASS THAT EXISTS INTO THE FUTURE, BUT IT HAS BEEN OBSERVED IN ANIMAL STUDIES.

2. We are concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models. STUDIES ARE NOT SCIENTIFIC AND NOT VALID UNLESS THEY ARE VIGOROUS, THOROUGH, REPLICABLE, AND PEER REVIEWED. THESE ARE THE TYPE OF STUDIES THAT RESPONSIBLE AGENCIES DEALING WITH ANY TYPE OF TOXIC OR ANY TYPE OF CHEMICAL THAT MAY POSE DANGER TO LIVING ORGANISMS AND HUMANS, LIKE RAD WASTE ABSOLUTELY DOES, MUST REQUIRE. ANYTHING LESS IS RECKLESS, IRRESPONSIBLE, AND UNSCIENTIFIC, AND DOOMING OUR ENVIRONMENT AND VIRTUALLY ALL OF ITS LIVING ORGANISMS, INCLUDING HUMANS. STUDIES FUNDED BY THOSE WHO PROFIT FROM BUSINESSES RELATED TO THE STUDIES TEND TO BE NOTORIOUS FOR FLAWED SCIENCE AND UNREPLICABLE FINDINGS AS WELL AS TOO NARROW FINDINGS THAT DO NOT PERTAIN THE COMPLETE OVERALL CONSEQUENCES OF EXPOSURES TO THEIR WASTE PRODUCTS. ANYTHING LESS THAN ACTUAL SCIENTIFIC STUDIES FUNDED BY INDEPENDENT SOURCES WITHOUT DEEP ARMS TO REACH INTO THE RESULT OR TO IMPACT THE FINDINGS IS UNACCEPTABLE WHEN IT COMES TO ANY TOXIC, PARTICULARLY NUCLEAR WASTE.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia. FULL CONSIDERATION OF PLANNED TERRORISM, CHILDREN'S UNMONITORED ACTIVITIES, AND HOMELESSNESS AND MENTAL ILLNESS MUST BE CONSIDERED, FOR EXAMPLES. THE IMPACTS OF MAJOR PLANETARY CATASTROPHES MUST BE CONSIDERED, SUCH AS CLIMATE CHANGE, FLOODING, GLACIERS, VOLCANOES, EARTHQUAKES, ASTEROID AND OTHER OUTER SPACE INTRUSIONS AND HITS, FOR EXAMPLES.

4. Finally, I request that the NRC classify Depleted Uranium. As a unique waste stream that continues to grow more radioactive for 2.1 million years, it makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years. I urge the NRC to finally classify this waste accurately to inform ongoing disposal efforts. CALLING RAD WASTE LOW LEVEL, MEDIUM LEVEL, OR HIGH LEVEL ARE ARBITRARY AND MISLEADING AND CONFUSING DESIGNATIONS, BECAUSE VIRTUALLY ALL NUCLEAR WASTE HAS DECAY PRODUCTS WITH VARIOUS DIFFERENT HALF-LIVES. THESE HALF-LIVES CAN CONTINUE DOWN A CHAIN OF RADIOACTIVE DECAY EVENTS THAT CAN EXTENT HUNDREDS, THOUSANDS, AND MILLIONS OF YEARS WITH CERTAIN RADIOACTIVE MATERIALS. IN FACT VIRTUALLY ALMOST ALL OF IT DOES LAST MUCH LONGER THAN MOST PEOPLE RECOGNIZE. THE LENGTH OF RADIOACTIVITY AND ITS DAMAGE TENDS TO BE SCIENTIFICALLY UNDERESTIMATED IN MOST GOVERNMENT ANALYSES, AND THIS REQUIRES CORRECTIONS IF AGENCIES ARE TO BE RESPONSIBLE AND SUFFICIENTLY ACCURATE.

ALL EXPOSURES TO RADIOACTIVITY CAUSE DAMAGE TO LIVING ORGANISMS AND TO HUMANS. IT IS A QUESTION OF HOW MUCH DAMAGE. THE DAMAGE IS REPRESENTED STRAIGHTFORWARD BY A LINEAR LINE THAT DIRECTLY CORRESPONDS TO EXPOSURE AND TO LENGTH OF TIME OF THAT EXPOSURE. THIS IS STRAIGHT SCIENCE OF THE MOST PREDICTABLE TYPE. THE MEMBRANES ON THE RED BLOOD CELLS APPEAR TO SHOW THE FIRST LINE OF DAMAGE IN HUMANS AND WARM-BLOODED ORGANISMS. ANY EXPOSURE, HOWEVER BRIEF, SHOWS SOME DEFORMITY TO THE MEMBRANE ON THE RED BLOOD CELLS. THIS IS UNDISPUTED MEDICAL SCIENCE. THE QUESTION IS HOW LONG DOES IT TAKE AN INDIVIDUAL'S IMMUNE SYSTEM TO REPAIR THE DAMAGE AND IF IT CAN REPAIR ALL THE DAMAGE. HEALTHIER ORGANISMS MAY BE ABLE TO REPAIR THE DAMAGE FROM VERY SHORT EXPOSURES. OLDER ORGANISMS AND VERY YOUNG ORGANISMS AND THOSE ALREADY CHALLENGED WITH OTHER PROBLEMS MAY NEVER RECOVER AND MAY HAVE SHORTENED LIFE SPANS AS A DIRECT RESULT OR OTHER CHALLENGING MEDICAL PROBLEMS, SUCH AS THYROID MALFUNCTIONS AND THYROID CANCER OR LEUKEMIA OR STILL BIRTHS, ETC. THESE ARE SCIENTIFIC AND MEDICAL FACTS THAT MUST BE CONSIDERED AND PROTECTED SUFFICIENTLY FROM NEGLIGENT AND IRRESPONSIBLE EXPOSURES TO THE GENERAL PUBLIC, TO WORKERS, AND TO SCIENTISTS AND OTHERS.

Thank you for the opportunity to comment.

SUSAN MICHETTI
605 SHEILA ST
MT HOREB, WI 53572

RulemakingComments Resource

From: Deb Olivier <Debdayolivier@gmail.com>
Sent: Thursday, July 09, 2015 9:36 AM
To: RulemakingComments Resource
Subject: [External_Sender] My comment on Waste Rules: Docket ID NRC-2011-0012

Utah's number one business is tourism. This is NOT compatible with being the world's nuclear waste dump. Energy Solutions has tried to accept waste from Europe!

Skiers and outdoor enthusiasts are not interested in traveling long distances to a dump site for their vacation. We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste, especially since so much of that waste is stored here.

I have some significant concerns about the proposed revisions to Part 61, but first wanted to express my support for one part: The proposed revisions appear to allow Utah to maintain its reliance upon classification tables, to enforce its long-standing ban on Class B&C wastes. Thank you for including that in the final rules. Utah must have the right to keep hotter wastes out of our state.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.

2. We are concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia.

4. Finally, I request that the NRC classify Depleted Uranium. As a unique waste stream that continues to grow more radioactive for 2.1 million years, it makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years. I urge the NRC to finally classify this waste accurately to inform ongoing disposal efforts.

Thank you for the opportunity to comment.

Deb Olivier
1941 S Wasatch Dr
Salt Lake City, UT 84108

RulemakingComments Resource

From: Nancy Halden <nfhalden@gmail.com>
Sent: Thursday, July 09, 2015 10:10 AM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules: Docket ID NRC-2011-0012

As you might know, Utah has one of the youngest populations of any state, as well as a history of people who were downwind of nuclear fallout and suffered the consequences. These two factors make us vigilant to the health implications of nuclear storage. We in Utah are very interested in the rules that the NRC makes to govern low level nuclear waste, especially since so much of that waste is stored here.

I have some significant concerns about the proposed revisions to Part 61, but first wanted to express my support for one part: The proposed revisions appear to allow Utah to maintain its reliance upon classification tables, to enforce its long-standing ban on Class B&C wastes. Thank you for including that in the final rules. Utah must have the right to keep hotter wastes out of our state.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.

2. We are concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia.

4. Finally, I request that the NRC classify Depleted Uranium. As a unique waste stream that continues to grow more radioactive for 2.1 million years, it makes no sense this has been arbitrarily lumped into the Class A category -- with waste that's only hazardous for a few hundred years. I urge the NRC to finally classify this waste accurately to inform ongoing disposal efforts.

Thank you for the opportunity to comment.

Nancy Halden
8872 S Silverstone Way
Sandy, UT 84093

RulemakingComments Resource

From: Debbie Don <dbeedon@outlook.com>
Sent: Thursday, July 16, 2015 5:39 PM
To: RulemakingComments Resource
Subject: [External_Sender] Docket ID NRC-2011-0012

July 15, 2015

Regarding – Docket ID NRC-2011-0012

Dear United States Nuclear Regulatory Commission,

I am writing regarding the proposed rule change on Low-Level Radioactive Waste.
I appreciate the opportunity to voice my concerns. However, I am skeptical that the die has already been cast.

I am a concerned citizen of Utah, and want to request you, the Commissioners, to please take a long hard look at the following concerns:

1. **Leaving depleted uranium classified as a Class A waste.**
   a. I do not understand how you as Commissioner's, can let this loophole in the law continue. Class A waste is the lowest level waste classification by the federal government. Class A waste decays away after 100-200 years. Depleted Uranium, by Energy Solutions' own estimate will remain with us and get "hotter and hotter for 2.1 million years." Forever. Forever.

      My fellow Utahns and I urge you to correct this classification error.

      At the June 10, 2015 meeting in Salt Lake City, the NRC representatives stated the NRC "recognized there were other issues that we would need to address and should address, and those issues had to do with trying to address any other waste streams that might come along in the future so that we don't have to continuously revise our regulation for new waste streams."

      My fellow Utahns and I urge you to not disguise depleted uranium as a Class A waste category, a move that everyone knows is an unwise decision, and that your own professional staff has questioned. Please do the right thing.

      Please create a classification that addresses elements that get hotter and hotter, for over 500 years. Risk inform the public of the waste classification tables that

are in the regulation. This new classification would include depleted uranium and "any other waste streams that might come along."

b. To do nothing, at this time, when you know it has been proven that depleted uranium is hotter than traditional Class A waste is negligent. Even our Governor Gary Herbert "has a hunch it's hotter than Class A waste and should be reclassified as something else." Doing nothing sets up the State of Utah for legal cases and will become a drain on our legal system.

Utah Code Ann Section #19-3-103.7 reads:
"No entity may accept in the state or apply for a license to accept in the state for commercial storage, decay in storage, treatment, incineration, or disposal:
(1) class B or class C low-level radioactive waste; or
(2) radioactive waste having a higher radionuclide concentration than the highest radionuclide concentration allowed under licenses existing on February 25, 2005, that have met all the requirements of Section 19-3-105."

Waste hotter than Class A waste is illegal in our State. Without your proactive leadership and preemptive response to federal direction on this waste classification, this issue could be tied up in the Utah court systems for years.
c. To allow this loophole to continue sets up the opportunity for Energy Solutions' to slide depleted uranium into Utah under the radar, while you, the NRC Commissioners drag your feet on classifying depleted uranium correctly once and forever. This creates mistrust among the public for our federal agency that is to regulate and take charge of this issue. Depleted uranium has been on your radar screen since the 1980's. Estimates on the government contracts that Energy Solutions may likely earn range from $15 to $20 million dollars per year.

2. **Requiring that each state issue a Performance Assessment to companies' that want to dispose of depleted uranium.**
   a. This will surely result in consultant companies, across the board, fighting their sides – whether it be for the people of the state, or for the companies that want the very lucrative government contracts to dispose of this very toxic waste.
   b. Please consider that Energy Solutions and their consultants have been going around and around with the state of Utah for approximately five (5) years. To reiterate, it will be the "consultants' wars." And the companies/consultants that have the most money and time to keep back-and-forth consultant reports going - wins. Not only do the tax payers get taken advantage of and exploited, but eventually payola can get in the way and the only ones that profit are the consultants. There is a long history here in Utah, in which Energy Solutions'

once known as Enviro Care bribed Radiation Control Board persons to get their way, and licenses approved. As you must know, the waste industry is a huge mean machine with a lot of money to be made. The federal government needs to dispose of over 750,000 metric tons of depleted uranium. Allowing Energy Solutions' to accept depleted uranium before you classify depleted uranium as a waste hotter than B or C class waste is allowing the cart before the horse.

c. As discussed in the SLC meeting, the foxes will pretty much be guarding the hen house. As referenced in the SLC discussion, "you have made an elaborate calculation system analyses that is done by the same people who will receive the waste and profit from it, and all they have to do is carry out some equations. Then you guys see if the equations look right, and then they can pretty much put any waste into these disposal sites that they want, and there will never be any consequences that they have to bear.

d. This system of every state having a different performance assessment process with different local requirements, different local storage conditions, different local climate controls, different local environmental demands, different intruder scenarios, different control procedures, different on and on and on. Every state will have different requirements and laws/statues to follow.

e. Another example of the fox guarding the hen house was discussed in SLC on June 10, 2015. NRC staff stated the existing regulation does not require an intruder assessment. It was stated, "So, that is the key part that the waste streams that are significantly different than what was analyzed in the early 1980's you had – somebody has to do a new intruder assessment, whether it's the **regulator or the licensee**. And **in these "proposed regulations, it is the licensee** that is going to perform that analyses."

3. Burying depleted uranium in a shallow grave approximately 10 feet underground, on top of a water table, is sound reasoning for millions of years.

a. This just doesn't pass the smell test. Don't let this come back and haunt your legacies, don't go against what your own experts have found and documented. Sheer ignorance, coupled with poor government oversight and pure-old greed, is often a recipe for disaster. One of the worries at Clive, Utah is site abandonment. The hedge fund that now owns Energy Solutions' could flip the site after receiving government contracts. New owners may be foreign and not grasp their responsibilities due to the lack of regulation and oversight. There are so many stories of waste, contamination and destruction of people's lives. Ten (10) feet is the height of a professional basketball standard. Love Canal, Three Mile Island, and our own Utah Down Winders.

b. In our June 10, 2015 meeting in Salt Lake City it was stated that your staff was directed by you, the Commissioners, to "conduct an analysis to determine whether or not we believe that the large quantities of depleted

uranium were, in fact, suitable for near surface disposal. … Our analysis showed us that it was, provided certain – under certain conditions. …we also recognized there were other issues we would need to address and should address, and those issues had to do with trying to address any other waste streams that might come along in the future so that we don't have to continuously revise our regulation for new waste streams. There was considerable direction from the commission direction to us…meaning the five, the five commissioners."

4. **Rulemaking Extension**

a. I would like to request that the NRC extend the rulemaking with additional sections to include:

1. New Classifications for waste that gets hotter over 500 years and also risk inform the waste classification tables that are in the regulation.
2. An extension on the Comment Period and the technical back up documents.

b. Yes, as discussed at the SLC meeting on June 10, 2015, I do believe the NRC – MUST present and offer another rulemaking forum that definitely addresses the specific classification of depleted uranium and also risk inform the waste classification tables that are in the regulation. The states and the public that have depleted uranium anywhere near -they MUST be informed and involved in another rulemaking specific to these issues.

5. **Scope of Analyses** – Compliance period, the protective assurance period, and the performance period and the defense-in-depth protections.

a. It was mentioned in our SLC Meeting, that siting characteristics are in section 61.50 and reference things that are looked at regarding the site. Three of the four topics mentioned are at best questionable regarding the Energy Solutions' site.

1. Is the site going to flood – and Is the water table going to fluctuate? To quote a recent local newspaper article "Most Utahns are familiar with Lake Bonneville that filled the valley of western Utah as recently (geologically) as 15,000 years ago. The Great Salt Lake, Utah Lake and Lake Bonneville are manifestations of a single expanding and contracting lake system that has flooded Clive many times. There can be little doubt that it will happen again. The only question is when."
2. How much seismicity might you have? I hope all of you have heard of the Wasatch Fault.
3. ...I have to mention the fact that the performance assessment timeframe goes from zero to 10,000 years although all data

points to this toxic material being hot for 2.1 million years.

b. As discussed with us in the June 10, 2015 SLC Meeting, Yes, I believe the NRC – MUST present and offer another rulemaking that definitely addresses the specific classification of depleted uranium and also risk inform the waste classification tables that are in the regulation. The public and states that may have depleted uranium anywhere near them, must be informed and involved in **another rulemaking specific to the classification of depleted uranium and also risk inform the waste classification tables that are in the regulations.**

I urge you to please:

Reclassify depleted uranium and require risk information regarding the waste classification tables that are in the regulation.

Stop the Consultant Wars. Let your professional staff do the jobs they were hired to do. Support the recommendations they have made without interfering with their expertise. Do the job you were commissioned to do listen to your own experts.

Consider historical scenarios and model leadership with a proactive direction on this serious issue of depleted uranium disposal.

Extend the rulemaking and comment periods if you need additional studies and information. Do not rush to a judgement that may have long lasting, health-related risks and environmental consequences that may harm others and haunt you.

Look at the overall Clive Utah site, for geological, seismic, and environmental concerns and repercussions.

Please reconsider this rulemaking. Even the NRC experts are uneasy with this proposed rulemaking and guidance document.

Debbie Don
Salt Lake City, Utah

RulemakingComments Resource

From: Robert Cerello <dionor888@yahoo.com>
Sent: Friday, July 17, 2015 3:33 PM
To: RulemakingComments Resource
Subject: [External_Sender] Enter Your Action Subject

Dear Secretary,

Your Action Content
Any weakening, lessening or other negative changes to the already lax rules in place is morally and ethically unacceptable to us as citizens. Is this all extremists have to do with our money and value time--attack regulations designed to shield citizens against corporate. government and extremists' wrongdoing?

Extremism in the defense of crime and vice is no virtue.
End the farce--name this design for what it is and stop it in its tracks. That's why you have powers.
The "radpoison" act should not harm human lives.
I will not permit it--and you should not do so.
thanks for doing the job you were loaned powers to do. Whatever the extremists of both left and right are calling this anti-regulatory idea, I assert that it's radpoison to the rest of us. That's all it can be.

And by the way--please shut down Indian Point, now, before it's too late.

Robert Cerello
8070 Orange Avenue Apt. 705
8070 Orange Avenue Apt. 705
La Mesa, CA 91942

PR-20, 61
80FR16081

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RulemakingComments Resource

From: Linda Andersson <llandersson4@gmail.com>
Sent: Friday, July 17, 2015 3:41 PM
To: RulemakingComments Resource
Subject: [External_Sender] Enter Your Action Subject

Dear Secretary,

There is no good reason to have nuclear energy plants. They create huge amounts of waste that end up in our waters, air and soil poisoning us and our animals and plant life. Solar and wind energy is more than abundant in the US. We're tired of watching explosions happen and kill workers and poison the earth with cancer-causing chemicals while generations later, innocent children are still being born with defects and cancer -- and the only benefactors are profiteers who make their huge profits from this industry. The fluoride they sell to the water industry is sodium fluoride instead of calcium fluoride, which only poisons consumers.

Nuclear power should be stopped altogether. Please work to make that happen.

Linda Andersson
2424 79th Ave NE
Medina, WA 98039

PR-20, 61
80FR16081

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RulemakingComments Resource

From: John Boomer <boomerart62@yahoo.com>
Sent: Friday, July 17, 2015 4:09 PM
To: RulemakingComments Resource
Subject: [External_Sender] New Rules

Please do not weaken the rules for nuclear waste definitions or disposal standards. I live in a uranium mining area of the South west and we are struggling to clean up mining and mill waste. It has been a long and difficult process and trust and faith in the process is essential. Thank you.

RulemakingComments Resource

From: wilkds@optonline.net
Sent: Friday, July 17, 2015 4:33 PM
To: RulemakingComments Resource
Subject: [External_Sender] Don't weaken radioactive waste rules.

It is time to act for the good of our country and our world.

I oppose the proposed 10 CFR 61 changes and ask NRC to make changes in the direction of greater isolation of waste. Radioactive releases and exposure to humans and other species must be prevented, not increased.

I especially reject and ask that you remove the following provisions in your proposal:

No deregulation of radioactive waste waste:
Remove all provisions that would allow nuclear waste to go to regular trash or other unregulated places or into commercial recycling into consumer goods. This approach has been consistently rejected by the American public and explicitly by Congress in the 1992 Energy Policy Act. Delete the existing "§ 61.6 Exemptions" and the proposed addition to "§61.7 Concepts" that would allow deregulating, exempting and releasing radioactive waste and materials from radioactive regulatory control.

No increase in radiation to the public:
Reduce radiation releases: the goal should be to prevent all releases. Reject the proposed change from the current allowable public dose of 25 millirems/year to the higher 25 millirems EDE, 100 millirems EDE, 500 millirems EDE or even more per year.

No "black box" Performance Assessments by dump operators:
Remove all provisions that would allow dump operators to do their own "Performance Assessments" and make "Safety Cases" to claim they can put more kinds of radioactive waste and longer-lasting nuclear waste in shallow land burial trenches. This presents an obvious conflict-of-interest issue, as operators would have a vested interest in a favorable outcome of such assessments.

No preemption of state's authority:
Allow states to continue setting stricter, more protective standards than NRC. Remove the "Level B" compatibility requirement.

Radioactive materials hazardous for 100 years or more should be kept out of burial grounds. Simply labeling various time periods (compliance, performance, protective assurance, etc) and assigning increasing allowable doses does not protect anyone--it simply makes it legal to pollute.

Sincerely,
Doris S. Wilk

PR-20, 61
80FR16081

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RulemakingComments Resource

From: ed christwitz <echristwitz@yahoo.com>
Sent: Friday, July 17, 2015 7:00 PM
To: RulemakingComments Resource
Subject: [External_Sender] Please strengthen radiation standards

Greetings. Please raise the bar on regulations for radioactive waste. The evidence shows we are already getting more cancer from the present levels. Thank you.

RulemakingComments Resource

From: Janie Roman <Janie.Roman@tceq.texas.gov>
Sent: Monday, July 20, 2015 1:02 PM
To: RulemakingComments Resource
Cc: Gallagher, Carol
Subject: [External_Sender] Docket ID NRC-2011-0012
Attachments: letterNRC.pdf; NRC Part 61 comments_TCEQ 7-24-15.docx

On behalf of TCEQ here is our letter and comments regarding the Proposed Revisions to 10 CFR Part 20 and 10 CFR Part 61 for Docket ID NRC-2011-0012.

If you have any questions please contact Mr. Brad Broussard (512) 239-6380 or by email at brad.broussard@tceq.texas.gov .

Thank you,

Janie Roman

TCEQ

512-239-0604

Janie Roman
Texas Commission on Environmental Quality
Intergovernmental Relations
Legislative Coordinator/EA
239-0604
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Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 20, 2015

Secretary, U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Rulemakings and Adjudications Staff

Re: Docket ID NRC-2011-0012

Dear Sir or Madam:

The Texas Commission on Environmental Quality (TCEQ) appreciates the opportunity to comment on the United States Nuclear Regulatory Commission's (NRC) proposed revisions to 10 CFR Part 61 provided in Request For Comments on The Draft Proposed Rule: Low-Level Radioactive Waste Disposal (10 CFR PART 61)(RIN 3150-Al92). TCEQ previously advised NRC staff that comments would be submitted.

Enclosed please find the TCEQ's detailed comments relating to the NRC's proposed revisions referenced above. If you have any questions concerning the enclosed comments, please contact Mr. Brad Broussard of the Radioactive Materials Division, at (512) 239-6380, or at brad.broussard@tceq.texas.gov.

Sincerely,

Richard A. Hyde, P.E.
Executive Director

Comments on Proposed Revisions to 10 CFR Part 20 and
10 CFR Part 61
Docket ID NRC-2011-0012

Overview:

The Texas Commission on Environmental Quality (TCEQ) values the opportunity to provide comments on the Nuclear Regulatory Commission's (NRC) proposed revisions to 10 CFR Part 20 and 10 CFR Part 61. The TCEQ supports the proposed changes to 10 CFR Part 20 and has no comments on those revisions at this time.

The TCEQ supports the proposed revisions to 10 CFR Part 61 requiring technical analyses and the associated compliance period, protective assurance period, and performance period. The TCEQ also supports the proposed requirement for development of waste acceptance criteria based on site-specific analysis. There is further support for conducting an intruder analysis and the related dose/dose target for protection of human health. Further, the TCEQ supports identification and evaluation of features, events, and processes (FEPs) and a demonstration of defense-in-depth through engineering design and site characteristics.

The TCEQ has the following comments as noted below in both a general and specific context.

General Comments

The TCEQ suggests adding definitions in the regulations for defense-in-depth and the safety case, which were always present in the performance objectives and facility design and location requirements. This will explain more clearly to the public the methodology used to ensure that a LLRW disposal facility will protect public health and safety while providing a means for taking care of the need to dispose of LLRW waste. The proposed requirements for the licensee to submit a safety case analysis of the LLRW disposal facility that includes a defense-in-depth analysis will clarify and make more transparent to the public the decision-making and analysis necessary in determining that the waste acceptance criteria and the facility design and location will result in the safe disposal of the LLRW.

The proposed changes will allow the use of a performance assessment to determine waste acceptance criteria for waste that was not considered in the original analysis that lead to the current LLRW classification. This will give the states and licensees additional flexibility while maintaining public health and safety. Texas has already employed the use of a performance assessment to determine what concentrations, total activity, and additional restraints are required for the disposal of depleted uranium since the original

waste classification analysis did not include large amounts of depleted uranium and agrees that this methodology should be standard throughout the country.

The proposed three-tiered approach, with staggered dose limits over three time periods of a disposal site, provides a reasonable balance between the need to assess site performance and the inherent uncertainty in predicting dose to the public and intruders very far into the future. The three-tier approach will still allow Texas to analyze the performance of the LLRW disposal facility up to peak dose as is currently required in Texas rules. However, those rules require the compliance period to be 1,000 years or peak dose, whichever is longer. Adopting the proposed compliance period with a compatibility category B may be perceived as a lowering of the standards for radioactive waste disposal. The TCEQ requests that NRC assign those requirements as compatibility category C, as further detailed below.

Specific Comments

1.) **Amended Section 61.13(e), Technical Analyses.**

61.13(e) states "Analyses that assess how the disposal site limits the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses shall be required for disposal sites with waste that contains radionuclides with average concentrations exceeding the values listed in table A of this paragraph, or if necessitated by site-specific conditions. For wastes containing mixtures of radionuclides found in table A, the total concentration shall be determined by the sum of fractions rule described in paragraph 61.55(a)(7). The analyses must identify and describe the features of the design and site characteristics that will demonstrate that the performance objectives set forth in §§ 61.41(c) and 61.42(c) will be met."

Comment: The TCEQ suggests that the NRC consider removing Table A and references from the proposed rule and move the table to the draft guidance document, NUREG-2175. The TCEQ supports the remaining proposed revisions in 61.13 for conducting technical analyses and the compatibility categories.

2.) **Amended Section § 61.41(a), Protection of the General Population From Releases of Radioactivity.**

61.41(a) states "Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 0.25 milliSievert (25 millirems) to any member of the public within the compliance period. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable during the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a)."

Comment: The compatibility category for this amended section is proposed to remain unchanged as category A. The TCEQ suggests the NRC consider a compatibility category of C so that Texas can keep the requirement of peak dose or it may be perceived as a lowering of the standards for radioactive waste disposal. This will allow Texas to retain the flexibility in regulations more stringent than the NRC.

3.) **New Section § 61.41(b), Protection of the General Population From Releases of Radioactivity.**

61.41(b) states "Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals shall be minimized during the protective assurance period. The annual dose, established on the license, shall be below 5 milliSieverts (500 millirems) or a level that is supported as reasonably achievable based on technological and economic considerations in the information submitted for review and approval by the Commission. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a)."

Comment: The TCEQ suggests removing "established on the license." Since this will already be stated in the rule there is no need to state it in the site's license as well. Also, this new section is being proposed with a compatibility category B. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.41(b) and will be consistent with the compatibility category in 61.13.

4.) **Amended Section § 61.42(a), Protection of Inadvertent Intruders.**

61.42(a) states "Design, operation, and closure of the land disposal facility must ensure protection of any inadvertent intruder into the disposal site who occupies the site or contacts the waste at any time after active institutional controls over the disposal site are removed. The annual dose must not exceed 5 milliSieverts (500 millirems) to any inadvertent intruder within the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b)."

Comment: The compatibility category for this amended section is proposed to be changed from compatibility H&S to compatibility category A. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.42(a) and will be consistent with the compatibility category in 61.13.

5.) **New Section § 61.42(b), Protection of Inadvertent Intruders.**

61.42(b) states "Design, operation, and closure of the land disposal facility shall minimize exposures to any inadvertent intruder into the disposal site at any time during the protective assurance period. The annual dose, established on the license, shall be below 5 milliSieverts (500 millirems) or a level that is supported as reasonably achievable based on technological and economic considerations in the information submitted for review and approval by the Commission. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b)."

Comment: The compatibility category for this new section is proposed to be compatibility category B. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.42(b) and will be consistent with the compatibility category in 61.13.

6.) **Revised Section § 61.58 Waste acceptance.**

61.58 states *"Waste acceptance criteria.* Each applicant shall provide, for approval by the Commission, criteria for the acceptance of waste for disposal that provide reasonable assurance of compliance with the performance objectives of subpart C of this part. Waste acceptance criteria shall specify, at a minimum, the following:...."

Comment: The compatibility category for this amended section is proposed to be changed from compatibility D to compatibility category B. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.58.

RulemakingComments Resource

From: Ashley Soltysiak <ashley@healutah.org>
Sent: Monday, July 20, 2015 5:36 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comments for ID: NRC-2011-0012-0077
Attachments: HEAL NRC Part 61 Comments 2015.pdf

To Whom It May Concern,

We appreciate the opportunity to provide comments on the 10 CFR Part 61 proposed rule-making. Attached you will find the comments for HEAL Utah, an environmental non-profit based in Salt Lake City, UT. Please contact me if you have any questions regarding this submission.

Kind Regards,
Ashley

--
Ashley Ann Soltysiak
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824 South 400 West
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To: Nuclear Regulatory Commission

From: HEAL Utah

Re: Comments on 10 CFR Part 61 rulemaking on Low-Level Radioactive Waste Disposal (Federal Register Number: 2015-06429, Docket Number: NRC-2011-0012)

Date: July 16, 2015

Thank you for providing the opportunity to comment on the Part 61 Rulemaking for Low-level Radioactive Waste Disposal. We would like to raise several issues that we urge the staff and Commissioners to consider as the NRC moves forward with its ongoing efforts to review and revise the LLRW plans and rulemaking.

Please consider the following comments, to help states most effectively regulate disposal facilities within their borders, to ensure that public health and the environment are protected and to permit the public and NGOs to adequately monitor these activities.

1. Recognize Flaws and Limits of the WAC approach.
Movement towards the Waste Acceptance Criteria (WAC) approach relying upon Performance Assessments (PA) has been guided by the desire to shift policy away from rigid rules and categories towards a flexible system that focuses on detailed technical reviews. These, it can be argued, will more accurately determine if a particular waste can be disposed of safely in a specific way and area.

At first glance, these are worthy goals and a seemingly reasonable strategy. However, in our experience, the emphasis on the WAC and PAs has one clear outcome that needs to be understood and addressed: It makes the process for states to manage LLRW much more cumbersome and increases the difficulty of engaging the public meaningfully in the process.

The advantage of the current LLRW system is that by drawing bright lines and creating distinct categories, it makes it easier for policymakers to institute policies and pass law that reflect their values and policy judgments. So, for example, here in Utah, our State Legislature decided that it was prudent to allow waste that would pose a hazard for a century or so (Class A) but not waste that would remain hazardous for 300-500 years (Classes B and C). Thus our state has had a ban on such waste since 2005.

The robust debate that ensued over this ban, which took place over several years in a range of forums, including the press, allowed for the engagement of a wide range of stakeholders – from representatives of the nuclear waste industry itself, to state legislators, to health specialists, academics, and the general public – to express an opinion and be part of the process. This has resulted in a system that might not be terribly flexible, but is certainly representative of the diversity perspectives held within the state.

Let's contrast that with the WAC process, based upon PAs. Here in Utah, we have an example of this process that has been ongoing with EnergySolutions and their 2011 PA. In this example, the corporation seeks to prove that near surface disposal at the Clive site is appropriate and safe for more than 700,000 tons of long-lived depleted uranium waste.

That PA is comprised not just of thousands of pages of documents, but also includes a complex proprietary computer model. Built into that model – and its thousands of pages of text – are literally hundreds and hundreds of assumptions, some critical, that all lead to the conclusion that the PA produced by EnergySolutions' consultant shows that the DU disposal on site is safe.

The state of Utah has an experienced staff given many years of experience handling LLRW matters and overseeing the Clive site. However, they simply didn't have the staff-power or expertise to unpack everything in the DU PA. Consequently, they hired an outside consultant who spent over a year reviewing the PA, in an expensive process that continues to this day, after the company recently sought a delay.

Who else in Utah has had a chance to review the PA? Frankly, our organization doubts that anyone outside of the few involved state employees, the consultants, and those of us at HEAL Utah have been able to even begin to unpack it. And even we — a professional grassroots organization with a decade-plus of experience in nuclear waste regulation and oversight (a unique institution in the United States) – have struggled to review more than a fairly small percentage of the PA. We think that we've raised some of the most important issues, but realistically, there are hundreds of pages of the PA that we don't have the resources and technical expertise necessary to provide meaningful comments.

And, for what its worth, we're very lucky in Utah, since we have a state agency that actually makes it fairly easy for us to review documents like the PA. The documents may be dauntingly long and complex, but at least they are available.

What other commercial facilities in the U.S. are large quantities of DU being considered for disposal? Waste Control Specialists, of Andrews, Texas. The state of Texas in fact has now approved their permit for disposal, despite a lack of transparency and engagement following that company's PA. HEAL tried to find out specifically how their DU would be stored, under what conditions, and what assumptions went into the decision to allow it at the facility and their process has proven to be considerably less transparent.

We emailed the Media Relations representative for the Texas environmental agency,

seeking a link to the WCS Performance Assessment. Here is her response (in a screenshot form):

Andrea Morrow 11:50 AM (3 hours ago)

to me

The performance assessment model belongs to WCS. The TCEQ reviews the model and has produced a large report as part of that review. It is not available online due to size however, you can file an Public Information Request for the information by going here: https://www.tceq.texas.gov/adminservices/data/reqinfo.html and following the instructions. PIRs are not handled in this office. Bear in mind, this is a lengthy document so you will want to budget accordingly.

Regards,
Andrea

Andrea Morrow
TCEQ Media Relations
512-239-5011 phone

And so, not only does Texas not even make its review of the PA available to the public – let alone the PA itself – it makes very clear that even asking to review it will be very expensive.

This disturbing example strikes to the heart of the fundamental problem with building a LLRW decision-making system around WAC and PAs: It serves to make it much more difficult for the public to have any meaningful input into critical nuclear waste decision-making processes. Reading and comprehending thousands of pages of documents and complex computer models – let alone offering comment on those – is far beyond the reach of nearly everyone. And, then, of course, we have states that apparently don't even plan to make those documents available to the public without a hefty sum of money. This situation represents government at its worst – incomprehensible and out of reach for the average citizen.

Allow us to make one more point about the WAC and PA approach: It puts an incredible amount of power and input into the hands of consultants. The waste disposal companies of course, pay the consultants who develop the PAs. There are very few such companies, and very few such consultants. Therefore, it is fundamentally in the interest of the consultant to "game" the PA, by manipulating the thousands of assumptions built into them, and to decide which scenarios are and are not considered, to ensure that the model reaches the conclusion which the consultant is being paid handsomely to reach. To not do so, assuredly, would affect the consultant's ability to win the next big contract.

When state and federal regulators and policymakers make critical LLRW policy judgments, in contrast, they do so based upon what one hopes are less self-interested criteria.

In short, we'd like to see the NRC, as parts of its Strategic Assessment, ensure that its overall shift towards "flexibility," using this new WAC and PA system doesn't make it more difficult for states to make their own LLRW policy decisions – and for the public to have significant input on LLRW license and permitting decisions.

2. Clarify language of the "Hybrid Waste Acceptance Approach"

We support the NRC's apparent intent to allow our state to maintain its ban on higher-level wastes, as established under the current LLRW classification table system. As previously described, the State of Utah currently has a ban on Classes B and C low-level radioactive waste.

However, the language, "to allow licensees… to develop site-specific WAC from the results of the technical analyses or from the requirements of the existing LLRW classification system," [1] seems to imply that the licensee can dictate which approach is applied. This contradicts what we have heard NRC Staff at public hearings attest to, which is that state regulators will have this authority. Therefore, we suggest that the rules be amended to explicitly clarify that the state will indeed have the jurisdiction, as we aim to ensure that the integrity of our state's ban is maintained under the proposed new framework.

3. Classify Depleted Uranium

We continue to believe it critical that the Commission budget staff time as soon as is feasible to determine whether Depleted Uranium is Class A, B, C, or Greater Than Class C waste.

Our understanding is that DU was classified as Class A waste effectively because of a historical slip-up. Since the original Part 61 rules didn't envision significant quantities of DU being disposed of by commercial facilities, regulators chose not to figure out where DU belonged. And, so, like any LLRW that wasn't classified, Class A became DU's default category

But Depleted Uranium is plainly different from its Class A cohorts. Instead of gradually degrading, DU actually increases in hazard for 2.1 million years. It will eventually exceed Class A requirements – which unequivocally violates our state's ban. The following graph, a re-creation of one used by the NRC itself, clearly depicts this differential.

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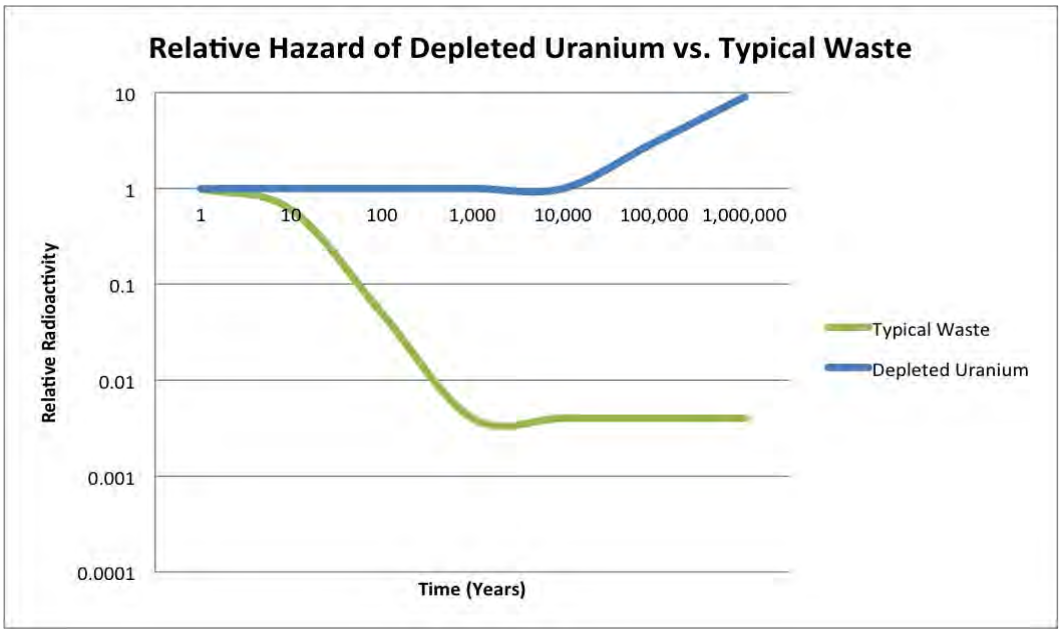
[1] Nuclear Regulatory Commission. *Low-Level Radioactive Waste Disposal; Proposed Rule .* Rockville, MD: Federal Register , 2015, 16100.



And while DU currently meets the requirements for Class A waste, in terms of long-lived radionuclides, according to NRC classification tables,[2] these are not reflective of its peak hazard, which is what LLRW should be classified as to best direct safe disposal efforts

And while the "A, B, C" classifications define current hazard, they also have grown to encompass the length of hazard. For example, in the Federal Register document describing the Part 61 revisions we're commenting upon here, these commonly used time frames are referenced. First, in regard to Class B waste, "wasteforms or containers should be designed to maintain gross physical properties and identity over 300 years, approximately the time required for Class B waste to decay to innocuous levels." In regard to Class C, the document states, "Class C LLRW may require either greater burial depth or an engineered barrier that will prevent inadvertent intrusion for 500 years." [3]

As you can see, these classifications are regularly used to also incorporate the timeframes of hazard duration.

As previously alluded to, length of hazard heavily influenced Utah's decision to ban B and C level wastes. This information was easily accessed, digested, and discussed by numerous stakeholders around the state. However, the average person, who lacks a significant depth of knowledge regarding Depleted Uranium, could easily get the perception that DU has a

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[2] Nuclear Regulatory Commission. "§ 61.55 Waste classification." 10 July 2014. <http://www.nrc.gov/reading-rm/doc-collections/cfr/part061/part061-0055.html>.
[3] Nuclear Regulatory Commission . *Low-Level Radioactive Waste Disposal; Proposed Rule .* Rockville, MD: Federal Register , 2015, 16085.

much shorter hazard length, as implied by its current classification. But, Depleted Uranium is clearly not a traditional Class A waste under the lens of hazard duration.

The difference in duration of hazard between typical Class A waste – which Utah takes now – and Depleted Uranium are so radically different that to lump the latter in with the former seems absurd. We can't fathom a reasonable argument why one would allow waste that does not reach a peak hazard for 2.1 million years to be treated just like waste that loses 90 percent of its hazard in less than 200.

The lack of resolution over how DU should be classified doesn't help states, regulators, or our citizens grapple with its disposal. Depleted Uranium ought to be classified at its potential hazard level – if not at even greater level, due to the sheer duration of hazard – but certainly not as Class A waste.

Prominently in Utah, Governor Gary Herbert has explicitly called upon the NRC to classify depleted uranium. He recently stated, "I expect the Nuclear Regulatory Commission to follow up on that and make their decision," he added, "Until that happens, I'm not comfortable having depleted uranium in Utah."[4] Thus, our state's decision to accept or deny the proposal by EnergySolutions hinges, in part, on this classification. Defaulting classification of unique waste streams to Class A, obfuscates the process and make its difficult for regulators and the public to set boundaries, in accordance to their values.

Given the stated desire of Utah officials to retain the classification system, we would urge the NRC to prioritize the classification of Depleted Uranium. It is, we believe, the most significant "unique waste" out there, and it is a baffling gap in regulation to not incorporate it into a regulatory system that Utah—one of the most important states in the LLRW arena—wishes to preserve.

If depleted uranium is actually disposed of commercially as Class A waste, we believe it may make it much more difficult to place LLRW facilities elsewhere in the country. The nation's current disposal facilities – in Utah, Washington, Texas and South Carolina – exist to safely get rid of low-level radioactive materials, like medical waste or lightly contaminated materials from the nuclear power industry.

When a community signs on to take waste like this though, they aren't being asked to sign a 2.1 million year contact, with a company that might be there to monitor it for a century or two—at best. This will ultimately dis-incentivize communities from allowing new LLRW facilities in their area, despite the obvious need. Allowing a material like DU to be disposed of as class A, will make it more of an eternal commitment and hazard than most communities are willing or prepared to deal with – so they will simply opt out.

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[4] Maffley, Brian. "Governor has a 'hunch' depleted uranium is hotter than the waste EnergySolutions is allowed to take." Salt Lake Tribune. April 16, 2015. http://www.sltrib.com/news/2408870-155/state-grants-energysolutions-request-for-a.

This must be a major consideration, because new low-level waste disposal facilities will be needed by 2050. According to comments by the Northwest Interstate Compact, many nuclear facilities will be decommissioned in the next 20-40 years, but the facilities in Richland, Washington and here in Utah, will only be around until 2056 and 2045, respectively. This means that although the need for this type of facility will continue to grow, support from the public will diminish, given the unique hazard posed by Depleted Uranium. This may make states unlikely to encourage development of commercial disposal sites because of the inconsistent rules and vastly different allowed waste streams than those originally decided through an active public process.

4. Amend the Compliance Period for Long-Lived Waste

We'd like to elaborate on a previously mentioned issue. We do not believe that long lived-waste streams, such as depleted uranium should only be modeled for a compliance period that is "reasonably foreseeable," for the simple reason that concentrated DU does not have a "reasonably foreseeable" hazard life. We believe that "safe disposal" can only be demonstrated if the public will be protected from unacceptable doses over the hazard life of the waste stream under evaluation.

If, as some in the nuclear waste disposal industry complain, such modeling over very long timeframes (10,000 to one million years) leads to unacceptably large uncertainty in the calculation, then that uncertainty should be viewed as evidence that near-surface disposal, with the corresponding likelihood that the stored materials come into contact with human populations, is not acceptable. A compliance period of 1,000 years for Depleted Uranium, a waste that grows more dangerous from hundreds of thousands of years, is difficult to justify.

Additionally, this ruling seems inconsistent with the guidance language "licensees should examine plausible scenarios for site evolution and characteristics in the site stability analysis."[5] Just because it's difficult to project what will happen to this waste over such long time frames doesn't mean that a company that wishes to dispose of it should be relieved of the challenge of doing so.

Similarly, a "qualitative" evaluation – which must conclusively demonstrate irreversible and catastrophic impacts in order for a waste stream, such as concentrated depleted uranium, to be found unacceptable for disposal – places far too large a burden on states, like Utah, that host nuclear waste disposal sites. For long-lived waste streams like concentrated depleted uranium, the compliance period should be a minimum of 10,000 years. Again, it would be better to consider up until the peak activity of the waste stream in question.

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[5] D. Esh, C. Grossman, H. Arlt, C. Barr, P. Yadav. "Guidance for Conducting Technical Analyses for 10 CFR Part 61." 2015. Nuclear Regulatory Commission . Office of Nuclear Material Safety and Safeguards. <http://pbadupws.nrc.gov/docs/ML1505/ML15056A516.pdf>.

5. Overruling Staff Reduces Public Faith in Rulemaking

This final point addresses several red flags that our organization has noted during the evolution of these rules. Commissioners have repeatedly overruled staff in an apparent effort to comply with industry requests.

For example, in 2011 NRC staff members recommended a 20,000-year compliance period to demonstrate the site safety. They state, "20,000 years would better capture, compared to shorter time frames, the in-growth of daughter products (e.g. Ra-226, Rn-222) from long-lived parents that can occur in some waste streams. For example, as shown in Figure 2, the in-growth of Ra-226 from uranium doesn't peak until after one million years with no loss of parent from the system." [6] Additionally, they discuss the benefits of longer-term compliance periods, because of their increased ability to capture changing climate cycles.

To this, EnergySolutions submitted the following comments to the NRC. "EnergySolutions is of the view that while a compliance period of 10,000 years may be workable, a compliance period of 1,000 years is preferable." [7] Conceding that 10,000-year compliance periods had precedent, after expressing outrage over the recommended 20,000 year limit.

Eventually, staff recommendations reduced to a 10,000-year compliance period. "The staff stated that because of the in-growth of progeny from DU, analysis time periods of 1,000 years or less result in significant truncation of estimated risk from disposal of DU, and this is the main reason why they propose a 10,000 year time of compliance for meeting the revised performance objective. " [8]

However, after receiving additional commentary by EnergySolutions, urging a shorter time frame, the commissioners eventually over-ruled staff and lowered the compliance period to 1,000-years.

In the same letter, EnergySolutions proposed a standard of "reasonably foreseeable" scenarios for the intruder assessment, not including the assumption that an intruder would ever inhabit the site. [9] This comment was also implemented into the proposed rule making, verbatim, and in direct opposition to the initial staff recommendations—who had sought to

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[6] "Technical Analysis Supporting Definition of Period of Peiformance for Low-Level waste Disposal ." May 2011. Nuclear Regulatory Commisssion . <http://pbadupws.nrc.gov/docs/ML1110/ML111030586.pdf>.

[7] Magette, Thomas E. "EnergySolutions Letter." 17 June 2011. Nuclear Regulatory Commission. <http://pbadupws.nrc.gov/docs/ML1117/ML11172A181.pdf>.

[8] Letter, Advisory Committee on Reactor Safeguards. "10 CFR PART 61 – REVISIONS TO LOW-LEVEL RADIOACTIVE WASTE DISPOSAL REQUIREMENTS ." 19 Feb 2014. <http://pbadupws.nrc.gov/docs/ML1404/ML14041A152.pdf>.

[9] Magette, Thomas E. "EnergySolutions Letter." 17 June 2011. Nuclear Regulatory Commission. <http://pbadupws.nrc.gov/docs/ML1117/ML11172A181.pdf>.

consider the evolution of the site and consider a much broader array of intruder scenarios. Over-ruling the recommendations of staff, in favor of industry, deteriorates public faith that these rules were made in the genuine interest of their health and safety.

In sum, we appreciate the opportunity to comment on the proposed revisions to 10 CFR Part 61. Allow us to reiterate our central points: We oppose any system that would overturn a ban on hotter waste for which Utahns fought so hard, or force the state to accept waste streams it has deemed unnecessarily risky. Additionally, we urge the NRC to finally classify Depleted Uranium to reflect its true hazard level and duration.

Thank you for your time and consideration. Please feel free to contact us with any questions or clarifications.

Kind Regards,

Matt Pacenza
Executive Director
HEAL Utah
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(801) 355-5055 (office)

824 South 400 West, Suite B-111
Salt Lake City, Utah 84101

RulemakingComments Resource

From: Welling, Mike (VDH) <Mike.Welling@vdh.virginia.gov>
Sent: Tuesday, July 21, 2015 12:19 PM
To: Comfort, Gary
Cc: OAS Executive Board; Einberg, Christian; Rusty Lundberg; Charles Maguire; ganttaa@dhec.sc.gov; Fordham, Earl W (DOH)
Subject: [External_Sender] STC-15-016 OAS Comments
Attachments: STC-15-016 LLW OAS Comments.pdf

Attached are the OAS Board comments.

Michael Welling
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http://www.vdh.virginia.gov/Epidemiology/RadiologicalHealth/

Ben Franklin once said “Without continual growth and progress, such words as improvement, achievement and success have no meaning”

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Michael Welling, Chair, Virginia
Sherrie Flaherty, Chair-Elect, Minnesota
Alan Jacobson, Past-Chair, Maryland
Debra Shults, Treasurer, Tennessee
Megan Shober, Secretary, Wisconsin
Michael Ortiz, Director, New Mexico
Jennifer Opila, Director, Colorado

July 21, 2015

Gary Comfort
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, DC 20555

RE: Request for Comments on the Proposed Amendments to Low-Level Radioactive Waste Disposal Regulations, 10 CFR Parts 20 and 61 (STC-15-016)

Dear Mr. Comfort,
The Organization of Agreement States (OAS) Executive Board (Board) has reviewed the above document and respectfully submits the following comments for consideration by the NRC.

The Board objects to redoing the site's performance assessment unless that site opts to take significant quantities of long-lived alpha emitters (e.g., DU).

The Board proposes Compatibility C designation instead of Compatibility B designation for the new parts of Part 61. Many states that currently regulate low-level radioactive waste sites have state standards that are more stringent than the requirements in the proposed rule. These states should not be forced to reduce their standards to conform to the new NRC rules. These states should be allowed to implement standards that are acceptable to the state and the communities that host these disposal facilities as long as those standards are at least as stringent as the NRC standards.

The proposed rules primarily impact the four Agreement States who have low-level radioactive waste disposal facilities in their states; South Carolina, Texas, Utah and Washington. The Board supports the comments of these states on the proposed rules.

We appreciate the chance to comment on this subject, and stand ready to answer any questions you may have.

Sincerely,

Michael Welling

Michael Welling
OAS Chair
Director Radioactive Materials Program
Virginia Dept of Health
109 Governor St, Room 730
Richmond, VA 23219

Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin

RulemakingComments Resource

From: Steve Shearer <zmbe76@gmail.com>
Sent: Friday, July 17, 2015 3:28 PM
To: RulemakingComments Resource
Subject: [External_Sender] Don't weaken radioactive waste rules

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Secretary,

Nuclear power generates more than 95% of the radioactivity buried at commercial radioactive waste dumps in the U.S. Some of that waste stays dangerous for literally millions of years.

All of the six "first generation" "low-level" radioactive waste dumps that opened in the 1960s have leaked; some are still leaking. Operating dumps currently are open in UT, TX, SC and WA. In addition, a lot of nuclear waste is processed in Tennessee and then sent on to those states. The NRC is proposing a rule change that would apply to these operating sites as well as any new dumps.

These weakened rules would let the public be exposed to a lot more radioactivity than is currently allowed by adopting the "updated" radiation regimen called EDE (Effective Dose Equivalent (EDE) allows more radioactivity per millirem for many radionuclides; we opposed this when NCR adopted it in other parts of its regulations and oppose incorporating it here for the same reasons). Allowable doses to the public would be raised from the existing 25 millirems a year to 25, 100, 500 or more millirems EDE per year. Of course, the NRC continues to ignore resarch that shows radiation causes even more cancer and cancer deaths in women and children than men and threatens the reproductive phase of our life-cycle.

This proposal is unacceptable; if there are to be any changes to radioactive waste rules, it should be to make them more protective of human health and the environment, not less so.

Steve Shearer
475 DOLORES ST
APT 6
SAN FRANCISCO, CA 94110

RulemakingComments Resource

From: Lynne Preston <bluelynne@sbcglobal.net>
Sent: Friday, July 17, 2015 3:28 PM
To: RulemakingComments Resource
Subject: [External_Sender] Enter Your Action Subject

Dear Secretary,

If there are to be any changes to radioactive waste rules, it should be to make them more protective of human health and the environment, not less so!

Lynne Preston
638 Rhode Island St.
San Francisco, CA 94107

RulemakingComments Resource

From: Carolyn Pressley <carolynpressley@gmail.com>
Sent: Friday, July 17, 2015 3:30 PM
To: RulemakingComments Resource
Subject: [External_Sender] Proposed NRC changes to radioactive wast regulations NOT OK

Dear Secretary,

Any changes to the radioactive waste regulations need to be more protective not less. Don't weaken the rules.

Carolyn Pressley
64 A Front Street
Belfast, ME 04915

RulemakingComments Resource

From: James Dixon <james@harehill.com>
Sent: Friday, July 17, 2015 3:32 PM
To: RulemakingComments Resource
Subject: [External_Sender] Enter Your Action Subject

Dear Secretary,

Dear folks,

Fukushima. Chernobyl. Three Mile Island. Radioactive poisoning. Children dying. Perhaps even you dying.

Need more be said, really?

No weakening of radioactive waste rules.

Strengthen radioactive waste rules.

Public health and safety is your job.

Do your job.

Sincerely,

James Dixon
Concerned Citizen

James Dixon
206 W. Washington Ave.
Terra Alta, WV 26764

RulemakingComments Resource

From: Saab Lofton <saablofton@hotmail.com>
Sent: Friday, July 17, 2015 3:32 PM
To: RulemakingComments Resource
Subject: [External_Sender] Enter Your Action Subject

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Secretary,

Nuclear power generates more than 95% of the radioactivity buried at commercial radioactive waste dumps in the U.S. Some of that waste stays dangerous for literally millions of years.

All of the six "first generation" "low-level" radioactive waste dumps that opened in the 1960s have leaked; some are still leaking. Operating dumps currently are open in UT, TX, SC and WA. In addition, a lot of nuclear waste is processed in Tennessee and then sent on to those states. The NRC is proposing a rule change that would apply to these operating sites as well as any new dumps.

These weakened rules would let the public be exposed to a lot more radioactivity than is currently allowed by adopting the "updated" radiation regimen called EDE (Effective Dose Equivalent (EDE) allows more radioactivity per millirem for many radionuclides; we opposed this when NCR adopted it in other parts of its regulations and oppose incorporating it here for the same reasons). Allowable doses to the public would be raised from the existing 25 millirems a year to 25, 100, 500 or more millirems EDE per year. Of course, the NRC continues to ignore resarch that shows radiation causes even more cancer and cancer deaths in women and children than men and threatens the reproductive phase of our life-cycle.

Under the proposal, dump operators could accept and bury just about any kind of nuclear waste that they want simply by doing a computer-model "performance assessment" and then claiming it's safe. The same entities that would profit by expanding their waste streams would do their own calculations to claim they can be safely managed for millions of years!

NRC also wants to prevent states from setting their own stricter standards, even though states usually end up with the liability from nuclear waste sites.

NO radioactive waste deregulation! Any rules changes should lead to more protective standards, not increased radiation exposures!

Saab Lofton
619 Third Avenue
Seattle, WA 98104

RulemakingComments Resource

From: MC Hagerty <mc@matrixmasters.com>
Sent: Friday, July 17, 2015 3:35 PM
To: RulemakingComments Resource
Subject: [External_Sender] Don't weaken radioactive waste rules

Dear Secretary,

Don't weaken radioactive waste rules. Any new rule must be more protective and not less. This is not the place to save money and this is not a partisan issue. This affects all of us, including the .01% also known as the billionaires!

We need stricter safety rules for any kind of nuclear waste, including allowing individual states to set their own stricter rules.

This is important for all human beings and the entire ecosystem.

MC Hagerty
POBox 131133
Catlsbad, CA 92013

RulemakingComments Resource

From: Joshua Seff <mv9508@sbcglobal.net>
Sent: Friday, July 17, 2015 3:36 PM
To: RulemakingComments Resource
Subject: [External_Sender] radioactive waste regulations.

Dear Secretary,

Please do not weaken rules related to radioactive waste exposure.

Joshua Seff
9508 George Washington Dr.
McKinney, TX 75070

RulemakingComments Resource

From: Vincent Hardt <vvince2001@hotmail.com>
Sent: Friday, July 17, 2015 3:40 PM
To: RulemakingComments Resource
Subject: [External_Sender] Please do not weaken waste disposal rules

Dear Secretary,

I am concerned with the proposed rule changes, which would weaken standards of care for muclear waste and, in some cases, allow waste disposal sites to self-report on their compliance. We need stronger standards to protect the public.

Vincent Hardt
29w424 Butternut Ln
Warrenville, IL 60555

RulemakingComments Resource

From: Sharon Feissel <stardust@sonic.net>
Sent: Friday, July 17, 2015 4:25 PM
To: RulemakingComments Resource
Subject: [External_Sender] weakening radioactive waste rules

Dear Commission:

Sometimes what I read is as shocking as if someone walked up and socked me in the face for no reason. That was the kind of jolt I got when I read that the Nuclear Regulatory Commission wants to weaken the rules on radioactive waste. Do you not understand radioactivity, its human consequences, its long, long, long lifespan and ability to do harm over that time span? PLEASE think of the public well-being from directly increased radiation exposure, to ground and water contamination, to reproductive disruption of humans and animals, to the well-documented link to cancer. YOU KNOW this element is not at all safe, so instead of weakening regulations, you should be tightening up all loop holes and work-arounds to secure more protection and complete safety. And in a country where States' Rights is often a rallying cry, for Heaven's sake, please allow States the right to even further regulate what goes on within their boundaries.

Sometimes the guiding principle just needs to mean doing "what's right," not what's convenient, what's economical, what's favored by lobbyists, or what's easiest or pushes the problem off onto others, including other generations.

Please do your job--stand firm. Do what's right.

Sharon Feissel

RulemakingComments Resource

From: Marion Lakatos <mplakatos@gmail.com>
Sent: Friday, July 17, 2015 5:03 PM
To: RulemakingComments Resource
Subject: [External_Sender] Make rules more stringent

I am concerned that you plan on weakening rules for the disposal of nuclear waste. I feel this is a terrible mistake. The protection of the public and the environment should be your main concern. If states want more stringent rules governing waste this should be allowed and not restricted to the government rules. Do your job and protect the public from this hazard.
Thank you,
Marion Lakatos

RulemakingComments Resource

From: Susan Griffin <griffinsusan@comcast.net>
Sent: Friday, July 17, 2015 6:19 PM
To: RulemakingComments Resource
Subject: [External_Sender] Radioactive

Dear Ms or Sir,

I urge not to weaken restraints against radioactive materials. These laws should be stronger not weaker!

Susan Grffin

RulemakingComments Resource

From: Katherine Forrest <kaforrest@earthlink.net>
Sent: Friday, July 17, 2015 11:54 PM
To: RulemakingComments Resource
Subject: [External_Sender] Radioactive waste regulations

NRC Commissioners:

As a public health physician, I am concerned that you are considering changes in the radioactive waste regulations that will increase the threat to human beings and other living things. You should be acting in the interest of the public welfare, not in the interest of industry.

The radiation protection standards should be strengthened, if anything—certainly not weakened. Monitoring and safety assessment should be done by independent parties not affiliated with dump operators or other parties in the nuclear industry. Moreover, if states wish to have even stricter safety standards for radioactive waste, they should be allowed to do so.

If you change radioactive regulations, you should tighten them, if anything.

Katherine Forrest, MD, MPH

RulemakingComments Resource

From: Jonathan von Ranson <commonfarm@crocker.com>
Sent: Saturday, July 18, 2015 6:10 AM
To: RulemakingComments Resource
Subject: [External_Sender] Radioactive waste rules

There is no good scientific basis for weakening the rules governing the handling of radioactive wastes, so I strongly urge you in the new round of rulemaking not to weaken them.

Jonathan von Ranson
PO Box 153
Wendell MA 01379

RulemakingComments Resource

From: Janice Palma-Glennie <palmtree7@hawaiiantel.net>
Sent: Saturday, July 18, 2015 11:20 PM
To: RulemakingComments Resource
Subject: [External_Sender] Don't weaken rules

Aloha,

I am very disturbed to hear that the Nuclear Regulatory Commission is considering changes to its radioactive waste regulations which would weaken, rather than strengthen, regulation of radioactive waste, i.e., corporations writing the rules.

Rule changes would also deny states a say in having stricter standards as well as creating a clear conflict-of-interest by allowing waste dump operators to perform their own safety assessments in order to accept more kinds of waste at their sites.

Please use your integrity to do what's right for the people and planet: deny these weaker rules which threaten all of us, including your childrens' children.

Sincerely,
Janice palma-glennie
Kailua-kona hawai`I

PR-20, 61
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46

PUBLIC SUBMISSION

As of: 7/22/15 9:18 AM
Received: July 21, 2015
Status: Pending_Post
Tracking No. 1jz-8k3h-r4jp
Comments Due: July 24, 2015
Submission Type: Web

Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0106
Comment on FR Doc # 2015-06429

Submitter Information

Name: Christopher Lish

General Comment

Sunday, July 19, 2015

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemakings and Adjudications Staff

Subject: Don't weaken radioactive waste rules -- Low-Level Radioactive Waste Disposal (Docket ID: NRC-2011-0012-0077)

Dear Secretary of the Commission Annette Vietti-Cook

I strongly oppose the proposed 10 CFR 61 changes and ask the Nuclear Regulatory Commission (NRC) to make changes in the direction of greater isolation of waste. Radioactive releases and exposure to humans and other species must be prevented, not increased.

I especially reject and ask that you remove the following provisions in your proposal:

No deregulation of radioactive waste:
Remove all provisions that would allow nuclear waste to go to regular trash or other unregulated places or into commercial recycling into consumer goods. This approach has been consistently rejected by the American public and explicitly by Congress in the 1992 Energy Policy Act. Delete the existing " 61.6 Exemptions" and the proposed addition to "61.7 Concepts" that would allow deregulating, exempting and

releasing radioactive waste and materials from radioactive regulatory control.

No increase in radiation to the public:
Reduce radiation releases: the goal should be to prevent all releases. Reject the proposed change from the current allowable public dose of 25 millirems/year to the higher 25 millirems EDE, 100 millirems EDE, 500 millirems EDE, or even more per year.

No "black box" Performance Assessments by dump operators:
Remove all provisions that would allow dump operators to do their own "Performance Assessments" and make "Safety Cases" to claim they can put more kinds of radioactive waste and longer-lasting nuclear waste in shallow land burial trenches. This presents an obvious conflict-of-interest issue, as operators would have a vested interest in a favorable outcome of such assessments.

No preemption of state's authority:
Allow states to continue setting stricter, more protective standards than NRC. Remove the "Level B" compatibility requirement.

Radioactive materials hazardous for 100 years or more should be kept out of burial grounds. Simply labeling various time periods (compliance, performance, protective assurance, etc.) and assigning increasing allowable doses does not protect anyone--it simply makes it legal to pollute.

Thank you for your attention to my comments. Please do NOT add my name to your mailing list. I will learn about future developments on this issue from other sources.

Sincerely,
Christopher Lish
Olema, CA

RulemakingComments Resource

From: Snyder, Michael <msnyder@epri.com>
Sent: Wednesday, July 22, 2015 10:30 AM
To: RulemakingComments Resource
Cc: Wilmshurst, Neil; Stark, Randy; Camper, Larry; Edwards, Lisa; Kim, Karen
Subject: [External_Sender] Docket ID NRC-2011-0012; NRC-2015-0003 "Low-Level Radioactive Waste Comment Letter
Attachments: Part61-LimitedRulemaking_EPRI CommentLetter_7-22-2015.pdf

On behalf of Lisa Edwards, Senior Program Manager for EPRI Chemistry, Radiation Safety, & Used Fuel Management please find attached a comment letter regarding the proposed revisions to 10CFR61 and 10CFR20 related to low-level radioactive waste disposal as presented for public comment on March 26, 2015. EPRI thanks you for the opportunity to comment.

Sincerely,

Michael Snyder
Senior Technical Leader
Electric Power Research Institute
3420 Hillview Avenue | Palo Alto, CA 94304
Tel: 650.855.8591 | Mobile: 650.223.3656
Email: msnyder@epri.com

ELECTRIC POWER
RESEARCH INSTITUTE

July 22, 2015

Rulemaking.Comments@nrc.gov
Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
ATTN: Rulemaking and Adjudications Staff

Subject: Docket ID NRC-2011-0012; NRC-2015-0003 "Low-Level Radioactive Waste Disposal"

Dear Madam Secretary:

The Electric Power Research Institute (EPRI) is an independent non-profit organization that conducts scientific research and development relating to the generation, delivery and use of electricity for the benefit of the public. We thank the Nuclear Regulatory Commission (NRC) for allowing EPRI to provide comment on the proposed rulemaking on Low-Level Radioactive Waste Disposal (Site-Specific Analysis Rulemaking).

The purpose of this letter is to provide comments to the NRC regarding the proposed revisions to 10CFR61 and 10CFR20 related to low-level radioactive waste (LLRW) disposal as presented for public comment on March 26, 2015. These comments are based on EPRI's technical research in the area of LLRW and comments previously submitted to the NRC on this topic.

EPRI Report 1021098, "Options for Improved Low Level Waste Disposal Using 10CFR61.58," recommended a number of changes to the regulatory requirements based on our research. All have been incorporated in the proposed rule in one form or another. The recommendations are summarized as follows:

- The risk from radionuclides typically present in nuclear power plant waste is primarily driven by relatively short half-life radionuclides. Longer lived radionuclides, such as the transuranic isotopes, dominate the risk after 500 years and are initially limited by concentration to ensure safety. EPRI research results indicated that after 1,000 years, LLRW generated during the course of the normal operation of a nuclear plant poses little risk to the public. The proposed rule recognizes the general nature of LLRW and limits the time period for the performance assessment for compliance to 1,000 years.
- The concentration limits tabulated in 10 CFR 61.55 are based upon International Council on Radiation Protection (ICRP) 2 dose conversion factors. These dose conversion factors have been updated in more recent ICRP publications. The proposed rule recognizes this fact and permits the use of more up-to-date dose assessment methods.

- The concentration limits tabulated in 10 CFR 61.55 were based on a set of generic site assessment models and conservative assumptions intended to make the limits generally applicable. Current LLRW disposal site development is occurring in dry climate areas where many of these assumptions are overly limiting with respect to radionuclide transport and projected doses. The use of site-specific performance assessments could result in different concentration limits while maintaining safety factors. The proposed rule recognizes this and establishes guidance to perform these kinds of analyses and establish site-specific criteria for LLRW disposal.

These proposed revisions enable a more technically accurate and risk-based approach to LLRW disposal. EPRI offers the following additional comments for consideration by the Nuclear Regulatory Commission:

1. **Protective Assurance Period:** Long time frames of analysis (greater than 1,000 years for the protective assurance period) have high levels of uncertainty that make the results of such analyses difficult to quantify and open to a high degree of interpretation. There are few points of comparison with past human activity to benchmark such analyses against. The need for analysis beyond 1,000 years should be more clearly limited to specific waste streams that are dominated by long-lived radionuclides. The typical LLRW streams that have already been evaluated and are not dominated by these long-lived radionuclides should not be subject to this new requirement.

2. **Institutional Control Period and Inadvertent Intrusion:** The scientific or technical basis for the 100-year active institutional control period and timing of inadvertent intrusion is unclear. An active institutional control period of 300 years is more probable, provides a more accurate assessment of the risk to an inadvertent intruder, and would better align with U.S. and international practices.

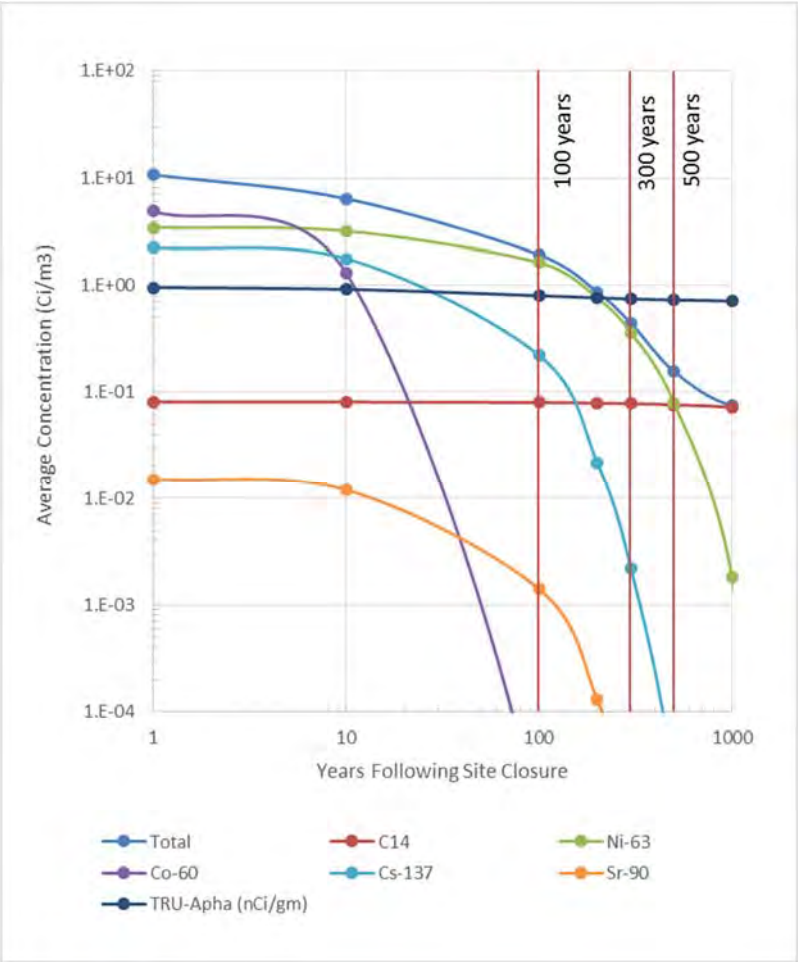
   A recent expert elicitation study conducted on behalf of the Nevada National Security Site (NNSS) and the Department of Energy (DOE)[1] concluded that the greatest probability of inadvertent human intrusion into disposal sites would occur some time after the loss of active institutional controls. The NRC's deterministic assumption that inadvertent human intrusion into disposal sites occur immediately after the loss of institutional controls is therefore a reasonable, simplified and conservative approach. However, the timeframe of the loss of institutional control and inadvertent intrusion should be re-evaluated to reflect DOE and international study results.

[1] **Black, P., et. al.** *DOE/NV-593-Vol. 1, Assessing the Probability of Inadvertant Human Intrusion at the Nevada Test Site Radioactive Waste Management Sites.* Oak Ridge : USDOE, 2001.

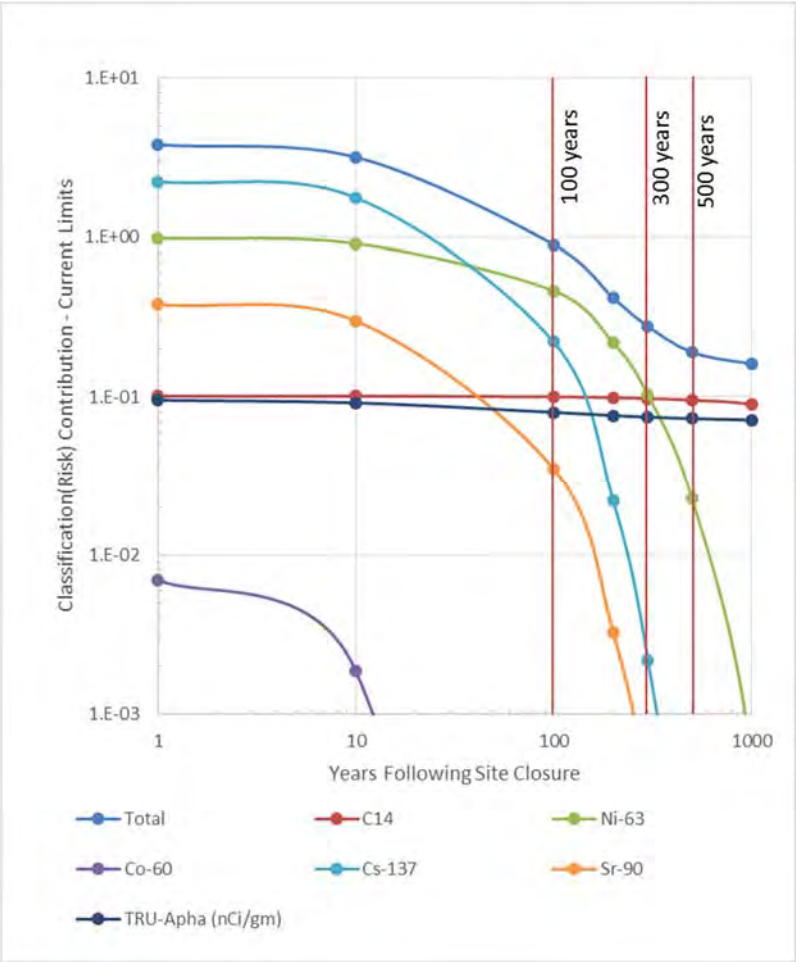
The NNSS, the International Atomic Energy Agency (IAEA), and Washington Department of Public Health consider active institutional controls to be effective for several hundred years after disposal site closure. The IAEA "Safety Assessment for Near Surface Disposal of Radioactive Waste"[2] state that active institutional controls "are generally considered to have an effectiveness of up to a few hundred years." The Washington Department of Public Health stated that the Richland site's "'institutional control period' could last for several centuries."[3] The NNSS study concluded that the 50th percentile for intrusion occurred at greater than 300 years after site closure and that the probability of intrusion at 100 years after site closure at the less than the 20th percentile. Based on these studies, a sound technical basis exists to place the time for inadvertent intrusion at 300 years after site closure.

EPRI research indicates that the majority of activity in LLRW from nuclear utilities consists of radioisotopes that will decay to minimal levels within 300 years. This recognition was fundamental to the original framing of 10 CFR 61, which concentrated primarily on non-fuel waste generated from power plant operations (EPRI, 2010). A graph of average concentrations of primary radionuclides from nuclear utilities is shown below.

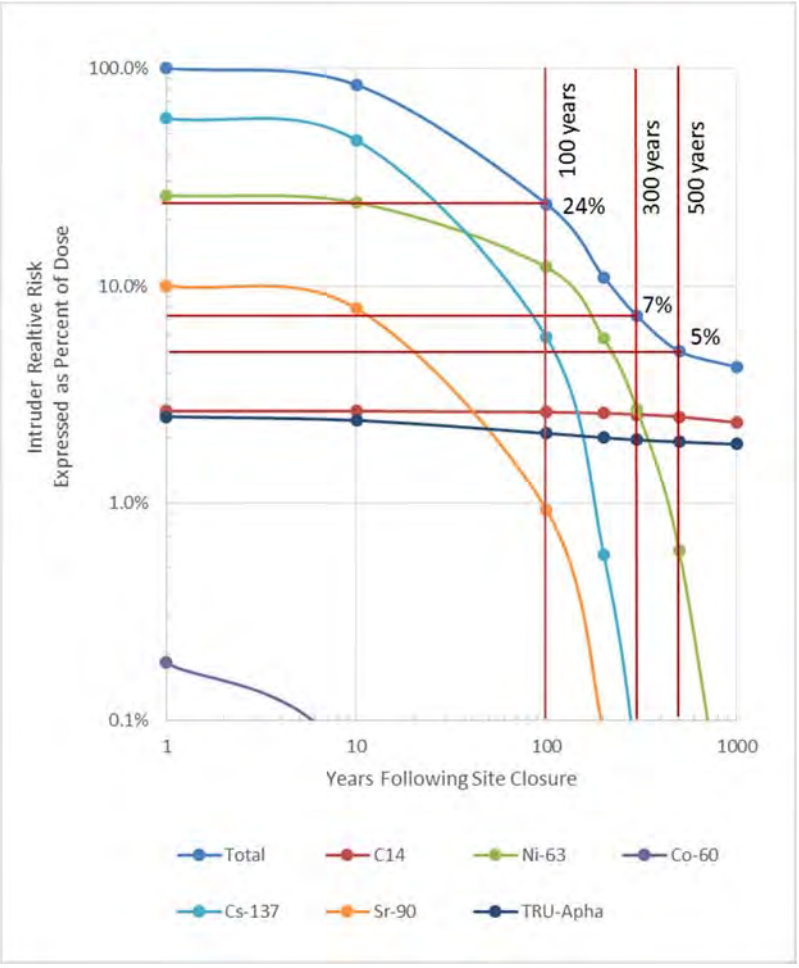
[2] **IAEA.** *WS-G-1.1, Safety Assessment for Near Surface Disposal of Radioactive Waste.* Vienna : IAEA, 1999.
[3] **Thatcher, Andrew H.** *Radiological Risk Assessment: Low Level Radioactive Waste Disposal Site Richland, Washington.* Washington Department of Health, Office of Radiation Protection. October 2003.



The concentration values identified above can be divided by the existing 10 CFR 61.55 concentration limits as a measure of risk. The results are shown below.



For the first 300 years disposal risk is driven almost entirely by ^{137}Cs and ^{63}Ni. After 500 years, only ^{14}C and TRU continue to stand as dominant risk contributors, but at reduced levels from that observed during the first 300 years. Neither ^{14}C nor TRU in this mixture are ever more than about 10% of the Class A limits (EPRI, 2010).



This data indicates that the relative total intruder risk at 100 years is 24% of the intruder risk at the time of site closure. However, based on the international studies referenced above, the more probable time for the failure of institutional controls is 300 years after site closure. The relative total intruder risk at 300 years is 7% of the risk at the time of site closure. As such, when 100 years is used as the time period for intrusion (coincident with the loss of active institutional controls), the risk is three times higher compared to when intrusion is more likely to occur. While the proposed rule assumption that inadvertent intrusion occurs immediately after the loss of institutional control is a reasonable and conservative approach, the time of the loss of institutional control should be re-evaluated.

3. **Blended Waste Described as Unanalyzed Waste Stream:** A motivation to amending the current regulations is to ensure that waste streams not analyzed during the development of the current regulation can be disposed of safely. Explicitly identified are depleted uranium and blended waste streams. The addition of 61.13 (e) Table A and the greater than 10,000 year performance period analysis requirement has resolved this concern for depleted uranium and the 2015 revision of the BTP has resolved this concern for other wastes.

   The NRC position in the draft rule is that "the blending of different classes of LLRW could also result in LLRW streams with concentrations that are inconsistent with the assumptions used to develop tables 1 and 2 of 10 CFR 61.55," which could pose an increased risk to an inadvertent intruder. This position is inconsistent with Revision 1 of the Concentration Averaging and Encapsulation Branch Technical Position (BTP). For development of the BTP, NRC staff analyzed several well drilling scenarios to determine under which conditions blending of waste streams would be safe (i.e. an annual exposure to inadvertent intruder of less than 5 mSv (500 mRem)). Using the results of the analysis, NRC staff placed constraints on blending waste streams to ensure that such waste streams are generated and disposed of in a manner to ensure public safety. Therefore, EPRI recommends that references to blended waste streams as not being analyzed be removed.

4. **Requirement for Site Closure Site-Specific Technical Analysis:** The site-specific technical analysis is identified to include: a) a performance assessment, b) an intruder assessment, c) performance period analyses, and d) demonstration of defense-in-depth protections. The site-specific technical analysis is to be provided to the regulatory authority by all operating licensees for continued operation of the disposal sites. The proposed rule further states that the site-specific technical analysis is required at the time of site closure. The rationale behind this is to provide assurance that previously unanalyzed waste streams meet performance objectives. If all of the waste that was disposed of at a particular site was analyzed in the initial site-specific technical analysis and only disposed of in accordance with the initial-site specific technical analysis, the requirement to submit a second analysis at closure should be unnecessary. An alternative to the proposed analysis requirement at closure would be to allow sites to analyze for "new" waste streams during operation prior to accepting them for disposal. This option provides greater assurance of compliance and eliminates the potential for disposal of waste streams that may not meet performance objectives.

5. **Generator's Certification Statement:** The use of NRC Form 540 is a regulatory requirement for all waste shipments regardless of the consignee (processor, collector or

disposal site) (Part 20 Appendix G III, 6.) Form 540 includes a generator's certification statement as follows:

> *This is to certify that the herein-named materials are acceptable for disposal, are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the department of transportation and the commission.*

The words "disposal" and "classified" should be removed from the certification statements in NUREG/BR-0204, Form 540 and 10 CFR Part 20 Appendix G to account for such situations where waste is not being shipped for disposal and as a result may not be classified.

The statement could be modified to bound all waste shipments regardless of the consignee (processor, collector, or disposal facility) as follows:

> *This is to certify that the herein-named materials are acceptable for the consignee's waste acceptance criteria, are properly characterized, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the department of transportation and the commission.*

Alternatively a second Generator Certification Statement could be provided that applies to shipments not intended for disposal. In its current form, the certification statement may constitute a material false statement when used for shipments to processors or for Class B and C wastes requiring structural stability.

Furthermore, certification statements should not be tied exclusively to waste acceptance criteria for disposal sites, as proposed in the revised 10 CFR Part 20 Appendix G Section II, because certification is required for all shipped waste regardless of consignor (generator) or consignee (processor, collector or disposal facility). Not all wastes shipped are suitable for disposal in the shipped form and may require further conditioning prior to disposal.

6. **Clarification Regarding Average Concentrations:** The discussion of the performance period analysis defines average concentrations as disposal site concentrations (volume of waste, stabilizer materials, material placed with disposal units and the materials used to construct disposal units). The proposed language for 10 CRF 61.13 (e) states "… waste

that contains radionuclides with average concentrations exceeding the values listed in table A of this paragraph…". It does not, however, explicitly state that the concentrations of the waste are the disposal site concentrations. The language should state this explicitly to avoid confusion.

7. **Dose Level and Effective Dose Equivalent:** When referring to waste disposal, ICRP 103 (2007) states:

> *…[D]ose estimates should not be regarded as measures of health detriment beyond times of several hundred years into the future. Rather they represent indicators of the protection afforded by the disposal system. The commission [ICRP] has given specific guidance for disposal of long lived solid radioactive waste in publication 81 and this guidance remains valid.*

The proposed reference dose thresholds in 61.42 are not risk informed when the same numerical values are used for 0-1,000 years and 1,000 to 10,000 years given the increases in uncertainty that occur as time elapses. The dose thresholds in the proposed rule should align with the latest ICRP guidance for international consistency and in recognition of the increased uncertainty of dose projections for long time periods into the future, as follows:

- The dose values in 61.41 (a), 61.41 (b), 61.42 (a), and 61.42 (b) should state that the units are presented as effective dose equivalents (EDE) to be consistent with latest dose assessment science and terminology.
- The value in the proposed 61.41 (a) for doses to the public during the compliance period (0-1,000 years) should be changed from 0.25 mSv/a (25 mrem/a) to 0.3 mSv/a[4] (30 mrem/a) for consistency with ICRP 103 and ICRP 81.
- The value in the proposed 61.41 (b) for doses to the public during the protective assurance period (1,000 to 10,000 years) should be changed from 5 mSv/a (500 mrem/a) to 10 mSv/a (1 rem/a). This is consistent with ICRP 81 recommendations for doses below which interventions[5] are likely not justified.
- The value in the proposed 61.42 (a) for doses to the inadvertent intruder during the compliance period (0-1,000 years) should be changed from 5 mSv/a (500 mrem/a) to 10 mSv/a (1 rem/a). This is consistent with ICRP 81 recommendations for doses below which interventions are likely not justified.

---

[4] 0.3 mSv/a (30 mrem/a), in ICRP 103 and as recommended by EPRI, remains a fraction of the recommended total individual public dose limit of 1 mSv/a (100 mrem/a) in ICRP 103 and a fraction of the same required individual public dose limit of 1mSv/a (100 mrem/a) in 10CFR20.1301.

[5] Examples of interventions when used in this context could mean additional protective measures in the disposal site design, a different disposal site location, etc.

- The value in the proposed 61.42 (b) for doses to the inadvertent intruder during the protective assurance period (1,000 to 10,000 years) should be changed from 5 mSv/a (500 mrem/a) to 100 mSv/a (10 rem/a). This is consistent with ICRP 81 recommendations for doses above which interventions are almost always justified.

8. **Structural Stability and the Proposed 61.58:** All three of the U.S. disposal sites accepting waste that require structural stability (normally Classes B and C) attain that stability primarily, or entirely, through actions taken at the disposal site during waste emplacement. The shipped waste package does not necessarily provide the required structural stability. The shipped package may be a licensed component of the disposal method (for example, a polyethylene high integrity container used at the Barnwell, SC facility); it is the concrete overpack applied during the disposal process, however, that fulfills the waste stability requirement in 61.56 (b) (1). Therefore, the proposed 61.58 (a) (2) is likely not achievable as written because, in general, waste as shipped does not meet the stability requirement. The proposed 61.58 (a) (2) should be reworded to specify containers and/or conditioning required by the disposal site as a component of stability recognizing that stability requirements may be fulfilled completely by the actions of the disposal site or partially by the waste container (shipped package) then completed by activities at the disposal site.

9. **Introduction of the Term "Waste Acceptance Criteria" for Site Specific Technical Analyses:** All waste consignees (processors, collectors and disposal sites), already have some form of waste acceptance criteria (WAC) or waste acceptance guidelines (WAG). This terminology, while not currently in regulation, has existed and been used for many years. In order for a consigner to ship waste (classified or not) to a consignee, it must meet the consignee WAC or WAG (hereafter WAC will be used for simplicity).

   When the term WAC is used in the proposed rules (Parts 20 and 61) and guidance (NUREG-2175), it could be construed to have a different definition depending upon where it is used. It may refer only to sites using a site specific technical analysis in accordance with the proposed revision to 61.13 and 61.58 or it may have a more generic meaning for all consignees accepting waste.

   It would be helpful to add clarity to the regulations and guidance to refer to "waste acceptance criteria" as "site specific waste acceptance criteria," "alternative waste acceptance criteria," "61.13 waste acceptance criteria," or something similar when the term "waste acceptance criteria" is referring to a disposal site that has implemented a site specific technical analysis in accordance with the proposed revisions to 61.13 and 61.58 in lieu of a more traditional 61.55 waste classification approach.

The results of EPRI research related to this topic have been published in several publicly available technical reports:

- An Evaluation of Alternative Classification Methods for Routine Low Level Waste from the Nuclear Power Industry. EPRI, Palo Alto, CA, 2007, 1016120
- Proposed Modifications to the NRC Branch Technical Position on Concentration Averaging and Encapsulation (BTP): Technical Bases and Consequence Analysis. EPRI, Palo Alto, CA, 2008, 1016761
- Options for Improved Low Level Waste Disposal Using 10 CFR 61.58. EPRI, Palo Alto, CA, 2010. 1021098.

Thank you for consideration of this letter in finalizing the revisions to 10 CFR Part 20 and 61.

Sincerely,

Lisa Edwards
Senior Program Manager
EPRI Chemistry, Radiation Safety, & Used Fuel Management

c: Larry Camper, US NRC
Neil Wilmshurst, EPRI
Randy Stark, EPRI

RulemakingComments Resource

From: llwforuminc@aol.com
Sent: Wednesday, July 22, 2015 11:58 PM
To: RulemakingComments Resource
Subject: [External_Sender] Attached Please Find Comments re Proposed New 10 CFR Part 61 Rule (Docket ID NRC 2011-0012) from LLW Forum's Part 61 Working Group
Attachments: P61WG Comments re New Proposed Part 61 Rule Language - FINAL (7.22.15).pdf

To whom it may concern:

Attached please find comments from the Low-Level Radioactive Waste Forum (LLW Forum) Part 61 Working Group (P61WG) on the proposed rule to amend 10 CFR Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste,* as published for public comment at 80 *Federal Register* 16,081 on March 26, 2015.

The LLW Forum is a non-profit organization of representatives appointed by Governors and compact commissions that seeks to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and its 1985 amendments, as well as to promote the objectives of regional low-level radioactive waste disposal compacts.

In 2012, the LLW Forum formed the P61WG—which is comprised of representatives from the four sited-states of South Carolina, Texas, Utah and Washington, as well as a representative from the Commonwealth of Pennsylvania—to provide input from the states and compacts on the 10 CFR Part 61 rule making initiative.

Thank you in advance for your consideration.

Regards,

Todd D. Lovinger, Esq.
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P61WG Comments re NRC's Proposed Amendments to 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste, as Published for Comment at 80 *Federal Register* 16,081

The Low-Level Radioactive Waste Forum (LLW Forum) is a non-profit organization of representatives appointed by Governors and compact commissions that seeks to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and its 1985 amendments, as well as to promote the objectives of regional low-level radioactive waste disposal compacts. In 2012, the LLW Forum formed the Part 61 Working Group (P61WG)—which is comprised of representatives from the four sited-states of South Carolina, Texas, Utah and Washington, as well as a representative from the Commonwealth of Pennsylvania—to provide input from the states and compacts on the 10 CFR Part 61 rulemaking initiative.

On March 26, 2015, the U.S. Nuclear Regulatory Commission (NRC) published a proposed rule to amend 10 CFR Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste,* at 80 *Federal Register* 16,081 for public comment. On the same day, NRC also published a notice of availability of associated guidance, *Guidance for Conducting Technical Analyses for Low-Level Radioactive Waste Disposal*, for public comment at 80 *Federal Register* 15,930.

The P61WG developed and hereby submits for consideration by NRC the following comments in response to the Part 61 proposed rule and associated technical guidance document as published in the *Federal Register* on March 26, 2015.

SPECIFIC COMMENTS

The P61WG has identified the following areas of agreement with the proposed new rule language and offers the following comments with regard to proposed changes concerning intruder analysis, institutional control period, performance assessment, defense-in-depth, and site stability.

Areas of Agreement

The P61WG agrees with statements made by the NRC that the current 10 CFR Part 61 regulations ensure public health and safety at all the commercial low-level radioactive waste (LLRW) facilities and also supports the following *Federal Register* notice statements:

- "The regulations in 10 CFR Part 61 are risk-informed and performance-based, and ensure public health and safety are protected in the operation of any commercial LLRW disposal facility."[1]

[1] *Federal Register* notice dated March 26, 2015, "Low-Level Radioactive Waste Disposal," (80 *Federal Register* 16,082), page 16,084.

- "Regardless of whether the assumptions regarding the LLRW, operational practices, facility design, or site characteristics of the reference LLRW disposal facility are consistent with current facilities, the NRC believes that the 10 CFR Part 61 LLRW classification system remains protective of public health and safety for the LLRW streams that were analyzed in the development of the regulations because of the reasonably conservative nature of the analysis used to develop the LLRW classification system."[2]

- "Because of the conservative nature of the assumptions used in the original 10 CFR Part 61 regulatory basis to develop the LLRW classification, the LLRW classification system is expected to be protective of public health and safety as long as LLRW disposal facilities operate within the regulatory basis of the original 10 CFR Part 61 regulations."[3]

In addition, the P61WG agrees with the following changes to 10 CFR Part 61 as proposed by NRC:

1. Revisions to the existing technical analysis for protection of the general population to include a 1,000 year compliance period and explicitly requiring a site specific analysis using modern dose methods.

2. Adding a new site-specific technical analysis for the protection of inadvertent intruders that would include a 500 mSv/yr dose limit.

3. Providing licensees and regulators flexibility by allowing waste acceptance criteria (WAC) to be developed using site-specific analyses for LLRW disposal of unique waste streams (based on the results of these technical analyses) or to continue using the existing LLRW classification requirements.

4. Use of the total effective dose equivalent (TEDE) in § 61.41 and the dose limit of 25 mSv/yr.

5. Allowing licensees the flexibility to use International Commission on Radiation Protection (ICRP) dose methodologies in a site-specific performance assessment.

6. The new requirement to redo performance assessments within five years of closure, provided no new additional sampling should be done (unless absolutely needed) and provided only updating:

    - the inventory; and,

    - equation values such as kd and potential exposure scenarios appropriate to the specific location.

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[2] *Federal Register* notice dated March 26, 2015, "Low-Level Radioactive Waste Disposal," (80 *Federal Register* 16,082), page 16,099.
[3] *Federal Register* notice dated March 26, 2015, "Low-Level Radioactive Waste Disposal," (80 *Federal Register* 16,082), page 16,099.

Intruder Analysis

The P61WG offers the following comments and questions concerning intruder analysis considerations:

7. NRC has stated that there may be site-specific conditions that require licensees to assess disposal facilities beyond the compliance period even when long-lived waste is limited. This statement is not consistent with other NRC statements and inspection findings. NRC should state in detail what specific concerns they have with current sited state facilities that would require additional analysis beyond the currently accepted 500-year timeframe, associated with the current waste classification system, for the more traditional LLRW streams.

8. The inadvertent intruder assessment would be a new requirement under § 61.13 to demonstrate compliance with the performance objective to protect inadvertent intruders at § 61.42. The inadvertent intruder assessment would have to demonstrate that the annual dose would not exceed a proposed 500 mSv/yr limit over a newly defined 1,000-year compliance period. Current LLRW sites operating under current Part 61 regulations should not need to demonstrate protection of the general population from releases of radioactivity, and protection of inadvertent intruders using the 1000-year compliance period analysis, because the current waste classification system already ensures protection at 500 years. If use of the waste classification system ensures protection at 500 years, why is NRC requiring proof at 1,000 years for sites that are not going to accept non-traditional waste streams?

Institutional Control Period

The P61WG offers the following comments concerning the institutional control period:

9. As part of the defense-in-depth philosophy, NRC should allow Agreement States the flexibility to fund institutional control periods beyond the 100-year institutional control period. NRC should recognize the need for a "passive" institutional control period beyond the first 100 years and for the remainder of the life of the facility. The timeframe for the institutional period should be established on a state-specific basis.

10. NRC should reconsider its argument that although the longevity of government may reasonably be assumed to extend beyond 100 years, the 100-year institutional control period is also tied to the possibility of bureaucratic error. Such an argument is unreasonable in light of the fact that 40 CFR 192.12 requires post-closure care and maintenance in perpetuity at reclaimed uranium mill sites.[4] NRC should address the inconsistency between LLRW institutional control periods and perpetual institutional control periods required at uranium mill tailings facilities.

[4] See also Appendix A to Part 40, "Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content," and NUREG-1620, "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act."

Performance Assessment

The P61WG offers the following questions and comments regarding issues concerning performance assessments:

11. The uncertainties associated with the long period of performance assessment are large enough that it is very challenging to make a credible prediction about the long-term performance of the disposal facility (10,000 years and beyond). This will complicate the licensing process for any future commercial LLRW disposal facilities and currently operating sites that elect to only accept traditional LLRW streams. Therefore, the most appropriate action for the NRC would be to develop a new stand-alone § 61.60 or a new Subpart H for sites that propose to accept large volumes of long-lived radionuclides. (See the following sections for additional information.)

12. Provide the basis for defining long-lived waste as waste that contains more than 10 percent of its initial radioactivity after 10,000 years. Does this correlate to the annual dose limit of 500 mSv for the inadvertent intruder scenario?

13. The protective assurance period should be applied only to sites that pursue acceptance of large volumes of long-lived waste streams. This makes sense and ensures that the disposal of these new or previously unanalyzed waste streams would not present an unacceptable risk to future generations by minimizing radiation doses from the end of the compliance period until 10,000 years. In addition, the assigned dose stated in § 61.41(b) and § 61.42(b) for the protective assurance period is not clear. As stated in these paragraphs, the annual dose shall be below 5 mSv or a level that is supported as reasonably achievable. Is the 5 mSv an upper limit or are higher levels allowed if supported as reasonably achievable based on technological and economic considerations?

14. Establishing a three-tiered approach is not efficient, clear or reliable. Implementation of a three-tiered approach will place a significant burden on Agreement States, facility operators and generators without providing added safety protection. A two-tiered approach with a compliance period of 1,000 years and an analysis out to peak dose as a second tier would be protective and is more clear, efficient and reliable. A two-tiered approach out to peak dose will close the current gap for risks that increase for long-lived radionuclides.

15. Some sited states have concerns about revisiting the site performance assessment unless they opt to take significant quantities of long-lived alpha emitters (e.g., depleted uranium). The concept of requiring all facilities to redo the performance assessment, even when a state will not accept the new waste streams, brings in to question the cost/benefit of the action.

16. Section 61.13(e) seems to state that a performance assessment is only needed if a site is going to take long-lived alpha emitters.

Defense-in-Depth

The P61WG offers the following comments related to defense-in-depth considerations:

17. The proposed rule should include a clear (explicit) statement that licensing decisions are based on defense-in-depth protections. The extensive proposed text explaining the "safety case" and describing its attributes should be removed and provided in guidance. The proposed language is not clear (understandable), efficient, and will be very difficult to implement reliably. It is understood that explicitly identifying and describing the features of the design and site characteristics that provide defense-in-depth protection should be required. However, no specific new analyses beyond identifying and describing the features of the design and site characteristics that provide defense-in-depth protection should be required.

18. The revised regulations introduce a new term called the "Safety Case." Safety Cases (SC) are, in their simplest terms, a collection of arguments and evidence showing that a facility can be sited, designed, constructed, commissioned, operated and shutdown/closed in a safe manner. A key component of the SC is the analytical safety (performance) assessment. The NRC equates the Safety Case to a Performance Assessment + Defense-in-Depth. Sited states will also be constrained by the state laws and regulations governing safety. Currently operating sites believe their processes (radioactive materials licensing, including a performance assessment and a site environmental review (e.g., National Environmental Policy Act (NEPA) or similar state laws)) will produce as robust a safety case.

19. Defense-in-depth information (e.g., several independent barriers) should be available in pre-operational documents for each site. For current sites, retrofitting may be extremely difficult if the site is dependent on only one or two robust barriers. For example, in Washington, the site operator buries radium sources, stabilized in concrete, in state-approved packages at depth in stable trenches.

Site Stability

The P61WG offers the following comments related to site stability considerations:

20. If a site accepts only LLRW that meets the current waste classification system (500-year safety standard), that site should be exempted from the NRC's proposal to revise § 61.44 to specify that stability of the disposal site must be demonstrated for the compliance and protective assurance periods of 10,000 years.

21. NRC states, because NRC regulations already require a site stability analysis, the NRC does not anticipate any additional cost to the licensee resulting from the changes to § 61.44. The P61WG disagrees. Revised § 61.44, requiring stability for 10,000 years, is unreasonable. The NRC, the U.S. Environmental Protection Agency (EPA) and Congress (e.g., Uranium Mill Tailings Remediation Control Act legislation) have recognized that requiring stability beyond 200 to 1,000 years cannot be proven. Current stability requirements for Part 61 sites are largely met.

22. The "Concepts" § 61.7 refers to 100, 300 and 500-year timeframes in multiple instances, but not timeframes on the order of thousands of years. Specifically, § 61.7(a)(2) for waste characterization requires that site characteristics should take into account the radiological

characteristics of the waste and be evaluated for at least a 500-year timeframe and § 61.7(f)(3) suggests that the effective life of an intruder barrier be at least 500 years. Section 61.7(f)(1) suggests that Class B and C waste forms or containers should be designed to be stable over 300 years. However, the language proposed in § 61.44 requires long-term stability of the disposal site for the newly defined compliance (1,000 years) and protective assurance (10,000 years) periods that are much longer timeframes.

The concept of stability for a period of 10,000 years seems incommensurate with the overall concept of near-surface disposal of LLRW given the constantly changing surface environment over time. Also, ensuring stability of surface soil in 10,000 years presents an obvious challenge, yet Class C waste can be buried up to 5 meters below the ground surface of a near-surface disposal facility in accordance with § 61.52(a)(2). In addition, engineered barriers for near-surface disposal have finite lifespans.

GENERAL COMMENTS

The P61WG offers the following comments regarding applicability of the proposed new requirements and policy considerations related to the Part 61 rulemaking initiative.

Applicability of the Requirements

NRC should consider the following comments regarding the potential impact of the new proposed rule language:

23. In the section titled, "Why do the regulatory requirements need to be revised?" as contained on page 16,087 of the *Federal Register* notice, one of the reasons provided is related to new waste streams that were not envisioned during the development of 10 CFR Part 61. These waste streams include, but are not limited to, depleted uranium from enrichment facilities, LLRW from U.S. Department of Energy (DOE) operations, blended LLRW streams in quantities greater than previously expected, and the generation of different LLRW streams that may result from new technologies. The concerns related to the disposal of these waste streams are not entirely applicable to all existing facilities. For example, only two of the existing facilities are candidates for the disposal of depleted uranium from commercial enrichment facilities or from DOE. Also, one of the disposal facilities disposes of all waste with intruder barriers so the "large scale blending of Class B and C concentrations of LLRW with Class A to produce a Class A mixture that could result in a dose to an inadvertent intruder that is above 500 mrem" would not be relevant. Since the waste streams described will be considered for future disposal, the associated new requirements should only affect those facilities that pursue these waste streams in the future.

24. For those sites that continue to use the existing classification requirements, any new requirements should be determined on a case-by-case basis and implemented through terms and conditions of the license consistent with the provisions in § 61.1(a). [Note: NRC's recent explanation of § 61.1(a) purpose and scope is problematic. Section § 61.1 states that "Applicability of the requirements in this part to Commission licenses for waste disposal facilities in effect on the effective date of this rule will be determined on a case-by-case basis." This language recognizes that new requirements introduced after a facility is sited, licensed and

operated under previous requirements would not necessarily be binding on either Agreement States or operators that, in good faith, committed to, and were licensed under, specific site conditions and licensing requirements. NRC staff interprets that this only applies to the early 1980's timeframe. NRC's new interpretation is changing those commitments and licensing requirements and adding burdens on Agreement States, operators and generators by changing the criteria for long-term operation, closure and decommissioning for a specific site as a form of back-fit. Without some form of grandfathering, Agreement States will be subject to significant burdens and future litigation risks.].

25. The applicability of the original rule published in 1982 was set forth in § 61.1(a) which states in relevant part, "Applicability of the requirements in this Part in effect on the effective date of this rule will be determined on a case-by-case basis and implemented through terms and conditions of the license or by orders issued by the Commission." Many of the Part 61 requirements were eventually applied through license conditions to near-surface disposal facilities in operation on the effective date of the rule, and the applicability was determined on a case-by-case basis as stated in § 61.1(a). This language afforded regulators of licensed disposal facilities the flexibility to consider when, and if, each facility should comply with the new requirements based on practical, economical and technical considerations.

26. Language is proposed to be added in § 61.13 requiring that technical analyses shall be submitted by all "[l]icensees with licenses for land disposal facilities in effect on the effective date of this subpart…at the next license renewal or within 5 years of the effective date of this subpart, whichever comes first." The case-by-case decision-making afforded by § 61.1(a) is thereby taken away in the proposed language of § 61.13. The proposed rule language should be clarified to reflect that the case-by-case application afforded by § 61.1(a) also applies to the proposed rule.

27. During a public meeting in Columbia, South Carolina on June 2, 2015, an NRC representative indicated that the language in § 61.1(a) was only intended to apply to the initial Part 61 requirements and not to subsequent revisions to Part 61. We disagree. That interpretation is not made clear by either the current or the proposed language. If available, the NRC should identify information in documents related to the original promulgation of Part 61 that supports this interpretation. We recommend providing explicit language to allow flexibility regarding subsequent revisions to Part 61 for licensed facilities with licenses in effect on the effective date of the original rule.

28. While the use of the term "case-by-case" may have been intended to refer to a facility, the proposed changes to Part 61 are the most significant since its promulgation and warrant flexibility for each requirement. It is unclear what flexibility exists in the applicability of the original and the proposed new Part 61 requirements.

29. NRC should also consider revising the language to clearly indicate that the applicability of individual requirements of the rule would be determined on a case-by-case basis. In support of this suggestion, please note that the current and proposed language "implemented through terms and ***conditions*** of the license" implies that the individual requirements of Part 61 may be applied separately since only a single ***condition*** of a license to require compliance with Part 61 as a whole.

30. The NRC should revise the language to indicate that “case-by-case” refers to each individual licensed facility and to each individual requirement. It is understood that many of the requirements of Part 61 are related. Therefore, the regulator would have to carefully consider how to individually apply the requirements of the regulation. NRC should structure the regulation to be amenable to individual application of requirements where practical. This could be accomplished by separating the proposed new requirements for technical analyses into a separate section, an appendix or a subpart.

31. NRC should allow flexibility in determining the applicability of the proposed requirements to waste already disposed and future waste disposal, taking into consideration established precedence, technical and economic issues, and the effect on overall site design.

32. Although many Part 61 requirements were eventually applied to waste disposal facilities that had licenses in effect on the effective date of the original Part 61 rule, the requirements were typically only applied to future waste disposal operations. For example, waste already disposed was not required to be evaluated to determine whether it may have been considered Class B or Class C waste under the then-new waste classification system. Such an evaluation was not considered necessary since a decision to apply new stability and intruder protection requirements to waste already disposed would likely be disruptive to the disposal system, result in an increase in dose to workers and potentially the general population, and create an unnecessary technical and economic burden for the licensee and the regulator.

33. The proposed language in § 61.7(f)(2) states that waste classified under § 61.55(a)(6) may not decay to acceptable levels in 100 years and safety is provided by limiting quantities and concentrations of the material consistent with the disposal site design. Such limitations on quantities and concentrations can only reasonably be applied to future waste disposals.

34. Similarly, § 61.7(f)(3) states that waste that will not decay to acceptable levels in 100 years “...must be stable and be disposed at a greater depth...” and “where site conditions prevent deeper disposal, intruder barriers such as concrete covers may be used.” For waste already disposed, classified under § 61.55(a)(6), and where site conditions prevent deeper disposal, the only option would be to use intruder barriers. The incorporation of such barriers into site design as a remedial measure could have negative consequences. For example, high integrity containers (special containers designed to provide stability) within the disposal unit have structural design requirements based in part on the overburden expected in the disposal environment. In this example, adding concrete barriers on the surface would be incompatible with the overall site design and could compromise the integrity of the high integrity containers. Also, for LLRW disposal facilities, one of the major activities is typically to install a final engineered cap as an engineered barrier and to enhance site stability. For one site, the final cap has been installed for the majority of the disposal area. Once the final cap is installed and the related drainage features of the site are designed, any modification such as adding concrete barriers would compromise the overall site design.

35. It is clear that, at the time of the initial promulgation of the requirements in Part 61, NRC recognized the need to allow for flexibility in applying new regulations to existing facilities by explicitly addressing its applicability to existing facilities in § 61.1(a). The language in § 61.1(a) aligns with the philosophy that waste disposed in good faith and in accordance with applicable

standards in place at the time should not necessarily be subject to new requirements that may be technically impractical and/or financially prohibitive. The reasons to adopt such a philosophy remain valid regardless of whether disposal facilities were able to eventually comply with some of the, then-new, requirements. The NRC should continue to adhere to this philosophy.

36. This philosophy is also evident in the following examples found in EPA's regulations:

Example One

EPA's 40 CFR 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes - Subpart B, Environmental Standards for Disposal" originally promulgated September 19, 1985: The applicability paragraph found at 40 CFR 191.11(b)(2) states that the Subpart does not apply to "Wastes disposed of before November 18, 1985."

The explanation for the decision not to apply the new rule to wastes already disposed can be found in the document, "The US EPA's Re-Promulgation of Environmental Standards for the Management and Disposal (40 CFR Part 191) Update 1990," by Raymond Clark, *et al.* The document, which can be found at http://www.wmsym.org/archives/1990/V1/87.pdf, states as follows:

> *As it was originally promulgated, 40 CFR 191 did not apply to wastes already disposed of. The various provisions of Subpart B were to be met through a combination of steps involving disposal system design and site selection and operational techniques. The agency believed that it was appropriate that subpart B apply only to disposal occurring after promulgation so that the full range of site selection and design controls could be taken into account in complying with this rule.*

It is reasonable to apply the same logic to LLRW that has already been disposed. For existing LLRW disposal facilities and waste already disposed, site selection is fixed, disposal system design is either fixed or offers limited options for changes, and operational techniques may offer more options for changes but only for future disposals. Given these limitations, actions that have been taken prior to the effective date of the rule should be subject to new standards on a case-by-case basis.

Example Two

EPA's "Amendments to the Corrective Action Management Unit Rule," which can be found at http://www.gpo.gov/fdsys/pkg/FR-2000-08-22/pdf/00-20534.pdf: While the entire context of this rule is not relevant to the applicability of new requirements for LLRW disposal, the concepts applied regarding "grandfathering" are of interest. In providing an explanation for the flexibility offered by "grandfathering" certain corrective action management units, the EPA states that "…good-faith work has been done …" and the "… imposition of the new requirements would be an inefficient use of a facility's and the agency's cleanup resources." (EPA also suggests using the proposed amendments as guidance.)

This idea is relevant in terms of an existing licensed LLRW disposal facility where both the licensee and regulator may have already expended resources in the development of a closure plan and, more significantly, in performing and completing activities associated with closure of the disposal facility, such as final cap installation and the construction of site drainage features.

Policy Considerations

The P61WG encourages NRC to take note of the following policy considerations:

37. If the NRC proceeds with the proposed rulemaking approach, it will likely make future site development much more difficult and it will:

    - Considerably change the dynamics of the site development process, including the ability of states and compacts to gain public support for the development of new LLRW disposal facilities. There needs to be a significant separation in the LLRW regulations between what is considered a traditional LLRW disposal facility (using waste classification tables to ensure safety after 500 years), and those facilities that intend to pursue the disposal of large volumes of long-lived radioactive wastes, in which the peak dose will not occur for tens of thousands of years.

    - Impact one of the most important arguments for both regulators and state officials, as regulators will no longer be able to inform the public that the vast majority of activity of the LLRW disposed at a facility will decay to a safe level that is only a fraction of its original activity within 500 years (1% of the original activity)—a statement the public can relate to and accept.

    - Adversely impact current operating sites that have no intention of accepting for disposal large quantities of long-lived radionuclides, such as large volumes of depleted uranium. Such action is unnecessary and burdensome, especially when one considers that NRC has already determined that public health and safety and the protection of an inadvertent intruder is adequately addressed by the current language found in Part 61, as long as the waste classification system is followed. If NRC moves forward with the proposed revision, it is likely that any new states considering the development of a traditional LLRW site may decide against it, as they recognize that the rules can change at any time to allow extremely different waste streams than were contemplated during the original public process.

38. Where practical, NRC should avoid the "one size fits all" approach in the development of new regulations or requirements for disposal of LLRW. For example, the design of the Pennsylvania regional facility requires an above-grade construction with multiple barriers (e.g., engineered cover, over-packs and disposal modules) and shallow land burial is prohibited. The facility design and other state-specific requirements would not allow disposal of large quantities of certain types of waste (low activity - high volume waste and depleted uranium) at a future facility in the Commonwealth of Pennsylvania. The regulations in Pennsylvania, as well as the regulations in the four current sited states of South Carolina, Texas, Utah and Washington, establish a concentration limit for disposal of Ra-226 at their regional facility.

39. It is extremely important that NRC maintain the current LLRW classification system in 10 CFR Part 61 and not remove it. Removal would present many challenges because the LLRW classification requirements are well integrated with other requirements of 10 CFR Part 61 as well as with some sited states' LLRW disposal requirements and as individual licensee programs. Complete replacement of the LLRW classification system would likely expand the effect of the rule revisions beyond the intended scope of this rulemaking.

40. The Regulatory Analysis of the proposed rule is inadequate because staff has significantly underestimated the burden and cost of implementation of the complex proposal on the Agreement States, operators and generators. The estimated costs (burden) of implementation are off by a factor of two or more.

41. The NRC fails to identify un-quantified liabilities created by the proposed language. It will also likely generate extensive litigation risk for existing sites as closure plans are implemented.

The NRC staff, in its goal to develop new requirements governing the disposal of large quantities and concentrations of long-lived radionuclides in a near surface disposal facility, has proposed a framework of requirements largely based on high-level radioactive waste guidance documents. This extensive "how to" guidance, applied to all LLRW disposal facilities, is both unnecessary and overly restrictive. The discussion is wordy, not concise, rambling and ambiguous. Certain language used in the "Concepts" section of the regulation (e.g., "insights provide input for making regulatory decisions") is undefined, broad, unclear and ambiguous and therefore not appropriate language for a regulation. This language is more suitable for regulatory guides or the statements of consideration that should accompany the rule, not for the regulation itself.

The proposed new rule could have significant unintended consequences including the following: existing sites may consider early closure to avoid litigation risks incurred by the proposed rule amendments; the proposed rule will likely be a barrier for development of new sites for LLRW disposal; and, the burdensome and unnecessary new language included in the proposed rule may deter investment in new disposal capacity. The rule should not overlie the new set of requirements on existing sites that desire to continue to use and apply the existing Part 61 requirements.

PROPOSED ALTERNATIVE APPROACH: MAINTAIN CURRENT 10 CFR PART 61 REGULATIONS AS WRITTEN FOR TRADITIONAL WASTE STEAMS AND DEVELOP A NEW STAND-ALONE § 61.60 OR A NEW SUBPART H TO ADDRESS NEW UNANTICIPATED WASTE STREAMS

The P61WG provides the following analysis in support of keeping the 10 CFR Part 61 regulations as written for traditional LLRW streams, as well as retaining the current language in § 61.58 and its intended flexibility for NRC and Agreement States. In regard to waste streams that were not previously anticipated, the P61WG recommends that NRC develop a new stand-alone § 61.60 or a new Subpart H as more fully explained below.[5]

[5] The State of Texas, which has already authorized the disposal of large quantities of depleted uranium at the Waste Control Specialists LLC facility in Andrews County, does not concur with the approach that is described in this section as advocated by the States of South Carolina, Utah, Washington and the Commonwealth of Pennsylvania.

Reasons to Keep the Current Part 61 Regulations as Written for Traditional Waste Streams

The P61WG believes that NRC should keep the current 10 CFR Part 61 regulations as written for traditional LLRW streams and should retain the current language in § 61.58 and its intended flexibility for NRC and Agreement States for the following reasons:

42. The principle basis used for setting the current 10 CFR Part 61 classification limits, LLRW characteristic requirements, and operational requirements, focused on limiting public exposures, as well as limiting exposure to an inadvertent intruder. Other considerations at the time included long-term environmental impacts, LLRW disposal facility stability, institutional control costs, and financial impacts. NRC has stated on numerous occasions that all four operating sites have been found to be in compliance with Part 61 and protective of public health and safety. This finding illustrates how valuable the current regulations are for safe disposal of LLRW. It is very important to keep Part 61 as written for traditional LLRW streams.

43. In its *Federal Register* notice, NRC stated that regardless of whether the assumptions concerning the LLRW regulations, operational practices, facility design, or site characteristics of the referenced LLRW disposal facility are consistent with current facilities, NRC believes that the 10 CFR Part 61 LLRW classification system remains protective of public health and safety for the LLRW streams that were analyzed in the development of the regulations because of the reasonably conservative nature of the analysis used to develop the LLRW classification system.

44. NRC's contention that the proposed rule will balance the consideration of the risks from the disposal of large volumes of long-lived LLRW with significant uncertainties that may be associated with long-term analysis is not necessary for sites that continue to only take the traditional waste streams allowed under the current classification system. Traditional sites follow the current regulations, and the protection of inadvertent intruders is demonstrated by compliance with the LLRW classification language (§ 61.55) and segregation requirements (§ 61.52, "Land disposal facility operation and disposal site closure"), and by providing adequate barriers to inadvertent intrusion.

45. The statement in the *Federal Register* notice that "the development of concentration limits by generic analysis or policy works well for countries that only have one disposal site" fails to properly acknowledge that the current system has a long history of success and has worked well for the four operational sites in the United States.

46. The current classification system establishes concentration limits for all of the LLRW sites. This approach involves using an analysis that demonstrates the safe decay of waste within 500 years, with regulator-derived concentrations and quantity limits for long-lived isotopes. This approach has been used successfully in this country and has the advantage of effectively mitigating the questions of long-term performance uncertainties, and ensuring the protection of public health and safety for present and future generations.

Proposed Alternative Approach that Addresses Traditional Waste Streams and the New Unanticipated Waste Streams

The P61WG recommends the following alternative approach to address the new unanticipated waste streams:

47. A Waste Acceptance Criteria (WAC) approach should be included. However, removing the current language in § 61.58 and its intended flexibility for NRC and Agreement States is not the most preferred approach. A new stand-alone § 61.60 or a new Subpart H should be developed that addresses use of the WAC approach and incorporates the following additional changes:

    - Section 61.7, "Concepts," has been overwhelmed by an attempt to provide unnecessary and burdensome "how to" guidance in the rule. In general, the proposal is an overreach with inclusion of excessively prescriptive language taken from high-level radioactive waste (HLW) guidance documents that is not necessary for rulemaking and should be limited to guidance.

    - Similarly, § 61.13, "Technical Analysis," has been overwhelmed with very prescriptive "how to" guidance in the rule. Section 61.13(e) is not clear and will be very difficult to implement in a contested case. Table A is unclear and subject to interpretation, which will place an unnecessary burden on states and operators.

    - Add a subsection to § 61.7, "Concepts," to reflect the new structure and requirements in Part 61 governing acceptance and disposal of "the newer and additional waste streams" containing higher concentrations and larger quantities of longer-lived radionuclides. This would include reference to a new stand-alone § 61.60 or a new subpart H that would apply prospectively to new long-lived waste streams. It would specify the new incremental requirements and analyses that an applicant would need to complete in order to receive and dispose of the newer waste streams. The incremental requirements would be based on the proposed revisions to § 61.13, "Technical Analyses" (Performance Assessment), § 61.42 "Protection of Individuals to Inadvertent Intrusion," and § 61.58 "Alternative Requirements for Waste Classification and Characteristics."

48. NRC staff indicates that a currently operating site, or a new proposed LLW disposal site, could choose to continue to use and apply the existing waste classification system and associated waste form and disposal requirements set out in Part 61, or could apply a new set of WAC developed through the analyses prescribed in the proposed rule changes. For example, the staff states: "In defining LLRW streams with acceptable radionuclide concentrations or activities and waste forms, licensees or license applicants would be allowed to use either the results of the site-specific technical analyses set forth in 10 CFR 61.13, or the LLRW classification requirements in 10 CFR 61.55." NRC further states as follows: "In the proposed rule, the NRC is proposing the hybrid waste acceptance approach (Option 3) as the regulatory LLRW acceptance framework for the near-surface disposal of LLRW. The hybrid waste acceptance approach provides a framework for the use of either the generic LLRW classification system specified in 10 CFR 61.55 or the results of the technical analyses required in 10 CFR 61.13." This distinction does not appear to be clearly delineated in the rule changes. It is not clear how the regulator and operator would implement this approach. Moving this language to a new stand-alone § 61.60 or a

new subpart H would be efficient, effective and clarify that it applies only to any new waste streams accepted after the date of the new rule.

49. The proposed language in 61.58(a)(1) states that "Allowable activities and concentrations shall be developed from the technical analyses required by either 61.13 for any land disposal facility or the waste classification requirements set forth in 61.55 for a near-surface disposal facility." The discussion of "Option 3. Hybrid waste acceptance approach" on page 16,100 of the *Federal Register* notice uses the term hybrid but then describes an "either/or" approach. NRC should clarify whether a WAC could be approved that proposes limits for individual radionuclides from both the results of the technical analyses and the waste classification tables, a true hybrid approach. (i.e., can the licensee pick and choose limits for each specific radionuclide from the waste classification tables ***and*** the results of the analysis carte blanche or does the licensee have to choose one ***or*** the other exclusively?).

50. As currently written, the proposed changes in paragraph 61.58(h) create at least four important concerns. First, it inappropriately predetermines the outcome of a decision about the use of waste acceptance criteria by using the phrase "will be approved." Second, with the apparent certainty in the approval of the waste acceptance criteria, it limits flexibility and undermines the ability to exercise the option proposed by the hybrid approach, which allows for the continued use of the existing waste classification system. Third, it creates regulatory confusion by implying that with the approval of waste acceptance criteria, application of the waste classification system is unnecessary or even completely moot. Fourth, the reference to applying the criteria of § 61.23 is overly broad and should at least specifically exclude paragraph (h), which addresses financial surety, and is not directly tied to a determination of the approval of waste acceptance criteria. Additionally, given the proposed language in § 61.7, "Concepts," regarding waste acceptance, the reference to using the criteria of § 61.23 is inconsistent. As described in § 61.7, waste acceptance is based on meeting the performance objectives and is not specifically linked to the criteria of § 61.23.

51. Notwithstanding the substantive comments above, the language in 61.58(a)(1) should be grammatically revised to move the word "either" and add the word "from," as follows: "Allowable activities and concentrations shall be developed **either** from the technical analyses required by ~~either~~ 61.13 for any land disposal facility or **from** the waste classification requirements set forth in 61.55 for a near-surface disposal facility."

COMPATIBILITY CATEGORIES, ADMINISTRATIVE COMMENTS AND RECOMMENDATION TO PERFORM REGULATORY AND BACK-FIT ANALYSES

The P61WG offers the following comments regarding compatibility categories and administrative issues. In addition, the P61WG recommends the performance of regulatory and back-fit analyses for the proposed rulemaking.

Compatibility Categories

The P61WG provides the following comments related to compatibility categories for the proposed rulemaking:

52. NRC and the host Agreement States should collaborate to determine an appropriate compatibility category and to minimize the potential for unintended consequences that could result from the implementation of the final rule.

53. Key revisions to Part 61 are designated as Compatibility Category B. Such a designation creates a conflict with Utah's existing depleted uranium performance assessment rule. In April 2010, Utah adopted a rule specifically addressing when a performance assessment is required for depleted uranium disposal, as well as the framework and nature of the performance assessment. The use of Compatibility Category B removes the flexibility that an Agreement State, such as Utah, needs in order to address state-specific needs and circumstances. For example, the proposed compliance period of 1,000 years is inadequate for a depleted uranium performance assessment. The certainty of progeny ingrowth requires a minimum compliance period of 10,000 years in order to determine compliance with the required performance objectives. The P61WG strongly encourages the Commission to offer the needed flexibility to the Agreement States by removing the Compatibility Category B designations in the proposed rule. While the 10,000-year timeframe may be workable, the breakdown between compliance period and protective assurance period should be left to the states with a minimum compliance period of 1,000 years.

Administrative Comments

The P61WG offers the following administrative comment related to the proposed rulemaking:

54. Changes are proposed for the language in § 61.28(a); however, there is no listing for § 61.28(a) in the "Proposed Compatibility Category for 10 CFR Part 61" on page 16,112 of the *Federal Register* notice. There is, however, a listing for § 61.28(a)(2) that also has proposed changes.

Regulatory Analysis and Back-fit Analysis

The P61WG encourages NRC to consider performing a regulatory analysis and back-fit analysis for the following reasons:

55. NRC should perform a rigorous cost-benefit analysis so that it fully understands the impacts of this important rulemaking on all affected licensees.

56. The NRC voluntarily performed a regulatory analysis and published Draft Regulatory Analysis for Proposed Rule: Low-Level Radioactive Waste Disposal (10 CFR Part 61) in February 2015. The NRC did not perform a back-fit analysis as described in 10 CFR 50.109. Neither a back-fit analysis nor a regulatory analysis is required by statute or regulation for 10 CFR Part 61. However, the NRC has been voluntarily performing regulatory analyses since 1976.

57. Although this regulatory analysis does provide assumptions of the estimated costs for implementation of revisions to Part 61, the estimated implementation costs presented are generic in nature and do not include site specific considerations that could substantially increase these costs. Also, there are potential additional costs that may not have been considered. These include, but may not be limited to, costs associated with procuring regulatory technical expertise required to review and comment on the performance assessments that utilize the new complex methods proposed, and costs associated with potential remediation activities at existing sites under the current Part 61 requirements.

NRC estimates that the regulators of existing facilities will need to expend substantial resources in implementing the proposed new requirements. Many states do not have the resources or expertise to review analyses that are substantially more complex than the current required analyses and will likely need to seek assistance from the NRC staff or private companies to perform the reviews. External review assistance is more expensive than internal reviews and most states do not have funds set aside for this. License fees could potentially be increased to support the more complex reviews, but license fees are typically set in regulation and would require legislative support to increase and therefore could not be guaranteed. It is our understanding that actual costs incurred by licensees that completed similar performance analyses (to meet state requirements for depleted uranium acceptance that are already in place), and those incurred by Agreement States reviewing the analyses, substantially exceeded the NRC cost estimates published in the Regulatory Analysis document. NRC should reconsider the basis for these cost estimates and publish updated information.

58. Given the significant costs to licensees, license applicants, and regulators associated with implementing the new proposed requirements, and considering that the proposed revisions represent the most substantial changes to Part 61 since its promulgation, the NRC should consider performing an expanded regulatory analysis, including a back-fit analysis. This analysis should assess whether the proposed revisions will provide for a substantial increase in the overall protection of the public health and safety at sites that will not accept these new unanticipated waste streams and at the sites that will take them and that the associated direct and indirect costs are justified by the benefits. In performing the expanded analysis, the NRC should address the pertinent items listed in 10 CFR 50.109(c).

RulemakingComments Resource

From: Charles Brexel Sr. <cbrexel@aol.com>
Sent: Thursday, July 23, 2015 6:38 AM
To: RulemakingComments Resource
Subject: [External_Sender] Radioactive Waste Disposal 10 CFR61 Docket ID NRC-2011-0012

Dear Secretary,

I, along with probably more than 225 million Americans (i.e. 9 out of 10 Americans in recent surveys), who want the least local pollution and health risk from nuclear power reactors, and along with more than 24.36 million members and supporters of the supporting organizations listed below and more supporting organizations, strongly oppose the proposed 10 CFR 61 changes and ask the NRC to make changes in the direction of greater isolation of waste.

Radioactive releases and exposure to humans and other species must be prevented, not increased.

We especially reject and ask that you remove the following provisions in your proposal:

No deregulation of radioactive waste:

Remove all provisions that would allow nuclear waste to go to regular trash or other unregulated places or into commercial recycling into consumer goods. This approach has been consistently rejected by the American public and explicitly by Congress in the 1992 Energy Policy Act. Delete the existing "§ 61.6 Exemptions" and the proposed addition to "§61.7 Concepts" that would allow deregulating, exempting and releasing radioactive waste and materials from radioactive regulatory control.

No increase in radiation to the public:

Reduce radiation releases: the goal should be to prevent all releases. Reject the proposed change from the current allowable public dose of 25 millirems/year to the higher 25 millirems EDE, 100 millirems EDE, 500 millirems EDE or even more per year.

No "black box" Performance Assessments by dump operators:

Remove all provisions that would allow dump operators to do their own "Performance Assessments" and make "Safety Cases" to claim they can put more kinds of radioactive waste and longer-lasting nuclear waste in shallow land burial trenches. This presents an obvious conflict-of-interest issue, as operators would have a vested interest in a favorable outcome of such assessments.

No preemption of state's authority:

Allow states to continue setting stricter, more protective standards than NRC. Remove the "Level B" compatibility requirement.

Radioactive materials hazardous for 100 years or more should be kept out of burial grounds. Simply labeling various time periods (compliance, performance, protective assurance, etc) and assigning increasing allowable doses does not protect anyone--it simply makes it legal to pollute.

The members and supporters of the supporting organizations for this letter include more than the listed members and supporters for each of the following organizations (more than 24.36 million total):

National Wildlife Federation – 4 million Credo Action – 3.5 million Sierra Club – 2.4 million National Audubon Society – 2 million Natural Resources Defense Council (NRDC) – 2 million World Wildlife Fund (WWF) – 1.09 million Earthjustice – 1 million Environment America – 1 million The Nature Conservancy – 1 million Defenders of Wildlife – 1 million Environmental Defense Fund – 1 million Clean Water Action – 1 million Center for Biological Diversity – 825,000 League of Conservation Voters – 700,000 The Wilderness Society – 500,000 Public Citizen – 400,000 Greenpeace – 250,000 Friends of the Earth US – 210,200 Union of Concerned Scientists – 200,000 NukeFree.org – 120,000 Southern Alliance for Clean Energy – 50,000 Physicians for Social Responsibility – 50,000 Waterkeeper Alliance – 24,000 South Florida Wildlands Association – 17,400 Nuclear Information and Resource Service (NIRS) – 9,130 Beyond Nuclear – 8,990 San Luis Obispo Mothers for Peace - 2,145 Mothers for Sustainable Energy (The Mothers Project) – 1,935 Florida Consumer Action Network – 1,810 Nuclear Watch South - 615 Alliance for Nuclear Responsibility in San Luis Obispo - 170

In addition, by virtue of its outrageous and extreme expense; the deceptively high carbon footprint of the nuclear fuel chain; and the inherent contradiction of integrating "baseload" power with the variable nature of 21st century energy technologies, nuclear power is actually counterproductive at addressing the pressing issue of climate change.

Moreover, while nuclear is lower carbon than coal or oil, it delivers a range of other poisons - plutonium, strontium, cesium, etcetera - to our environment through routine releases, radioactive waste, and the less frequent, but devastating, atomic meltdowns.

We urgently need greater support, encouragement and deployment of clean solar power, wind power, energy efficiency, geothermal power, smart grid interfaces for rooftop solar (in Hawaii as just one urgent example), battery storage technologies, other smart grid technologies and other clean renewable energy technologies.

Instead of propping up obsolete, 50-year-old technologies like nuclear power, we should be embarking on our own energy transition to a new nuclear-free, carbon-free energy system that can power our nation cleanly, safely, sustainably and affordably.

Furthermore, nuclear power is the most expensive form of power and, without question, could not exist without massive taxpayer subsidies, including the “Price-Anderson” law that places a cap on industry liability in the event of a nuclear accident.

The market price evidence is overwhelmingly clear and compelling - nuclear power is an outrageously and extremely more expensive energy solution. In fact, the US energy market continues to move, faster and faster, toward an extremely better value energy future, reliant on solar and wind power, not the outrageously and extremely expensive and risky nuclear power.

As of 7/5/15, it has already been costing our manufacturing industry, our businesses and our homeowners much less to buy solar power than natural gas, coal, oil, timber, biomass or nuclear power. And, it is expected to continue to cost them typically another 20% less per year for, at the least, the next few years. It is at http://www.usatoday.com/story/money/markets/2015/07/05/motley-fool-solar-energy/29583021/

As of 7/5/15, all bids for selling power from solar power utility-scale projects are now in the 4 cents to 5 cents per kWh range – this is much less than what it costs you to build a natural gas, coal, oil, timber, biomass or nuclear power plant. It is at http://www.usatoday.com/story/money/markets/2015/07/05/motley-fool-solar-energy/29583021/

As of 7/9/15, two bids for selling power from solar power utility-scale projects have now come in below 4 cents per kWh, with one bid coming in below 3.9 cents per kWh – this is much less than what it costs you to build a natural gas, coal, oil, timber, biomass or nuclear power plant. It is at http://www.utilitydive.com/news/nv-energy-buys-utility-scale-solar-at-record-low-price-under-4-centskwh/401989/

As of 6/23/15, the price of wholesale solar power has been forecasted by independent analysts at Bloomberg New Energy Finance to continue to decrease, at the least, for the next 25 years. It is at

http://www.bloomberg.com/news/articles/2015-06-23/renewables-to-beat-fossil-fuels-with-3-7-trillion-solar-boom

As of 7/5/15, according to GTM Research, the cost of utility-scale solar projects has fallen 67% in the past five years, and is expected to fall another 44% in the next couple of years.

As of 7/5/15, “Since solar costs are beating those of competing energy sources, there are expectations of a boom in demand -- and it's going to be a global solar boom. GTM Research predicts that solar installations will triple to 135 GW annually by 2020.”

On 7/5/15, investment analyst Travis Hoium of The Motley Fool said: “We're past the point of no return -- solar energy will be the biggest new energy source in the future.”

US wind power, as of 8/22/14, hit an all-time national average low purchase price of 2.5 cents per kWh – this is much less than what it costs you to build a natural gas, coal, oil, timber, biomass or nuclear power plant. It is at http://www.theenergycollective.com/eric-wesoff/468266/price-us-wind-power-all-time-low-25-cents-kilowatt-hour

As of 5/31/15, lawyers for Wal-Mart, a hospital group and a coalition of other ratepayers found that Florida utilities were buying Oklahoma wind power for just 2 cents per kilowatt hour: “Henry and the lawyers for OG&E’s corporate customers formed a kind of tag team, taking turns blasting the company for refusing to even study new wind power. They repeatedly pointed out that in-state competitors as well as Florida and New Mexico utilities were buying Oklahoma wind for just 2 cents per kilowatt hour, even cheaper than coal without pollution controls, while OG&E hadn’t purchased new wind in four years—even though its ads boasted about its commitment to wind. When its witnesses claimed their transmission lines were too congested to add new wind, Henry produced internal documents suggesting the congestion could be fixed for about 3 percent of the cost of the new coal scrubbers.”
http://www.politico.com/agenda/story/2015/05/inside-war-on-coal-000002

As of 3/12/15, the price of wholesale wind power will continue to decrease, at the least, for the next 10 years according to a Department of Energy report. It is at http://www.bloomberg.com/news/articles/2015-03-12/wind-energy-without-subsidy-will-be-cheaper-than-gas-in-a-decade

On 8/8/14, Amory Lovins, a physicist and chief scientist at the Rocky Mountain Institute, found that “Wind and solar become the most economical options while gas and nuclear become the least economical”. It is at http://www.theenergycollective.com/eric-wesoff/468266/price-us-wind-power-all-time-low-25-cents-kilowatt-hour

In addition, 9 out of 10 Americans, including Republicans, Democrats and Independents, want more solar and wind power installed, rather than using natural gas, coal, oil and nuclear power.

According to a comprehensive 12-year Harvard survey as of 1/1/15, 90% of all Americans, including Republicans, Democrats and Independents, said that they wanted solar and wind energy to increase and 80% of all Americans said that they wanted solar and wind energy to “increase a lot”. It is at http://www.forbes.com/sites/jeffmcmahon/2015/01/01/americans-want-america-to-run-on-solar-and-wind/

The Harvard study found that all Americans overwhelmingly prefer solar and wind power, rather than natural gas, coal, oil and nuclear power, because solar and wind power provide the least local pollution and health risk.

On 9/19/14, a UBS investment banking report called nuclear power plants the “the DINOSAUR of the future energy system” and Amory Lovins, a physicist and chief scientist at the Rocky Mountain Institute, said that nuclear power was an “OBSOLETE technology”: “Banking giant UBS calls the big, slow, lumpy, expensive coal and nuclear plants “the dinosaur of the future energy system: Too big, too inflexible, not even relevant for backup power in the long run.” Such obsolete technologies are less at risk from regulatory mandates than from

market defeat by a swarm of agile competitors that their promoters don't even recognize." It is at http://www.forbes.com/sites/amorylovins/2014/09/19/micropowers-quiet-takeover/2/

As of 7/6/15, worldwide investments in solar, wind and other renewable power are already running at a rate that is ten times greater than investments in nuclear power. It is at http://www.greentechmedia.com/articles/read/renewables-outpace-nuclear-in-major-economies

As of 7/6/15, not one single new generation (i.e. Generation III) nuclear reactor has been able to come into service in the past 20 years. Most new generation nuclear reactors are delayed three to nine years and are extremely far over budget. It is at http://www.greentechmedia.com/articles/read/renewables-outpace-nuclear-in-major-economies

As of 7/16/15, Jonathon Porritt, co-founder of the Forum for the Future and former Chairman of the U.K. Sustainable Development Commission, wrote in the forward to the "World Nuclear Industry Status Report 2015" that: "The impressively resilient hopes that many people still have of a global nuclear renaissance are being trumped by a real-time revolution in efficiency-plus-renewables-plus-storage, delivering more and more solutions on the ground every year." It is at http://www.greentechmedia.com/articles/read/renewables-outpace-nuclear-in-major-economies

Nuclear power is clearly an obsolete and old technology. Nuclear power is clearly an energy of the past. Nuclear power is clearly not where the overwhelming amount of innovation in new energy technology is occurring.

As of 2014 and 2015, most of the major power companies and utilities in the EU have already transitioned away from both nuclear power and fossil fuels. On 12/18/14, David Elliott, an Emeritus Professor of Technology Policy at the Open University, said: "It's hardly surprising then that most of the major power companies and utilities in the European Union (EU) have backed away from nuclear, including SSE, RWE, Siemens and most recently E.ON, in favor of renewables." It is at http://ecowatch.com/2014/12/18/renewables-outpace-nuclear-energy/

Solar and wind power are clearly the most innovative and newest technologies. Solar and wind power are, overwhelmingly, the energies of the present and future. Solar and wind power are clearly where the overwhelming amount of innovations and developments are rapidly occurring.

As of 5/29/15, for the year so far, 84.1% of all new power installations for U.S. utility companies were solar power, wind power and other renewables. Natural gas power supplied the rest of the new power installations. It is at http://safeenergy.org/2015/05/29/checking-in-on-the-energy-transition/

Germany and Sweden continue to very rapidly decommission all of their nuclear power plants and to very rapidly transition to solar and wind power. France is also rapidly cutting down its amount of nuclear power and is also rapidly transitioning to solar and wind power.

California has only two, very old nuclear reactors left in operation at the Diablo Canyon nuclear power plant. Like the overwhelming majority of states and countries, California is also continuing to very rapidly transition to solar and wind power.

On 1/7/15, Governor Brown of CA called for increasing the state renewable portfolio standard (RPS) to 50% by 2030, reducing petroleum use in cars and trucks in California by 50%, and doubling building energy efficiency, all by 2030. As of 6/5/15, the Senate has already passed a bill for the plan and the Assembly is expected to also act in 2015. It is at http://www.lawofrenewableenergy.com/2015/04/articles/renewable/governor-brown-announces-new-2030-greenhouse-gas-reduction-target-for-california/

NRG Energy had already reorganized the entire company in 2014 and early 2015 to quickly and massively ramp up converting their business services to supply zero carbon emission, clean energy such as solar and wind power. It is at http://www.utilitydive.com/news/what-happened-when-nrg-energy-disrupted-its-own-business-model/401472/

Since 2008, Duke Energy, the largest US power company, has been working on becoming one of the largest renewable energy developers in the nation. It is at http://www.utilitydive.com/news/how-americas-largest-power-company-plans-to-become-a-leading-renewables-de/401539/

Since 2014 and earlier, Arizona Public Service, Tucson Electric Power, Southern Company, Georgia Power, Southern California Edison, the Hawaiian Electric Company (HECO) and many other US electric utility and power supply companies have all been quickly and massively ramping up their installations of zero carbon emission, clean energy such as solar and wind power. It is at http://www.utilitydive.com/news/grid-edge-live-2015-the-trends-behind-the-explosion-in-distributed-resourc/401417/

On 6/29/15, Pacific Gas and Electric Corporate Strategy Officer Elizabeth Brinton said about electric power utility companies quickly and massively transitioning to become major renewable energy suppliers: “Business as usual for the [electric power] utility cannot continue. There is urgency for us to recognize disruption is an opportunity.”

As of 6/11/15, Vermont has a law for electric utilities to be at 75% renewables by 2032 and at 55% renewables by 2017. It is at http://www.utilitydive.com/news/new-vermont-law-mandates-75-renewables-by-2032-targets-residential-emissi/400777/ and http://www.eia.gov/todayinenergy/detail.cfm?id=21852

As of 6/29/15, Governor Cuomo of NY presented an energy plan under NY's REV plan to be at 50% renewable energy by 2030. The Assembly has already passed a bill for the plan and the Senate bill is awaiting a vote. It is at http://www.governorswindenergycoalition.org/?p=13551 and file:///C:/Users/Charles/Downloads/2015-overview.pdf and http://energyplan.ny.gov/Plans/2014.aspx

Effective 7/1/15, it is the law in Hawaii that 100% of its electricity come from renewables by 2045, with 30% by 2020, 40% by 2030 and 70% by 2040 as interim targets. It is at http://www.utilitydive.com/news/100-renewables-by-2045-is-now-the-law-in-hawaii/400495/ and http://www.eia.gov/todayinenergy/detail.cfm?id=21852

Nuclear power is clearly in rapid decline in use in the US and throughout the world, while solar and wind power are, clearly and compellingly, experiencing exponential growth for the next 25 years and longer.

It will be even harder and even more expensive to get parts, operation, maintenance, support and engineering services for nuclear power as the decline in the use of nuclear power plants continues to accelerate over the next couple of decades.

In addition, nuclear power plants use outrageous and extreme quantities of precious fresh water supplies for cooling. New reactors on the drawing board would still need to withdraw more than 1,140,000 gallons of water per minute from nearby lakes, rivers or oceans.

The United States is highly vulnerable to continuing and worsening drought as climate change continues to worsen.

Nuclear power plants in Alabama and Tennessee and other states have been shut down because of drought. More nuclear power plants will be shut down when drought continues to get worse because of climate change.

Nuclear reactors also imperil fish larvae and other forms of aquatic life, which are strained from the water as it travels through thousands of metal tubes to become steam that turns the turbines to make electricity. A 2005 study found that one coastal power plant in Southern California destroyed nearly 3-and-a-half million fish in just one year.

Solar and wind power do not require any use of our extremely precious fresh water drinking and agricultural irrigation supplies.

In addition, any more new nuclear reactors would produce even more radioactive waste that would not decay for the next 250,000 and millions of years. Solar and wind power do not produce any radioactive pollution.

Nuclear power has been proven to be dangerous, dirty, harmful and obsolete. We need proven 21st century energy technologies, not failed, 50-year-old technology holdovers.

We, every regulator, every world leader, every world lawmaker, every environmental organization and every consumer must keep strongly urging every nuclear, oil, natural gas, coal and electric utility company to quickly and massively ramp up converting their business services to supply zero carbon emission, clean energy such as solar, wind and geothermal power.

We, every regulator, every world leader, every world lawmaker, every environmental organization and every consumer must also keep strongly urging every nuclear, oil, natural gas, coal and electric utility company to quickly and massively ramp up converting their business services to supply other clean energy products and services, such as:

1. Batteries for electric vehicles, home power storage, business power storage and utility-scale power storage
2. Home, business and utility-scale inverters with advanced capabilities (such as ultra-fast trip times and battery-backup) and settings, to allow for more connection of renewable energy to the grid.
3. Smart grid technology products and services 4. 2-way smart grid communication systems and services as part of a modern smart grid 5. Energy efficiency products and services - plus renewable energy (like solar and wind) products and services - plus battery storage products and services 6. Electric car, truck, bus and/or train manufacturing

With the success of the Tesla Model S and its impending large-scale lithium ion battery manufacturing from Tesla's Gigafactory, it appears that Big Oil and Gas could now become even more interested in transitioning to becoming a large-scale supplier in the battery business. It is at http://ecowatch.com/2015/07/14/elon-musk-tesla-model-s/

As just one example, it has been suggested and discussed that a Big Oil and Gas company, like ExxonMobil, could purchase a successful battery manufacturer, like Tesla, and thereby massively and quickly ramp up electric car and truck manufacturing and use. It is at http://www.albertaoilmagazine.com/2015/07/is-teslas-model-s-the-beginning-of-the-end-for-oil/

In 11/28/07, ExxonMobil Chemical was originally involved in developing a new battery technology that made lithium-ion batteries usable for electric cars. It is at http://www.chron.com/business/article/Exxon-to-unveil-hybrid-car-battery-breakthrough-1811103.php

In addition, on 9/19/11, CEO Peter Loscher of Siemens, one of the world’s leading nuclear reactor manufacturers, explained that the company did not see a future in building any more new nuclear power plants. Siemens announced that it would no longer manufacture nuclear reactors and that it was leaving the nuclear industry. Siemens transitioned massively and quickly into a leading supplier of wind, solar and geothermal products and services. It is at http://thinkprogress.org/climate/2011/09/19/321935/siemens-quits-nuclear-industry/

Also, since 9/9/11 and before, Alstom, another major nuclear power manufacturer, has significantly transitioned and increased its offshore wind power, onshore wind power, solar and geothermal power products and services. It is at http://www.fool.com/investing/general/2014/12/20/offshore-wind-uk-siemens-better-watch-out-for-gene.aspx and http://www.alstom.com/microsites/power/products-services/renewables/

Also, since 9/9/11 and before, Areva, one of the world's largest nuclear reactor manufacturers, has significantly transitioned and increased its rapidly growing offshore wind power products and services and formed Adwen in a joint venture with Gamesa. It is at http://www.adwenoffshore.com/about-us/profile/ and http://suppliers.areva.com/EN/home-256/index.html

In place of any more new, harmful and wasteful nuclear power, we very strongly urge you to urge every nuclear and electric power utility company to quickly and massively ramp up converting their business services to supply zero carbon emission, clean energy such as solar, wind, geothermal power and other clean energy products and services.

Thank you for seriously considering our requests.

Charles Brexel Sr.
12085 Wexford Overlook
Roswell, GA 30075

PR-20, 61
80FR16081
50

PUBLIC SUBMISSION

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Comments Due: July 24, 2015
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Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0119
Comment on FR Doc # 2015-06429

Submitter Information

Name: Kurt Harris

General Comment

See attached file(s)

Attachments

ANS USU Statement

American Nuclear Society Student Chapter – Utah State University

After reviewing the NRC's proposed rule changes to 10 CFR Parts 20 and 61, we have concluded that the NRC's proposed rules are sufficient to safely regulate the disposal of low-level radioactive waste (LLRW), and, furthermore, the costs to industry, Agreement States, and the NRC are not overly-burdensome. Site-specific analyses will allow for safe disposal of large amounts of long-lived LLRW like depleted uranium (DU), which was not considered during the development of the previous regulations.

The site-specific approach for licensees and license applicants is thorough. First, they must complete a performance assessment to protect the general population. Second, they perform an intruder assessment to protect inadvertent intruders. Third, they analyze the performance period to mitigate long-term risk, followed by a demonstration of defense-in-depth, which shows layers of overlapping provisions that compensate for each other should one failure occur. Finally, they demonstrate site-stability, focusing on stability of the wasteform, stability of the facility, and geologic stability.

EnergySolutions' Clive facility in Utah (located over 60 miles west of Salt Lake City) is one of only four LLRW disposal facilities in the United States. The company plans to ship over half of the 750,000 tons of DU stored in Kentucky, Ohio, and South Carolina to Clive for disposal. [1] The NRC reports that the total amount of DU LLRW requiring disposal is 10^9 kg, or roughly 1 million tons.

The quantity of DU LLRW to be disposed of in Utah is relatively small. 1 million tons pales in comparison to the 1.6 billion tons of CO_2 emitted by coal plants in the U.S. in 2014 alone. These carbon dioxide emissions do far more harm to human health and the environment than this small amount of DU. Furthermore, even if all 10^9 kg were deposited in Utah, given the high density of DU (19.1 g/cm^3), the waste would only occupy a volume of 52,000 m^3, or a cube about 37 meters on each side. [2]

DU is about 60% as radioactive as the same mass of natural uranium. The high concentration of DU at disposal sites creates the problem. DU is weakly radioactive because of its long half-life of about 4.5 billion years. It emits alpha radiation which cannot penetrate the skin and only travels about 4 cm in air, though it is harmful if ingested. Decay products include gaseous radon-222, an alpha emitter that is more mobile than the parent radionuclides. However, with a half-life of 3.8 days, site-specific analyses will place disposal sites a sufficient distance from large populations that any leaking gas would decay to negligible amounts before reaching anyone that could inhale it long-term.

After over one million years of DU storage, secular equilibrium is reached, where daughter product production rates roughly equals their respective decay rates. It is at this point that peak radioactivity occurs, at levels roughly 14 times that initially used for waste classification. Concentrations of the decay product radium-226, an alpha emitter with a half-life of 1,600 years, may increase beyond Class A and Class C. [3] This would be a problem if Utah law does not allow for the disposal of anything except Class A LLRW. The potential change of LLRW classifications over long periods of time does not seem to be addressed well in the NRC's proposed rules, but is particularly important in Utah given our restrictions. However, we would prefer that Utah take the lead on disposing of nuclear waste of all classifications, so that clean nuclear power can expand here in the United States. It is not reasonable to expect the NRC to promise to never change the classification of DU, though their definition of long-lived waste is clear, under which DU would definitely fall. This clarity in rulemaking will allow for clear distinctions between waste types and ensure safe disposal. We also hope that as research is done on the health effects of low doses of radiation, updates can be made to the limits specified, as small doses may not cause any adverse health effects if our bodies may be able to repair themselves faster than the damage caused.

Many people in Utah are concerned that the location of EnergySolutions' Clive facility is above an aquifer and in the path of Lake Bonneville as it returns and recedes over time. The risks are that

groundwater could be contaminated, and that above-ground storage containers of LLRW could be washed away. Fortunately, a performance assessment – required by the NRC – will address the potential contamination of groundwater, and analysis of the performance period should address concerns such as Lake Bonneville's return. Disposal of DU will be safe as long as EnergySolutions and other companies can perform the analyses proposed by the NRC with sufficient thoroughness to satisfy federal and state regulators. If EnergySolutions can demonstrate that Clive is safe, according to the NRC's standards, then Utah should follow the science and allow them to dispose of DU there.

Realistically, we don't expect DU to sit unused forever. It is valuable as fuel in breeder reactors, which are likely to be used again in the United States or for re-enrichment. A 2008 estimate valued only a third of the U.S. DU inventory at $7.6 billion. [4] Breeder technology was been proven safe and effective in the Integral Fast Reactor in 1986 at Idaho National Lab, and in many other locations. With Utah's coal plants aging, we believe our state is ideal for the eventual construction of such nuclear power plants.

Utah stands to benefit greatly from the expansion of nuclear power. In 2005, there were 16 aging coal-fired generating stations, with 5,080 MW of capacity, representing 74% of the state's total electric generating capacity. In 2006, Utah's coal-fired power plants released approximately 41 million tons of CO_2 – 66% of the state's total CO2 emissions – as well as 34,000 tons of sulfur dioxide and 68,000 tons of nitrogen oxide. Although emissions controls have lowered these figures slightly, nuclear power could make substantial reductions to Utah's pollution. Furthermore, the aging power infrastructure already has water allocations from the state, and so could be replaced with small modular reactors – all while retaining and likely increasing the local employment opportunities.

In conclusion, we believe the NRC's proposed rules will provide for safe disposal of long-lived LLRW like DU without overly-burdening the nuclear energy industry. Long-term analyses should be performed for storage, but DU will likely be used as fuel in future reactors, providing great benefits to the states storing it, and potentially eliminating the risks associated with daughter products of U-238. EnergySolutions will perform the analyses required, and should find storage of DU in Utah to be feasible and profitable. Though there is a lot of misinformation spread regarding nuclear waste (for example, images of green glowing barrels of waste), we feel it is important that good policies be made by the NRC and by Utah according to sound science and engineering principles. Doing so will allow for cleaner energy production in Utah and nation-wide, and a brighter future for everyone.

Kurt Harris
PhD Candidate, Mechanical Engineering

Landon Hillyard
President, ANS at USU

[1] B. Maffly, "EnergySolutions pauses plan to dispose of nation's depleted uranium in Utah landfill," *The Salt Lake Tribune,* 13 April 2015.

[2] "U.S. Energy Information Administration," [Online]. Available: http://www.eia.gov/tools/faqs/faq.cfm?id=77&t=11. [Accessed 28 May 2015].

[3] U. DEQ, "Depleted Uranium (DU) Waste," May 2015. [Online]. Available: http://www.deq.utah.gov/businesses/E/EnSolutions/depleteduranium/performassess/docs/2015/05May/DUWaste.pdf.

[4] "Depleted Uranium," [Online]. Available: http://en.wikipedia.org/wiki/Depleted_uranium#Uranium_hexafluoride. [Accessed 29 May 2015].

RulemakingComments Resource

From: Bill Logue <Bill@LogueGroup.com>
Sent: Thursday, July 23, 2015 9:38 AM
To: RulemakingComments Resource
Cc: Snyder, Amy; Ray Vaughan; Bill Logue
Subject: [External_Sender] Docket ID NRC–2011–0012
Attachments: 2015-07-23_CTF_comment_letter_on_proposed_10-CFR-61_revision.pdf; ATT00001.htm

Good morning,

On behalf of the West Valley Citizen Task Force, attached please find comments on Docket ID NRC–2011–0012

Should you have any difficulty opening this document please contact me.

Bill Logue, Facilitator
West Valley Citizen Task Force
Email: Bill@LogueGroup.com
Phone: 860.521.9122

THE WEST VALLEY
CITIZEN TASK FORCE

July 23, 2015

Secretary, U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001
ATTN: Rulemakings and Adjudications Staff
Rulemaking.Comments@nrc.gov

Docket ID NRC–2011–0012

Dear Secretary:

We submit the following comments on NRC's proposed revision of 10 CFR 61. This revision would, among other things, ensure that low-level radioactive waste (LLRW) streams "that are significantly different from those considered during the development of the current regulations (i.e., depleted uranium and other unanalyzed waste streams) can be disposed of safely and meet the performance objectives for land disposal of LLRW…"[1] We recognize the importance of ensuring safe disposal of wastes not previously considered when the 10 CFR 61 regulations were initially written in the early 1980s. At the same time, we are concerned that the proposed revision makes fundamental changes that go beyond filling such gaps. Some of these proposed changes would add too much flexibility and would make the regulations less protective. For example:

Conceptual basis and site characterization

1. Section 61.50(a)(1) (part of "Disposal site suitability requirements for land disposal") would be weakened by eliminating existing language that says "The primary emphasis in disposal site suitability is given to isolation of wastes, a matter having long-term impacts, and to disposal site features that ensure that the long-term performance objectives of subpart C of this part are met, as opposed to short-term convenience or benefits." This is an interpretive statement rather than a substantive requirement, but its deletion seems illustrative of some of the changes that are being proposed. We believe that the existing wording ("The primary emphasis in disposal site suitability is given to isolation of wastes, a matter having long-term impacts, and to disposal site features that ensure that the long-term performance objectives of subpart C of this part are met, as opposed to short-term convenience or benefits") needs to be retained within these regulations[2] and should remain a guiding principle of 10 CFR 61.

2. The proposed change in section 61.50(a)(2), which is another part of "Disposal site suitability requirements for land disposal," would make that requirement essentially meaningless. The existing requirement is that "The disposal site shall be capable of being characterized, modeled,

[1] U.S. Nuclear Regulatory Commission, 80 *Federal Register* 16082-125 (March 26, 2015) at 16082.

[2] We recognize that similar wording can be found in the *Federal Register* notice for the proposed rule (*id.* at 16103) but believe that the wording needs to remain within the actual regulations at 61.50(a)(1).

analyzed and monitored." This seems like an obvious and crucial requirement. The proposed revision would weaken it by saying, "To the extent practicable, the disposal site shall be capable of being characterized, modeled, analyzed and monitored." This change should not be made. In order to qualify for a license, any LLRW disposal site should be capable of being characterized, modeled, analyzed and monitored with the best available techniques. Sites incapable of meeting this requirement should not be eligible for land disposal of LLRW, and the requirement should not be weakened by adding the words "To the extent practicable."

3. Section 61.7(a)(1) would be weakened by a new sentence that emphasizes the availability of exemptions under existing section 61.6 and suggests that such exemptions are available "as needed." Exemptions are already available under section 61.6 but should be the exception rather than the rule. It's not appropriate to feature them in section 61.7(a)(1) as part of the "concept" of the 10 CFR 61 disposal requirements.

Radiological protection and dose limits

4. New section 61.7(c)(5), in combination with 61.41(a), would change and weaken the dose methodology for thyroid protection. The allowable dose to the thyroid would be increased by a substantial factor (ranging up to a factor of 11) in an exposure scenario dominated by radioiodine.[3] We recognize the attraction of using a revised method of dose calculation that combines internal and external dose into a single value, as currently used in 10 CFR 20; however, such a revision should not be portrayed as a neutral or purely scientific change in calculation method. The *Federal Register* notice for the proposed rule explains the change by claiming that "A holistic approach [using a dose limit expressed as an effective dose such as TEDE] provides a large benefit in LLRW disposal dose assessment because of the range of radionuclides that comingled within the LLRW."[4] In our view, the claimed "large benefit in LLRW disposal dose assessment" is primarily a short-term computational convenience which relies unduly on an assumption that the radionuclides "comingled within the LLRW" would remain comingled at the point of human exposure. This is not likely to be true for long-lived mobile radionuclides such as Iodine-129 which may migrate more quickly than other radionuclides into contact with humans and (in the case of I-129) be taken up by the thyroid. Given the importance of thyroid protection, we believe that the existing thyroid dose limit in 10 CFR 61.41 should be retained as a more protective standard than the proposed revision. If and when the standard is revised, it should be supported by a more complete and explicit analysis than is provided in the *Federal Register* notice for the proposed rule.

5. Standards for protection of the general public (section 61.41) are currently not restricted to any particular time span but would be revised to provide a 25 mrem/year whole-body dose limit during the next 1,000 years, followed by a 500 mrem/year whole-body dose limit for the period beyond the next 1,000 years. In our view, the 25 mrem/year whole-body dose limit should be applied in perpetuity (or as long as the radiological hazard persists) to ensure protection of

[3] The increase in thyroid dose "ranging up to a factor of 11" is based on a tissue weighting factor of 0.03 for the thyroid, as expressed in 10 CFR 20.1003 and ICRP Publication 26.

[4] *Federal Register, op. cit.*, at 16104.

human health. There is no justification for offering future members of the general public a 20-fold lower standard of protection than is set for the general public during the next 1,000 years. The primary emphasis in disposal site suitability should be given to isolation of wastes and to minimization of long-term impacts, as opposed to short-term convenience or benefits. Thus, the general public's whole-body exposure limit from a closed disposal facility should continue indefinitely at a 25 mrem/year standard.

6. Standards for protection of inadvertent intruders (section 61.42) are currently expressed qualitatively ("must ensure protection") but would be revised by setting a quantitative annual exposure limit of 500 mrem/year. We recognize the value of a quantitative limit but believe that the whole-body dose limit should be set at 25 mrem/year rather than 500 mrem/year, consistent with the 25 mrem/year whole-body dose limit for the general public in section 61.41. There is no justification for offering "inadvertent intruders" a 20-fold lower standard of protection than is set for the general public. NRC asserts that "it is possible, though unlikely, that an inadvertent intruder might occupy a disposal site in the future and engage in normal pursuits without knowing that they are receiving radiation exposure."[5] However, for various closed waste sites, including the West Valley site when closed, it seems *likely* (rather than unlikely) that inadvertent intruders will occupy the site in the future and engage in normal pursuits without knowing that they are receiving radiation exposure. In other words, inadvertent intruders are members of the general public who may come into closer contact with radiological contamination through no fault of their own – and as such, they deserve the same protection as the general public. An inadvertent intruder's whole-body exposure limit from a closed disposal facility should be set at 25 mrem/year and should continue indefinitely at a 25 mrem/year standard.

7. According to a new definition of "Intruder assessment" that is proposed in Section 61.2, "Intruder assessment is an analysis that: (1) Assumes an inadvertent intruder occupies the site and engages in normal activities or other reasonably foreseeable pursuits that are realistic and consistent with expected activities in and around the disposal site at the time of site closure and that might unknowingly expose the person to radiation from the waste..." This proposed new language contains unduly restrictive words ("consistent with expected activities in and around the disposal site at the time of site closure") that should be eliminated from the definition of "Intruder assessment." An intruder assessment should cover site occupation and normal activities "or other reasonably foreseeable pursuits that are realistic and that might unknowingly expose the person to radiation from the waste..." Expected activities in and around the disposal site "at the time of site closure" are *not* a realistic indicator of reasonably foreseeable pursuits in the future (e.g., 1,000 years from now).

8. Revised standards for protection of the general public and of inadvertent intruders beyond 1,000 years (sections 61.41 and 61.42) could allow relatively unprotective standards "based on technological and economic considerations." Technological and economic considerations should not supersede the dose limits in sections 61.41 and 61.42. The primary emphasis in disposal site suitability should be given to isolation of wastes and to minimization of long-term impacts, as opposed to short-term convenience or benefits.

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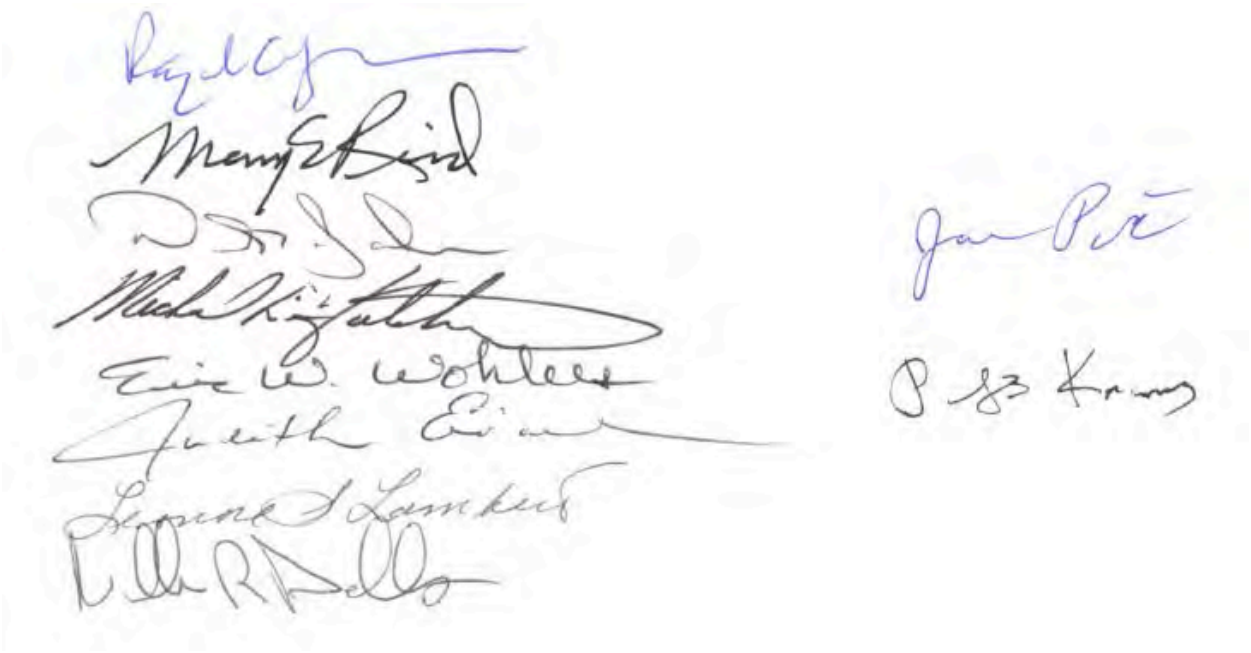
[5] *Id.* at 16090.

Agreement State Compatibility

9. As part of the proposed revision, NRC may limit the ability of Agreement States to set more protective requirements for certain sections of 10 CFR 61.[6] The CTF does not support any part of the proposed revision that would limit New York State's ability to set more protective requirements.

We appreciate the opportunity to comment and trust that NRC will give these comments full consideration.

Sincerely,



The West Valley Citizen Task Force

[6] This is discussed under the heading "Agreement State Compatibility," *id.* at 16111-114.

From: SCHLUETER, Janet <jrs@nei.org>
Sent: Thursday, July 23, 2015 11:31 AM
Subject: [External_Sender] Proposed 10 CFR Part 61 Rule on Low Level Radioactive Waste Disposal (80FR16082); NRC Docket NRC-2011-0012
Attachments: 07-23-15 Proposed 10 CFR Part 61 Rule on Low Level Radioactive Waste Disposal (80FR16082)_ NRC Docket NRC-2011-0012.pdf

THE ATTACHMENT CONTAINS THE COMPLETE CONTENTS OF THE LETTER

July 23, 2015

Ms. Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemaking and Adjudications Staff

Subject: Proposed 10 CFR Part 61 Rule on Low Level Radioactive Waste Disposal (80FR16082); NRC Docket NRC-2011-0012

Project Number: 689

Dear Madam Secretary:

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI)[1] appreciates the opportunity to provide comments on the proposed Part 61 rulemaking published in the Federal Register on March 26, 2015 (80FR16082). We appreciate the many public meetings held by the U.S. Nuclear Regulatory Commission (NRC) staff on this rulemaking, and look forward to future interactions on this and other low level radioactive waste (LLRW) regulatory matters. We also appreciated the opportunity afforded to NEI to participate as a panel member in the June 25, 2015 Commission briefing. It was clear during the briefing that this rulemaking raises several complex regulatory and policy issues, and we trust that this letter along with those of other stakeholders will help inform the agency's decision on how to proceed.

At first glance, one might assume that the current operators of the existing Agreement State-licensed LLRW disposal sites are the only stakeholders impacted by this rule. However, it should be recognized that any modification to the existing radioactive waste regulatory framework has a direct and potentially unintended impact on radioactive waste processors and generators, e.g., nuclear power plants, uranium enrichment facilities, and broad scope licensees. Therefore, we offer comments on the proposed rule and have identified potential or unintended impacts from its implementation, which we trust will be fully considered by NRC.

Sincerely,

Janet R. Schlueter
Senior Director, Fuel and Materials Safety

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Sent through www.intermedia.com

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

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NUCLEAR ENERGY INSTITUTE

July 23, 2015

Ms. Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemaking and Adjudications Staff

Subject: Proposed 10 CFR Part 61 Rule on Low Level Radioactive Waste Disposal (80FR16082); NRC Docket NRC-2011-0012

Project Number: 689

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At first glance, one might assume that the current operators of the existing Agreement State-licensed LLRW disposal sites are the only stakeholders impacted by this rule. However, it should be recognized that any modification to the existing radioactive waste regulatory framework has a direct and potentially unintended impact on radioactive waste processors and generators, e.g., nuclear power plants, uranium enrichment facilities, and broad scope licensees. Therefore, we offer comments on the proposed rule and have identified potential or unintended impacts from its implementation, which we trust will be fully considered by NRC.

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

In Summary, the current rulemaking should be discontinued or, at minimum, its scope narrowed.

We acknowledge the staff's exhaustive and transparent efforts to date in developing the proposed rule made available for comment. However, the current rule's scope has expanded beyond its original intent, the current Regulatory Cost-Benefit Analysis is deficient, and future NRC decisions on the Part 61 Waste Classification (WC) Tables could require subsequent conforming modifications to this proposed rule (see item 5 below). Therefore, this rulemaking should be discontinued in its current form and other options pursued (see item 2 below). As was discussed during the June 25, 2015 Commission briefing, a question regarding the safe disposal of large quantities of depleted uranium (DU) arose during the licensing of the Louisiana Energy Services facility now operating in New Mexico (CLI-05-20). Since then, the issue of unique LLRW streams other than DU was raised and the rulemaking's scope expanded. The rule expansion is unnecessary and will introduce undue burden and unintended consequences that will negatively impact the industry and Agreement States, as well as the potential for new LLRW disposal sites.

Should NRC proceed with this rulemaking, the scope of the rule should be narrowed to its original intent, i.e., the safe disposal of large quantities of DU. Further, the rule should only apply prospectively to those sites that seek authorization from their regulators to dispose of large quantities of DU. With this approach, current licensees or future applicants would not be required to conduct an initial or updated Performance Assessment (PA) at site closure if they do not plan to accept large quantities of DU for disposal. Should circumstances change, it is reasonable that a PA would be required. (See item 3 below).

General Comments:

We offer the following comments, which we trust will inform NRC's decision on whether or how to proceed with this rulemaking.

1. *First and most importantly: Current regulations "ensure public health and safety are protected in the operation of any commercial LLRW disposal facility."*[2] The staff recognizes and industry supports the NRC statement that LLRW disposed of in accordance with Part 61 or its Agreement State equivalent ensures public health and safety today through, in part, application of the integrated systems approach. NRC, Agreement States and industry work to ensure that all forms of LLRW are disposed of in accordance with applicable regulations and with pre-approval by the appropriate regulatory agency. There is no information to suggest that disposal of LLRW pursuant to the current regulatory framework is unsafe or is not adequately protective of public health and safety and the environment. Current disposal practices include, but are not limited to safe disposals authorized under the alternate pathway allowed under 10 CFR 20.2002. In fact, adequate pathways for LLRW disposal exist nationwide and are utilized as allowed under the current national regulatory framework. Therefore, from a public health and safety perspective, this rulemaking is not necessary.

[2] *Federal Register* Notice dated March 26, 2015, "Low-Level Radioactive Waste Disposal," (80FR16082), page 16084.

2. *Draft Regulatory Analysis is Deficient* – The current Draft Regulatory Analysis considers only two options, i.e., do nothing or proceed with a limited site-specific rule. Further, no benefits from the current rulemaking were identified. We believe that other viable options, not all of which include rulemaking, should have been analyzed and included for completeness. Such options include:

   - Option 1: discontinue the rulemaking, finalize the NRC guidance and work with the sited Agreement States (each of which has an existing site-specific regulatory framework in place) to address the disposal of large quantities of DU;
   - Option 2: option 1 without finalizing the NRC guidance; or
   - Option 3: revise the proposed rule to limit it to its original intent as directed by the Commission in its 2009 staff requirements memorandum[3]. For example, the rule would simply require licensees or applicants to submit, and receive prior approval from the appropriate regulatory authority of, a site-specific PA if they seek authorization to dispose of large quantities of DU. This approach is consistent with that currently allowed under 10 CFR 61.58 and compatible Agreement State regulations. Such flexibility should be retained.

   With any of the options, it should be recognized that the sited Agreement States, who are the only regulators of existing commercial LLRW disposal sites, have the necessary regulatory framework in place today to address this matter. In fact, each Agreement State has made, or is in the process of making, licensing decisions about the need for site-specific PAs and whether disposal of the waste streams captured by this proposed rule would be allowed at their respective sites. In addition, the NRC has an effective oversight tool in place today to coordinate with the sited Agreement States. Specifically, NRC determines the adequacy and compatibility of each sited States' LLRW management regulatory program through its Integrated Materials Performance Evaluation Program (IMPEP) and reports its findings publicly.

   Draft Cost-Benefit Analysis is Deficient: NRC has stated that the rule's impact is limited to LLRW disposal site operators. However, as was discussed during the Commission briefing, the regulatory analysis fails to: 1) identify and consider the impacts to all categories of NRC licensees impacted by this proposed rule; and 2) conduct the necessary cost-benefit analysis for such licensees. Such licensees include but are not limited to commercial uranium enrichment facilities licensed under Part 70 which generate DU and LLRW, and commercial nuclear power plants, fuel fabricators, byproduct materials licensees and other generators of LLRW. It is clear that costs imposed on the LLRW disposal site operators to comply with this rule would ultimately be borne by the LLRW generators since the site operators must recoup any rule implementation costs. To that end, the LLRW Northwest Compact representative stated during the June Commission briefing that increased associated permit costs was currently estimated at approximately 8% should the rule go into effect. Further, and equally important, is the fact that NRC did not evaluate the cost-benefit associated with requiring a disposal site operator, who does not intend to dispose of DU and where the sited

[3] Staff requirements memorandum dated March 18, 2009 in response to SECY-08-147, "Staff Response to Commission Order CLI-05-20 Regarding Depleted Uranium."

Agreement State will not allow future disposals of DU, to perform a PA. Again, these unjustified and unanalyzed costs would likely be borne by waste generators and processors.

3. *The rule should only apply prospectively to those sites that seek authorization to dispose of large quantities of DU.* First, a prospective approach is consistent with that implemented by NRC and the Agreement States when the original Part 61 went into effect. The regulators recognized that there was no safety basis to apply all or some of the new requirements to LLRW that had already been disposed of in accordance with requirements in effect at the time. In fact, implementing some of the then new Part 61 requirements, e.g., intruder protection would result in unjustified or impractical technical and economic burdens to licensees and the regulator. Thus, requirements were imposed on a case-by-case basis. In that regard, the case-by-case decision making currently allowed under 10 CFR 61.1(a) should be retained; however, it appears that the language proposed for 10 CFR 61.13 would supersede 10 CFR 61.1(a). NRC should clarify this issue.

   Secondly, LLRW is safely disposed of today in accordance with site-specific licenses issued by the sited Agreement State. There is no evidence to suggest otherwise or that the current regulatory framework is inadequate from a public health and safety perspective. The sited Agreement State programs, in combination with NRC's oversight through the IMPEP, help ensure that current and future waste management operations are in compliance with all applicable regulations. Therefore, should NRC proceed with this rulemaking, the rule should only apply prospectively to those sites that seek authorization from their regulators to dispose of large quantities of DU. With this approach, current licensees or future applicants would not be required to conduct an initial PA or updated PA at site closure if they do not plan to accept large quantities of DU for disposal. Should circumstances change, it is reasonable that a PA would be required.

4. *Compatibility Level for the Rule.* Should the rulemaking proceed, we offer the following comments on the complex issue of compatibility. Industry generally supports and is sensitive to the need for national consistency and uniformity in most regulatory arenas. As such, we recognize that a Compatibility Level B designation for this rule has appeal to some. However, for all intents and purposes, a designation of Level B may not be a practical or implementable approach for this rule, nor is it meaningful in its application. Further, the location of the LLRW disposal facilities and the fact that LLRW is transported across the nation from generators and processors to the disposal sites is not, in and of itself, a "transboundary implication" necessitating a Compatibility Level B. Rather, the determination of "transboundary implications" has most often been applied to address the movement of goods and services under reciprocity between NRC and the Agreement States and not simply the transport of radioactive material or waste from one location to another, e.g., LLRW, sealed sources, used fuel. Further, the issue of more clearly defining "transboundary implications" under Compatibility Level B is discussed in SECY-15-0087 now before the Commission for consideration.

   In addition, unlike other NRC regulatory business lines where NRC either has sole jurisdiction or has relinquished its authority to an Agreement State, there are no LLRW disposal sites licensed by NRC under Part 61. Rather, each sited Agreement State has a Part 61-compatible regulation in place to address LLRW disposal, including the disposal of DU and other waste streams envisioned by this

rule. As such, disposal site-specific waste acceptance criteria is in place today and would continue to be used by LLRW disposal site operators when implementing the proposed rule as written. This fact remains regardless of the compatibility level designation assigned to Part 61, and we fully support the necessary flexibility afforded by the current rule. Therefore, unless NRC demonstrates that, based on public health and safety, the Agreement States must adopt a rule that is either "identical" or "essentially identical" to NRC's rule (as required by Compatibility Levels A and B, respectively) national uniformity is not necessary. While we recognize that the Compatibility Level is a matter of consultation between the NRC, Agreement States and the Commission, we respectfully suggest that the most appropriate Compatibility Level appears to be C. Specifically, Level C would allow Agreement States to be more restrictive than the NRC's rule (which some already are) and allow each sited Agreement State to retain its current approach to regulating LLRW disposal. Finally, we are confident that NRC will continue to monitor the adequacy and compatibility of the Agreement State programs through the IMPEP.

5. *Part 61 Waste Classification (WC) Tables:* As stated by NRC staff, the Part 61 WC tables are maintained for now, but could be revised during a subsequent rulemaking which could necessitate conforming changes to the final version of this proposed rule, i.e., "a whiplash effect on licensees." Therefore, we are commenting on this proposed rule without the benefit of being fully aware of or informed by potential impacts from future Part 61 rulemakings. Such modifications could include incorporating up to date science or removal of the Part 61 waste classification tables[4]. Clearly, this is a significant disadvantage of proceeding with a limited rulemaking at this time and perhaps, in combination with the Agreement State programs and safe disposal practices in place today, reason enough not to proceed. Instead, the issues surrounding the WC tables should be fully vetted and evaluated by NRC to determine which impacts might be realized from such modifications. It should also be recognized that there are significant statutory implications of modifying the WC tables or removing them in their entirety from Part 61—and compatible Agreement State regulations--since the WC tables are explicitly referenced in the Low Level Radioactive Waste Policy Act of 1985. These issues are not insurmountable but should be carefully identified and analyzed for impacts to this rulemaking.

6. *Use of the word "analysis" versus "consideration"*: NRC's introduction of the word, "analysis" in the context of "defense-in-depth" is a new requirement and a concept without definition in the proposed rule. "Analysis" implies the need for an unprecedented and perhaps unjustified, unnecessary and impractical quantitative approach for evaluating long-term site performance in addition to the explicit consideration of uncertainty and variability. Therefore, NRC should delete "analysis" and use a term that more clearly reflects the historical approach to defense-in-depth used by licensees, NRC and the Agreement States, e.g., "consideration."

[4] U.S. Nuclear Regulatory Commission Staff Requirements Memorandum on SECY-2013-0001.

We trust the comments above help inform any decision on whether to proceed with this rulemaking and we look forward to learning how stakeholder comments are resolved. I would be pleased to answer any questions on the comments contained herein.

Sincerely,

Janet R. Schlueter

c: Mr. Larry Camper, NMSS/DUWP, NRC
Ms. Marissa Bailey, NMSS/FSCE, NRC
Mr. David Esh, NMSS/DUWP/PAB, NRC

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Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0122
Comment on FR Doc # 2015-06429

Submitter Information

Name: Sue Smith
Address: United States,

General Comment

See attached file(s)

Attachments

Cindy Bladey-Part61final

Conference of Radiation Control Program Directors, Inc.

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July 23, 2015

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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Docket ID NRC-2015-0003

The Board of the Conference of Radiation Control Program Directors (CRCPD) appreciates the opportunity to comment on the Nuclear Regulatory Commission's (NRC's) proposed changes to 10 CFR 61 as published on March 28, 2015. The Board's response has taken into consideration sited and non-sited state opinions.

1. The Board highly recommends Part 61 be left "as is" as much as possible. Updating existing requirements in these sections is a good practice. Since half of the existing sites do not plan on accepting significant quantities of the new long-lived alpha emitting radionuclides, the new requirements should be inserted into at least a new section (e.g., §61.60).

2. The Board objects to redoing the site's performance assessment unless that site opts to take significant quantities of long-lived alpha emitters (e.g., DU). If we read §61.13(e) correctly, the Performance Assessment (PA) is only needed if a site is **going to take** long-lived alpha emitters.

3. The Board concurs with the new requirement to redo a site's PA within 5 years of closure. This allows assumptions made tens of years earlier to be reviewed and perhaps data updated. Unless absolutely needed, no new additional sampling should be done; only updating:

    a. the inventory (adjust projected quantities),
    b. equation values such as k_d,

4. The Board concurs that Defense-in-Depth information (e.g., several independent redundant barriers) should be available in pre-operational documents for each site. For current sites, retrofitting may be extremely difficult if the site is dependent on only one or two robust barrier(s).

5. The revised regulations introduce a new term called the Safety Case. Safety Cases (SC) are, in their simplest terms, a collection of arguments and evidence showing a facility can be sited, designed, constructed, commissioned, operated and shutdown/closed in a safe manner. A key component of the safety case is the analytical safety assessment. The NRC equates the SC's to a PA plus Defense-in-Depth. The exact form of a SC depends on the laws and regulations at a given site. Between radioactive materials licensing and a site environmental review (e.g., NEPA or state equivalent laws), mostly likely the critical components of a SC will be addressed. Is this consistent with the NRC's Safety Case expectation?

6. The Board supports a sited state's ability through regulatory/licensing action to develop site-specific waste classification levels (e.g., similar to 10 CFR 61.55 Tables). Site specific values will provide flexibility not currently in the regulations. The wording in the current proposed rule seems to allow the site operator to decide if other than 10 CFR 61.55 tables will be used. The rule needs to be clearly worded that the site regulator decides if site-specific values will be used.

7. Impacts of regulation changes on the development of new sites are unknown. The NR C in its Regulatory Basis for Proposed Revisions to Low-Level Waste Disposal Facilities (10 CFR Part 61) in part states-PA will be based largely on inference, development of models, and data acquisition to demonstrate 10 CFR Part 61 PA's are met.

   We understand the nature of the uncertainty associated with near surface disposal of Low Level Radioactive Waste (LLRW) and the need for flexibility in a performance based regulatory approach. However, because the proposed rule is ambiguous in in some parts it leaves open the opportunity for the following unintended consequences:

   - New proposed sites that want to dispose of alpha emitters may walk away from the siting process due to the risk associated with uncertainty within the regulation.
   - Varying interpretation of inference could create regulatory mission creep and a regulatory process that becomes too burdensome.
   - Creation of a complex patchwork of regulations that don't allow for a single standard of LLRW packaging.

   The unintended consequences can be minimized in the new proposed rule by adding context to its framework while at the same providing flexibility for existing LLRW sites.

8. The Board is concerned about the compatibility of some sections of the proposed rule. Several new sections are proposed Compatibility Level B. The Board fails to see what significant transboundary issues would arise after already allowing sites to develop site-specific waste acceptance criteria. The definitions of the Compliance Period (CP) and Protective Assurance Periods (PAP) in §61.2 should be more flexible to support individual state's needs. For example, with the idea of the total CP + PAP timeframe remaining 10,000 years and the CP not being less than 1,000 years, the CP could be 2,000 years and PAP 8,000 years. In this case a longer CP is more conservative (i.e., public dose limit is extended). The 2013-001 SRM spoke to reasonable uncertainty and the comfort level of the decision makers. This added flexibility will help the states where their decision makers feel comfortable (e.g., risk informed) accepting additional uncertainty.

   Since the following sections are primarily dose related, the Board supports the proposed Compatibility Levels for:

   a. §61.41(a), (b), and (c)
   b. §61.42(a), (b), and (c)

9. A regulatory back-fit analysis, although not required, should have been performed for this revision.

10. Further details should be provided for review and comment on how the financial burden for implementation of this revision placed on sited Agreement State programs was derived.

11. Predictions of site stability for 10,000 years (required in §61.44) are subjective and filled with uncertainty. The Board agrees with NRC staff in that site stability is critical to achieving the performance objectives of §61.41 and §61.42. What is not readily apparent is why the site stability performance objective (§61.44) needs to stand alone in the NRC's world of performance based regulations. Due to concern over uncertainty, the NRC in the past several years, has reduced its timeframe for its public dose limit (0.25 mSv annually) compliance to 1000 years. Isn't the site stability performance objective subject to the same uncertainty?

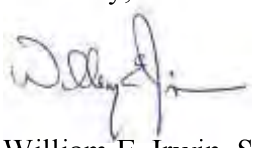
12. The assigned dose stated in §61.41(b) and §61.42(b) for the PAP is not clear. As stated in these paragraphs, the annual dose shall be below 5 mSv or a level that is supported as reasonably achievable …. Is the 5 mSv an upper limit or are **higher levels** allowed if supported as reasonably achievable based on technological and economic considerations?

13. The Board understands the Guidance for Conducting Technical Analyses for 10 CFR Part 61 (NUREG-2175) supports the current proposed rulemaking. The CRCPD appreciates the ability to review both the proposed rule and corresponding guidance at the same time. The Board suggests a new draft guidance document be released for additional review after the Commission approves Part 61.

14. NRC's re-interpretation of §61.1(a) is a concern for existing sites. While interpreted as grandfathering in the current version of 10 CFR 61, NRC staff have altered their view of §61.1(a). The current interpretation recognizes that new requirements introduced after a facility is licensed and operating under previous requirements would not necessarily be binding on either Agreement States or operators that committed to, and were licensed under, specific site conditions and licensing requirements in good faith. Existing sites may need to depend on current interpretation in the near term. Little explanation has been given for this change. An explanation is requested.

If you have any questions regarding these comments, please feel free to contact Earl Fordham at 509-946-0234 or earl.fordham@doh.wa.gov)

Sincerely,



William E. Irwin, Sc.D., CHP
Chairperson

cc: Board of Directors

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Comment on FR Doc # 2015-06429

Submitter Information

Name: Kent Rosenberger

General Comment

See attached

Attachments

SRR-CWDA-2015-00093

Savannah River
R med ation
AECOM | BECHTEL CH2 | B&W | AREVA

JUL 2 3 2015

SRR-CWDA-2015-00093
RSM Track #: 10065

U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

COMMENTS ON PROPOSED REVISION TO 10 CFR PART 61 – DOCKET ID NRC-2011-0012

Savannah River Remediation LLC (SRR) is transmitting for your consideration the attached comments on your proposed revision to 10 CFR Part 61. SRR appreciates the opportunity to review the proposed rule and in general supports the revision especially in the area of explicit definition of a time of compliance that is consistent with that defined in existing U.S. Department of Energy requirements. This consistency is a benefit to .S. Department of Energy contractors such as SRR which develop Performance Assessments to meet U.S. Department of Energy requirements and to meet 10 CFR Part 61 Subpart C performance objectives as required by Section 3116 of the National Defense Authorization Act for FY2005.

Please direct any questions to Kent Rosenberger at (803)557-9328 or kent.rosenberger@srs.gov.

Sincerely,

Kent H.

Kent H. Rosenberger
Waste Disposal Authority

KHR/khr

c: S. R. Ross, DOE-SR, 704-S
D. J. Ferguson, 704-S
J. K. Fortenberry, SRR, 766-H
V. A. Franklin, 705-1C
S. A. Thomas, 705-1C
T. F. England, 705-1C
L. B. Romanowski, 705-1C
S. P. Hommel, 705-1C
R. R. Seitz, SRNS, 773-43A

Savannah River Remediation LLC Comments on Proposed Revision to 10 CFR Part 61

Comment ID	Part 61 Section	Comment
SRR-1	§ 61.2 *Compliance period*	The clarification of an explicit compliance period is considered an improvement to the rule and the use of 1,000 years consistent with that defined in existing U.S. Department of Energy requirements is a positive change.
SRR-2	§ 61.2 *Disposal unit*	The definition of disposal unit includes the statement "For near-surface disposal the unit is usually a trench". This statement was specifically deleted from § 61.7(a)(2).
SRR-3	§ 61.2 *Inadvertent intruder*	An inadvertent intruder may not always be a human being. Animals and plants can also intrude upon a site. Recommend revising the term from *inadvertent intruder* to *inadvertent human intruder* in order to clarify this distinction.
SRR-4	§ 61.2 *Long-lived waste*	The definition of long-lived waste is confusing. The definition appears to be defining long-lived radionuclides. While many waste forms may contain some quantity of long-lived radionuclides, not all of these waste forms may be long-lived waste. The definition should be refined to fit the context of the use of the term in the proposed rule.
SRR-5	§ 61.2 *Performance assessment*	Item 3 in the definition states "Estimates the annual dose to <u>any</u> member of the public…". The use of the term "any" could imply the Maximum Exposed Individual (MEI) or other such exposure context which is not consistent with evaluating exposures based on typical regional human behaviors and consumption rates. It is recommended to simply state to a member of the public versus any.
SRR-6	§ 61.2 *Performance period*	The definition of performance period states it is a timeframe without any end time after the protective assurance period. The definition should explicitly cite an end time such as the time of peak dose. In the absence of such an end time one could interpret the definition as a requirement to model to infinity.
SRR-7	§ 61.2 *Protective assurance period*	The clarification of an explicit protective assurance period is considered an improvement to the rule and a reasonable compromise to previous proposed revisions to the rule.
SRR-8	§ 61.2 *Stability*	The definition states that stability means structural stability. The term stability is often used in the context of the long-term stability of the closure cap which typically involves erosional impacts. While this may alter the engineered function of the closure cap it would not impact structural stability. The context for the term stability should be elaborated upon in the definition such as applying to the stability of the waste form or disposal container.
SRR-9	§ 61.7(a)(1)	The term earthen is deleted in this paragraph in the first use with protective covers but not in the second use.

Comment ID	Part 61 Section	Comment
SRR-10	§ 61.7(a)(2)	This paragraph indicates disposal site characteristics should be considered for at least a 500-year timeframe which appears inconsistent with other considerations of changing site conditions over longer time periods. Please clarify the context of the 500-year timeframe use in this paragraph.
SRR-11	§ 61.7(c)(5)	Allowing for the use of "updated factors incorporated by the U.S. Environmental Protection Agency" and "the most current scientific models and methodologies" for the implementation of the dose methodology is considered an improvement to the rule.
SRR-12	§ 61.7(c)(5)	It is not clear when the 100-year institutional control period begins. Does it begin today, at the time of waste emplacement or at the time that the facility is closed? For relatively short-lived radionuclides (such as Sr-90 or Cs-137) the implications could be significant. Additional clarification would be helpful for avoiding conflicts that may arise from this ambiguity.
SRR-13	§ 61.12(b)	The context and timeframe of consideration for geomorphological and climatologic features should be defined.
SRR-14	§ 61.13(a)(1)	Some features, events, and processes (FEPs) are difficult to provide technical bases for inclusion or exclusion; either because studying the FEP is very expensive and/or timely, or the very nature of the FEP is difficult to observe under real conditions or has an extreme element of uncertainty (e.g., impact of long term climate change on various man-made materials that have not yet existed for a long period of time). Requiring a technical justification for every FEP may, therefore, be an unrealistic expectation. Rather than requiring a technical basis/justification for inclusion or exclusion of every FEP, it may be more feasible/conducive to require a documented justification instead. A documented justification does not have to be technical but still requires the applicant to put an appropriate level of thought into each FEP.
SRR-15	§ 61.13(a)(4)	This paragraph implies that items such as climate change may not be necessary to evaluate if either the peak dose occurs within the compliance period or protective assurance period if evidence of climatic change for the disposal site is not expected in these timeframes. Please clarify if this was the intent of the revision.
SRR-16	§ 61.13(b)(3)(i)	"Normal" activities might not always include all of these activities. Recommend revising the middle of this section to read "… and engages in normal activities which may include …"
SRR-17	§ 61.13(b)(3)(iii)	This statement is ambiguous and could benefit from additional clarification, such as examples of how uncertainty can be accounted for.
SRR-18	§ 61.13(e) Table A	The definition of "Average Concentrations" should be provided. Is this the average of the waste package, disposal unit, disposal site, etc.? Without a definition it may have an unintended consequence in which sites may feel encouraged to mix their waste with "clean" material to dilute the waste concentration.

Comment ID	Part 61 Section	Comment
SRR-19	§ 61.13(e) Table A	The term long-lived alpha-emitting nuclides should be defined such as done in § 61.55 Table 1 which indicates a half-life greater than 5 years.
SRR-20	§ 61.23(c)	The term "individual" should be deleted from individual inadvertent intruders to be consistent with other uses of inadvertent intruder.
SRR-21	§ 61.41(a)	This paragraph refers to dose "to <u>any</u> member of the public…". The use of the term "any" could imply the Maximum Exposed Individual (MEI) or other such exposure context which is not consistent with evaluating exposures based on typical regional human behaviors and consumption rates. It is recommended to simply state to a member of the public versus any.
SRR-22	§ 61.42(a)	This paragraph refers to dose "to <u>any</u> inadvertent intruder…". The use of the term "any" could imply the Maximum Exposed Individual (MEI) or other such exposure context which is not consistent with evaluating exposures based on typical regional human behaviors and consumption rates. It is recommended to simply state to an inadvertent intruder versus any.
SRR-23	§ 61.50(2)(iii)	The language could be interpreted as excluding humid sites as a suitable location for waste disposal due to the shallow water table. This requirement should be revised or removed. It is reasonable to assume humid sites may require more engineered features and technical justification than arid sites but the requirement should be that the performance objectives of Subpart C of the rule must be met.
SRR-24	§ 61.57	This requirement seems to only apply if waste is being transported between facilities. Please clarify how to address these requirements for waste that is generated and disposed on site and is not transported from a different location given that requiring workers to apply labels to waste that will not be transported off site poses a health risk to the workers.

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Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0124
Comment on FR Doc # 2015-06429

Submitter Information

Name: Jay Laughlin

General Comment

Comments from URENCO USA on proposed rule making for Low-Level Radioactive Waste, 80 Fed. Reg. 16081 (March 26, 2015)

Attachments

URENCO USA Comments of 10 CFR 61 Proposed Rule Making

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U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001
ATTN: Rulemakings and Adjudications Staff

Subj: Comments of URENCO USA on NRC "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012), 80 *Fed. Reg.* 16081 (March 26, 2015)

On March 26, 2015, the Nuclear Regulatory Commission published a proposed rule to amend its regulations in 10 C.F.R. Part 61 governing low level radioactive waste (LLRW) disposal facilities, to require new and revised site-specific technical analyses and to permit the development of site-specific criteria for LLRW acceptance based on the results of these analyses. The proposed rule would affect LLRW disposal licensees or applicants that are regulated by the NRC or the Agreement States. Importantly, the proposed rule would also significantly affect uranium enrichment facility licensees such as URENCO USA (UUSA), which is fully responsible for the management and disposal of its depleted uranium (DU) waste in a LLRW disposal facility.

UUSA, the only operating commercial enrichment facility in the United States, is concerned that the proposed rule would result in new waste acceptance criteria and other restrictions that would make it more difficult for enrichment facilities to dispose of significant quantities of DU waste, which in turn, for example, could have impacts for onsite DU storage under the UUSA license. In UUSA's view, the NRC should:

1) Clarify the proposed new "minimization" requirements under Sections 61.41 and 61.42 (and any other relevant provisions) by adding objective criteria similar to those used for implementing the ALARA principle under Part 20. Alternatively, given the inherent difficulty of implementing such minimization requirements over the extremely long time horizons addressed by the rule, the NRC should consider dropping the minimization requirements and utilize only the prescribed dose limits.

2) Perform a backfitting analysis that quantifies the impacts and safety benefits of the proposed new waste acceptance requirements for affected generators of LLRW, such as enrichment facilities, as required by 10 C.F.R. 70.76.

3) Rather than delay resolution of the critical issue of the waste classification related to DU, pursue an integrated rulemaking that resolves that issue in a coordinated fashion in conjunction with the changes proposed in the present rulemaking.

UUSA is not opposed to the NRC's present rulemaking, and appreciates the NRC staff's significant efforts with respect to addressing complicated LLRW disposal issues. However, UUSA believes that, as a matter of sound regulatory policy, the NRC should evaluate the impacts the rulemaking could have on the overall regulated community, including generators of LLRW, and not just disposal facilities.

UUSA's Interest

The NRC's Part 61 rulemaking came about as a result of the licensing of the UUSA facility. During initial facility licensing, the Commission directed the NRC staff to evaluate the disposal of significant quantities of DU waste generated by uranium enrichment facilities. While the staff's original rulemaking efforts were subsequently expanded and bifurcated into the present rulemaking and a separate waste classification rulemaking, they both originated with the issues raised in the UUSA initial licensing proceeding regarding the potential for disposal of large quantities of DU waste from uranium enrichment facilities.[1]

The UUSA facility, located near Eunice, New Mexico, is the only operating commercial enrichment facility in the United States today. UUSA is in the process of expanding the capacity of the facility from the original nominal capacity of some 3 million separative work units (SWU) to over 5 million SWU. If the Part 61 rulemaking results in the imposition of more stringent criteria for disposing of DU waste in LLRW disposal facilities or otherwise restricts the number of LLRW disposal facilities that are able to accept DU waste in significant quantities, then UUSA's disposal options could decrease and its related costs could significantly increase, possibly forcing UUSA to store significantly more quantities of DU waste onsite and/or for longer periods. The disposal issue is further complicated by the Part 61 waste reclassification issue that could potentially result in some existing LLRW disposal facilities being unable to accept DU waste.

These outcomes could have significant adverse financial impacts on UUSA. Given the soft market conditions for uranium fuel following the Fukushima accident, any increase in operational or LLRW disposal costs could potentially create a challenge to continued future operations and adversely affect any need for further capacity expansion of the UUSA facility.

Based on UUSA's contact with several disposal facility operators across the United States, we understand that increased costs of new requirements resulting from the rulemaking will be passed on to generators, like UUSA, on a dollar-for-dollar basis. The NRC's current cost-benefit analysis of the proposed rule, as discussed in the Regulatory Analysis, shows increased costs to disposal facility licensees.[2] Thus, there can be no doubt that the pass-through of such costs will have a direct and substantive impact on generators like UUSA.

The UUSA facility is critical for economic, energy security, and national security/nonproliferation reasons. Uranium enrichment is necessary for the production of fuel for U.S. commercial nuclear power plants. The demand for uranium enrichment services is expected to remain relatively strong in the United States and worldwide, particularly with the continued increased growth of nuclear

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[1] The waste classification tables in Part 61 specify criteria for classifying LLRW for land disposal at a near-surface facility. The original development of Part 61 did evaluate depleted uranium, but not in the quantities generated at uranium enrichment facilities. *See, e.g.,* NUREG-0945, Vol 1, "Final Environmental Impact Statement on 10 CFR Part 61 Licensing Requirements for Land Disposal of Radioactive Waste: Summary and Main Report" at S-21 (in the discussion of "Isotopes Considered for Waste Classification Purposes," the NRC noted that in the draft environmental impact statement, a total of 23 different moderately or long-lived radionuclides were considered in the analysis, including DU).

[2] *Draft Regulatory Analysis for Proposed Rule: Low-Level Radioactive Waste Disposal Low-Level Radioactive Waste Disposal (10 CFR Part 61)* (Feb. 2015) at iv, 23.

energy around the globe. For these reasons, Congress has recognized the strategic importance of U.S. domestic uranium enrichment capability.[3]

In terms of long-term U.S. energy security, the Energy Information Administration's annual reports on uranium marketing show that the bulk of enrichment supply (generally over 70%) for U.S. nuclear power plants is foreign-based – including suppliers in Russia, China and France that are typically subsidized by their governments and would not be subject to the differential costs resulting from new requirements imposed by the present rulemaking. In this environment, discouraging the expansion of U.S.-based commercial enrichment services, by imposing new LLRW disposal requirements and costs not borne by most foreign providers, could significantly challenge the availability of long-term domestic enrichment services to U.S.-based utilities. This result could present a further challenge to the U.S. nuclear industry at a time when many merchant nuclear generating plants in competitive markets are facing economic stress despite the significant environmental and economic benefits nuclear energy produces for the country.[4]

UUSA's History with the Part 61 Rulemaking

For several years, the NRC has been undertaking an effort to amend its Part 61 regulations to account for the disposal of significant quantities of DU waste from commercial and Department of Energy uranium enrichment operations. The NRC has been approaching the Part 61 rulemaking from two angles. First, during the UUSA initial licensing proceeding, the Commission directed the staff to consider, outside the UUSA case, whether Part 61 should be amended after the staff evaluated the quantities of depleted uranium at issue in the waste stream from uranium enrichment facilities. Specifically, the Commission explained:

> The Commission is aware that in creating the § 61.55 waste classification tables, the NRC considered depleted uranium, but apparently examined only specific kinds of depleted uranium waste streams – "the types of uranium-bearing waste being typically disposed of by NRC licensees" at the time. The NRC concluded that those waste streams posed an insufficient hazard to warrant establishing a concentration limit for depleted uranium in the waste classification tables. Perhaps the same conclusion would have been drawn had the Part 61 rulemaking explicitly analyzed the uranium enrichment waste stream. But as Part 61's [Final Environmental Impact Statement] indicates, no such analysis was done. Therefore, the Commission directs the NRC staff, outside of this adjudication, to consider whether the quantities of depleted uranium at issue in the waste stream from uranium enrichment

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[3] Congress has characterized uranium enrichment as a "strategically important domestic industry of vital national interest," "essential to the national security and energy security of the United States," and "necessary to avoid dependence on imports." S. Rep No. 101-60, 101st Congress, 1st Session 8, 43 (1989); Energy Policy Act of 1992, 42 U.S.C. Section 2296b-6. National security and defense interests require assurance that the nuclear energy industry in the United States does not become unduly dependent on foreign sources of uranium or uranium enrichment services (S. Rep. No. 102-72, 102nd Congress 1st Session 144-45 (1991)), and domestically produced enriched uranium may also further non-proliferation goals. *Ibid.*

[4] *See The Nuclear Industry's Contribution to the U.S. Economy*, the Brattle Group (July 2015) (estimating that the U.S. nuclear industry contributes some $60 billion annually to GDP and lowers average annual CO2 emissions by 573 million tons).

> facilities warrant amending section 61.55(a)(6) or the section 61.55(a) waste classification tables.[5]

Second, in a Staff Requirements Memorandum (SRM-SECY-08-0147), dated March 18, 2009, the Commission directed the staff to pursue a limited scope rulemaking to specify a requirement for a site-specific analysis and associated technical requirements for unique waste streams including the disposal of so-called "large quantities" of DU waste. Specifically, the Commission's SRM stated:

> Previously, in the adjudicatory proceeding for the [UUSA] license application, the Commission determined that depleted uranium is properly classified as low-level radioactive waste. Although the Commission stated that a literal reading of 10 CFR 61.55(a)(6) would render depleted uranium a Class A waste, it recognized that the analysis supporting this section did not address the disposal of large quantities of depleted uranium.

The proposed rule is the result of this rulemaking effort that grew out of the UUSA licensing proceeding. In the proposed rule, the NRC explains (with emphasis added):

> In pursuing this limited rulemaking, the NRC is not proposing to alter the waste classification scheme. However, for unique waste streams including, but not limited to, significant quantities of depleted uranium, there may be a need *to impose additional criteria on its disposal at a specific facility or deny such disposal based on unique site characteristics*. Those restrictions would be determined through a site-specific analysis, which satisfies the requirements developed through the rulemaking process.[6]

Thus, the Part 61 rulemaking is intimately linked with the operation of uranium enrichment facilities, and the disposal of the DU waste generated at these facilities.

Comments on Proposed Rule

Comment 1: The proposed "minimization" requirements for the protective assurance and performance periods have not been adequately justified.

The proposed rule would impose ongoing dose "minimization" requirements that could apply throughout the life cycle of a disposal facility. Sections 61.41(b) and 61.42(b) (and perhaps other sections) would provide that for the "protective assurance period," which is between 1,000 and 10,000 years following closure of a LLRW disposal facility, the annual dose to the public or an inadvertent intruder from the facility shall be minimized. More specifically, these provisions would require that the annual dose shall be below 5 mSv (500 mrem) "*or a level that is supported as*

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[5] *See Louisiana Energy Services* (National Enrichment Facility), CLI-05-20, "Commission Memorandum and Order" (Oct. 19, 2005) at 17 (citations omitted).

[6] NRC Website, "Low-Level Radioactive Waste Disposal (Site-Specific Analysis Rulemaking)" (last updated June 5, 2015), available at http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html

reasonably achievable based on technological and economic considerations." (Emphasis added.) The NRC has termed this approach a "minimization analysis." Similarly, proposed Sections 61.41(c) and 61.42(c) require efforts to "minimize" releases to the general environment and exposures to any inadvertent intruder during the "performance period" (the timeframe after the 10,000-year protective assurance period).

The proposed new minimization concept raises concerns for UUSA as a generator of DU waste. The proposed rule does not provide any substantive discussion of the technical or regulatory basis for the minimization requirements. As a result, unless the NRC carefully explains and limits the new minimization requirements with objective criteria, it will create uncertainty and a moving target for affected licensees and LLRW generators.

a. Lack of basis for new minimization standard

It appears that the minimization analysis concept was first introduced into the rulemaking in a February 12, 2014 Staff Requirements Memorandum (SRM), where the Commission approved publication of the proposed rule and draft guidance subject to certain conditions. The 2014 SRM directed the addition of a protective assurance period analysis that "should strive to minimize radiation dose with the goal of keeping doses below a 500 mrem/yr analytical threshold. The *radiation doses should be reduced to a level that is reasonably achievable based on technological and economic considerations.*" (Emphasis added.) The Commission vote sheets for the SRM do not provide a source for this language, although two Commissioners suggested that "as low as reasonably achievable" (ALARA) principles should apply to the protective assurance period analysis. This appears to be the origin of the proposed new minimization requirements, although there is no further discussion of the concept in the rulemaking record.

Neither the proposed rule nor the NRC's Regulatory Analysis for the rulemaking provides any technical or cost-benefit justification for the new minimization requirements. Similarly, the NRC's *Draft Guidance for Conducting Technical Analyses for Low-Level Radioactive Waste Disposal* (released with the proposed rule) does not provide any meaningful detail on this subject. The most in-depth discussion can be found in the Draft Guidance, which states:

> These requirements to minimize releases and exposures are intended to be conceptually similar to aspects of the ALARA requirement found in 10 CFR Part 20, which includes the use of optimization, feasibility analyses, and traditional cost-benefit analyses . . . The minimization analysis is conceptually similar to ALARA, but it is not identical.[7]

To provide regulatory certainty, the NRC, at a minimum, should develop a technical and regulatory basis to support any new minimization standards and clarify the proposed new requirements in any final rule. The language of the proposed rule is fraught with subjective terms, such as "should be reduced," "reasonably" achievable, and "technological and economic considerations." Without clarification of these subjective concepts, there will be uncertainly about how to comply with the

[7] NUREG-2175, *Guidance for Conducting Technical Analyses for 10 CFR Part 61*, Draft Report for Comment (Mar. 2015) at 6-11.

standards over the extremely long time horizons covered by the protective assurance and performance periods.

If the NRC intends to retain ongoing minimization requirements in the final rule, it should add objective criteria to the proposed language of Sections 61.41 and 61.42 to keep the minimization requirements from being overly subjective. As an example, the definition of ALARA in 10 C.F.R. Section 20.1003 contains certain objective limitations (emphasis added):

> *ALARA* (acronym for "as low as is reasonably achievable") means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part *as is practical consistent with the purpose for which the licensed activity is undertaken*, taking into account the state of technology, the economics of improvements in relation to state of technology, *the economics of improvements in relation to benefits to the public health and safety*, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

In addition, 10 C.F.R. Section 20.1101(b) states (emphasis added):

> The licensee shall use, *to the extent practical*, procedures and engineering controls *based upon sound radiation protection principles* to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).[8]

Thus the ALARA principle is defined by reference to objective standards of practicality and cost-benefit criteria, as well as being linked to the specific radiation protection requirements contained in Part 20 and nationally and internationally recognized standards. In contrast, the new minimization analysis requirement in proposed Sections 61.41(b) and 61.42(b) provides that the annual dose to the public or an inadvertent intruder shall be below 5 mSv (500 mrem) "or a level that is supported as reasonably achievable based on technological and economic considerations." With such potentially broad standards, it would be very difficult for licensees, generators, Agreement States, and the NRC to determine how to apply the new requirements, especially for the long-term time horizons for the protective assurance and performance periods. In fact, the ongoing minimization concept will be very difficult to implement for multiple Agreement States that may be using different regulatory approaches.

Accordingly, if the NRC retains the minimization requirements in the final rule, UUSA urges the NRC to clarify the language of the proposed new minimization requirements in proposed Sections 61.41 and 61.42 by adding objective criteria similar to those used in the well-established ALARA principle. The NRC should consider publishing the revised rule text for comment by stakeholders before finalizing the rule in order to ensure that the new requirements will be workable in practice. In any final rule, the NRC should also provide a full explanation of the new standards in the Statement of

[8] Presumably, the reference to "sound radiation protection principles" includes the well recognized standards provided by the International Commission on Radiation Protection (ICRP) and the National Council on Radiation Protection (NCRP).

Considerations so that licensees, LLRW generators, and Agreement States have a clear understanding of the intent of the new provisions.[9]

Alternatively, the NRC should consider dropping the proposed minimization concept from the final rule in view of the practical difficulties that will be created for implementing such a subjective requirement over thousands of years. Instead, the NRC could rely on the specific dose limits set forth in proposed Sections 61.41 and 61.42, which would provide objective criteria for licensees, generators, and Agreement States to meet.

In any event, if any ongoing minimization requirement is retained in the final rule, the NRC should give serious consideration to adding a backfitting protection provision to Part 61. The Commission adopted backfit rules for Part 50 and Part 70 as a matter of good regulatory policy, to ensure that the costs and benefits of proposed new requirements would be thoroughly analyzed before being imposed on affected licensees. The same policy holds true for LLRW disposal facilities licensed under Part 61. As the limited number of LLRW disposal facilities age, it will be increasingly important for the licensees, as well as the LLRW generators that depend on the disposal facilities, to have protection against the imposition of new regulatory requirements or positions that have not been properly justified. This is particularly true since an ongoing minimization standard could be a source of new regulatory positions imposed by the NRC or Agreement States.

b. Legal precedent on similar standards

In considering a minimization requirement for Part 61, the NRC should be mindful that, in some contexts, a "minimization" standard has been problematic. The basic problem is that a minimization standard can establish a moving target, since developments in technology and even the concept of what is "reasonably achievable" can change over time and lead to differences in opinion.

Such an approach can create considerable uncertainty for the regulated community. As the Supreme Court discussed in *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009), the Environmental Protection Agency (EPA) for some three decades made determinations on a case-by-case basis about the "best available technology" for power plant cooling water intake structures for purposes of "minimizing" adverse environmental impacts as required under the Clean Water Act.

As illustrated by the *Entergy* case, EPA's best available technology (BAT) standard has created debates over the extent to which cost could be taken into account in determining the BAT and how far a power plant would have to go in *minimizing* – as distinct from *reducing* -- impacts. In the *Entergy* case, the Supreme Court upheld the EPA's use of cost-benefit analysis to determine what technology is the BAT. In addition, the Court discussed the meaning of the Clean Water Act provision requiring use of the BAT "for minimizing adverse environmental impact."[10] The Supreme

[9] If the NRC does not clarify the new ongoing minimization requirements by incorporating objective criteria, the problem with subjectivity and uncertainty could be compounded for LLRW disposal facilities in Agreement States if the states were to seek to impose more specific restrictions or limits in the interest of "minimizing" releases or exposures.

[10] 33 U.S.C. 1326(b).

Court focused on the word "minimize" and concluded that "'minimize' is a term that admits of degree and is not necessarily used to refer exclusively to the 'greatest possible reduction.'"[11]

In line with the *Entergy* case, if the NRC were to retain a minimization concept in the final rule, it should clarify that the analysis of "technological and economic considerations" as set forth in proposed Sections 61.41 and 61.42 should be based on cost-benefit determinations, so that not every new and conceivably better technology must be adopted for reducing dose, but only a technology that is determined to be cost-justified because it would produce a *substantial* safety benefit and impose costs that are commensurate with the safety benefit. This would be consistent with the ALARA principle under Part 20. Further, based on the *Entergy* case, the NRC should clarify in the final rule that any "minimization" requirement is intended to be understood in relative terms, considering the costs and benefits to public health and safety, and is not intended to demand the greatest possible reduction of dose regardless of costs.

Comment 2: The NRC should perform a backfitting analysis to quantify the impacts and safety benefits of the proposed new requirements.

The proposed rule would require new and revised site-specific technical analyses that would be used to develop site-specific performance criteria for LLRW acceptance. In particular, these analyses would be used to establish site-specific Waste Acceptance Criteria (WAC), which generators and shippers of LLRW would be required to meet. The NRC nevertheless concluded that a backfit analysis is not required for the proposed rule, simply stating that the "requirements in this proposed rule do not involve any provisions that would impose backfits on nuclear power plant licensees licensed under 10 CFR Part 50 or 52 or fuel cycle licensees licensed under 10 CFR Part 70."[12]

Respectfully, UUSA disagrees and believes that the rulemaking should be treated as a backfit for enrichment facilities like UUSA and a backfitting analysis should be performed in accordance with the standards of 10 C.F.R. 70.76(a)(3). As a matter of sound regulatory policy, the NRC should perform a rigorous cost-benefit analysis so that it fully understands the impacts of this important rulemaking on all affected licensees, including uranium enrichment facilities that must dispose of significant quantities of DU waste.

a. The rule would have a significant impact on enrichment facilities.

The proposed rule would result in the imposition of new WAC that generators of LLRW will be required to meet, including uranium enrichment facility licensees. The statement in the "Backfitting" section of the proposed rule that the new provisions would not impose backfits on reactor or fuel cycle licensees is merely conclusory, and does not articulate a rational explanation for why the proposed rule would not result in the imposition of backfits.[13] Given that UUSA is one of the main

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[11] 556 U.S. at 219.

[12] 80 Fed. Reg. at 16116.

[13] In contrast to the proposed rule here, in other cases the NRC has articulated a logical and specific explanation to justify why a proposed change does not constitute a backfit. *See, e.g., Proposed Revisions to Site Characteristics and Site Parameters,* 80 Fed. Reg. 30285, 30286-87 (May 27, 2015) (explaining why proposed revisions to review standards for site characteristics did not represent a backfit for applicants and future applicants). If the NRC has

generators of DU, and the fact that the rulemaking largely originated from the UUSA initial licensing proceeding, it is apparent that the proposed rule changes would result in new requirements that have a significant impact on enrichment facility licensees like UUSA.

In concluding that the proposed rule would not impose backfits on reactors or fuel cycle facilities, the NRC appears to construe the rule narrowly as affecting only LLRW disposal facilities. In fact, the new requirements of the proposed rule can have a "domino" impact on tails management and disposal procedures and operational activities at waste generators like UUSA. While the LLRW disposal facility licensees would be required to perform new site-specific analyses in the first instance, the resulting site-specific WAC and other restrictions would be imposed on generators and shippers of LLRW. Thus a significant part of the burden of the new requirements would actually fall squarely on generators like UUSA. In addition, UUSA has been informed that the economic costs incurred by a disposal facility for complying with the new site-specific analysis requirements would be passed on to generators like UUSA on a dollar-for-dollar basis.

On its face, the proposed rulemaking clearly indicates that it is aimed at addressing the disposal of large quantities of DU waste from enrichment facilities. As the NRC states, the central focus of the rulemaking is to "ensure that LLRW streams that are significantly different from those considered during the development of the current regulations (*i.e.*, depleted uranium and other unanalyzed waste streams) can be disposed of safely and meet the performance objectives for land disposal of LLRW."[14]

Despite the central focus of the rulemaking, the NRC has not analyzed the cost and other impacts of the proposed rule on affected generators of DU waste. As a matter of sound regulatory policy, UUSA believes the NRC should prepare a "systematic and documented analysis" in accordance with Section 70.76 to analyze the impacts of the proposed rule on fuel cycle and other affected licensees. The Commission recently recognized the importance of performing such a "systematic and documented analysis" as required by Section 70.76 in order to ensure that new requirements are properly justified under the NRC's backfitting standards.[15]

b. The proposed rule meets the definition of "backfitting" under 10 C.F.R. 70.76.

While the new site-specific analysis requirements of the proposed rule would be imposed directly on disposal facility licensees, we believe the rule also constitutes a backfit for enrichment facility licensees under the definition of "backfitting" in 10 C.F.R. 70.76. Specifically, under 10 C.F.R. 70.76(a)(1), "backfitting" is defined to include "the modification of, or addition to, systems, structures, or components of a facility" or changes to "the procedures or organization required to operate a facility," any of which "may result from a new or amended provision in the Commission rules." The definition is broadly worded to include any new or modified regulation that has the effect of causing such changes for Part 70 licensees.

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developed an internal analysis of why the proposed rule does not involve any backfitting, the agency should make the analysis available to the public for comment as part of the rulemaking.

[14] 80 Fed. Reg. at 16082.

[15] See Commission Voting Record, dated June 18, 2015, on SECY-15-0045, *Issuance of Generic Letter 2015-01, Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities* (comments by Commissioner Svinicki and Commissioner Ostendorff on backfitting implications of the proposed generic letter).

Significantly, NRC precedent shows that a backfit can result not just from a rulemaking that amends Part 70 itself, but by any "new or amended provision in the Commission rules." In previous rulemakings with wide ranging impacts, the NRC has looked at how the new requirement would burden different types of licensees. The NRC has recognized that changes in, or new staff positions related to, other parts of the NRC regulations that affect Part 70 licensees can also be covered by the Part 70 backfitting rule. In connection with guidance for a recent rulemaking involving new Part 71 quality assurance requirements for transportation of radioactive materials, the NRC articulated the standard for determining whether a change under one Part of the regulations (such as Part 71) is a backfit for facilities licensed under another Part (such as Part 50 or 70) with backfitting protection. The NRC stated that the backfit rule will apply "where the activity regulated under other parts without backfitting or issue finality protections [e.g., Part 71] is an inextricable part of the regulated activity subject to backfitting or issue finality [e.g., Parts 50 and 70]."[16]

Clearly, with UUSA generating DU waste that needs to be disposed of in the LLRW disposal facilities and the impacts that changes to DU disposal criteria could have directly on the UUSA facility and license, the activities regulated under Part 61 are an "inextricable part" of a uranium enrichment facility's activities regulated under Part 70. In this regard, the Part 61 disposal facilities would be required to develop new WAC based on the site-specific analysis in the first instance.[17] The new requirements of the rule would then flow down as the disposal facilities would impose the new WAC and related restrictions on shippers and generators, such as UUSA, who would be required to meet the new WAC in order to dispose of their DU waste.

Due to the "domino" impact of the new requirements, the proposed rule would likely result in changes to facilities, procedures and operations of uranium enrichment plants, and thus would constitute a backfit within the meaning of 10 C.F.R. 70.76. Fundamentally, if the Part 61 amendments restrict the ability to dispose of DU waste in a LLRW disposal facility, then the rule could jeopardize the viability of commercial disposal paths for DU waste from uranium enrichment facilities. In any event, the new requirements of the proposed rule could result in the following types of changes at the UUSA facility:

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[16] *Establishing Quality Assurance Programs for Packaging Used in Transport of Radioactive Material*, 78 Fed. Reg. 29016, 29017 (May 16, 2013) (emphasis added). The NRC also recognized this principle, for example, in a rulemaking updating Part 26 fitness-for-duty requirements, where the NRC explained that a backfitting analysis was performed as required by Section 70.76 (as the rule applies to formula quantity strategic special nuclear material licensees who are subject to Part 26 requirements) and Section 50.109 (as applied to reactor licensees). *Fitness for Duty Programs; Final Rule*, 73 Fed. Reg. 16966, 17172 (Mar. 31, 2008).

[17] The proposed rule contains a number of new or amended NRC requirements and positions for Part 61 facilities. These include the new minimization analysis provisions in Sections 61.41(b) and 61.42(b) and the new defense-in-depth analyses to demonstrate that the disposal site and design meet the performance objectives. As noted by the NRC's Office of General Counsel in a backfitting presentation during the NRC's annual Regulatory Information Conference, in order to be a backfit, a staff's "changed position" must either be a "new position" or a position that is "different from a previously applicable Staff position." *See* G. Mizuno, NRC Office of General Counsel, "Backfitting: 'Changed' versus 'New' Guidance: A Presentation for the 2011 RIC NRC" (Mar. 20, 2011) at 6. The absence of a backfitting provision in Part 61 provides the NRC with the opportunity to avoid doing a cost-benefit analysis of the rule's impacts on LLRW disposal facilities that sound regulatory policy would dictate is necessary. For this reason, if the final rule retains such provisions as ongoing minimization requirements, we recommend that the Commission include a backfit rule provision in Part 61.

- Possible amendments to the materials limits and DU cylinder storage limits contained in the UUSA facility license. *See* License Conditions 6 (materials limits), 21 (limiting onsite cylinder storage to a capped amount), and 22 (limiting onsite storage of any one DU cylinder to 25 years). The rule could require license amendments to account for any need to expand capacity at existing storage space or constructing new storage facilities onsite.

- Changes to UUSA's tails management and disposal procedures and operational activities, as well as changes to the design of the facility to account for any additional onsite storage of DU.

- Changes to UUSA's financial assurance for decommissioning and decommissioning planning because the cost estimate for DU disposal may increase and to account for any new restrictions on DU disposal in LLRW disposal facilities. *See* License Condition 16(d), requiring updated decommissioning cost estimates and revised funding instruments for DU disposition on an annual basis to reflect projections for DU (note that the DU disposal cost estimate is contingent upon the DOE disposal path, which can only be used if DU is considered to be low level waste).

During the UUSA licensing proceeding, many of these issues were heavily contested, including the cost of depleted uranium disposal and onsite storage of depleted uranium. In fact, the UUSA license includes a specific condition setting onsite DU cylinder storage limits, both in terms of amount and duration. These potential impacts are squarely of the type contemplated under the definition of backfitting in 10 C.F.R. 70.76. Therefore, the proposed new or modified requirements of Part 61 would constitute a backfit for uranium enrichment facility licensees, and a backfitting analysis meeting the cost-benefit standards of Section 70.76(a)(3) should be performed.

c. The NRC's Regulatory Analysis is insufficient to justify the proposed rule.

Under 10 C.F.R. 70.76(a)(2), the NRC must prepare a "systematic and documented analysis" to show that a proposed backfit will produce a "substantial increase" in the overall protection of public health and safety and that the direct and indirect costs are justified in view of the increased protection. As explained below, while the NRC prepared a Regulatory Analysis for the present rulemaking, that analysis does not meet the NRC's standards of the backfit rule.

As part of the Regulatory Analysis, the NRC performed a cost-benefit analysis that addressed only the four affected disposal facilities and relevant agreement states.[18] Thus, the Regulatory Analysis does not address the impacts on large segments of the affected industry, such as Part 50 and 70 licensees that generate LLRW, even though the focus of the rulemaking is on disposal of large quantities of DU waste from enrichment facilities.

Further, the NRC acknowledges that the Regulatory Analysis did not quantify the safety or risk benefits of the proposed rule, but only considered the safety benefits in a "qualitative fashion."[19] The

[18] *See* Proposed Rule, 80 Fed. Reg. at 16082.
[19] *Id.*

Regulatory Analysis concluded that "[s]everal of the proposed amendments would increase operational flexibility for the licensees," but found that "this benefit for the licensees is difficult to quantify."[20]

Notably, the NRC's discussion of the qualitative benefits does not include a showing of any significant safety improvements. Without a showing of a substantial increase in safety from the proposed new requirements, the added costs resulting from the rule cannot be justified. A purely *qualitative* analysis of the safety benefits is simply inadequate for a rulemaking of this magnitude.

Congress has cautioned the NRC against relying on qualitative factors to justify backfits. In a Letter from Representative Upton and a number of other members of the House Committee on Energy and Commerce to then Chairman Macfarlane, dated September 19, 2014, the Committee questioned the NRC's reliance on qualitative factors as the sole basis to justify imposing new requirements and noted the importance of cost-benefit analyses to help ensure that regulatory changes yield safety benefits commensurate with the costs. The present rulemaking falls well within the scope of Congress' criticism because it does not analyze how any increased safety benefits would be commensurate with the costs of the rulemaking.

Indeed, a recent Supreme Court decision expressly addresses the importance of an agency evaluating costs when it adopts regulations. In *Michigan v. Environmental Protection Agency*, 576 U.S. ___ (June 29, 2015), the Court found it unreasonable for the EPA to refuse to consider cost when determining whether the agency should regulate power plant emissions of mercury and other hazardous air pollutants. In its decision, the Court notes:

> Agencies have long treated cost as a centrally relevant factor when deciding whether to regulate. Consideration of cost reflects the understanding that reasonable regulation ordinarily requires paying attention to the advantages and the disadvantages of agency decisions. It also reflects the reality that "too much wasteful expenditure devoted to one problem may well mean considerably fewer resources available to deal effectively with other (perhaps more serious) problems." *Entergy Corp. v. Riverkeeper, Inc.*, 556 U. S. 208, 233 (2009) (BREYER, J., concurring in part and dissenting in part).

Id., slip op., at 7.

Any agency action, the Court further explains, must "rest 'on a consideration of the relevant factors," which includes costs. *Id.*, slip op., at 5 (citation omitted). In making this evaluation, an agency should be mindful that "'costs' includes more than the expense of complying with regulations; any disadvantages could be termed a cost." *Id.*, slip op., at 7. "No regulation is 'appropriate'," the Court explains, "if it does significantly more harm than good." *Id.*

Similarly, the NRC's proceeding with the Part 61 rulemaking without fully considering the impacts on affected segments of the industry runs counter to the agency's policy initiative to reduce the

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[20] Draft Regulatory Analysis for Proposed Rule: Low-Level Radioactive Waste Disposal Low-Level Radioactive Waste Disposal (10 CFR Part 61) (Feb. 2015) at 20, and 23, "Table 4-4 Summary of Benefits and Costs."

"Cumulative Effects of Regulation" (CER). The NRC has characterized its CER efforts broadly as developing "tools that will allow the agency to consider more completely the overall impacts of multiple rules, orders, generic communications, advisories, and other regulatory actions on licensees and their ability to focus effectively on items of greatest import."[21] The NRC has focused much of its CER improvements to date on the rulemaking process, including ways to enhance stakeholder input and provide more accurate cost-benefit analyses to justify new rules, particularly with respect to improving the accuracy of estimates of licensee implementation costs for new regulatory requirements.[22] If the NRC were to ignore the impact of the proposed rule on affected generators of LLRW, the NRC would effectively be avoiding its own CER policy.

In sum, UUSA recommends that the Commission perform a backfitting analysis of the rulemaking as related to affected uranium enrichment facilities, which are the focus of the proposed rule.

Comment 3: The NRC should take an integrated approach to the Part 61 rulemaking by resolving the waste classification issue related to DU in conjunction with the present rulemaking.

The NRC undertook the present rulemaking, in large part, to determine the appropriate disposal path for large quantities of DU that are generated at domestic uranium enrichment facilities. The outcome of any Part 61 rulemaking could affect whether such facilities, including UUSA, have a viable commercial disposal path for DU.

Two important aspects of Part 61 influence the commercial disposal path for DU: (1) the Part 61 performance objectives applicable to any form of land disposal of LLRW, and (2) the Part 61 waste classification scheme, which establishes the type of waste that can be disposed of in a near surface disposal facility.[23] While the Commission is undertaking a significant revision to Part 61 to regulate disposal of DU waste, it has elected—seemingly without any reasoned basis—to take a "two-step" approach and address any waste classification rulemaking separately from the present rulemaking focused on the performance objectives. The NRC's plan for the future waste classification rulemaking would include risk-informing the Section 61.55 waste classification tables.

The NRC has not articulated a clear basis for proceeding in this two-step manner. In approving the Staff's request to cease work on a comprehensive rulemaking to revise Part 61 that would also cover the waste classification issue, the Commission simply noted that it would improve "efficiency."[24] The NRC should not move forward with one rulemaking on the performance criteria for waste disposal facilities under Part 61 and a separate rulemaking that will address the waste classification structure for DU waste under Part 61 because these criteria are intrinsically intertwined. As the NRC has noted, the waste classification tables and the site-specific waste acceptance criteria are designed to establish two "gates" for the disposal of LLRW – a generator can use either gate to determine if disposal of its waste is acceptable.

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[21] SECY-12-0137 at 1 (Mar. 2013).
[22] *See* SECY-12-0137 and COMSECY-14-0014.
[23] *See, e.g., Louisiana Energy Services* (National Enrichment Facility), CLI-05-05, "Commission Memorandum and Order" (providing description of Part 61 and its relevance to disposal of DU from the UUSA facility).
[24] *See* SECY-13-0001 at 1; and Commissioners' Staff Requirements Memorandum, dated March 26, 2013.

Notably, the waste classification issue establishes when a certain type of low level waste (such as Class A, B, C or Greater than Class C) can be disposed of in a certain type of facility, and the performance objectives apply to all methods of disposal, regardless of the type of facility. If the NRC engages in lengthy and unpredictable separate rulemakings involving these two gates, then there will be significant regulatory uncertainty. Both aspects of the contemplated Part 61 revisions clearly interrelate and arose from the same UUSA initial licensing proceeding. Because the two aspects are closely related, a subsequent rulemaking on the waste classification framework could undermine or at least substantively change how the current Part 61 rulemaking is to be implemented. A change to the waste classification of DU, for example, could require longer storage of DU or result in the removal of DU waste already disposed of in certain LLRW facilities. In any event, if the NRC proceeds with both rulemakings separately, licensees will likely be required to modify their procedures and facilities twice to implement each new rule.

Another reason to address the waste classification issue in conjunction with the site-specific criteria for LLRW acceptance is that the waste classification for DU is a matter that should be determined at the federal level by the NRC to ensure consistency nationwide in accordance with the NRC's "Policy Statement on Adequacy and Compatibility of Agreement State Programs."[25] As a matter of fairness to all stakeholders, the NRC should not "kick the can down the road" by failing to resolve the waste classification issue for DU now. Rather, the NRC should resolve the issue now either as part of a risk-informed re-examination in the present rulemaking or by determining that the waste classification issue no longer needs consideration and the waste classification Tables do not need to be revised.[26]

As a matter of good regulatory policy, an agency should evaluate significant revisions to a regulatory scheme in a single rulemaking so that it can fully evaluate and understand the impact that all the contemplated revisions to the rule could have on the regulated community and other stakeholders such as Agreement States. In these types of circumstances, the courts have discouraged agencies from taking a piecemeal—or "one step at a time"—approach to adopting revisions to regulations. As a general matter, an agency should take an integrated approach to rulemakings so that the full extent of the rulemaking efforts can be evaluated holistically. *See, e.g., Nat'l Ass'n of Broadcasters v. FCC*, 740 F.2d 1190, 1211 (D.C. Cir. 1984) (quoting *ITT World Communications, Inc. v. FCC*, 725 F.2d 732 at 754 (D.C.Cir.1984)), where the D.C. Circuit made clear that an agency must provide a reasonable rationale for proceeding one step at a time so that it is not "oblivious to the problems it was postponing or to their likely resolution."

Here, there is no pressing need to move forward with the present near-term rulemaking on performance criteria for disposal of DU when the resolution of a critical issue – the waste classification of DU – has been deferred. A better approach for all stakeholders would be to address both of these important issues in a single integrated rulemaking.

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[25] 62 Fed. Reg. 46517 (Sept. 3, 1997).

[26] As discussed above, if the final rule retains the proposed ongoing minimization requirements, we believe the Commission should include a backfit rule provision in the revised Part 61. Such a provision would allow affected licensees to seek relief from overly restrictive new requirements or regulatory staff positions implementing the Part 61 requirements that are not well justified. In areas where an Agreement State may seek to deviate from or go beyond the NRC's requirements, backfitting protection may provide a regulatory mechanism to allow licensees to resolve the issue so that it does not become a political (state vs. federal) issue.

* * * * *

UUSA appreciates the efforts of the NRC and the opportunity to comment on this important rulemaking. If you have any questions on these comments, please contact Amy Johnson at 575-394-6203 or Amy.Johnson@URENCO.com.

Respectfully,

Jay Laughlin
URENCO USA Chief Nuclear Officer and Head of Operations

RulemakingComments Resource

From: Greevesj@aol.com
Sent: Friday, July 24, 2015 10:55 AM
To: RulemakingComments Resource
Cc: phlohaus@gmail.com; greevesj@aol.com
Subject: [External_Sender] NRC 10 CFR PART 61 "Low-Level Radioactive Waste Disposal; Proposed Rule"
Attachments: 61 comments final 7-24-15.pdf; Part 61 Final letter to NRC 7-24-15.pdf

Annette L. Vietti-Cook
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001
ATTN: Rulemakings and Adjudications Staff

Subject: Comments on NRC 10 CFR PART 61 "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012), 80 Fed. Reg. 16081 (March 26, 2015)

Attached are pdf files with our submittal letter and attached detailed comments on NRC 10 CFR PART 61 "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012).

We regret that most of our comments are critical of the proposed rule. It is our opinion that the rule as proposed does more harm than good. Many of the proposed additions add unnecessary burdens and likely cannot be reasonably demonstrated.

We stand ready to assist the Commission in any why we can to support a modified path forward to a final rule.

John Greeves
Paul Lohaus

7/24/2015

Annette L. Vietti-Cook
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Subject: Comments on NRC 10 CFR PART 61 "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012), 80 Fed. Reg. 16081 (March 26, 2015)

Dear Ms. Vietti-Cook:

The purpose of this letter is to provide the Commission with our views concerning the Staff's approach outlined in the above Proposed Rule. We share the goal of both the Commission and the Staff, to make Part 61 a more risk-informed and performance-based rule.

The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to require new and revised site-specific technical analyses and to permit the development of criteria for LLRW acceptance based on the results of these analyses. These amendments would ensure that LLRW streams that are significantly different from those considered during the development of the current regulations (i.e., depleted uranium and other unanalyzed waste streams) can be disposed of safely and meet the performance objectives for land disposal of LLRW.

We agree the rule needs to be updated to reflect changes which have occurred since the original rule was promulgated such as development of newer dose assessment methodology, and to reflect changes in waste streams. However, the rule applies the new requirements developed to address new waste streams to all sites (both those sites desiring to accept the new waste streams and those sites which desire to continue to use the existing waste classification requirements). The rule should only apply the new requirements to sites which desire to accept the new waste streams (e.g. large quantities of depleted uranium). Therefore, we believe the final rule should clearly differentiate requirements that would be applied to sites developing specific waste acceptance criteria and accepting larger quantities of long lived material from those sites which will continue to use the existing waste classification system set out in Part 61. This is described in our detailed comments attached which propose development of a new section (61.60) to describe the additional incremental requirements which sites desiring to accept larger quantities of long lived radionuclides must meet. Existing or new sites which continue to use the existing waste classification requirements would not be subject to the new 61.60 requirements.

Our comments set out in the attachment; address 5 major areas of comment as follows:

1. We agree the rule should add and incorporate new dose assessment methodology and an explicit dose limit for the inadvertent intruder;

2. New requirements established by this rule making should be applied to existing operating sites on a case by case basis through terms and conditions of licenses similar to how requirements of the initial Part 61 rule were handled through Section 61.1. Existing sites should not automatically be subject to all of the new requirements as has been proposed by the NRC staff during the public meetings;
3. Clearly separate new requirements applicable to sites (new and existing) which desire to accept larger quantities of long lived material and develop site specific waste acceptance requirements from those sites (both existing and new) which will continue to use the existing Part 61 waste classification system. A new section 61.60 should be established to specify site specific waste acceptance requirements. Do not modify existing section 61.58. This suggested approach would also eliminate the need for a separate new rulemaking to address waste classification for waste streams containing large quantities of long lived material.
4. A two-tiered analysis should be proposed rather than a three-tiered analysis approach. A two-tiered approach would be adequate to ensure safety through a 1,000 year compliance period and analysis to peak dose for long lived radionuclides present in disposed waste; and
5. Eliminate from the proposed amendment revisions the extensive detail and unnecessary new requirements currently proposed. This would include eliminating the need for a separate safety case, the detailed defense in depth analysis, and the need for a new extensive stability analysis. Appropriate revisions to 61.7, 61.13, and the performance objective for stability should, therefore, be made accordingly.

We appreciate the opportunity to comment on the proposed amendments.

Questions regarding these comments may be directed to John Greeves at (301) 452-3511 or greevesj@aol.com and Paul Lohaus at (815) 303-8404 or phlohaus@gmail.com.

Respectively submitted,

John T. Greeves
Senior Regulatory Nuclear Consultant

Paul H. Lohaus
Senior Regulatory Nuclear Consultant

Enclosure: Comments on NRC 10 CFR Part 61 “Low-Level Radioactive Waste Disposal; Proposed Rule” (RIN 3150–AI92; Docket ID NRC–2011–0012)

cc:
Chairman Stephen G. Burns
Commissioner Kristine L. Svinicki
Commissioner William C. Ostendorff
Commissioner Jeff Baran

Comments on NRC 10 CFR Part 61 "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012)

Prepared by: John T. Greeves and Paul H. Lohaus

July 24, 2015

We agree the rule needs to be updated to reflect changes that have occurred since the original rule was promulgated such as development of newer dose assessment methodology, and to reflect changes in waste streams. We agree the final rule should revise the existing technical analysis for protection of the general population to include a 1,000-year compliance period. We also agree the proposed rule should add and incorporate new site-specific technical analysis (using modern ICRP dose methods) and an explicit 500 mr/y dose limit for the inadvertent intruder.

The rest of our detailed comments address major areas of concern as follows:

New requirements established by this rule making should be applied to existing operating sites on a case by case basis through terms and conditions of licenses similar to how requirements of the initial Part 61 rule were handled through Section 61.1. Existing sites should not automatically be subject to all of the new requirements as has been proposed by the NRC staff during the public meetings;

The rule should clearly separate new requirements applicable to sites which desire to accept larger quantities of long lived material and develop site specific waste acceptance requirements, from those sites which will continue to use the existing Part 61 waste classification system. A new section 61.60 should be established to specify site-specific waste acceptance requirements. Do not modify existing section 61.58. This suggested approach would also eliminate the need for a separate new rulemaking to address waste classification for waste streams containing large quantities of long lived material;

A two-tiered analysis should be proposed rather than a three-tiered analysis approach. A two-tiered approach would be adequate to ensure safety through a 1,000 year compliance period and analysis to peak dose for long lived radionuclides present in disposed waste;

Eliminate from the proposed amendment revisions the extensive detail and unnecessary new requirements currently proposed. This would include eliminating the need for a separate safety case, the detailed defense in depth analysis, and the need for a new extensive stability analysis. Appropriate revisions to 61.7, 61.13, and the performance objective for stability should, therefore, be made accordingly; and

Add a new requirement to allow either development of site-specific Waste Acceptance Criteria (WAC) for LLRW disposal of unique waste streams (based on the results of the technical analyses) <u>or</u> continue to use the existing Part 61 LLRW classification requirements.

Following are further details by specific section or subject area:

Section 61.1

For those sited States that continue to use the existing classification requirements any new requirements should be determined prospectively on a case-by-case basis and implemented through terms and conditions of the license consistent with provisions in 61.1(a).

NRC's recent explanation of section § 61.1(a) Purpose and scope is a problem. Section § 61.1 states that "Applicability of the requirements in this part to Commission licenses for waste disposal facilities in effect on the effective date of this rule will be determined on a case-by-case basis." This language recognizes that new requirements introduced after a site is sited, licensed and operated under previous requirements would not necessarily be binding on either agreement states or operators that committed to, and were licensed under, specific site conditions and licensing requirements in good faith. NRC's staff interprets that this only applies to the early 80's timeframe. NRC's new interpretation is changing those commitments and licensing requirements and adding unnecessary burdens on agreement states, operators and generators by changing the criteria for long term operation, closure and decommissioning for a specific site as a form of back fit. NRC staff states this as an exemption. Exemptions are covered in 61.6, not 61.1. Without some form of grandfathering, agreement states will be subject to significant burdens and future litigation risks.

Back Fit

NRC should give serious consideration to adding a back fit protection provision to Part 61. The Commission adopted back fit rules for Part 50 and Part 70 to ensure that the costs and benefits of proposed new requirements would be thoroughly analyzed before being imposed on affected licensees. The same policy holds true for LLRW disposal facilities licensed under Part 61. It is important for Part 50 and Part 70 licensees, as well as the other LLRW generators that depend on the disposal facilities, to have protection against the imposition of new regulatory requirements or positions that have not been properly justified.

Proposed three-tiered approach

One of the questions NRC posed included "Is the proposed three-tiered approach (a compliance period, followed by a protective assurance period, followed by a performance period, if applicable) appropriate"? No, a three-tier approach is not appropriate. Establishing a three-tier approach is not efficient, clear or reliable. Implementation of a three-tier approach will be a significant burden on Agreement States, Operators and generators without added safety protection. A three-tier approach is inconsistent with DOE's LLW disposal practices and international recommendations. A two-tiered approach with a first tier compliance period of 1,000 years and an analysis out to peak dose as a second tier would be protective and is much clearer, efficient and reliable. A two-tier approach out to peak dose will provide adequate protection and close any current gap for risks that increase for long-lived radionuclides.

Defense in depth

The proposed rule should include a clear (explicit) statement that licensing decisions are based on defense in depth (DID) protections. The extensive proposed text explaining the "safety case" and describing its attributes should be removed and provided in guidance. The proposed language is not clear (understandable), efficient, and will be very difficult to implement reliably. Explicitly identifying and describing the features of the design and site characteristics that provide defense-in-depth protection should be required. However, no specific defense in depth new analyses beyond identifying and describing the features of the design and site characteristics that provide defense-in-depth protection should be required.

Draft Regulatory Analysis

The draft Regulatory Analysis of the proposed rule is inadequate. The proposed rule will be a significant burden on the Agreement States, Operators and generators. Staff has significantly underestimated the burden and cost of implementation of the complex proposal on the Agreement States, Operators and generators. The estimated costs (burden) of implementation are off by a factor of 2 or more. The burden and costs associated with recent applications for Depleted Uranium (DU) disposal exceed the estimated costs in the draft Regulatory Analysis.

The NRC fails to identify un-quantified liabilities created by the propose language. It will also likely generate extensive litigation risk for existing sites as closure plans are implemented.

Guidance or Rule language

The staff, in its goal to develop new requirements governing disposal of large quantities and concentrations of long lived radionuclides in a near surface disposal facility, has proposed a framework of requirements largely based on HLW guidance documents such as NUREG-1854 NRC Staff Guidance for DOE Waste Determinations. This extensive "how to" HLW guidance applied to all LLW disposal facilities is unnecessary and burdensome. The discussion is wordy, not concise, rambling and ambiguous. Discussions such as "insights serving as input for making regulatory decisions" are so broad, undefined, unclear and ambiguous as to be inappropriate in a regulation. Existing sites could consider early closure to avoid litigation risks incurred by the proposed rule amendments. As the State of Washington representative stated in the recent Commission meeting, the proposed rule will likely be a barrier for development of new sites for LLW disposal. The burdensome and unnecessary new language included in the proposed rule will deter investment in new disposal capacity. The extensive "how to" guidance should be eliminated.

Waste Acceptance Criteria

A Waste Acceptance Criteria (WAC) approach should be included. However, removing the current language in 61.58 and its intended flexibility for NRC and agreement states is not appropriate. The current language in 61.58 should be retained.

It is particularly important to retain the current requirements in 61.58 given the requirements in 61.55(a)(2)(iv) which rely on the provisions of 61.58 to provide a basis for approving "…proposals for disposal of such waste in a disposal site licensed pursuant to this part…" as specified in 61.55(a)(2)(iv). 61.55(a)(2)(iv) does not identify criteria which the Commission would use to approve such a proposal. The criteria are contained in 61.58.

It also important to retain 61.58 given the definition of TRU waste contained in the WIPP Land Withdrawal Act as amended by Public Law 104-201. The WIPP Land Withdrawal Act contains wording reflecting the provisions of 61.58 in section 2(18)(C) where it provides reference to "…waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with Part 61…" The provisions of Part 61 referenced in this portion of the TRU waste definition can only be those set out in 61.58, as there are no other provisions in Part 61 providing for such site specific case-by-case approvals.

The existing definition of LLW contained in Section 2 "Waste" should be amended through this rulemaking action to conform to the statutory definition of LLW contained in the Low-Level Radioactive Waste Policy Amendments Act of 1985. The term "transuranic waste" should be removed. The definition, taken from the LLRWPAA of 1985, should read: "…radioactive material that is not high-level radioactive waste, spent nuclear fuel, or byproduct material (as defined in section 11e.(2) of the Atomic Energy Act of 1954…" Updating the definition would also serve to conform the definition of waste in Part 61 to the existing provisions in Section 61.1(b) dealing with purpose, scope and applicability of the rule.

In lieu of amending existing section 61.58, a new stand alone section 61.60 should be developed and added to the rule that addresses use of the WAC approach. We provide further details below and sections 61.7 and 61.13 should be modified accordingly. A new stand alone section 61.60 that addresses use of the WAC approach is described below.

Section 61.7 Concepts and Section 61.13 Technical Analysis

Section 61.7 Concepts has been overwhelmed by an attempt to provide detailed "how to" guidance in the rule. In general the proposal is an overreach with inclusion of extensive language taken from HLW guidance documents that is not appropriate for the LLW Section 61.7 Concepts. Technical analyses to assess the impact of site-specific factors over the longer term for new waste streams should be provided in a new stand alone section 61.60.

Similarly section 61.13 Technical Analysis has been overwhelmed with very extensive "how to" guidance in the rule. The exiting relatively simple and clear section 61.13, intended to require demonstration that the performance objectives of subpart C of this part be met, has been injected with HLW guidance on features, events, and processes taken from NUREG-1854. Section 61.13 (e) is not clear and will be very difficult to implement in a contested case. Table A is unclear and subject to interpretation, which will be a burden on states and operators.

Simply adding a subsection to 61.7 "concepts" to reflect the new structure and requirements in Part 61 governing acceptance and disposal of "the newer and additional waste streams" containing higher concentrations and larger quantities of longer-lived radionuclides would be useful. This would include reference to a new stand alone section 61.60 that would apply prospectively to new long-lived waste streams. It would specify the new incremental requirements and analyses that an applicant would need to complete in order to receive and dispose of the newer waste streams. The incremental requirements would be based on the proposed revisions to Sections 61.13, 61.42, and 61.58, modified to remove the "how to" guidance.

Hybrid waste acceptance approach

In the proposed rule, the NRC is proposing the hybrid waste acceptance approach (Option 3) as the regulatory LLRW acceptance framework for the near-surface disposal of LLRW.

NRC staff indicates that a currently operating site, or a new proposed LLW disposal site, could choose to continue to use and apply the existing waste classification system and associated waste form and disposal requirements set out in Part 61, or could apply a new set of WAC developed through the analyses prescribed in the proposed rule changes. For example, the staff states: "In defining LLRW streams with acceptable radionuclide concentrations or activities and waste forms, licensees or license applicants would be allowed to use either the results of the site-specific technical analyses set forth in 10 CFR 61.13, or the LLRW classification requirements in 10 CFR 61.55." We support this approach and believe the alternative needs to be clearly delineated within the final rule and associated Statement of Considerations (SOC).

The hybrid waste acceptance approach provides a framework for the use of either the generic LLRW classification system specified in 10 CFR 61.55 or the results of the technical analyses required in 10 CFR 61.13." This distinction does not appear to be clearly delineated in the rule changes. Rather, the rule changes, as proposed, appear to overlay on the existing operating sites and existing Agreement State regulatory agencies who desire to remain under the current regulatory regime set out in existing Part 61 an unnecessary new set of requirements (and extreme regulatory burdens). These new requirements should only apply to (1) existing sites which desire to accept and dispose of new waste streams containing higher concentrations and larger total quantities of long lived radionuclides, and (2) any new sites which desire to accept and dispose of the newer waste streams containing higher concentrations and larger total quantities of long lived radionuclides. The rule should not impose the new set of requirements on sited states that will not take new waste streams and desire to continue to use and apply the existing Part 61 requirements.

How this approach would be implemented by the regulator and operator is not clear. Who decides which approach is used, the regulator or the operator/applicant? Moving this language to a new stand alone section 61.60 would be efficient, effective and clarify that it applies only to any newer waste streams taken after the date of the new rule.

Technical analysis revision at closure

The requirement to revise the technical analyses at closure for existing sites that have met all previous requirements to date, unless new unexpected conditions are identified is a significant and unnecessary burden on both licensees and regulators.

Performance Objectives

The existing Performance Objectives have stood the test of time for over three decades and should not be expanded as proposed.

Section 61.41 Protection of the general population from releases of radioactivity should not be expanded, other than substituting "0.25 milliSievert (25 millirems)" for "the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ. The proposed additions are an unnecessary burden. Trying to demonstrate minimizing concentrations and releases will be an ordeal in any litigation.

Section 61.42 Protection of individuals from inadvertent intrusion should not be expanded other than adding "The annual dose must not exceed 5 milliSieverts (500 millirems) to any inadvertent intruder." Trying to demonstrate minimizing concentrations and releases will be an ordeal in any litigation. A 500 mrem/yr standard is an appropriate analytical threshold for inadvertent intrusion protection.

The proposed rule does not provide any substantive discussion of the technical or regulatory basis for the minimization requirements. It will create uncertainty and a moving target for affected licensees and LLRW generators. Neither the proposed rule nor the NRC's Regulatory Analysis for the rulemaking provides any technical or cost-benefit justification for the new minimization requirements. NRC should drop the proposed minimization concept from the final rule in view of the practical difficulties that will be created for implementing such a subjective requirement over thousands of years. NRC should rely on the specific dose limits set forth in proposed Sections 61.41 and 61.42, which would provide objective criteria for licensees, generators, and Agreement States to meet.

Section 61.44 Stability of the disposal site after closure should not be changed. The inserted language "for the compliance and protective assurance periods" should be removed. The insert will be an ordeal in any litigated case and is unnecessary.

NRC states, because NRC regulations already require a site stability analysis, the NRC does not anticipate any additional cost to the licensee resulting from the changes to 10 CFR 61.44. We disagree. Revised section § 61.44 Stability of the disposal site after closure is un-implementable. Requiring stability for 10,000 years is unreasonable. NRC, EPA and congress (Uranium Mill Tailings Remediation Control Act legislation) have recognized that requiring stability beyond 200 to 1,000 years cannot be proven. Current stability requirements for part 61 sites are largely met by complying with guidance developed for uranium recover facility sites that implement a 200 to 1000 year standard consistent with the URMCA requirements. Requiring stability for a 10,000 year period is unworkable and cannot be reasonably demonstrated. Other regulatory agencies do not have a comparable requirement for LLW disposal. Agreement states or operators will not be able to withstand adverse litigation in a contested hearing on proving stability for 10,000 years.

NRC Questions

One of the questions NRC posed included "Should there be a quantitative goal or dose limit associated with the performance period analysis, and if so, what should that goal or dose limit be?" A public dose limit of 25 mrem/yr and a 500 mrem/yr intruder dose limit are appropriate for adequate protection.

One of the questions NRC posed included "Is Compatibility Category B appropriate for the compliance period, protective assurance period, and the waste acceptance criteria?"

First we believe the final Performance Objectives, that we described above, should be Compatibly A or B. The Performance Objectives have always been considered the primary criteria for LLW disposal. Other Part 61 sections should allow states appropriate flexibility depending on local conditions.

We note some sited states (e.g., Texas and Utah) have already invested in siting, design and licensing conditions that are not compatible with the proposed rule language. The flexibility provided in section 61.1(a) should be maintained for such existing sited states.

We recommend in developing the final rule NRC seek greater consistency among the Agreement States, NRC and DOE for regulation of LLW.

Classification Tables

The present rulemaking should determine the appropriate disposal path for large quantities of DU and address whether the waste classification tables should be revised. The current proposal is to consider a future waste classification rulemaking that would include risk-informing the Section 61.55 waste classification tables. This would result in another lengthy rulemaking process with great uncertainty. Any subsequent changes to the waste classification of DU could require removal of DU waste already disposed of in certain LLRW facilities. Such uncertainty will delay the final decisions by many parties on disposition of DU waste. The NRC has not provided any basis for proceeding in this two-step manner. The NRC should not move forward with one rulemaking on criteria for waste disposal, and a delayed separate rulemaking that will address the waste classification structure for DU waste. NRC should resolve this issue now as part of the present rulemaking. The proposed changes in part 61 will close any gaps that exist in this rule and the waste classification Tables should not need to be revised.

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General Comment

State of Washington comments are included in the uploaded file.

Attachments

Washington State comments on proposed 10 CFR Part 61_July 23 2015

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July 23, 2015

Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
ATTN: Rulemakings and Adjudications Staff

RE: Docket ID NRC-2011-0012

On behalf of the state of Washington, below for your consideration are comments on 10 CFR Parts 20 and 61 Low-Level Radioactive Waste Disposal; Proposed Rule, as published in the Federal Register Vol. 80, No. 58, dated Thursday March 26, 2015.

1. The state highly recommends Part 61 be left "as is" as much as possible. Updating existing requirements in the sections is a good practice. However, since half of the existing sites do not plan on accepting significant quantities of the new long-lived alpha emitting radionuclides, the new requirements should be inserted into a new section (e.g., 61.60), or alternatively a new set of standalone regulations.

2. The state does not agree with the requirement to redo the site's performance assessment (PA) unless that site decides to take significant quantities of long-lived alpha emitters (e.g., DU). If we read 61.13(e) correctly, the PA is only needed if we **are going to take** long-lived alpha emitters.

3. The state concurs with the new requirement to redo a site's PA within 5 years of closure. This allows assumptions that were made years earlier to be reviewed and updated where needed. Unless absolutely needed, no new sampling should be need to be performed.; only updating:
    a. the inventory (adjust projected quantities),
    b. equation values such as k_d,

4. The state concurs that Defense-in-Depth information (e.g., several independent redundant barriers) should be available in pre-operational documents for each site. For current sites, retrofitting may be extremely difficult if the site is dependent on only one or two robust barrier(s).

5. The revised regulations introduce a new term called the Safety Case. Safety Cases (SC) are, in their simplest terms, a collection of arguments and evidence showing a facility can be sited, designed, constructed, commissioned, operated and closed in a safe manner. A key component of the safety case is the analytical safety assessment. The NRC equates the SC's to a PA + Defense-in-Depth. The exact form of a SC depends on the laws and regulations at a given site. Between radioactive materials licensing, performance assessments and a site environmental review (e.g., NEPA or state equivalent laws), the critical components of a SC will be addressed. Is this consistent with the NRC's Safety Case expectation?

6. The state supports a sited state's ability **through regulatory/licensing action** to develop site-specific waste classification levels (e.g., similar to 10CFR61.55 Tables). Site specific values will provide flexibility not currently in the regulations. The wording in the current proposed rule seems to allow the site operator to decide if other than 10CFR61.55 tables will be used. The rule needs to be clearly worded that the site regulator decides if site-specific values will be used.

7. Impacts of regulation changes on the development of new sites are unknown. The Nuclear Regulatory Commission in its Regulatory Basis for Proposed Revisions to Low-Level Waste Disposal Facilities (10 CFR Part 61) states in part that Performance Assessments' (PA) will be based largely on inference, development of models, and data acquisition to demonstrate 10 CFR Part 61 PA's are met.

   The state understands the nature of the uncertainty associated with near surface disposal of Low Level Radioactive Waste (LLRW) and the need for flexibility in a performance based regulatory approach. However, because the proposed rule is ambiguous in some parts it leaves open the opportunity for the following unintended consequences:

   - New proposed sites that want to dispose of alpha emitters may walk away from the siting process due to the risk associated with uncertainty within the regulation.
   - Varying interpretation of inference could create regulatory mission creep and a regulatory process that becomes too burdensome.
   - Creation of a complex patchwork of regulations that don't allow for a single standard of LLRW packaging.

   The unintended consequences can be minimized in the new proposed rule by adding context to its framework while at the same providing flexibility for existing LLRW sites.

8. The state supports the proposed Compatibility Levels for:
   a. 61.41(a), (b), and (c)
   b. 61.42(a), (b), and (c)

9. A regulatory back-fit analysis, although not required, should be performed for this revision.

10. Further details should be provided for review and comment on how the financial burden for implementation of this revision placed on sited Agreement State programs was derived. Initial review suggests the burden for some sites is underestimated by a factor of two.

11. Predictions of site stability for 10,000 years (required in 61.44) are subjective and filled with uncertainty. The state agrees with NRC staff in that site stability is critical to achieving the performance objectives of 61.41 and 61.42. What is not readily apparent is why the site stability performance objective (61.44) needs to stand alone in the NRC's world of performance based regulations. Due to concern over uncertainty, the NRC in the past several years, has reduced its timeframe for its public dose limit (0.25 mSv annually) compliance to 1000 years. Isn't the site stability performance objective subject to the same uncertainty?

12. The assigned dose stated in 61.41(b) and 61.42(b) for the Protective Assurance Periods (PAP) is not clear. As stated in these paragraphs, the annual dose shall be below 5 mSv or a level that is supported as reasonably achievable. Is the 5mSv an upper limit or are **higher levels** allowed if supported as reasonably achievable based on technological and economic considerations?

13. The state understands the Guidance for Conducting Technical Analyses for 10 CFR Part 61 (NUREG-2175) supports the current proposed rulemaking. The state appreciates the ability to review both the proposed rule and corresponding guidance at the same time. However, we suggest a new draft guidance document be released for additional review after the Commission approves Part 61.

14. The NRC has stated in public meetings and in the Federal Register Notice that the main reason for proposing changes to the current 10 CFR 61 is to ensure that low-level waste streams that are significantly different than the low-level waste streams that were considered in the current Part 61 can be addressed and disposed of in a manner that fully protects public health and safety. Furthermore, it has been stated that the existing set of regulatory criteria is adequate to protect public health and safety and the four operating disposal facilities have gone well above the fundamental requirements of Part 61. (See page 9 of Barnwell public meeting transcripts) In light of these statements, we believe that the current 61.1(a) regarding applicability and flexibility of the requirements for current waste disposal facilities be retained for the sites that do not plan to take new waste streams or significant quantities of the new long-lived alpha emitting radionuclides that were not envisioned in the original 10 CFR 61 analysis.

15. The Waste Acceptance Criteria is more subjective in the proposed rule. There should be a set of uniform criteria that is applicable to all LLRW disposal facilities as there currently is, and alternate characteristics should be allowed on a case by case basis as currently allowed in 10 CFR 61.58. Alternate characteristics would need to be well documented and reviewed by the NRC for compatibility and adherence to performance objectives.

If you should have any questions regarding these comments, please do not hesitate to contact me at (509) 946-0234 or at earl.fordham@doh.wa.gov

Sincerely,

Earl Fordham

Earl Fordham, CHP, PE
Deputy Director
Office of Radiation Protection

PR-20, 61
80FR16081

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PUBLIC SUBMISSION

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Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0126
Comment on FR Doc # 2015-06429

Submitter Information

Name: Mike Garner

General Comment

Thank you for providing the opportunity for the Northwest Compact to submit comments on NRC's 10 CFR Part 61 rulemaking (See attached file(s)

Attachments

20150723154258023

Northwest Interstate Compact
On Low-Level Radioactive Waste Management

P.O. Box 47600. Olympia, Washington 98504-7600. Mike Garner, Executive Director (360) 407-7102

July 23, 2015

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemaking and Adjudications Staff

Subject: Docket ID NRC-2011-0012 (Proposed Rule Changes, 10 CFR Part 61)
Submitted Online via Regulations.gov

Dear Madam Secretary:

The Northwest Interstate Compact would like to thank the U.S. Nuclear Regulatory Commission (NRC) for the opportunity to comment on the 10 CFR Part 61 proposed rulemaking. We strongly support the efforts of NRC to engage stakeholders and greatly appreciate the public meetings that NRC held in the sited states during May and June of 2015.

The following comments are offered by the Northwest Interstate Compact.

Background

The Low-Level Radioactive Policy Amendments Act of 1985 identifies those low-level radioactive wastes that are a state or interstate compact responsibility and those that are a federal government responsibility.

The U.S. Enrichment Corporation Privatization Act explicitly states the U.S. Department of Energy (USDOE) is responsible for LLRW (depleted uranium) generated by any uranium enrichment facility. States and interstate compacts have no liability for LLRW generated by these operations.

NRC is proposing significant changes to 10 CFR Part 61 as a result of two commercial disposal sites, Waste Control Specialists' Andrews County, TX and EnergySolutions' Clive, UT, that are pursuing large volumes of depleted uranium for disposal. As a result, NRC needs to develop regulations that address the disposal of large volumes of depleted uranium at commercial sites.

The country will need additional LLRW disposal sites by 2050. The Richland, WA disposal site will begin final closure activities in 2056; EnergySolutions' Clive, UT disposal site has 30 years of licensed capacity remaining and; additional nuclear utilities are scheduled to be decommissioned in the next 20-40 years.

Future LLRW disposal site development depends on the following factors:

1. Technical analysis demonstrating LLRW is disposed in a manner protective of public health and safety.
2. Just as importantly, site development requires local community, state, and public support before it can commence.
3. Stability in regulations governing LLRW disposal site operation.

Unintended Consequences of Proposed Rulemaking

NRC's proposed implementation of the rule undermines the dynamics found in the Low-Level Radioactive Waste Policy Amendments Act of 1985 as it universally incorporates rules that apply to a waste stream, depleted uranium, which is not even a state or interstate compact responsibility. This does not seem equitable.

Those commercial disposal sites that have no intention of accepting large volumes of depleted uranium for disposal will be subject to the economic burden of implementing the rule without receiving any economic benefit.

- Any licensee expense associated with the implementation of the proposed new regulations for the Richland, WA disposal site will be passed on to the generators in the form of higher disposal fees. The disposal rates of the Richland, WA license, US Ecology, are regulated by the Washington State Utilities and Transportation Commission. Seeing as this is a necessary expense to meet the new regulatory requirement, this expense would be added to US Ecology's annual revenue requirement which will result in increased disposal fees for LLRW generators using the Richland, WA facility.

Application of the rule to all commercial disposal sites undermines the stability of regulations governing traditional LLRW disposal.

- States may be hesitant to support site development as the rules can change at any time to allow extremely different waste streams than those contemplated during the original public process.
- It may make the public hesitant to support LLRW disposal site development as they recognize the rules can change significantly at any time which makes it difficult to know what they are truly supporting.

It is unlikely that a new disposal site meeting the requirements of the proposed rule could receive the public support necessary for site development. This results from the incorporation of large volumes of depleted uranium or other long-lived radionuclides and likely makes such a site un-siteable.

- Currently, state and compact representatives can inform the public the activity of LLRW disposed at a commercial disposal site will decay to 1% of its original activity within 500 years following disposal. The mere association of large volumes of depleted uranium compromises the ability of representatives to state this and this is an important loss.

- At the June 10, 2015 NRC public meeting in Salt Lake City, UT an NRC representative was asked if NRC had evaluated how the new rule may impact future site development. The representative indicated NRC had not evaluated this. I think it is in the best interest of our country to ensure that new regulations do not preclude the development of new LLRW disposal sites. If this were to occur, what good are the new rules if you have no commercial LLRW disposal sites in the future to apply the rules to?

Methods to Reduce Unintended Consequences

The new rule should apply only to those commercial LLRW disposal sites that seek to dispose of large volumes of depleted uranium; a USDOE responsibility.

- This could be accomplished through the incorporation of these requirements within a separate section or subpart of 10 CFR Part 61 that applies only to those disposal sites that choose to accept large volumes of depleted uranium for disposal.
    - One option is to include these regulatory requirements in a new subpart, Subpart H.
    - Another option is to include a new section under Subpart D, 61.60.

In each case these new regulations would apply only to those commercial LLRW disposal facilities seeking large volumes of depleted uranium or other long-lived radionuclides for disposal. This separation is needed in an effort to preserve future site development opportunities. Without such separation new site development is unlikely. Three of the four sited states support this approach.

Benefits of Alternate Implementation

- Aligns more closely with the tenets of the Low-Level Radioactive Waste Policy Amendments Act of 1985.
- Limits the economic burden to those commercial LLRW disposal sites that will benefit economically from the acceptance of large volumes of depleted uranium for disposal.
- Maintains a higher level of stability in the regulations governing the disposal of traditional LLRW.
- Makes future site development more difficult, but much less difficult than if the rule is applied to all commercial LLRW disposal sites.

Additional Comments

It is important to recognize it is unlikely there would be a current 10 CFR Part 61 rulemaking if two of the four commercial sites had not expressed an interest in accepting large volumes of depleted uranium for disposal.

There would seem to be significant benefit to be gained by leaving the current regulations governing the disposal of traditional LLRW in place. The current regulations are effective for traditional LLRW as NRC states on page 16099 of the Federal Register Notice the following:

> *Because of the conservative nature of the assumptions used in the original 10 CFR Part 61 regulatory basis to develop the LLRW classification, the LLRW classification system is expected to be protective of public health and safety as long as LLRW disposal facilities operate within the regulatory basis of the original 10 CFR Part 61 regulations.*

These regulations have been effective for the disposal of traditional LLRW and the public is familiar with them. This approach provides stability for the disposal of traditional LLRW; whereas the universal application of the new regulations will disrupt this stability as the public will have to learn an entirely new, very complicated system it is currently unfamiliar with.

In an attachment to a February 19, 2014 letter submitted to Chairman Macfarlane by the Advisory Committee on Reactor Safeguards Dr. J. Sam Armijo states in his last paragraph:

> *Absent a safety concern or benefit, it is not reasonable to impose such uncertainties or burdens on licensees who choose to make no changes in the waste streams they receive in the future. Imposition of more stringent requirements on future disposals could also raise public concerns regarding the safety of low level waste previously disposed of in compliance with existing regulations. This problem could be corrected by making the new rule applicable only to licensees engaged in the disposal of large quantities of DU.*

The Northwest Compact agrees with the above statement made by Dr. Armijo.

The Northwest Compact strongly supports the separation of regulations governing the disposal of large volumes of long-lived radionuclides such as depleted uranium from those regulations governing the disposal of traditional low-level radioactive waste. This separation is necessary if new, traditional low-level radioactive disposal sites are to be developed in the future. It is much more equitable as these regulations are being developed to address the disposal of a waste stream, depleted uranium, which is not a state or interstate compact responsibility.

Specific Questions

Why is NRC so set on the universal application of the proposed 10 CFR Part 61 rulemaking when the option exists for including the requirements governing the disposal of large volumes of long-lived radionuclides, such as depleted uranium, in a new section or subpart? The separation of these requirements would be more equitable; less disruptive; doesn't require the public to assimilate complex, new regulations for traditional LLRW streams; and reduces the negative impact on future site development. The separation of these requirements still allows NRC to develop regulations that address the disposal of large volumes of long-lived radionuclides, such as depleted uranium, at those commercial facilities that choose to accept such waste streams.

Why did NRC choose not to evaluate the potential impact of the universal application of this proposed rulemaking on future site development? This seems like an important issue to consider if NRC expects states and interstate compacts to successfully site future commercial LLRW disposal sites prior to the closure of the current sites.

The Northwest Compact would like to thank NRC for the opportunity to provide comments on the proposed 10 CFR Part 61 rulemaking.

Sincerely,

Mike Garner

Mike Garner, Chair/Executive Director
Northwest Interstate Compact

cc: Northwest Interstate Compact Committee

PR-20, 61
80FR16081
59

PUBLIC SUBMISSION

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Submission Type: API

Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0127
Comment on FR Doc # 2015-06429

Submitter Information

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Three Lincoln Ctr, Suite 1700
5430 LBJ Fwy
Dallas, TX, 75240
Email: skirk@valhi.net
Submitter's Representative: Roy King
Organization: Waste Control Specialists LLC

General Comment

Please see comments of Waste Control Specialists LLC in attached file.

Attachments

7-24-15 Waste Control Specialists Comments on Proposed Changes to 10 CFR 61 Docket NRC-2011-0012

July 24, 2015 **VIA EMAIL and FEDERAL EXPRESS**

Ms. Annette L. Viette-Cook, Secretary
U.S. Nuclear Regulatory Commission
ATTEN: Rulemaking and Adjudications Staff
Washington, DC 20555-001

References: (1) Docket ID NRC-2011-0012

(2) Federal Register, Low-Level Radioactive Waste Disposal, Volume 80, No. 58, published on March 26, 2015

(3) Commissioners' Briefing on Proposed Revisions to 10 CFR Part 61 and Low-Level Radioactive Waste Disposal, June 25, 2015

Subject: Proposed Revisions to 10 CFR Part 61

Dear Madam Secretary:

Waste Control Specialists LLC (WCS) herby submits written comments regarding proposed revisions to Title 10 of the Code of Federal Regulations (CFR) Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste*, as requested in Reference *2*. WCS is appreciative of the invitation and opportunity to share our views on the proposed rule with the Commissioners of the U.S. Nuclear Regulatory Commission (NRC) on June 25, 2015 (Reference 3). Our comments contained herein serve to supplement those provided to the Commissioners at the referenced briefing on the proposed revisions to 10 CFR 61.

WCS supports the proposed rule, but encourages the Commission to provide flexibility to the Agreement States to maintain existing regulations, by designating this rule as a Compatibility Category C requirement. We also encourage the Commission, once this rulemaking is finalized, to complete the task of providing a specific waste classification to the category of waste known as large quantities of Depleted Uranium (DU). WCS' comments are provided herein to address both of these areas.

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Support for the Proposed Rule

WSC supports the proposed rule especially as it relates to the "large quantities of DU" waste stream. WCS believes that the requirements governing disposal of unique waste streams like large quantities of DU, as specified in the proposed rulemaking, provide a defensible approach for protecting public health and safety. WCS also supports the three-tiered approach specified in the proposed rulemaking. However, WCS recommends that Agreement States should not be required to promulgate less stringent federal requirements than those already established in those states for the disposal of such waste streams.

On August 28, 2014, the Texas Commission on Environmental Quality (TCEQ) authorized disposal of large quantities of DU in both the WCS Texas Compact Waste Disposal Facility and the WCS Federal Waste Disposal Facility, located at WCS' Andrews County, Texas site. The TCEQ regulatory requirements governing the disposal of large quantities of DU are more stringent than those contemplated in the proposed changes to Part 61 (Reference 2). The WCS disposal facility was the first new commercial disposal facility since Congress enacted the Low-Level Radioactive Waste Policy Act of 1980, as amended in 1985. Other previous attempts were proven unsuccessful at ten other locations across the U.S., not necessarily because of technical issues, but more often because of the lack of community support. Not long after the failed attempt to license the Sierra Blanca Low-Level Radioactive Waste Disposal Facility near El Paso, the Texas legislature created the framework for a new commercial disposal facility for Class A, B and C Low-Level Radioactive Waste (LLW) requiring a state-of-the-art facility with siting and engineering criteria more rigorous than any of those in existence at the time.

In line with that directive, TCEQ promulgated disposal regulations that were more stringent than those required by the NRC either under the existing or proposed changes to Part 61. These more stringent standards were applied to the WCS site in the authorization process. We believe the support our facility received from the State of Texas and local communities in west Texas and southeastern New Mexico was in part due to the more stringent Texas requirements. Community support in hosting a waste disposal facility for Class A, B, and C LLW cannot be overstated. For these reasons, while WCS supports the proposed rule, WCS strongly recommends that the NRC provide flexibility to the Agreement States to maintain existing regulations in those states that may be more stringent than those specified in the proposed rulemaking. Accordingly, WCS respectfully encourages the NRC to assign such requirements as a Compatibility Category "C", as specified in the proposed changes to 10 CFR Parts 61.13(e), 61.41(a), 61.41(b), 61.42(a), 61.42(b), and 61.58.

Waste Classification for Depleted Uranium

Upon finalizing the proposed rule, WCS encourages the NRC to proceed forward and determine a specific waste classification for disposal of large quantities of DU. It was our understanding that initially this Part 61 rulemaking was to include a waste classification for large quantities of DU, a waste category that was not contemplated, and thus not specifically classified in the original Part 61 rule. However, the current proposed rule does not contain a resolution of that classification issue.

During a public meeting on this proposed rulemaking, NRC staff noted that the proper classification of large quantities of DU, if based on science, would be "hotter" than Class A LLW. However, at present Part 61, including the classification tables, does not provide a specific classification for this waste stream. Thus, large quantities of DU are considered Class A LLW by default. However, consistent with the comments of NRC staff at the public meeting, large quantities of DU are more hazardous than Class A LLW. During the licensing of the WCS facility conducted by the TCEQ, it was well understood that disposal of DU, especially large quantities of DU, required more stringent requirements than those which apply to Class A LLW. TCEQ's licensing review specifically considered the impacts from climate change, potential erosion or degradation of the cover system, proximity to a water table, and the recognition that DU should be disposed of as deep as possible within the disposal unit. The licensing review also evaluated time periods well beyond the 10,000 years given that DU becomes more radioactive over time. Based on the review, TCEQ included license requirements that large quantities of DU must be containerized and disposed of at the greatest depth possible within the disposal unit, requirements that are more stringent than those which apply to other Class A LLW. We ask that this same consideration be given to this waste stream by NRC.

Accordingly, WCS strongly urges the NRC to complete the proposed rulemaking and then proceed to determine the proper waste classification for disposal of large quantities of DU as contemplated in the revised staff requirements in SECY-13-0001, issued on March 26, 2013.

WCS appreciates the opportunity provided by the Commission to share our views on this important rulemaking. WCS requests that all correspondences regarding this matter be emailed directly to my attention (skirk@valhi.net) as soon as possible after issuance. If you have any questions or need additional information, please contact me at 972-450-4284.

Sincerely,

J. Scott Kirk, CHP
Vice President of Licensing and Regulatory Affairs, Corporate Radiation Safety Officer

cc: Larry Camper, NRC
Charles Maguire, TCEQ
Rodney Baltzer, WCS
Betsy Madru, WCS
Elicia Sanchez, WCS
WCS Regulatory Compliance
WCS Records Management

RulemakingComments Resource

From: Khayyat, Adnan <Adnan.Khayyat@illinois.gov>
Sent: Friday, July 24, 2015 11:20 AM
To: RulemakingComments Resource
Subject: [External_Sender] Docket ID NRC-2011-0012
Attachments: IEMA's Comments RE Docket ID NRC-2011-0012.pdf

Please find attached IEMA's comments RE Docket ID NRC-2011-0012.

Thanks for the opportunity to comment,
Adnan

Adnan G. Khayyat
Chief, Bureau of Radiation Safety
Illinois Emergency Management Agency
Adnan.Khayyat@illinois.gov
217.558.3945

IEMA
Illinois Emergency Management Agency

James K. Joseph, Director

July 24, 2015

Secretary
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Attn: Rulemakings and Adjudications Staff

Attached are the Illinois Emergency Management Agency (IEMA) comments on the proposed revisions to 10 CFR Part61 (Docket NRC-2011-0012). IEMA thanks the Commission for the opportunity to comment on the proposed regulatory revision.

Any questions pertaining to the attached comments may be directed to Kelly Grahn at Kelly.Grahn@illinois.gov or 630-293-8242.

Sincerely,

Adnan Khayyat, Chief
Bureau of Radiation Safety

Attachment

Comments from the Illinois Emergency Management Agency on
March 2015 Proposed Rule
Low-Level Radioactive Waste Disposal (10 CFR Part 61)
[NRC-2011-0012]

The Illinois Emergency Management Agency (IEMA) thanks the US Nuclear Regulatory Commission (NRC) for the opportunity to review the proposed revisions to Part 61. IEMA offers the following general and specific comments for the NRC's consideration

General Comment

As a State with a closed LLRW facility, we want to ensure that this facility is "grandfathered" and that any proposed changes in the Part 61 revision do not result in *any* increased costs with our ongoing monitoring effort for this facility or place any undue burden onto the state.

Specific Comments

In § 61.13

The analyses identified in this section become more uncertain the longer the compliance period. Guidance would be required to assist the applicant and regulator in defining the range of performance variables for natural and engineered features of the disposal facility and the range of degrading mechanisms and disruptive processes. Please ensure that this guidance is provided in the associated guidance document for this Rule.

9. In § 61.41

The ALARA objective for the performance period analysis is subject to debate as to what is a reasonable release. IEMA agrees that a fixed dose limit is not appropriate. However, specific guidance is warranted to assist the applicant and regulator as to what should be seen as reasonable. Please ensure that this guidance is provided in the associated guidance document for this Rule.

10. In § 61.42

The addition of the 5 milliSieverts (500 millirems) standard for the inadvertent intruder dose during the compliance period eliminates the uncertainty for the applicant and regulator. Specific guidance is warranted to assist the applicant and regulator as to what should be seen as a reasonable intruder dose during the performance period. Please ensure that this guidance is provided in the associated guidance document for this Rule.

RulemakingComments Resource

From: Roger Seitz <rogerseitz5@msn.com>
Sent: Friday, July 24, 2015 11:25 AM
To: RulemakingComments Resource
Subject: [External_Sender] Docket ID NRC-2011-0012
Attachments: Roger Seitz.pdf

Dear Sir/Madame

Please find attached my comments on the propose rule for 10 CFR Part 61.

Regards,
Roger Seitz

Comments from Roger Seitz

NRC's Proposed Rule: 10 CFR Part 61
Docket ID NRC-2011-0012
Published March 26, 2015

I appreciate the opportunity to review the language for the proposed rule. The effort from NRC staff to provide draft guidance along with the rule was very helpful in better understanding the intent regarding implementation of the rule. However, I do have a number of concerns related to the proposed rule. I have provided responses to the specific requests for feedback followed by comments on specific language in the rule.

Note that although the guidance was helpful, I believe that substantial revision will be necessary to accommodate the needed changes for the proposed rule, thus I request that the guidance be revised and then resubmitted for public comment after the proposed rule is updated (I have also submitted a similar comment in response to the request for comments on the guidance).

NRC requests for comment in Federal Register notice

The NRC is seeking feedback on the proposed approach, especially with regard to whether a 5 milliSievert (500 mrem) annual dose target is appropriate for the protective assurance period and whether it is appropriate to require licensees or license applicants to consider alternative levels to minimize exposures to an inadvertent intruder. (80 FR 16090)

Comment #1: I believe that the protective assurance period should be eliminated. After reviewing the proposed rule and associated guidance, it is my opinion that the use of an intermediate "protective assurance" period (from 1000 to 10,000 years after closure) with a numerical dose target does not really enhance protectiveness with respect to long-lived radionuclides and does not appropriately acknowledge and recognize the uncertainties and limitations of modeling over very long time frames. A two-tiered approach using the 1,000 year compliance period and performance objectives followed by the more qualitative performance period more appropriately addresses uncertainties and also provides a means to address the potential for catastrophic impacts that could potentially occur. Much of the excessive complexity of the proposed rule and guidance can be attributed to trying to accommodate the added protective assurance time frame.

If the protective assurance period is retained, the use of 500 mrem as a dose target or goal seems reasonable because it reflects the uncertainty and speculative nature of calculations extending into extreme times beyond 1,000 years. 500 mrem/yr is below the average annual dose for people living in the United States today (see NCRP Report 152) and is also not inconsistent with risks considered acceptable resulting from radon exposure in residences.[1] Internationally, there is good

[1] The EPA's radon action level—the level below which the Agency does not recommend actions to further reduce radon levels—is 4 pCi/L. At that level of exposure over a lifetime, the increased risk of lung cancer is up to 62 in 1000, which is equivalent to doses well above 100 mrem/yr. See. *A Citizen's Guide to Radon*, U.S. Environmental Protection Agency, http://www.epa.gov/radon/pubs/citguide.html

acceptance that exposures on the order of natural background are reasonable reference points for very long term assessments. The IAEA suggests that "[i]n very long time frames . . . uncertainties could become much larger and calculated doses may exceed the dose constraint [of 100 mrem]. Comparison of the doses with doses from naturally occurring radionuclides may provide a useful indication of the significance of such cases."[2]

In addition, several changes to the proposed regulatory language would also be needed to align the requirements with NRC's stated intentions if the protective assurance period is retained. Importantly, the proposed regulatory language does not set forth 500 mrem as a "goal," but rather imposes requirements. This is inconsistent with the NRC's stated intent in the preamble and with the Commission's direction in its February 12, 2014 Memorandum, which calls for a "goal of keeping doses below a 500 mrem/yr threshold." The use of the term minimize is also problematic and can be interpreted to be more stringent than the dose limits applied during the compliance period.

If the 500 mrem annual dose is properly conveyed as a target, then consideration of alternative levels is inherently included; that is, a goal allows some flexibility, especially in view of appropriate qualifying terms such as "reasonably achievable." Beyond 1000 years after closure, measures to further reduce doses below the target level are not justifiable, because they may entail large costs for little change in modeled doses to a hypothetical future member of the public and a hypothetical future inadvertent intruder; such an approach is inconsistent with ethical principles that state that emphasis for the very long term should be on averting catastrophic consequences. If the protective assurance period is retained (noting that I think it should not be retained), I recommend the proposed regulatory language be changed to reflect that additional efforts need not be made to further reduce doses if the goal of 500 mrem is met for these times far in the future.

As previously stated, the NRC is making available the draft guidance document (see Docket ID NRC–2015–0003) for public comment concurrent with the publication of this proposed rule and is seeking comments on whether the approaches described in the guidance are adequate or if further specification for inadvertent intruder scenarios in the proposed rule is necessary. (80 FR 16091)

Comment #2: I recommend that the definitions for intruder assessment and inadvertent intruder be clarified. Although including the text that the intruder assessment should consider only activities that are "realistic and consistent with expected activities in and around the disposal site at the time of site closure" is helpful, I would recommend adding further clarification in the inadvertent intruder definition to specify "reasonably foreseeable" pursuits. For full clarity, I recommend that the definition of "intruder assessment" more specifically state that consideration of the scenarios used originally in the development of Part 61 is sufficient to comply with the proposed requirements for intruder assessment, which confirms that those scenarios remain sufficient. I also believe the need for the phrase "resource exploration or exploitation" is not clear and thus I suggest it should be eliminated from the definition of "inadvertent intruder."

[2] ''Geological Disposal of Radioactive Waste,'' DS154, IAEA, 2005, Section A.7.

The NRC is seeking feedback on the proposed approach, especially with regard to whether a dose limit is needed for the long-term analyses or whether the proposed metric combined with barrier analyses is more appropriate. (80 FR 16092)

Comment #3: It is my view that a dose limit is not needed or appropriate for the extremely long timeframe addressed by the performance period. I do believe there is benefit in considering potential impacts beyond the time when the results can be assigned quantitative meaning. Such an assessment can provide valuable information to guide waste acceptance criteria, design optimization, and defense-in-depth measures. I believe it is most appropriate during the performance period and the approach to use analytical results only qualitatively. I recommend that the protective assurance period be eliminated and that the performance period, with no quantitative dose criterion, begins immediately following the compliance period, at 1000 years after closure. The results from any performance period analyses after 1000 years should be viewed recognizing the increasingly speculative and uncertain nature of the results especially as the likelihood of catastrophic natural processes becomes high (e.g., ice ages).

Due to the increasingly speculative nature of calculations over hundreds or thousands of years, a dose limit or goal for timeframes beyond 1,000 years is difficult to justify. Recommendations from a number of organizations, including the IAEA, NEA, ICRP, and ACNW tend to recognize the lack of credibility when trying to quantitatively interpreting modeling results for timeframes beyond even several hundred years. The proposed approach with no dose limit or target during the performance period is appropriate and reasonable. I also believe that it is not necessary to establish a requirement for a barrier analysis as a formal criterion. Such an analysis can help to better understand the relative roles of different components of a disposal system, but is not appropriate as a formal criterion.

The NRC is seeking feedback on the proposed approach, especially with regard to whether a 5 milliSievert (500 mrem) annual dose goal is appropriate for the protective assurance period and whether it is appropriate to consider alternative, higher levels based on technological and economic considerations. (80 FR 16098)

Comment #4: As stated above (see comment 1), I recommend that the protective assurance period be eliminated. I recommend that a two-tiered approach be adopted that retains the proposed 1000-year compliance period, eliminates the protective assurance period, and applies the qualitative performance period approach to modeling assessments beginning at 1000 years after closure.

However, if the protective assurance period is retained, I support the use of 500 mrem as a dose target or goal because it reflects, better than lower dose levels would, the uncertainty and speculative nature of calculations extending into extreme times beyond 1,000 years. A target dose of 500 mrem/yr is below the average annual dose for people living in the United States today (see NCRP Report 152) and is not inconsistent with risks considered acceptable resulting from radon exposure in residences. See more details in Comment #1.

Is the proposed three-tiered approach (a compliance period, followed by a protective assurance period, followed by a performance period, if applicable) appropriate? (80 FR 16106)

Comment #5: It is my opinion that a three-tiered approach is not appropriate. A two-tiered approach with a compliance period of 1,000 years is preferred. See comments 1 and 4 above for additional discussion.

Is 500 mrem/yr an appropriate analytical threshold for the protective assurance period? (80 FR 16106)

Comment #6: As described previously, I do not support a protective assurance period, but if such a period is retained, I support a 500 mrem/yr dose target or goal for the protective assurance period, recognizing the increasingly speculative nature of calculations over hundreds and thousands of years. This is also consistent with the fact that 500 mrem/yr is less than annual average exposures considered acceptable in the United States today (see NCRP Report 152).

Should there be a quantitative goal or dose limit associated with the performance period analysis, and if so, what should that goal or dose limit be? (80 FR 16106)

Comment #7: As described in preceding comments, no quantitative goal or dose limit should be established for the performance period.

The NRC requests comment on the proposed rule with respect to the clarity and effectiveness of the language used. (80 FR 16114)

Comment #8: I believe the proposed rule language needs revision to improve its clarity and effectiveness, including removal of content that is better suited for guidance. A number of the updates proposed for the regulation are unnecessarily complex and difficult to understand in places. This appears largely related to trying to define considerations related to the protective assurance period and highlights the consequences of being too prescriptive and not fully embracing a performance based approach. The prescriptive approach leads to content in multiple sections using language more appropriate for guidance. Sections such as “concepts” are excessively detailed (with much information that would be more appropriately included in guidance) and contain some discussions that imply possible requirements; at the same time, the discussions omit clarifying details essential to bound the regulatory analyses and prevent unfettered discretion in implementation. The proposed regulation would require new analyses while retaining (and even adding to) detailed, directive criteria on aspects that would be addressed more appropriately in site-specific PA and intruder assessment analyses.

Another source of confusion is that the proposed regulation would add new definitions for several terms, which do not follow well-established, internationally accepted concepts described clearly in published documentation. This leaves open questions about whether or not the NRC’s proposed definitions signify a meaningful departure from the accepted concepts, and for what reasons. I suggest that NRC be consistent with established definitions as much as possible. See more detail below.

General Concerns (followed by specific comments)

Risk-informed approach

Comment #9: I agree with the NRC's intention for the proposed changes to reflect a risk-informed approach to regulation of low-level waste disposal (See, e.g., 80 FR 16083, col. 1; 16089, col. 3; 16091, col. 2. . .), but the proposed rule does not fully implement a risk-informed and performance-based approach. The proposed regulations would add numerous new requirements for site-specific analyses. However, the proposed regulations appear to not embrace the use of performance based site specific analyses to form the basis on which compliance is evaluated.

The proposed rule appears to embrace a more prescriptive regulatory approach approach using technology-based and generic (i.e., non-site-specific) requirements related to engineered components, stability, determination of analytical timeframes, and siting criteria, among others. Such prescriptive criteria are unnecessary and at odds with a truly risk-informed approach to regulation. As the NRC has stated, "the risk-informed, performance-based approach . . . eliminates arbitrary or prescriptive siting and design criteria, as well as detailed requirements such as quantitative subsystem performance objectives." (See 66 FR 55737) A sound conceptual model of the site and a comprehensive performance assessment (PA) provide the means to assess the significance of site attributes, the components of the disposal system, their interactions, and their effects on performance.

For a performance based approach, the emphasis should be on the use of site-specific analyses demonstrate a reasonable assurance of compliance with the dose limits or targets based on the relevant features of the site and facility (including those that may be beneficial as well as those that may be detrimental to performance). Numerous additional requirements and separate analyses that are implied in the proposed rule are merely burdensome without adding to protectiveness. For example, with site-specific analyses, the definition and table for "long-lived waste" are not needed and can be removed. Likewise, a separate, quantitative site stability analysis (as implied by the technical analysis mentioned in §§ 61.7(c)(1), 61.13(d) and 61.23(e) and as suggested in the Guidance) is not necessary; rather, the focus should be on whether the PA provides reasonable assurance that the performance objectives at §§ 61.41 and 61.42 will be met, taking account of the longevity of the hazard and site stability. I suggest that the NRC carefully review the proposed rule to eliminate extraneous prescriptive criteria and analyses that do not align with a risk-informed and performance-based approach.

Three-tiered approach to compliance over different timeframes

Comment #10: I recommend that a two-tiered approach be adopted that retains the proposed 1000-year compliance period (and associated dose limit), eliminates the protective assurance period (and associated reference dose), and applies the qualitative performance period approach to modeling assessments beginning at 1000 years after closure. A two-tiered approach would provide important information about the performance implications of long-lived nuclides into the

very far future, while reducing the unnecessary complexity of the proposed rule and appropriately accommodating greatly increased uncertainties at very long timeframes.

I support the 1000-year timeframe and associated dose limit for the initial compliance period; the period appropriately limits speculation and reflects the limitations on how long performance assessment results for low-level waste disposal can reasonably be used in a quantitative manner to assess compliance.

I also support the concept of considering analyses and intruder assessments over longer periods. There is value in considering, qualitatively, potential impacts beyond the time when the results can be assigned quantitative meaning with respect to potential health effects. Such an assessment can provide valuable information to guide waste acceptance criteria, design optimization, and defense-in-depth measures. I support, in principle, the performance period and the approach to use analytical results only qualitatively. Several changes are suggested to better align the proposed rule language with the declared intentions of the NRC; these are discussed in more detailed comments.

However, the imposition of an intermediate "protective assurance" period (from 1000 to 10,000 years after closure) with a numerical dose limit (as written) or dose target (as NRC apparently intended) does not appropriately accommodate the uncertainties and limitations of modeling over very long time frames. It establishes *de facto* requirements over very long timeframes without adding materially to an understanding of the relevant behavior of long-lived nuclides—depleted uranium, in particular.

- The IAEA says, for example, that for engineered near-surface disposal facilities, a modeling period on the order of "a few thousand years may still be reasonable." (IAEA Safety Guide SSG-23, 2012) The ICRP observes that doses and risk "cannot be forecast with any certainty beyond around several hundreds of years into the future."(ICRP-81) The NEA acknowledges that, "while some hazard may remain for extremely long times, increasing uncertainties mean that there are practical limitations as to how long anything meaningful can be said about the protection provided by any system against these hazards. These practical limitations need to be acknowledged in safety cases." A 10,000-year period for quantitative assessment and comparison against a dose criterion for low-level disposal facilities goes well beyond these recommendations.

- In addition, the NRC's primary justification (as described in the "Technical Analysis Supporting Definition of Period of Performance for Low-Level Waste Disposal") for a 10,000-year "break-point" is consistency with regulatory precedents that relate solely to high-level waste and deep geologic repositories. The characteristics of the waste and the predictability of the disposal systems both differ substantially from the context of near-surface low-level waste disposal and therefore are not appropriate precedents. More relevant are existing regulations for materials and sites that are comparable to low-level waste; those regulations establish compliance periods of 1000 years, at most. (See 10 CFR Part 20.2002; 10 CFR Part 40, Appendix A; 40 CFR Part 192.) The NRC's own Advisory Committee on Nuclear Waste (ACNW) noted, regarding earlier staff proposals to impose a 10,000-year

period of performance, that the timeframe was "arbitrary and lacked bases in either standards or regulations."

- The ACNW further warned that assessments beyond an initial compliance tier should "be used to evaluate the robustness of the facility over long periods of time and should not become *de facto* regulation." (See NRC Technical Analysis, pp. 1, 2.) As discussed in further detail in later comments, the proposed regulations would establish dose limits rather than goals—and, in fact, with greater stringency than for the compliance period.

- The protective assurance period also is not necessary in view of intergenerational equity considerations to avoid "actions that pose a realistic threat of irreversible harm or catastrophic consequences" for future generations. (See "Technical Analysis Supporting Definition of Period of Performance," p. 10.) The proposed compliance period alone is sufficient to satisfy that ethical obligation. That is, providing reasonable assurance that doses (which will be extremely localized) will be limited to 25 mrem/yr—much less than background radiation or routine medical exposures—for the next *forty* generations covered by a 1000-year compliance period goes well beyond averting "catastrophic consequences." This is especially true considering that exposures from a disposal system, even in the extremely far future, would be localized and will be considered qualitatively.

I recommend, therefore, that the proposed requirements related to a protective assurance period be eliminated. Instead, the performance period (and the qualitative approach to further modeling) should begin at 1000 years after closure.

New definitions

Comment #11: The proposed regulation includes some new definitions. Among these are several that are justified (in the Federal Register discussions) primarily on aligning the U.S. approach with those endorsed in international guidance: specifically, defense-in-depth, performance assessment and safety case. However, the proposed regulations do not use definitions that have been developed through consensus approaches, including participation from U.S. regulatory agencies. I believe that linking the concepts to international and national guidance, as applicable, is a reasonable approach. But this would be best accomplished by adopting the documented definitions that have been established for these terms.

Uncertainty and limitations of PA over long time frames

Comment #12: The FR notice appropriately discusses the increasing uncertainties, and the decreasing confidence—and thus meaningfulness for quantitative decision-making—that can be placed in numerical analyses over longer time frames. (See, e.g., 80 FR 16091, col. 3.) As noted previously, such limitations on the use of PA are also well-recognized internationally by the IAEA, ICRP and OECD Nuclear Energy Agency. More generally, a performance assessment, even for several hundred years into the future, cannot be regarded as a "prediction" of future disposal system behavior. Rather, it is a hypothetical projection of possible behavior, based on reasonably conservative assumptions and simplifications. These concepts and limitations on PA

are acknowledged in some of the FR discussions, but are not well reflected in the regulatory language.

I suggest that additional caveats and explanation be added in the concepts section and throughout the rule to appropriately reflect the issue with meaningfulness of speculative and uncertain results in the context of decision-making. The use of terms such as "ensure" protectiveness should be avoided. The regulatory language should instead be consistent with the concept of reasonable assurance.

Reasonable assurance

Comment #13: There is a need to define or clearly explain the term "reasonable assurance" in the context of the increasingly speculative nature of calculations over hundreds or thousands of years. Given the longer time frames that are associated with the proposed rule, there is a need to better describe the concept, especially compared to the expectations for operations of nuclear facilities.

Exclusion of radon

Comment #14: I believe that radon be excluded from the dose-based performance objectives. The inclusion of radon is significantly inconsistent with expectations applied to other EPA, NRC and DOE regulations that address management of uranium-containing materials ([e.g., 40 CFR Part 190.10, 40 CFR Part 61 (subpart H), 40 CFR Part 61.192 (subpart Q), 10 CFR Part 40 (Appendix A, criterion 6), 10 CFR Part 20.1101(d), DOE Order 435.1]. The proposed performance objectives in Part 61 should be updated to be more consistent with other national requirements related to radon for wastes containing uranium. One of the main reasons for considering the update to Part 61 is to address DU, so modifications to the existing rule in the interest of consistency with other EPA and NRC regulations addressing uranium is appropriate. NRC should exclude uranium from the all pathways dose objective and also add a performance objective for radon flux, consistent with the approaches in other promulgated rules.

Concepts and Technical Analyses

Comment #15: These sections of the proposed rule include information that reflects a prescriptive rather than risk informed approach and is better suited for guidance. For example, the discussions in concepts on "intruder assessment," "waste with significant concentrations and quantities of long-lived radionuclides," defense-in-depth, and also the discussion of stability in the waste classification discussion do not appear necessary. The use of words such as "can," "may," and "should" are indicators that statements are more appropriate for guidance rather than for a rule.

Long-term analyses

Comment #16: I am concerned about the messages that are implied by references to "long-term analysis" (e.g., 80 FR 16091) in the context of 10,000 years. This undermines the fact that for near surface disposal of radioactive waste, regulations consistently consider much longer time

frames than are considered for disposal of other wastes. Five hundred or 1,000 years are very long-term analyses and should be described as such. Statements that give the impression that analyses for 500 or 1,000 years are not considering long-term impacts are misleading and should be avoided and greater emphasis should be placed on how robust the approach has been, and is, for assessments to support safe disposal of radioactive waste.

Closure terminology

Comment #17: The proposed regulation contains inconsistent use of the term "closure." The definition of intruder assessment (proposed § 61.2), for example, refers to "the time of site closure." The definition of compliance period refers to "closure of the disposal facility." An existing definition for site closure and stabilization describes a set of actions rather than a point in time. The definition for the protective assurance period uses the terminology "following closure of the site." There is similarly inconsistent usage throughout the rule, with various terms being used: closure, final closure, site closure, final site closure, time of site closure, site closure phase, disposal site closure, and closure of the land disposal facility. It is not clear if the terms are meant to be interchangeable or if the differences in terms carry significance. It is recommended to review and terminology and make it consistent as much as possible; where there are differences, the reasons should be made clear by context or explanation.

Specific Comments

§ 61.2, Compliance period definition

Comment #18: The definition for compliance period describes when it ends, but is unclear about when it begins. This leaves some ambiguity regarding whether the provision should be applied during the operational period. It is suggested that the definition be revised to clarify that the compliance period for the purposes of § 61.41 and § 61.42 begins at the time of closure of the disposal facility. I suggest that the cross-reference in § 61.43 (to § 61.41) be deleted, and either the salient requirements incorporated directly into § 61.43 or, given the existing cross-reference to Part 20, the requirements concerning effluents in § 20.1302 and § 20.1301 be used.

§ 61.2, Defense-in-depth definition

Comment #19: The definition of defense-in-depth does not reflect the accepted use of the term, either in the U.S. or internationally (e.g., in IAEA SSR-5 and the IAEA Safety Glossary) and is inconsistent with the preamble. As noted in the preamble, "The NRC's defense-in-depth approach to risk management ensures that safety is not wholly dependent on any single element of the design, construction, maintenance or operation of a regulated facility. . . . Defense-in-depth for a land disposal facility includes, but is not limited to, the use of remote siting, consideration of waste forms and radionuclide content, engineered features, and natural geologic features of the disposal site." Other relevant features mentioned in the preamble are, for example, land ownership and institutional control requirements. (See 80 FR 16102, col. 2.) It is suggested that the definition be revised to reflect the broader consideration that are discussed in the preamble as well as in § 61.7(d).

§ 61.2, Inadvertent intruder and intruder assessment definitions

Comment #20: I support the clarification that the intruder assessment should consider only activities that are "realistic and consistent with expected activities in and around the disposal site at the time of site closure." Further, I note that NRC has stated that the approach used to develop the classification tables remains protective. I agree, and thus suggest that the use of scenarios similar to those considered in the development of Part 61 is sufficient to meet inadvertent intruder protection requirements. I suggest clarifying this approach in the definitions in the proposed rule. This is a reasonable approach to limit speculation regarding potential scenarios and emphasizes the continued protectiveness of the existing classification system. It also reduces the regulatory burden because there already exists considerable experience in implementing these scenarios.

§ 61.2, Long-lived waste definition

Comment #21: I suggest that the definition of long-lived waste be deleted. The definition appears to imply a definition of a new class of waste, which is not necessary in a true risk informed, performance based approach. The appropriate basis to determine whether longer-term analysis is needed is the site-specific performance assessment rather than arbitrary numerical criteria using the tables for Class A waste. Note that implementation of a two tier approach with a compliance time of 1,000 years would remove the need for the prescriptive definition and table. See also comments on § 61.13(e).

§ 61.2, Performance assessment definition

Comment #22: The definition should include a consideration of associated uncertainties, as is done in the definition of *intruder assessment*, especially in view of the proposed requirement in §§ 61.13(a)(3), (a)(8) and (a)(9) to consider probabilities and uncertainties regarding various aspects of performance assessment including unlikely features, events and processes; variability in the disposal facility and environment; and alternative conceptual models. It is suggested to use language as consistent as possible with existing definitions (e.g., NCRP Report No. 152, p. 18, or IAEA SSG-23 on safety assessment) rather than developing a new definition.

The proposed definition also places unnecessary focus on the concept of features, events and processes (FEPs), which is at odds with other definitions that have been widely used (e.g., from the ICRP, the IAEA, and the NEA). By using this terminology, the proposed rule appears to be requiring a single methodology to achieve a conceptual site model, an approach that is inconsistent with recent positions from the international community. (See, e.g., the IAEA Safety Guide No SSG-23 on safety assessment and the OECD NEA Methods for Safety Assessment of Geological Disposal Facilities: Outcomes of the MeSA Initiative, 2012.) The use of an existing definition from one of these sources would resolve this issue as well.

Finally, the consideration of all FEPs (or whatever terminology is ultimately used)—namely, FEPS that "might affect the disposal system"—is too broad and could entail consideration of highly unlikely or fantastic events or combinations of events. Consideration should be limited to

"reasonably foreseeable and significant" FEPs or factors that are relevant to performance. See also the comments on §§ 61.13(a)(1) through (a)(5).

§ 61.2, Performance period definition

Comment #23: The proposed definition of the performance period specifies no end point and no criteria for establishing what period of time must be covered by analyses beyond 10,000 years. NRC makes clear that the period is left undefined in order to allow site-specific factors to be considered (80 FR 16097, col. 1) Additional discussion highlights that the time of peak dose would be a substantial consideration in determining how far into the future the modeling projections should run. (See ibid. and 80 FR 16092, col. 1) This is, in general, an approach that is consistent with a risk-informed process. It is not appropriate to imply there is no end to the potential time frame to be considered. NRC (in its "Technical Analysis Supporting Definition of Period of Performance") rejects a peak dose approach with an undefined performance period, in part because "peak dose could occur beyond the period of geologic stability, which would render quantitative values essentially meaningless." (p. 11)

I recommend that, at a maximum, the performance period should not extend beyond peak dose (or impacts) or the period of near-surface geologic stability, whichever is sooner. I understand that a significant motivator for the performance period is to gain information regarding long-term performance—but 1,000 years *is* very long-term performance. Modeling beyond 1,000 years should be conducted with the recognition of the growing speculation and uncertainty. At some time beyond 1,000 years, the loss of value of the information obtained from additional modeling as a quantitative basis for decisions needs to be acknowledged. The value of quantitative results for decisions will always be limited by whether site-specific characteristics dictate that it might be useful *and* there is a valid scientific and technical basis on which assessment may be founded. For near-surface disposal, the second condition is fulfilled only during the period of surface geologic stability, and this is the maximum amount of time that any assessments in the regulation should cover. As the NEA aptly noted, "while some hazard may remain for extremely long times, increasing uncertainties mean that there are practical limitations as to how long anything meaningful can be said about the protection provided by any system against these hazards. . . . These practical limitations need to be acknowledged in safety cases."3

The NRC has already recognized, in its draft NUREG-2175 (p. 2-24) that it is necessary to establish an end point for the performance period; the essential criteria to do so belong in regulation, not in guidance. The definition of "performance period" should be revised, therefore, to clarify that the performance period extends until peak dose or impacts are reached or the period of surface geologic stability, whichever is sooner. This is consistent with the approach NRC presents in its draft guidance (NUREG-2175). Note that this approach does not exclude discussing what may happen beyond a performance period, but helps to maintain proper perspective regarding the utility of such speculation.

[3] NEA 2009 *Timescales Report,* p. 27.

§ 61.2, Safety case definition

Comment #24: I support including the concept of the safety case in the proposed regulation, as it provides a fuller view of site and disposal system understanding, and provides a means to document and address the non-quantitative factors that can enhance confidence in safety. While these concepts have long been an implicit part of the licensing process, using the term *safety case* emphasizes that the U.S. approach is in concert with international approaches. However, it is unclear why NRC staff have developed their own definition of safety case rather than using those established in international guidance (e.g., IAEA SSG-23, Paragraph 1.3). I suggest using a definition from existing publications.

§ 61.7(c)(4), Intruder assessment concept

Comment #25: The use of a strictly enforced dose limit as the performance objective for an inadvertent intruder assessment covering any period after closure is inconsistent with DOE and international positions regarding inadvertent intrusion. The general position internationally is that intruder assessments are hypothetical cases used to identify features that can help reduce the potential for and/or consequences of intrusion. That is, human intrusion analyses are used as a tool to assist in optimization of the disposal facility design. The IAEA safety standards, for example, recommend no limits regarding human intrusion, but instead offer guidelines for what doses may warrant efforts to reduce the probability or consequences of intrusion. (See IAEA SSG-5, para. 2.15.) The ICRP similarly recommends no dose constraint for human intrusion, saying that a constraint "is not applicable in evaluating the significance of human intrusion because, by definition, intrusion will have bypassed the barriers which were considered in optimization of protection for the disposal facility . . . any protective actions required should be considered during the development of the disposal facility." The ICRP considered that "reasonable efforts should be made to reduce the probability of human intrusion or to limit its consequences" when doses exceed 100 mSv." (See ICRP-81, paragraphs 63-64).

I recommend that the dose limit for intruder protection be recast as a goal that is used to develop waste acceptance criteria and demonstrate added robustness of the disposal approach. If this is not done, then I recommend that additional clarifying discussion be provided in the concepts section to include the points mentioned above. See also comments on § 61.42(a).

§ 61.7(c)(6), Waste with significant concentrations of long-lived radionuclides

Comment #26: In a risk-informed approach, a site-specific analysis will inherently address whether the proposed waste inventory poses longer term hazards or not and, thus, whether analyses will need to address longer time frames. The site-specific analyses required over the compliance period and beyond, in themselves, constitute a case-by-case evaluation that provides the basis for determining whether relevant performance aspects (such as time of peak dose) have been adequately captured. This is true regardless of what characteristics (longevity, mobility, etc.) contribute to the need for longer-term assessment. The specificity defining and categorizing "long-lived waste" is unnecessary and the concept should be deleted from the rule.

§ 61.7(d), Defense-in-depth

Comment #27: The discussion of defense-in-depth, while broader than the proposed definition in § 61.2, does not reflect the accepted use of the term, either in the U.S. or internationally (e.g., in IAEA SSR-5 and the IAEA Safety Glossary) and is inconsistent with the preamble. As noted in the preamble, "The NRC's defense-in-depth approach to risk management ensures that safety is not wholly dependent on any single element of the design, construction, maintenance or operation of a regulated facility. . . . Defense-in-depth for a land disposal facility includes, but is not limited to, the use of remote siting, consideration of waste forms and radionuclide content, engineered features, and natural geologic features of the disposal site." Other relevant features mentioned in the preamble are, for example, land ownership and institutional control requirements. (See 80 FR 16102, col. 2.) The more inclusive view of defense-in-depth, including administrative and operational controls, should be included in the discussion of the concept.

§ 61.7(f), Waste classification and stability

Comment #28: The emphasis on details related to "long term" stability is not needed. Stability is important for the several hundred year time frame assumed for the classification system (e.g., assumptions for the classification tables), but over many hundreds or thousands of years, stability as a criterion, becomes less meaningful for assessing level of protectiveness. If the site-specific PA demonstrates that performance objectives can be met with reasonable assurance for extreme time frames (e.g., thousands of years or more), even if there are increases in infiltration or other changes in the system, then "stability" as a separate and specific criterion is not needed. In addition, such requirements may be very difficult to meet, but at the same time may have little impact on the protection of human health (e.g., calculated dose). In a performance-based approach, the performance assessment is the appropriate means to account for the relevance of factors such as this. It is recommended that the discussion of stability in this section be deleted; if it is kept, no changes from the existing rule language in § 61.7 are necessary and, in the interest of reducing complexity and confusion, the existing language in the current rule should be retained. See also comments on §§ 61.13(d) and 61.51.

§ 61.13, Application to existing facilities

Comment #29: The preamble to the proposed regulations (at page 16088) states that the proposed rule would become effective 1 year after the final rule is published for NRC licensees, and that Agreement States would have 3 years to adopt compatible provisions. In turn, the proposed regulatory language for § 61.13 and in § 61.58(d) would require existing licensees to conduct various additional technical analyses and apply new waste acceptance provisions at the next license renewal or within 5 years of the effective date of the proposed new requirements, whichever comes first. In contrast to both approaches, the existing general provisions in Subpart A (§ 61.1(a))—which would not be amended by the proposed regulation— state that applicability of requirements in Part 61 to existing licensees "will be determined on a case-by-case basis." I recommend conforming revision to § 61.1(a) and, as necessary, the final preamble to the regulations, so that the provisions are consistent with each other. Given the numerous new provisions and new analysis that would be required by the regulations, it seems more appropriate

to delay application of the proposed regulations until a reasonable time in the future, with an emphasis on *new* waste streams and *new* operations.

§§ 61.13(a)(1) to (a)(5), Technical analyses (FEPs consideration)

Comment #30: The focus on the term "features, events and processes" does not align well with more recent international best practice, in which approaches based on "safety functions" have emerged. (See, for example, http://www.oecd-nea.org/rwm/reports/2012/nea6923-MESA-initiative.pdf) It is recommended that the rule be revised to reinforce and place more emphasis on the more current approaches for scenario development involving the use of safety functions, either through revisions to this section or with additional discussion added in the concepts section.

If the protective assurance period is retained (which I do not support), the approach to the identification of relevant FEPs in performance assessment beyond the compliance period seems reasonable (i.e., FEPs applicable in the compliance period (up to 1000 years) be extended and that new FEPs be added only if scientific information compelling such changes is available (See 80 FR 16090, col. 1.)). However, the proposed regulatory language may require revision to properly reflect the stated intention. To this end, § 61.13(a)(1) should be revised to more clearly apply to the compliance period performance assessment, as in "Consider features, events and processes that might affect compliance with § 61.41(a)."

It is not clear why a separate requirement is provided [in § 61.13(a)(5)] regarding degradation or alteration processes. The requirement in § 61.13(a)(1) already requires a technical basis for inclusion or exclusion of all FEPs, so the provisions on degradation are redundant. I suggest that the proposed § 61.13(a)(5) be deleted.

§ 61.13(a)(10), Roles of natural and engineered features

Comment #31: I do not understand the purpose for the requirement to "identify and differentiate between the roles performed by the natural disposal site characteristics and design features of the disposal facility." The relevant aspects of both the site and the engineered features, as well the interactions between them, are appropriately captured by requirements to consider relevant FEPs. Prescriptively requiring further analyses seems to imply redundant requirements. Further, it is not clear what value is added to risk-informed decision-making and licensing, while at the same time adding to potential confusion, especially since it implies the possibility of sub-system requirements. I suggest that this paragraph be deleted.

§ 61.13(b), Inadvertent intruder analyses

Comment #32: The description of the inadvertent intruder analyses is confusing and inconsistent with the definition proposed for an *intruder assessment* in § 61.2. The "analyses" appear to include additional requirements beyond the assessment, as described in §§ 61.13(b)(1) to 61.13(b)(2). However, the required information is vague and adds little apparent value to risk-informed decision making and thus does not appear necessary in the proposed rule. I recommend removing this detail from the rule.

§ 61.13(d), Long-term stability

Comment #33: The proposed rule retains an existing requirement to analyze long-term stability of the disposal site, with slight changes to the language. However, the implications of this requirement are very different from the original intent of the rule, when applied over timeframes of thousands to tens of thousands of years that are addressed in the proposed rule. It is not possible for extreme time frames (thousands of years or more) that long-term stability of the site "can be ensured," as the revised language now states. Furthermore, the requirement is superfluous in view of the risk informed, performance based approach advocated in the new rule. In a risk-informed, performance-based approach, the site specific analysis is the appropriate means to account for the relevance of factors such as this. If performance objectives can be demonstrated to be met with reasonable assurance for extreme time frames (e.g., thousands of years or more), even if there are increases in infiltration or other stability-related changes, then "stability" as a separate and specific criterion is not needed. A requirement on long-term stability may be very difficult to meet, and at the same time may have little impact on the protection of human health (e.g., dose calculation). It is recommended that the requirement for a separate analysis of site stability be deleted. If the provision is retained, the proposed language that stability "can be ensured" should be dropped, and the analysis should extend no longer than the compliance period. See also comments on § 61.44.

§ 61.13(e), Potential long-term radiological impacts (Table A)

Comment #34: The proposed provisions require analyses over the performance period (i.e., beyond 10,000 years after closure) "for disposal sites with waste that contains radionuclides with the average concentrations exceeding the values listed in Table A of this paragraph, or if necessitated by site-specific conditions." Several changes from the proposal are suggested to enhance the technical basis and better align it with the intent to use site specific performance analyses:

- Table A should be eliminated. The technical basis described for the derivation of the concentrations is limited and unclear. The preamble states that the values are "primarily, but not solely, based on the Class A LLRW concentration values" (80 FR 16097, col. 1), but does not explain why the Class A limits are an appropriate indicator or technical basis to determine the need for analyses beyond 10,000 years. There is no justification for defining hazards over extreme time frames based on the Class A limits, since such time frames were not considered in developing those limits. Furthermore, Table A may be rendered moot by the clause regarding "site-specific conditions," where the table alone will not be determinative of whether a longer-term analysis is needed. Given this, the results of site-specific analyses already required for the compliance and protective assurance period should be used to determine whether it is appropriate to conduct longer-term analyses. This approach is technically supportable and better aligns with the declared intent to establish a risk informed, performance-based approach using site-specific analysis.

- To establish clear expectations on the part of licensees, further explanation should be provided on what "site-specific conditions" might necessitate performance period analyses

(e.g., results of site specific analyses). The preamble discussion on timeframes (80 FR 16093 *et seq.*) makes clear that the peak dose, including potential in-growth of progeny (from uranium, in particular) is a central consideration, and this could provide an appropriate basis for delineating the need for analysis extending into the extremely far future. I recommend that the site-specific analysis be used to determine the appropriate duration to be considered.

- As noted in my general comments, I recommend that the protective assurance period be eliminated.

Therefore, it is suggested that § 61.13(e) be revised to read, "The time period required to be considered shall be determined based on site-specific conditions addressed in the PA. Performance period calculations shall be performed if the analyses for compliance period in §§ 61.41(a) and 61.42(a) indicate that peak doses have not been attained (i.e. doses are stable or rising) at 1000 years, including consideration of the in-growth of progeny from the intended waste streams."

§ 61.13(f), Defense-in-depth

Comment #35: The basis for the need to conduct a defense in depth analysis is not clear. This effort should be focused on documenting the contributors to defense-in-depth rather than a quantitative analysis. As noted earlier, the accepted use of the term (and NRC's own discussions of it in the preamble to, and other sections of, this proposed rule) encompass siting and operational aspects. Furthermore, as NRC observes, "The capabilities of any of those design features and site characteristics may not be either independent or totally redundant. . . . The capabilities of site characteristics and engineered features over the long timeframes are subject to interpretation and include many uncertainties. . . . Therefore, the NRC expects that licensees will rely on both the characteristics and the engineered features, in combination, to provide reasonable assurance that the overall performance of the disposal site will be adequate over long time periods." (80 FR 16092) The function of the various engineered and natural barriers, and their interactions, is required to be accounted for in the performance assessment. As NRC has observed in other regulations related to radioactive waste disposal, "a complete performance assessment . . . will illustrate the effectiveness of the multiple barriers, and the implementation of the philosophy of defense in depth, such that the individual protection standard is shown to be met even when barriers are challenged. . . . The Commission is confident that evidence for the resilience, or lack of resilience, of a multiple-barrier system will be found by examining a comprehensive and properly documented performance assessment of the behavior of the overall repository system." (See 66 FR 55759.)

Further quantitative assessment, as implied by the term "analyses," of redundancy over long time frames is likely to be highly uncertain and difficult to interpret—and ignores many other important facets of defense-in-depth. To address these concerns, it is suggested that the language in § 61.13(f) be revised to read, "A description of defense-in-depth measures applied at the proposed disposal facility, and discussion of the means by which they provide passive safety, provide redundancy, or enhance confidence in the safety case and long-term performance."

§ 61.41(a), Protection of the general population

Comment #36: No definition is provided for "any member of the public." The requirement should be restricted to a representative member of the public located in the general environment (i.e., outside the boundaries of the disposal system, including the buffer zone) of the disposal facility. Such an approach is also consistent with the application of updated dosimetry methods that would be allowed by the proposed changes. More recent ICRP guidance discusses the applicability of limits and constraints to a "representative person." (See ICRP 103, Section 5.4.2.). Since one intent of the update to Part 61 is to address new dosimetry, a change to consider the concept of a representative person seems to be reasonable as well.

§ 61.41(b), Protection of the general population during the protective assurance period

Comment #37: As noted in my general comments, I recommend that the protective assurance period be deleted, and that the performance period be designated to begin at 1000 years after closure. Accordingly, I recommend that the proposed provisions of § 61.41(b) be eliminated.

If the protective assurance period and the associated analyses are retained, then several important changes and clarifications should be made to align the provision with NRC's stated intentions.

- The requirement to "minimize" releases of radioactivity for the protective assurance period is inappropriately stringent and does not seem to reflect the intention of the NRC. The preamble discussion states that "The protective assurance analyses are being proposed as a minimization process (i.e., optimization) with guidance provided on the goals to use in the minimization process." (80 FR 16089, col. 3) The term minimize does not properly reflect the multi-faceted optimization process, which entails consideration of numerous factors; indeed, "minimize" as used in the proposed regulatory language can be interpreted as being more stringent than the ALARA requirement applied to the compliance period, since it does not clearly allow for consideration of what is feasible or reasonable.

- Furthermore, proposed § 61.41(b), as written, does not set forth "goals," but rather imposes requirements. As such, it is not consistent with the Commission's direction in its February 12, 2014 Memorandum, which calls for a "goal of keeping doses below a 500 mrem/yr threshold." NRC expresses its intention that the dose level for the protective assurance period should function as "a goal rather than a limit." (80 FR 16097, col. 3) While this intention is reflected in the language allowing "a level that is supported as reasonably achievable," the requirement to minimize releases adds confusion.

- No definition is provided for the "general environment." A definition should be added, here or in § 61.2, to clarify that the general environment means that area outside the boundaries of the disposal system and its buffer zone.

In order to better align the regulatory language with the stated intentions of the NRC for the protective assurance period, it is suggested that the following alternative language be used:

> Efforts shall be made to reduce releases to a level that is reasonably achievable based on technical and economic considerations, *provided* that licensees shall be presumed to meet this goal if the annual dose does not exceed a dose target of 5 milliSieverts (500 millirem). Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a).

§§ 61.41(a)-(b), Protection of the general population

Comment #38: The treatment of radon should be consistent with that in other rules that address Uranium from the NRC and other U.S. regulatory agencies. Radon should be specifically excluded from consideration in assessing compliance with the dose limits and targets in these sections. A separate radon performance objective (e.g., a flux limit) would be consistent with other NRC, EPA, and DOE rules [e.g., 40 CFR Part 190.10, 40 CFR Part 61 (subpart H), 40 CFR Part 61.192 (subpart Q), 10 CFR Part 40 (Appendix A, criterion 6), 10 CFR Part 20.1101(d), DOE Order 435.1]. A major factor in the update to Part 61 is to address DU, so consistency with other national regulations addressing uranium is appropriate. NRC should address radon using a performance objective for radon flux similar to other existing rules.

§ 61.41(c), Protection of the general population during the performance period

Comment #39: As noted in my general comments, I support the concept of a performance period, for which the potential impacts beyond 1000 years are considered qualitatively to inform site understanding and contribute to optimization of design. I recommend that the performance period begin at 1000 years after closure, directly following the compliance period. Whether or not this change to the performance period timeframe is made, the use of the term “minimize” is not appropriate in the requirements for the performance period. The term “minimize” does not properly reflect the multi-faceted optimization process, which entails consideration of numerous factors; indeed, “minimize” as used in the proposed regulatory language can be interpreted as being more stringent than the ALARA requirement applied to the compliance period, since it does not clearly allow for consideration of what is feasible or reasonable. It is suggested that the language be revised to read, “Effort shall be made to reduce releases of radioactivity . . . .”

§ 61.42(a), Protection of inadvertent intruders during the compliance period

Comment #40: The application of a dose limit for an inadvertent intruder assessment covering any period after closure is inconsistent with international positions regarding inadvertent intrusion. The general position internationally is that intruder assessments are hypothetical cases used to identify features that can help reduce the potential for and/or consequences of intrusion. That is, human intrusion analyses are used as a tool to assist in optimization of the disposal facility design. The IAEA safety standards, for example, recommend no limits regarding human intrusion, but instead offer guidelines for what doses may warrant additional optimization: for annual doses in the range of 1-20 mSv (100 mrem-2 rem), “reasonable efforts are warranted at the stage of development of the facility to reduce the probability of intrusion or to limit its consequences.” (See IAEA SSG-5, para. 2.15.) The ICRP similarly declined to recommend a dose constraint for human intrusion, saying that a constraint “is not applicable in evaluating the significance of human intrusion because, by definition, intrusion will have bypassed the barriers

which were considered in optimization of protection for the disposal facility. . . any protective actions required should be considered during the development of the disposal facility" (i.e., in optimization). The ICRP considered that "reasonable efforts should be made to reduce the probability of human intrusion or to limit its consequences" when doses exceed 100 mSv. (See ICRP-81, paragraphs 63-64). I recommend that the 500 mrem dose limit for intruder protection during the compliance period be recast as a goal that is used to develop waste acceptance criteria and to demonstrate added robustness of the disposal approach. Corresponding changes are also needed in § 61.13(b)(3) to reflect that dose-based performance objectives in § 61.42 are goals (or guidelines) and not strict dose limits. See also comments on § 61.7(c)(4).

The requirement that the disposal facility must "ensure" protection is an overstatement of what can be demonstrated in performance assessment projections for even the compliance time period. The language should be revised to more accurately reflect the reasonable assurance concept (which is applied through the proposed provision at § 61.23(b)), to read, "Design, operation and closure of the land disposal facility must provide protection of an inadvertent intruder . . . ."

§§ 61.42(a)-(b), Protection of inadvertent intruders during the compliance and protective assurance periods

Comment #41: The treatment of radon should be consistent with that in other rules addressing Uranium from the NRC and other U.S. regulatory agencies. That is, radon should be specifically excluded from consideration in assessing compliance with the dose limits and targets in these sections. Instead, NRC should develop a separate radon performance objective consistent with other NRC, EPA, and DOE rules (e.g., the flux limit). All agencies that address uranium related wastes that lead to radon generation exclude radon from all pathways and treat it separately [e.g., 40 CFR Part 190.10, 40 CFR Part 61 (subpart H), 40 CFR Part 61.192 (subpart Q), 10 CFR Part 40 (Appendix A, criterion 6) 10 CFR Part 20.1101(d)], all of which specifically exclude radon in the air/all pathways objectives]. A major factor in the update to Part 61 is to address DU, so consistency with other EPA and NRC regulations addressing uranium is appropriate.

§ 61.42(b), Protection of inadvertent intruders during the protective assurance period

Comment #42: As noted in my general comments, I recommend that the protective assurance period be deleted, and that the performance period be designated to begin at 1000 years after closure. Accordingly, I recommend that the proposed provisions of § 61.42(b) be eliminated.

If the protective assurance period and the associated analyses are retained, then important changes and clarifications should be made to align the provision with NRC's stated intentions. The use of the term "minimize" is problematic in this context, as discussed regarding the requirements for protection of the general public for the protective assurance period. (See comments on § 61.41(b).) For the same reasons, it is suggested to revise the requirement to read:

> Reasonable and practicable measures shall be taken in the design, operation and closure of the land disposal facility to control exposures to an inadvertent intruder during the protective assurance period. Efforts shall the made to reduce releases to a level that is reasonably

> achievable based on technical and economic considerations, *provided* that licensees shall be presumed to meet this goal if the annual dose does not exceed a dose target of 5 milliSieverts (500 millirem). Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b).

Corresponding changes are also needed in § 61.13 to reflect the NRC's stated intention that the reference dose is intended as a target and not a limit. In paragraph 61.13(b)(3), the phrase "doses that exceed the limits set forth in § 61.42" should be revised to reflect that dose-based performance objective in § 61.42(a) (see preceding comment) and § 61.42(b) are goals (or guidelines) and not strict dose limits.

§ 61.42(c), Protection of inadvertent intruders during the performance period

Comment #43: The use of the term "minimize" is problematic in this context, as discussed regarding the requirements for protection of the general public for the performance period (§ 61.41(c)). For the same reasons, it is suggested to revise the requirement to read: "Efforts shall be made to reduce exposures to an inadvertent intruder . . . ."

§ 61.44, Stability of the site after closure

Comment #44: The proposal retains an existing requirement regarding stability of the site after closure, with proposed wording that extends the requirement to cover the compliance period and the protective assurance period. As noted in my general comments, I recommend that the protective assurance period be eliminated. Whether or not this is done, the extension of the existing requirements to extremely long time frames—out to ten thousand years—is unjustified and burdensome. The value in separate requirements for site stability over thousands of years is questionable. More importantly, in a performance-based approach, the performance assessment is the appropriate means to account for the relevance of factors such as this. If performance objectives can be demonstrated to be met with reasonable assurance for extreme time frames (e.g., thousands of years or more), even if there are increases in infiltration, then "stability" as a separate and specific criterion or performance objective is not needed. A requirement on long-term stability may be very difficult to meet, and at the same time may have little impact on the protection of human health (e.g., dose calculation).

It is recommended that this performance objective be deleted. If it is retained, the language should reflect that the requirement is relevant for only a limited, reasonable period of time following closure. I suggest that it could be appropriate to demonstrate stability for the period of time over which Class B and Class C wastes forms are expected to endure (as discussed in the proposed concepts in § 61.7(f)), in order to support continued use of the classification tables. Another period may be justifiable, but in no case should stability be evaluated separately beyond the compliance period (i.e., 1000 years). The language should also be modified to require that measures "eliminate to the extent practicable the need for ongoing active maintenance of the disposal site during the institutional control period so that only surveillance, monitoring, or minor custodial care are required." See also comments on §§ 61.7(f) and 61.13(d).

§ 61.50 (a)(2), Site suitability for near-surface disposal

Comment #45: The value of the enhanced specific requirements for site-suitability is questionable, and this section is unduly prescriptive and detailed for a performance based approach. More importantly, while such provisions were meaningful complementary requirements to the table-based classification approach, such criteria are unnecessary and at odds with a truly risk-informed approach to regulation. As the NRC has stated, "the risk-informed, performance-based approach . . . eliminates arbitrary or prescriptive siting and design criteria, as well as detailed requirements such as quantitative subsystem performance objectives." (See 66 FR 55737) A sound conceptual model of the site and a comprehensive performance assessment (PA) provide the means to assess the significance of site attributes. In a performance-based approach, the appropriate method to evaluate the site suitability is the site-specific performance assessment. Performance-relevant site characteristics and associated disruptive events (and uncertainties) must be considered (as is required already by other parts of the proposed regulations); if the performance objectives can be shown to be met with reasonable assurance, then additional criteria are not necessary. Such restrictions may eliminate potentially viable sites without adding public protection. It is recommended that the detailed site suitability criteria in § 61.13(a)(s) be eliminated to reflect the implementation of a performance-based approach.

§ 61.58, Waste acceptance criteria exceptions

Comment #46: NRC's proposed approach allows that the WAC may be established based on site-specific analyses that account for the site and facility performance, or based on the pre-existing classification tables. Once the WAC is established, the provisions of § 61.52(12) prohibit the disposal of any waste that does not meet the acceptance criteria. According to the proposed rule, any adjustments to the WAC would require a license modification [§ 61.58(g)].

There is no provision for considering exceptions from the WAC. Under the proposed regulation, a license amendment would be required in order to accept waste with characteristics that were not addressed in the PA and WAC. However, as NRC acknowledges throughout its regulatory discussion, small amounts of waste falling outside the PA assumptions (i.e., small amounts of DU or other long-lived waste) may be accommodated in a disposal facility without affecting its protectiveness. Given this, it would be useful to provide a means for exceptions by a less onerous method than submitting a license amendment. An appropriate mechanism might be by special analyses as a supplement to the PA that would be reviewed by the regulator, which shows reasonable assurance that the performance objectives can still be met. Alternatively, NRC may consider an alternative approach that does not incorporate the WAC directly in the license.

Department of Energy
Washington, DC 20585

July 23, 2015

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555
ATTN: Rulemakings and Adjudication Staff
Docket ID NRC-2011-0012

To Whom It May Concern:

The enclosed document provides comments from the U.S. Department of Energy, Office of Environmental Management, on the proposed rule (published on March 26 at 80 FR 16082) for revisions to 10 CFR Part 61, *Low-Level Radioactive Waste Disposal.*

Sincerely,

Frank Marcinowski
Deputy Assistant Secretary for
Waste Management

Enclosure

Enclosure

Department of Energy's Comments on
Nuclear Regulatory Commission's Proposed Rule: 10 CFR Part 61,
Published March 26, 2015

Department of Energy's Comments – General Issues

Risk-informed approach

We agree with the Nuclear Regulatory Commission's (NRC) intention for the proposed changes to reflect a risk-informed approach to regulation of low-level radioactive waste (LLW) disposal (See, e.g , 80 FR 16083, col. 1; 16089, col. 3; 16091, col. 2. . .), but the proposed rule does not fully implement a risk-informed and performance-based approach. The proposed regulations would add numerous new requirements for site-specific analyses. However, the proposed regulations would not allow these analyses to form the basis on which compliance is evaluated.

Instead, the proposed rule retains vestiges of a mandatory, non-site-specific approach, which preserves-- and, in fact, adds to-- technology-based and generic (i.e., non-site-specific) requirements related to engineered components, stability, determination of analytical timeframes, and siting criteria, among others. Such criteria are unnecessary and at odds with a truly risk-informed approach to regulation. As the NRC has stated, "the risk-informed, performance-based approach . . . eliminates arbitrary or prescriptive siting and design criteria, as well as detailed requirements such as quantitative subsystem performance objectives" (66 FR 55737). A sound conceptual model of the site and a comprehensive performance assessment (PA) provide the means to assess the significance of site attributes, the components of the disposal system, their interactions, and their effects on performance. Again, as NRC has observed, "advances in performance assessment technology support the use of performance assessment results for estimating long-term repository performance. They also obviate, in the Commission's view, the need to prescribe arbitrary, minimum performance standards for subsystems to build confidence in the system's overall performance" (66 FR 55758). While these observations were made in the context of regulations for the Yucca Mountain repository, the conclusions were based on high-level regulatory approaches and technological evolution—not site-specific considerations—and therefore the reasoning is equally applicable to this rulemaking.

Thus, it should be sufficient that the PA and other site-specific analyses demonstrate a reasonable assurance of compliance with the dose limits or targets—considering the relevant features of the site and facility (including those that may be beneficial as well as those that may be detrimental to performance). Numerous additional requirements and separate analyses are merely burdensome without adding to protectiveness. For example, with site-specific analyses, the definition and table for "long-lived waste" are not needed and can be removed. Likewise, a separate, quantitative site stability analysis (as implied by the technical analysis mentioned in §§ 61.7(c)(1), 61.13(d) and 61.23(e) and as suggested in the Guidance) is not necessary; rather,

the focus should be on whether the PA provides reasonable assurance that the performance objectives at §§ 61.41 and 61.42 will be met, taking account of site stability. We note specific instances where requirements should be deleted, and we also suggest that NRC carefully review the proposed rule to eliminate extraneous criteria and analyses that do not align with a risk-informed and performance-based approach.

Three-tiered approach to compliance over different timeframes

We do not support the proposal for a three-tiered approach to compliance. We recommend that a two-tiered approach be adopted that retains the proposed 1,000-year compliance period (and associated dose limit), eliminates the protective assurance period (and associated reference dose), and applies the qualitative performance period approach to modeling assessments beginning at 1,000 years after closure. A two-tiered approach would provide important information about the performance implications of long-lived nuclides into the very far future, while reducing the unnecessary complexity of the proposed rule and appropriately accommodating greatly increased uncertainties at very long timeframes.

We endorse the 1,000-year timeframe and associated dose limit for the initial compliance period; the period appropriately limits speculation and reflects the limitations on how long performance assessment results for low-level radioactive waste disposal can reasonably be used in a quantitative manner to assess compliance.

We also support the concept of extending performance analyses and intruder assessments over longer periods. There is value in considering, qualitatively, the results of modeling beyond the time when the results can be assigned quantitative meaning with respect to potential health effects. Such an assessment can provide valuable information to guide waste acceptance criteria, design optimization, and defense-in-depth measures. We support, in principle, the performance period and the approach to use analytical results only qualitatively. Several changes are suggested to better align the proposed rule language with the declared intentions of NRC; these are discussed in more detailed comments.

However, the imposition of an intermediate "protective assurance" period (from 1,000 to 10,000 years after closure) with a numerical dose limit (as written) or dose target (as NRC apparently intended) does not appropriately accommodate the uncertainties and limitations of modeling over very long timeframes. It establishes *de facto* requirements over very long timeframes without adding materially to an understanding of the relevant behavior of long-lived nuclides and does not provide additional protectiveness to members of the public or to the hypothetical inadvertent intruder:

- The International Atomic Energy Agency (IAEA) says, for example, that for engineered near-surface disposal facilities, a modeling period on the order of "a few 1,000 years may still be reasonable" (IAEA Safety Guide SSG-23, 2012). The International Commission on Radiological Protection (ICRP) observes that doses and risk "cannot be forecast with any certainty beyond around several hundreds of years into the future" (ICRP-81). The Organization for Economic Cooperation and Development's (OECD) Nuclear Energy Agency (NEA) acknowledges that, "While some hazard may remain for extremely long

times, increasing uncertainties mean that there are practical limitations as to how long anything meaningful can be said about the protection provided by any system against these hazards. *These practical limitations need to be acknowledged in safety cases.*" NEA further states, regarding the application of quantitative criteria at 1,000 to 10,000 years and beyond, that it is "recognized in regulations and safety cases that the actual levels of dose and risk, if any, to which future generations are exposed cannot be forecast with certainty over such time frames".[1] A 10,000-year period for quantitative assessment and comparison against a dose criterion for low-level radioactive waste disposal facilities goes well beyond these recommendations.

- In addition, NRC's primary justification (as described in the "Technical Analysis Supporting Definition of Period of Performance for Low-Level Waste Disposal") for a 10,000-year "break-point" is consistency with regulatory precedents that relate solely to high-level waste and deep geologic repositories. The characteristics of the waste and the predictability of the disposal systems both differ substantially from the context of near-surface low-level radioactive waste disposal and therefore are not appropriate precedents More relevant are existing regulations for materials and sites that are comparable to low-level waste; those regulations establish compliance periods of 1,000 years, at most (See 10 CFR Part 20.2002, 10 CFR Part 40, Appendix A; 40 CFR Part 192) NRC's Advisory Committee on Nuclear Waste (ACNW) noted, regarding earlier staff proposals to impose a 10,000-year period of performance, that the timeframe was "arbitrary and lacked bases in either standards or regulations."

- The ACNW further warned that assessments beyond an initial compliance tier should "be used to evaluate the robustness of the facility over long periods of time and should not become *de facto* regulation" (NRC Technical Analysis, pp. 1, 2). As discussed in further detail in later comments, the proposed regulations would establish dose limits rather than goals—and, in fact, with greater stringency than for the compliance period.

- Quantitative—or "semi-quantitative" (as described at 80 FR 16096, col. 2)—assessment of modeling results up to 10,000 years after closure also contributes little to protectiveness. The discussion accompanying the proposed regulations states repeatedly that disposal of depleted uranium (DU) low-level radioactive waste is a driving factor in the proposed rule revisions However, the activity of DU low-level waste (taking account of ingrowth of progeny) is expected to be relatively constant until well beyond 10,000 years ("Technical Analysis Supporting Definition of Period of Performance," Figure 1).

- The protective assurance period also is not necessary in view of intergenerational equity considerations to avoid "actions that pose a realistic threat of irreversible harm or catastrophic consequences" for future generations ("Technical Analysis Supporting Definition of Period of Performance," p. 10). The proposed compliance period alone is sufficient to satisfy that ethical obligation. That is, providing reasonable assurance that doses (which will be extremely localized) will be limited to 25 mrem/yr—much less than

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[1] See *Considering Timescales in the Post-Closure Safety of Geological Disposal of Radioactive Waste*, OECD Nuclear Energy Agency, 2009, pp. 8, 9.

background radiation or routine medical exposures—for the next *forty* generations covered by a 1,000-year compliance period goes well beyond averting "catastrophic consequences".

We recommend, therefore, that the proposed requirements related to a protective assurance period be eliminated. Instead, the performance period (and the qualitative approach to further modeling) should begin at 1,000 years after closure

New definitions

The proposed regulation would add new definitions for a number of terms. Among these are several that are justified (in the Federal Register (FR) discussions) primarily on aligning the U.S approach with those endorsed in international guidance: specifically, defense-in-depth, performance assessment and safety case. However, the proposed regulations do not use definitions that have been developed through international consensus, including participation from U.S. regulatory agencies. No explanation is provided for the departure from accepted published definitions. We believe that linking the concepts to international and national guidance is a laudable goal, and that it will be best accomplished by adopting the documented definitions that have been established for these terms in international and national guidance and technical reports. See comments on specific definitions in § 61.2.

Uncertainty and limitations of PA over long timeframes

FR notice appropriately discusses the increasing uncertainties, and the decreasing confidence—and thus meaningfulness for quantitative decision-making—that can be placed in numerical analyses over longer timeframes (See, e.g., 80 FR 16091, col. 3.) As noted previously, such limitations on the use of PA are also well-recognized internationally by the IAEA, ICRP and NEA. (See general comment on the three-tiered compliance approach.) More generally, a PA, even for several hundred years into the future, cannot be regarded as a "prediction" of future disposal system behavior. Rather, it is a hypothetical projection of possible behavior, based on reasonably conservative assumptions and simplifications. These views reflect international consensus. NEA says: "Calculated values are to be regarded not as predictions but rather as indicators that are used to test the capability of the system. . . . Doses and risk evaluated in safety assessments are to be interpreted as illustrations of potential impact to stylized, hypothetical individuals based on agreed sets of assumptions."[2] These concepts and limitations on PA are acknowledged in some of the FR discussions, but are not well reflected in the regulatory language.

We suggest that additional caveats and explanation be added in the concepts section and throughout the rule to appropriately reflect the issue and the balance to be struck (see subsequent comment) The use of terms such as "ensure" protectiveness should be avoided. The regulatory language should instead be consistent with the concept of reasonable assurance.

[2] NEA 2009 Timescales Report, pp. 9, 12

Reasonable assurance

In a similar vein, a definition or discussion (in § 61.2 or § 61 7) should be added for the term "reasonable assurance." None is provided in the proposed rule though the term is used extensively in the regulatory language. The concept, when applied to the timeframes incorporated in the proposed rule, has implications very different than its application in other contexts in which it is applied by NRC (during operation of nuclear facilities, for example) and, therefore, deserves particular attention. We suggest that the concept adhere to NRC's interpretation as used in the context of geological disposal, which is consistent with the Environmental Protection Agency's (EPA) term "reasonable expectation," as applied to analyses up to or beyond 10,000 years:

> Performance assessments need not provide complete assurance that the requirements . . . will be met. Because of the long time period involved and the nature of the events and processes of interest, there will inevitably be substantial uncertainties in projecting disposal system performance. Proof of the future performance of a disposal system is not to be had in the ordinary sense of the word in situations that deal with much shorter time frames. Instead, what is required is a reasonable expectation, on the basis of the record before the implementing agency, that compliance . . . will be achieved. [40 CFR 191.13(b)]

This is consistent with NRC's explanation in the "Technical Analysis" (p. 5) that the results of compliance analysis "are not interpreted as unequivocal numerical proof of the expected behavior of a waste disposal facility".

Exclusion of radon

It is recommended that radon be excluded from the dose-based performance objectives. The inclusion of radon is significantly inconsistent with expectations applied to other EPA, NRC and the Department of Energy's (DOE) regulations that address management of uranium-containing materials [e.g., 40 CFR Part 190 10, 40 CFR Part 61 (subpart H), 40 CFR Part 61.192 (subpart Q), 10 CFR Part 40 (Appendix A, criterion 6), 10 CFR Part 20.1101(d), DOE Manual 435.1-1] The proposed performance objectives in Part 61 should be updated to be more consistent with other national requirements related to radon for wastes containing uranium. A major factor in the update to Part 61 is to address DU, so modifications to the existing rule in the interest of consistency with other EPA and NRC regulations addressing uranium is appropriate. NRC might consider instead adding a performance objective for radon flux, consistent with the approaches in other promulgated rules.

Concepts and Technical Analyses

These sections of the proposed rule include information that appears overly prescriptive and is better suited for guidance. Furthermore, some of the detail is not appropriate (see specific comments below). For example, the discussions in concepts on "intruder assessment," "waste with significant concentrations and quantities of long-lived radionuclides," defense-in-depth, and also the discussion of stability in the waste classification discussion do not appear necessary.

The use of words such as "can," "may," and "should" are indicators that statements are more appropriate for guidance rather than for a rule. See specific comments on §§ 61 7 and 61.13.

Long-term analyses

The references to "long-term analysis" in the FR notice (e g., 80 FR 16091) seem to emphasize analysis covering 10,000 years or more; however, depending on the context, analyses for 500 or 1,000 years are also long-term analyses and should be described as such. Statements that give the impression that analyses for 500 or 1,000 years are not considering long-term impacts should be avoided

Closure terminology

The proposed regulation contains inconsistent use of the term "closure." The definition of intruder assessment (proposed § 61.2), for example, refers to "the time of site closure." The definition of compliance period refers to "closure of the disposal facility." An existing definition for site closure and stabilization describes a set of actions rather than a point in time. The definition for the protective assurance period uses the terminology "following closure of the site". There is similarly inconsistent usage throughout the rule, with various terms being used. closure, final closure, site closure, final site closure, time of site closure, site closure phase, disposal site closure, and closure of the land disposal facility. It is not clear if the terms are meant to be interchangeable or if the differences in terms carry significance. It is recommended that NRC review such terminology and make it consistent as much as possible; where there are differences, the reasons should be made clear by context or explanation.

DOE Comments – Proposed Regulatory Provisions

§ 61.2, Compliance period definition

The definition for compliance period describes when it ends, but is unclear about when it begins. This leaves some ambiguity regarding whether the provision should be applied during the operational period It is suggested that the definition be revised to clarify that the compliance period for the purposes of § 61.41 and § 61.42 begins at the time of closure of the disposal facility. As a conforming change, the cross-reference in § 61.43 (to § 61.41) should be deleted, and either the salient requirements incorporated directly into § 61.43 or, given the existing cross-reference to Part 20, the requirements concerning effluents in § 20.1302 and § 20.1301 be used

§ 61.2, Defense-in-depth definition

The definition of defense-in-depth does not reflect the accepted use of the term, either in the U.S or internationally (e.g., in IAEA SSR-5 and the IAEA Safety Glossary) and is inconsistent with the preamble. As noted in the preamble, "The NRC's defense-in-depth approach to risk management ensures that safety is not wholly dependent on any single element of the design, construction, maintenance or operation of a regulated facility. . . Defense-in-depth for a land

disposal facility includes, but is not limited to, the use of remote siting, consideration of waste forms and radionuclide content, engineered features, and natural geologic features of the disposal site." Other relevant features mentioned in the preamble are, for example, land ownership and institutional control requirements (80 FR 16102, col. 2). Even in operating nuclear facilities, the term is understood to encompass a range of strategies, procedures, and operational considerations that go well beyond simply redundant physical barriers. (See https://www.iaea.org/ns/tutorials/regcontrol/assess/assess3213.htm.) It is suggested that the definition be revised to reflect the broader consideration that are discussed in the preamble as well as in proposed § 61.7(d).

§ 61.2, Inadvertent intruder and intruder assessment definitions

We support the clarification that the intruder assessment should consider only activities that are "realistic and consistent with expected activities in and around the disposal site at the time of site closure." NRC notes that the approach used to develop the classification tables remains protective. We agree, and note that this implies that the use of scenarios similar to those considered in the development of Part 61 is sufficient to meet the intent of the requirements We suggest clarifying this point in the regulatory language, in the definition for either the inadvertent intruder or the intruder assessment. This is a reasonable approach to limit speculation regarding potential scenarios and emphasizes the continued protectiveness of the existing classification system. It also reduces the regulatory burden because there already exists considerable experience in implementing these scenarios.

The use of the term "resource exploration or exploitation" in the definition of inadvertent intruder is problematic. It could be interpreted to include mining, which has not been considered within the realm of inadvertent intruder analyses in the past and could be complex to model and quantify. More importantly, the inclusion of resource exploitation adds little to no value to the intruder analysis for low-level radioactive waste. For geologic disposal, such scenarios can be important because they may serve as the sole means for intruders to access waste. For near-surface disposal, however, the potential outcomes of resource exploration would be very similar to (and likely bounded by) the "standard" intruder scenarios (i.e., resident farmer, well-drilling, and basement excavation), which already account for the possibility of waste being encountered directly. It is recommended that the term resource "exploitation" be eliminated from the definition of inadvertent intruder and, as noted above, that the definition of inadvertent intruder assessment be clarified to focus on the intruder scenarios used to establish the waste classification tables.

§ 61.2, Long-lived waste definition

The definition of long-lived waste should be deleted (and if retained, technical justification should be provided). Furthermore, the definition is extraneous; after being defined, the term appears only in § 61 7, Concepts. A quantitative interpretation of the term is not needed or relevant to its single use in that context. The appropriate basis to determine whether longer-term analysis is needed is the site-specific performance assessment rather than arbitrary numerical criteria. Implementation of a two tier approach with a compliance time of 1,000 years, as we

recommend, would remove the need for the definition and table. See also comments on proposed § 61.13(c)

§ 61.2, Performance assessment definition

The definition should include a consideration of associated uncertainties, as is done in the definition of *intruder assessment*. This is especially important in view of the proposed requirement in § 61.13(a)(3), (a)(8) and (a)(9) to consider probabilities and uncertainties regarding various aspects of performance assessment including unlikely features, events and processes; variability in the disposal facility and environment; and alternative conceptual models. It is suggested to use language that is as consistent as possible with existing definitions (e.g., NCRP Report No. 152, p. 18, or IAEA SSG-23 on safety assessment) rather than developing a new definition.

The proposed definition also places unnecessary focus on the concept of features, events and processes (FEPs), which is at odds with other definitions that have been widely used (e g., from ICRP, IAEA, and NEA) By using this terminology, the proposed rule appears to be requiring a single methodology to achieve a conceptual site model, an approach that is inconsistent with recent positions from the international community (e.g., the IAEA Safety Guide No SSG-23 on safety assessment and the NEA Methods for Safety Assessment of Geological Disposal Facilities: Outcomes of the MeSA Initiative, 2012). The use of an existing definition from one of these sources would resolve this issue as well.

Finally, the consideration of all FEPs (or whatever terminology is ultimately used)—namely, FEPS that "might affect the disposal system"—is too broad and could entail consideration of highly unlikely or fantastic events or combinations of events. Consideration should be limited to "reasonably foreseeable and significant" FEPs or factors that are relevant to performance. See also the comments on proposed § 61.13(a)(1) through (a)(5).

§ 61.2, Performance period definition

The proposed definition of the performance period specifies no end point and no criteria for establishing what period of time must be covered by analyses beyond 10,000 years. NRC makes clear that the period is left undefined in order to allow site-specific factors to be considered (80 FR 16097, col. 1). Additional discussion highlights that the time of peak dose would be a substantial consideration in determining how far into the future the modeling projections should run (ibid. and 80 FR 16092, col. 1). This is, in general, an approach that is consistent with a risk-informed process and that DOE supports.

However, it is not appropriate to forego any ultimate end-point for the performance period. Without an endpoint (or factors to be considered) for the performance period and associated analysis, the proposed regulations would impose an arbitrary and burdensome approach and would risk generating uncertain analyses without potential usefulness for risk-informed decision making In this regard, NRC (in its "Technical Analysis Supporting Definition of Period of Performance") rejects a peak dose approach with an undefined performance period, in part

because "peak dose could occur beyond the period of geologic stability, which would render quantitative values essentially meaningless" (p. 11).

An unrestrained performance period would not only extend modeling analyses beyond potential usefulness, but would also impose additional requirements. The proposed requirements in § 61.42(c), for example, require that "effort shall be made to minimize releases . . at any time during the performance period." (See also DOE comments on minimization, in general comments and regarding proposed sections § 61.41(b) and (c), § 61.42(b) and (c).) With no end to the performance period, this means that licensees could be required to take measures now to reduce future potential releases, based on highly uncertain and limited analyses. This is not justifiable and conflicts with ethical principles that assign greater weight to near-term hazards than to hypothetical long-term risks. In this regard, DOE generally conducts performance assessments for low-level radioactive waste disposal to the time of peak dose or a shorter time period, as appropriate, to risk inform decisions. However, DOE does not impose dose limits or performance measures during time frames beyond 1,000 years post-closure.

Consistent with the above principles, we recommend that, at a maximum, the performance period should not extend beyond peak dose (or impacts) or the period of surface geologic stability, whichever is sooner.

NRC has apparently dismissed part of this approach, stating in the proposed supporting guidance (NUREG-2175) that "It would not be appropriate to constrain the analyses to the period of near-surface geologic stability, as one of the reasons for undertaking the performance period analyses is for a licensee to communicate to decision-makers the potential range of consequences from the disposal action. Near-surface geologic instability may result from a process such as fluvial erosion (e.g., driven by lake formation), which could have severe impacts at an unstable site. Near-surface geologic instability may indicate that the site is unsuitable for disposing of significant quantities of long-lived radioactive waste. A licensee should not use near-surface geologic instability as a basis for limiting the analysis. If the analysis for LLW disposal was limited to the period of near-surface geologic stability, the analysis could be truncated prematurely and the long-term risks and uncertainties may not be understood. In addition, instability could be used as a basis to select a site, which is not acceptable." (p. 2-24)

While NRC's staff express legitimate concerns, these concerns nonetheless do not justify the regulatory approach proposed in the rule and supporting guidance. We agree that it would be objectionable to provide an incentive for picking an unstable site in order to avoid the regulatory burden of extended analyses, but we find it unlikely that such a site would fulfill the other significant requirements in the rule. Furthermore, there are means to counter such an effect without extending modeling. Indeed, requiring a description and justification of when and why the performance period is truncated would give significant insights into the site characteristics and stability. It is within NRC's discretion to consider such information as part of the safety case on which the licensing process will be based.

Most important, the extension of performance analyses beyond the period of surface geologic stability is unsupportable from a technical perspective. Geologic repositories may rely on longer timeframes for analysis precisely because, being at depth, they are not likely to be significantly

affected by events and processes at the surface The timeframe for surface effects from geologic processes is notably less than that for deeper geologic stability (NEA 2009 Timescales Report[3], Figure 5.12a and pp. 27-28). Once processes affecting the surface at a certain magnitude and breadth occur, the analysis of the site is unreliable even qualitatively. Any results are, furthermore, much less likely to be relevant, since populations near a site affected by, for example, a new ice age are likely to face much more significant and immediate threats to their lifestyle and survival than the potential for a localized incremental increase in cancer risk.

NEA says, "Truncating calculations too early may run the risk losing information - for example on the possible timing and magnitude of peak consequences . . . At sufficiently distant times, however, uncertainties call into question most of the assumptions made in evaluating radionuclide releases." The NEA further cautions that relying on such modeling can undermine confidence in the safety case (NEA 2009 Timescales Report, p. 73). While calculations can always be extended, they add no value if they cannot be meaningfully interpreted, and to require them implies a level of confidence that is not warranted. As noted in our general comments on the three-tiered approach, doses and risk "cannot be forecast with any certainty beyond around several hundreds of years into the future" (ICRP-81), so calculations for longer time periods already test the limitations of PA. The interpretation, even qualitatively, of assessments beyond the time of relevant geologic stability is truly questionable. Even if peak impacts might occur beyond the period of surface geologic stability, the reliance on modeling at that point, with its inherent uncertainties regarding nearly every aspects of assessment[4] is entirely insufficient as a basis for regulatory decision making and the requirement for "effort to minimize . . . to the extent reasonably achievable". (See proposed § 61.41(c) and proposed § 61.42(c); see also DOE comments regarding minimization, in general comments and regarding proposed sections § 61.41(b) and (c); § 61.42(b) and (c))

We understand also that a significant motivator for the performance period is to gain information regarding long-term performance—but even 1,000 years already *is* long-term performance. Analyses for longer-term performance should be conducted with the recognition of the growing speculation and uncertainty over time. As NEA aptly noted, "while some hazard may remain for extremely long times, increasing uncertainties mean that there are practical limitations as to how long anything meaningful can be said about the protection provided by any system against these hazards. . . . These practical limitations need to be acknowledged in safety cases "[5] Modeling should be extended further only if site-specific characteristics dictate that it might be useful *and* there is a valid scientific and technical basis on which assessment may be founded. For near-surface disposal, the second condition is fulfilled only during the period of surface geologic stability, and this is the maximum amount of time that any assessments in the regulation should cover.

NRC has already recognized, in its draft NUREG-2175 (p. 2-24) that it is necessary to establish an end point for the performance period; the essential criteria to do so belong in regulation, not in guidance. The definition of "performance period" should be revised, therefore, to clarify that the

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[3] *Considering Timescales in the Post-closure Safety of Geological Disposal of Radioactive Waste*, OECD Nuclear Energy Agency, 2009, p 39 Future citations refer to this report as "NEA 2009 Timescales Report "

[4] See " Technical Analysis Supporting Definition of Period of Performance for Low-Level Waste Disposal, Figures 3 and 4

[5] NEA 2009 *Timescales Report*, p 27

performance period extends until peak dose or impacts are reached or the period of surface geologic stability, whichever is sooner

§ 61.2, Safety case definition

We support including the concept of the safety case in the proposed regulation, as it provides a fuller view of site and disposal system understanding, and the non-quantitative factors that can enhance confidence in safety. While these concepts have long been an implicit part of the licensing process, using the term *safety case* emphasizes that the U.S. approach is in concert with international approaches. It is puzzling, therefore, that NRC provides its own definition of safety case rather than using those established in international guidance. The existing international guidance is sufficient and applicable for the case of LLW disposal, thus there is no need for significant elaboration of the concept in the rule. We suggest that NRC, as much as possible, use language consistent with the safety case definition issued by IAEA. See *The Safety Case and Safety Assessment for the Disposal of Radioactive Waste*, Specific Safety Guide No. SSG-23, IAEA, 2012 (Paragraph 1.3, for example).

§ 61.7(c)(4), Intruder assessment concept

The proposed new performance objective (cross-referenced in proposed § 61.7(c)(4)) uses a dose limit during the compliance and protective assurance periods (or, for the protective assurance period only, an alternative level, if approved, that is reasonably achievable based on technical and economic considerations). The use of a strictly enforced dose limit as the performance objective for an inadvertent intruder assessment covering any period after closure is inconsistent with DOE and international positions regarding inadvertent intrusion. The general position internationally is that intruder assessments are hypothetical cases used to identify features that can help reduce the potential for and/or consequences of intrusion. That is, human intrusion analyses are used as a tool to assist in optimization of the disposal facility design. IAEA's safety standards, for example, recommend no limits regarding human intrusion, but instead offer guidelines for what doses may warrant efforts to reduce the probability or consequences of intrusion (IAEA SSG-5, para. 2.15). ICRP similarly recommends no dose constraint for human intrusion, saying that a constraint "is not applicable in evaluating the significance of human intrusion because, by definition, intrusion will have bypassed the barriers which were considered in optimization of protection for the disposal facility . . . any protective actions required should be considered during the development of the disposal facility". ICRP considered that "reasonable efforts should be made to reduce the probability of human intrusion or to limit its consequences" when doses exceed 100 mSv (ICRP-81, paragraphs 63-64).

We recommend that the dose limit for intruder protection be recast as a goal that is used to develop waste acceptance criteria and demonstrate added robustness of the disposal approach. If this is not done, then we recommend that additional clarifying discussion be provided in the concepts section to include the points mentioned above. See also comments on proposed § 61.42(a).

§ 61.7(c)(6), Waste with significant concentrations of long-lived radionuclides

The site-specific PA will inherently address whether the proposed waste inventory poses longer term hazards or not and, thus, whether analyses will need to address longer timeframes. The site-specific analyses required over the compliance period and beyond, in themselves, constitute a case-by-case evaluation that provides the basis for determining whether relevant performance aspects (such as time of peak dose) have been adequately captured. This is true regardless of what characteristics (longevity, mobility, etc.) contribute to the need for longer-term assessment. The specificity defining and categorizing "long-lived waste" is unnecessary and the concept should be deleted from the rule.

§ 61.7(d), Defense-in-depth

The discussion of defense-in-depth, while broader than the proposed definition in § 61.2, does not reflect the accepted use of the term, either in the U.S. or internationally (e g., in IAEA SSR-5 and the IAEA Safety Glossary) and is inconsistent with the preamble. As noted in the preamble, "NRC's defense-in-depth approach to risk management ensures that safety is not wholly dependent on any single element of the design, construction, maintenance or operation of a regulated facility. . . . Defense-in-depth for a land disposal facility includes, but is not limited to, the use of remote siting, consideration of waste forms and radionuclide content, engineered features, and natural geologic features of the disposal site." Other relevant features mentioned in the preamble are, for example, land ownership and institutional control requirements (80 FR 16102, col. 2). The more inclusive view of defense-in-depth, including administrative and operational controls, should be included in the discussion of the concept.

§ 61.7(f), Waste classification and stability

The emphasis on details related to "long term" stability is not needed. Stability is important for the 500 year timeframe for the classification system (e.g., assumptions for the classification tables), but over thousands of years, stability becomes less meaningful for assessing level of protectiveness If the site-specific PA demonstrates that performance objectives can be met with reasonable assurance, even if there are increases in infiltration or other changes in the system, then "stability" as a separate and specific criterion is not needed. Such requirements may be very difficult to meet, but at the same time may have little impact on the protection of human health (e.g , calculated dose). In a performance-based approach, PA is the appropriate means to account for the relevance of factors such as this. It is recommended that the discussion of stability in this section be deleted. See also comments on §§ 61.13(d) and 61.51.

§ 61.13, Application to existing facilities

The preamble to the proposed regulations (at page 16088) states that the proposed rule would become effective 1 year after the final rule is published for NRC licensees, and that Agreement States would have 3 years to adopt compatible provisions. In turn, the proposed regulatory language in the chapeau to § 61.13 and in § 61.58(d) would require existing licensees to conduct various additional technical analyses and apply new waste acceptance provisions at the next license renewal or within 5 years of the effective date of the proposed new requirements,

whichever comes first. In contrast to both approaches, the existing general provisions in Subpart A (§ 61.1(a)) —which would not be amended by the proposed regulation —state that applicability of requirements in Part 61 to existing licensees "will be determined on a case-by-case basis." We recommend conforming revision to § 61.1(a) and, as necessary, the final preamble to the regulations, so that the provisions are consistent with each other. Given the numerous new provisions and new analysis that would be required by the regulations, DOE also supports delaying application of the proposed regulations until a reasonable time in the future, with an emphasis on *new* waste streams and *new* operations.

§ 61.13(a)(1) to (a)(5), Technical analyses (FEPs consideration)

The focus on the term "features, events and processes" does not align well with more recent international best practice, in which approaches based on "safety functions" have emerged (see, for example, http://www.oecd-nea.org/rwm/reports/2012/nea6923-MESA-initiative pdf). It is recommended that the proposed rule be revised to reinforce and place more emphasis on the more current approaches for scenario development involving the use of safety functions, either through revisions to this section or with additional discussion added in the concepts section.

Furthermore, as noted in our general comments, DOE does not support the imposition of the protective assurance period and recommends that it be eliminated. However, if the protective assurance period is retained, DOE supports the approach to the identification of relevant FEPs in performance assessment beyond the compliance period: that FEPs applicable in the compliance period (up to 1,000 years) be extended and that new FEPs be added only if scientific information compelling such changes is available (80 FR 16090, col. 1). However, the proposed regulatory language may require revision to properly reflect the stated intention. To this end, § 61.13(a)(1) should be revised to more clearly apply to the compliance period performance assessment, as in "Consider features, events and processes that might affect compliance with § 61.41(a)."

It is not clear why a separate requirement is provided [in § 61.13(a)(5)] regarding degradation or alteration processes. The requirement in § 61.13(a)(1) already requires a technical basis for inclusion or exclusion of all FEPs, so the provisions on degradation are redundant. We suggest that the proposed § 61 13(a)(5) be deleted.

§ 61.13(a)(10), Roles of natural and engineered features

It is not clear what purpose is served by the requirement to "identify and differentiate between the roles performed by the natural disposal site characteristics and design features of the disposal facility." The relevant aspects of both the site and the engineered features, as well the interactions between them, are appropriately captured by requirements to consider relevant FEPs (or safety functions). To require further analyses and differentiation imposes redundant requirements and provides no value-added to risk-informed decision-making and licensing--but does add confusion, especially since it implies the possibility of sub-system requirements. We suggest that this paragraph be deleted.

§ 61.13(b), Inadvertent intruder analyses

The description of the inadvertent intruder analyses is confusing and inconsistent with the definition proposed for an *intruder assessment* in proposed § 61.2. The "analyses" appear to include additional requirements beyond the assessment, as described in proposed § 61.13(b)(1) to 61 13(b)(2). However, the required information is vague and adds little apparent value to risk-informed decision making:

- It is not clear how (or what type of) "human intrusion analyses" can demonstrate that the waste acceptance criteria will be met [proposed § 61.13(b)(1)] The allowable activity levels in waste acceptance criteria (WAC) may, in fact, be based on an intruder assessment, among other analyses (see proposed § 61.58(a)(1)). To base the WAC on an intruder assessment and then to require a human intrusion analysis to confirm compliance with the WAC is circular and meaningless On-the-ground compliance with the WAC is adequately addressed by the waste characterization and certification requirements in § 61.58. The provision at proposed § 61.13(b)(1) should be deleted.

- It is not clear how (or what type of) analyses can demonstrate that "adequate barriers to human intrusion will be provided" [proposed § 61.13(b)(2)] In a performance-based and risk-informed approach, the means to demonstrate that barriers are adequate is to show that performance objectives can be met with the performance assessment and intruder assessment. As NRC has observed in other regulations related to radioactive waste disposal, "A complete performance assessment . . . will illustrate the effectiveness of the multiple barriers, and the implementation of the philosophy of defense in depth, such that the individual protection standard is shown to be met even when barriers are challenged. . . The Commission is confident that evidence for the resilience, or lack of resilience, of a multiple-barrier system will be found by examining a comprehensive and properly documented performance assessment of the behavior of the overall repository system." (66 FR 55759) The analysis at proposed § 61.13(b)(2) adds no specificity or substance and should be deleted.

Proposed paragraph 61.13(b)(3)(ii) would require "adequate" barriers to intrusion. No definition or criteria are provided to judge the adequacy of barriers. The remaining language in the paragraph appropriately describes the relevant features of a barrier that may contribute to its effectiveness and the need to provide a basis for the period of effectiveness. The term "adequacy" adds little value but raises the question of additional (but arbitrary, given that they are not specified) criteria being applied; the term should be dropped from the requirement.

§ 61.13(d), Long-term stability

The proposed rule retains an existing requirement to analyze long-term stability of the disposal site, with slight changes to the language However, the implications of this requirement are very different when applied over timeframes of thousands to tens of thousands of years. It is not possible for such timeframes (thousands of years or more) that long-term stability of the site "can be ensured," as the revised language now states. Furthermore, the requirement is superfluous in view of the numerous other site-specific analyses now proposed. In a performance-based approach, the performance assessment is the appropriate means to account for the relevance of factors such as this. If performance objectives can be demonstrated to be met with reasonable

assurance, even if there are increases in infiltration or other stability-related changes, then "stability" as a separate and specific criterion is not needed. A requirement on long-term stability may be very difficult to meet, and at the same time may have little impact on the protection of human health (e.g , dose calculation). It is recommended that the requirement for a separate analysis of site stability be deleted. If the provision is retained, the proposed language that stability "can be ensured" should be dropped. and the analysis should extend no longer than the compliance period. See also comments on § 61.44.

§ 61.13(e), Potential long-term radiological impacts (Table A)

The proposed provisions require analyses over the performance period (i.e., beyond 10,000 years after closure) "for disposal sites with waste that contains radionuclides with the average concentrations exceeding the values listed in Table A of this paragraph, or if necessitated by site-specific conditions". Several changes from the proposal are suggested to enhance the technical basis and better align it with the intent to use site specific performance analyses:

- Table A should be eliminated. The technical basis described for the derivation of the concentrations is limited and unclear. The preamble states that the values are "primarily, but not solely, based on the Class A LLRW concentration values" (80 FR 16097, col. 1), but does not explain why the Class A limits are an appropriate indicator or technical basis to determine the need for analyses beyond 10,000 years. There is no justification for defining hazards over this duration based on the Class A limits, since such timeframes were not considered in developing those limits. Furthermore, Table A may be rendered moot by the clause regarding "site-specific conditions," where the table alone will not be determinative of whether a longer-term analysis is needed. Given this, the results of site-specific analyses already required for the compliance period (and the protective assurance period, if it is retained) should be used to determine whether it is appropriate to conduct longer-term analyses. This approach is technically supportable and better aligns with the declared intent to establish a risk-based approach using site-specific PAs.

- To establish clear expectations on the part of licensees, further explanation should be provided on what "site-specific conditions" might necessitate performance period analyses. The preamble discussion on timeframes (80 FR 16093 *et seq*) makes clear that the peak dose, including potential in-growth of progeny (from uranium, in particular) is a central consideration, and this could provide an appropriate basis for delineating the need for extending the analysis. We recommend that the site-specific analysis be used to determine the need for analyses into the far future.

- As noted in our general comments, we recommend that the protective assurance period be eliminated.

Therefore, it is suggested that § 61.13(e) be revised to read, "The time period required to be considered shall be determined based on site-specific conditions addressed in the PA. Performance period calculations shall be performed if the analyses for compliance period in §§ 61.41(a) and 61.42(a) indicate that peak doses have not been attained (i.e. doses are stable or rising) at 1,000 years, including consideration of the in-growth of progeny from the intended

waste streams." See also DOE's comments on § 61.2, performance period definition, for discussion of the recommended limits on the performance period.

If the protective assurance period is retained, then the language in § 61.13(e) should be revised to read: "The time period required to be considered shall be determined based on site-specific conditions addressed in the PA. Performance period calculations shall be performed if the analyses for compliance and protective assurance periods in §§ 61.41(a)-(b) and §§ 61.42(a)-(b) indicate that peak doses have not been attained (i.e. doses are stable or rising) at 10,000 years, including consideration of the in-growth of progeny from the intended waste streams." See also DOE's comments on § 61.2, performance period definition, for discussion of the recommended limits on the performance period.

§ 61.13(f), Defense-in-depth

It is unclear what value is provided by "analyses" to be conducted to demonstrate that defense-in-depth measures are included at a disposal facility. This effort should be focused on documenting the contributors to defense-in-depth rather than a quantitative analysis. As noted earlier, the accepted use of the term (and NRC's own discussions of it in the preamble to, and other sections of, this proposed rule) encompasses siting and operational aspects Furthermore, as NRC observes, "The capabilities of any of those design features and site characteristics may not be either independent or totally redundant. . . . The capabilities of site characteristics and engineered features over the long timeframes are subject to interpretation and include many uncertainties. . . . Therefore, NRC expects that licensees will rely on both the characteristics and the engineered features, in combination, to provide reasonable assurance that the overall performance of the disposal site will be adequate over long time periods." (80 FR 16092) The function of the various engineered and natural barriers, and their interactions, is required to be accounted for in the performance assessment. As NRC has observed in other regulations related to radioactive waste disposal, "A complete performance assessment . . . will illustrate the effectiveness of the multiple barriers, and the implementation of the philosophy of defense in depth, such that the individual protection standard is shown to be met even when barriers are challenged. . . . The Commission is confident that evidence for the resilience, or lack of resilience, of a multiple-barrier system will be found by examining a comprehensive and properly documented performance assessment of the behavior of the overall repository system." (66 FR 55759)

Further quantitative assessment, as implied by the term "analyses," of redundancy over long timeframes is likely to be highly uncertain and difficult to interpret—and ignores many other important facets of defense-in-depth. To address these concerns, it is suggested that the language in § 61.13(f) be revised to read, "A description of defense-in-depth measures applied at the proposed disposal facility, and discussion of the means by which they provide passive safety, provide redundancy, or enhance confidence in the safety case and long-term performance."

§ 61.41(a), Protection of the general population

No definition is provided for "any member of the public". The requirement should be restricted to a representative member of the public located in the general environment (i.e., outside the

boundaries of the disposal system, including the buffer zone) of the disposal facility. Such an approach is also consistent with the application of updated dosimetry methods that would be allowed by the proposed changes. More recent ICRP guidance discusses the applicability of limits and constraints to a "representative person" (ICRP 103, Section 5.4.2).

§ 61.41(b), Protection of the general population during the protective assurance period

As noted in our general comments, we recommend that the protective assurance period be deleted, and that the performance period be designated to begin at 1,000 years after closure Accordingly, we recommend that the proposed provisions of § 61.41(b) be eliminated.

If the protective assurance period and the associated analyses are retained, then several important changes and clarifications should be made to align the provision with NRC's stated intentions.

- The requirement to "minimize" releases of radioactivity for the protective assurance period is inappropriately stringent and does not seem to reflect the intention of NRC. The preamble discussion states that "The protective assurance analyses are being proposed as a minimization process (i.e., optimization) with guidance provided on the goals to use in the minimization process." (80 FR 16089, col. 3) The term minimize does not properly reflect the multi-faceted optimization process, which entails consideration of numerous factors; indeed, "minimize" as used in the proposed regulatory language can be interpreted as being more stringent than the As Low As Reasonably Achievable (ALARA) requirement applied to the compliance period, since it does not clearly allow for consideration of what is feasible or reasonable.

- Furthermore, proposed § 61.41(b), as written, does not set forth "goals," but rather imposes requirements. As such, it is not consistent with the Commission's direction in its February 12, 2014 Memorandum, which calls for a "goal of keeping doses below a 500 mrem/yr analytical threshold". NRC expresses its intention that the dose level for the protective assurance period should function as "a goal rather than a limit" (80 FR 16097, col. 3). While this intention is reflected in the language allowing "a level that is supported as reasonably achievable," the requirement to minimize releases adds confusion.

- No definition is provided for the "general environment". A definition should be added, here or in § 61.2, to clarify that the general environment means that area outside the boundaries of the disposal system and its buffer zone.

In order to better align the regulatory language with the stated intentions of NRC for the protective assurance period, it is suggested that the following alternative language be used.

> Efforts shall be made to reduce releases to a level that is reasonably achievable based on technical and economic considerations, *provided* that licensees shall be presumed to meet this goal if the annual dose does not exceed a dose target of 5 milliSieverts (500 millirem) Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a).

§ 61.41(a)-(b), Protection of the general population

The treatment of radon should be consistent with that in other rules from NRC and other U.S. regulatory agencies. Radon should be specifically excluded from consideration in assessing compliance with the dose limits and targets in these sections. A separate radon performance objective (e.g., a flux limit) would be consistent with other NRC, EPA, and DOE rules [e.g., 40 CFR Part 190.10, 40 CFR Part 61 (subpart H), 40 CFR Part 61.192 (subpart Q), 10 CFR Part 40 (Appendix A, criterion 6), 10 CFR Part 20.1101(d), DOE Manual 435.1-1]. A major factor in the update to Part 61 is to address DU, so consistency with other national regulations addressing uranium is appropriate. NRC might consider instead adding a performance objective for radon flux.

§ 61.41(c), Protection of the general population during the performance period

As noted in our general comments, we support the concept of a performance period, for which the results of modeling analyses are considered qualitatively to inform site understanding and contribute to optimization of design. We recommend that the performance period begin at 1,000 years after closure, directly following the compliance period. Whether or not this change to the performance period timeframe is made, the use of the term "minimize" is problematic in the requirements for the performance period. The term "minimize" does not properly reflect the multi-faceted optimization process, which entails consideration of numerous factors; indeed, "minimize" as used in the proposed regulatory language can be interpreted as being more stringent than the ALARA requirement applied to the compliance period, since it does not clearly allow for consideration of what is feasible or reasonable. It is suggested that the language be revised to read, "Effort shall be made to reduce releases of radioactivity . . . ."

§ 61.42(a), Protection of inadvertent intruders during the compliance period

The application of a dose limit for an inadvertent intruder assessment covering any period after closure is inconsistent with international positions regarding inadvertent intrusion. The general position internationally is that intruder assessments are hypothetical cases used to identify features that can help reduce the potential for and/or consequences of intrusion. That is, human intrusion analyses are used as a tool to assist in optimization of the disposal facility design. The IAEA safety standards, for example, recommend no limits regarding human intrusion, but instead offer guidelines for what doses may warrant additional optimization: for annual doses in the range of 1-20 mSv (100 mrem-2 rem), "reasonable efforts are warranted at the stage of development of the facility to reduce the probability of intrusion or to limit its consequences" (IAEA SSG-5, para. 2.15). ICRP similarly declined to recommend a dose constraint for human intrusion, saying that a constraint "is not applicable in evaluating the significance of human intrusion because, by definition, intrusion will have bypassed the barriers which were considered in optimization of protection for the disposal facility. . . any protective actions required should be considered during the development of the disposal facility" (i.e., in optimization). ICRP considered that "reasonable efforts should be made to reduce the probability of human intrusion or to limit its consequences" when doses exceed 100 mSv (ICRP-81, paragraphs 63-64).

The establishment of a dose limit for intrusion is also inconsistent with NRC's approach in establishing 10 CFR Part 61 initially. While NRC originally proposed to adopt a 500 mrem inadvertent intruder standard, this approach was dropped from the final rule because (as explained in the final EIS[6]) NRC concluded that the dose level could reasonably be used as the basis for deriving waste classification tables (i.e., as a target for identifying measures to reduce potential impacts of inadvertent intrusion), but its use as a regulatory limit was not justified or practical. We recommend that the 500 mrem dose limit for intruder protection during the compliance period be recast as a goal that is used to develop waste acceptance criteria and to demonstrate added robustness of the disposal approach. Corresponding changes are also needed in proposed § 61.13(b)(3) to reflect that dose-based performance objectives in proposed § 61 42 are goals (or guidelines) and not strict dose limits. See also comments on proposed § 61.7(c)(4).

The requirement that the disposal facility must "ensure" protection is an overstatement of what can be demonstrated in performance assessment projections for even the compliance time period. The language should be revised to more accurately reflect the reasonable assurance concept (which is applied through the proposed provision at § 61 23(b)), to read, "Design, operation and closure of the land disposal facility must provide protection of an inadvertent intruder . . . ." (Suggested language changes are shown underlined.)

§ 61.42(a)-(b), Protection of inadvertent intruders during the compliance and protective assurance periods

The treatment of radon should be consistent with that in other rules from NRC and other U.S. regulatory agencies. That is, radon should be specifically excluded from consideration in assessing compliance with the dose limits and targets in these sections. Instead, NRC should develop a separate radon performance objective consistent with other NRC, EPA, and DOE rules (e.g., the flux limit). All agencies that address uranium related wastes that lead to radon generation exclude radon from all pathways and treat it separately [e.g., 40 CFR Part 190.10, 40 CFR Part 61 (subpart H), 40 CFR Part 61.192 (subpart Q), 10 CFR Part 40 (Appendix A, criterion 6) 10 CFR Part 20.1101(d), DOE Manual 435.1-1], all of which specifically exclude radon in the air/all pathways objectives]. A major factor in the update to Part 61 is to address DU, so consistency with other EPA and NRC regulations addressing uranium is appropriate.

§ 61.42(b), Protection of inadvertent intruders during the protective assurance period

As noted in our general comments, we recommend that the protective assurance period be deleted, and that the performance period be designated to begin at 1,000 years after closure. Accordingly, we recommend that the proposed provisions of § 61.42(b) be eliminated.

If the protective assurance period and the associated analyses are retained, then important changes and clarifications should be made to align the provision with NRC's stated intentions The use of the term "minimize" is problematic in this context, as discussed regarding the requirements for protection of the general public for the protective assurance period. (See

[6] NUREG-0945 Final Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Vol 1 - Summary and Main Report, Nov. 1982,p. 5-4.

comments on proposed § 61.41(b).) For the same reasons, it is suggested to revise the requirement to read:

> Reasonable and practical measures shall be taken in the design, operation and closure of the land disposal facility to control exposures to an inadvertent intruder during the protective assurance period. Efforts shall the made to reduce releases to a level that is reasonably achievable based on technical and economic considerations, *provided* that licensees shall be presumed to meet this goal if the annual dose does not exceed a dose target of 5 milliSieverts (500 millirem). Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b).

Corresponding changes are also needed in proposed § 61.13 to reflect NRC's stated intention that the reference dose is intended as a target and not a limit. In proposed paragraph 61.13(b)(3), the phrase "doses that exceed the limits set forth in § 61.42" should be revised to reflect that dose-based performance objectives in § 61 42(a) (see preceding comment) and § 61.42(b) are goals (or guidelines) and not strict dose limits.

Note that we also recommend using the term "practical" rather than "practicable" in the regulatory language. See comments on proposed section § 61 44 for further explanation.

§ 61.42(c), Protection of inadvertent intruders during the performance period

The use of the term "minimize" is problematic in this context, as discussed regarding the requirements for protection of the general public for the performance period (proposed § 61.41(c)). For the same reasons, it is suggested to revise the requirement to read· "Efforts shall be made to reduce exposures to an inadvertent intruder . . . ."

§ 61.44, Stability of the site after closure

The proposal retains an existing requirement regarding stability of the site after closure, with proposed wording that extends the requirement to cover the compliance period and the protective assurance period As noted in our general comments, we recommend that the protective assurance period be eliminated Whether or not this is done, the extension of the existing requirements out to 10,000 years is unjustified and burdensome. The value in separate requirements for site stability over thousands of years is questionable It is also inconsistent with previous NRC evaluations of stability relevant to disposal of long-lived radionuclides In considering disposal of DU-contaminated materials in near-surface disposal. NRC accepted that design measures and cell construction practices provided a "technical basis sufficient for demonstrating long-term site stability".[7]

Most importantly, in a performance-based approach, the performance assessment is the appropriate means to account for the relevance of factors such as this. If performance objectives can be demonstrated to be met with reasonable assurance, even if there are increases in infiltration, then "stability" as a separate and specific criterion or performance objective is not

[7] "Safety Evaluation Report Request For Alternate Disposal Approval And Exemptions For Specific Hematite Decommissioning Project Waste At US Ecology's Idaho Facility, October 28, 2011, ADAMS ML 111441087, p 7

needed A requirement on long-term stability may be very difficult to meet, and at the same time may have little impact on the protection of human health (e.g., dose calculation).

It is recommended that this performance objective be deleted. If it is retained, the language should reflect that the requirement is relevant for only a limited, reasonable period of time following closure. We suggest that it could be appropriate to demonstrate stability for the period of 300 years over which Class B and Class C wastes forms are expected to endure (as discussed in the proposed concepts in § 61.7(f)), in order to support continued use of the classification tables. Another period may be justifiable, but in no case should stability be evaluated separately beyond the compliance period (i.e., 1,000 years). We also recommend changing "practicable" to "practical" in the existing regulatory language; as commonly understood, "practicable" means capable of being put into effect, whereas "practical" refers to something that is also sensible or worthwhile.[8] The language should also be modified to require that measures "eliminate to the extent practical the need for ongoing active maintenance of the disposal site during the institutional control period so that only surveillance, monitoring, or minor custodial care are required." (Suggested language modification are shown underlined.) See also comments on proposed §§ 61.7(f) and 61.13(d).

§ 61.50 (a)(2), Site suitability for near-surface disposal

NRC's proposal retains (but reorganizes) detailed site suitability requirements. In view of the numerous other site-specific analyses now proposed, the value of specific requirements for site-suitability is questionable, and this section is unduly detailed. More importantly, while such provisions were meaningful complementary requirements to the table-based classification approach, such criteria are unnecessary and at odds with a truly risk-informed approach to regulation. As NRC has stated, "the risk-informed, performance-based approach . . eliminates arbitrary or prescriptive siting and design criteria, as well as detailed requirements such as quantitative subsystem performance objectives" (66 FR 55737). A sound conceptual model of the site and a comprehensive performance assessment provide the means to assess the significance of site attributes. In a performance-based approach, the appropriate method to evaluate the site suitability is the site-specific performance assessment. Performance-relevant site characteristics and associated disruptive events (and uncertainties) must be considered (as is required already by other parts of the proposed regulations); if the performance objectives can be shown to be met with reasonable assurance, then additional criteria are not necessary. Such restrictions may eliminate potentially viable sites without adding public protection. It is recommended that the detailed site suitability criteria in proposed § 61.13(a)(s) be eliminated.

§ 61.58, Waste acceptance criteria exceptions

NRC's proposed approach allows that the WAC may be established based on site-specific analyses that account for the site and facility performance, or based on the pre-existing classification tables. Once the WAC is established, the provisions of proposed § 61.52(12) prohibit the disposal of any waste that does not meet the acceptance criteria. According to the proposed rule, any adjustments to the WAC would require a license modification [proposed § 61.58(g)].

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[8] See, e.g., *Webster's II New Riverside University Dictionary*, 1984

There is no provision for considering exceptions from WAC. Under the proposed regulation, a request for a license amendment would be required in order to accept waste with characteristics that were not addressed in the PA and WAC. However, as NRC acknowledges throughout its regulatory discussion, small amounts of waste falling outside the PA assumptions (i.e., small amounts of DU or other long-lived waste) may be accommodated in a disposal facility without affecting its protectiveness. Given this, it would be useful to provide a means for exceptions by a less onerous method than submitting a license amendment. An appropriate mechanism might be by special analyses as a supplement to the PA, which shows reasonable assurance that the performance objectives can still be met. Alternatively, NRC may consider an alternative approach that does not incorporate the WAC directly into the license.

DOE responses to NRC's specific requests for comments in the Federal Register notice

NRC is seeking feedback on the proposed approach, especially with regard to whether a 5 milliSievert (500 mrem) annual dose target is appropriate for the protective assurance period and whether it is appropriate to require licensees or license applicants to consider alternative levels to minimize exposures to an inadvertent intruder. (80 FR 16090-16091)

As discussed in our general comments (above), we recommend that the protective assurance period be eliminated. The imposition of an intermediate "protective assurance" period (from 1,000 to 10,000 years after closure) does not appropriately accommodate the uncertainties and limitations of modeling over very long timeframes. It establishes *de facto* requirements over very long timeframes without adding materially to an understanding of the relevant behavior of long-lived nuclides—depleted uranium, in particular. We recommend that a two-tiered approach be adopted that retains the proposed 1,000-year compliance period (and associated dose limit), eliminates the protective assurance period (and associated reference dose), and applies the qualitative performance period approach to modeling assessments beginning at 1,000 years after closure.

If the protective assurance period is retained, we support the use of 500 mrem as a dose goal for the hypothetical inadvertent intruder (and the hypothetical future member of the public) because it reflects, better than lower dose levels would, the uncertainty and speculative nature of calculations extending into timeframes beyond 1,000 years. A target dose of 500 mrem/yr is below the average annual dose for people living in the United States today[9] and is on the same order as risks considered acceptable resulting from radon exposure in residences, for example.[10] Internationally, there is good acceptance that exposures on the order of natural background are reasonable reference points for very long term assessments. IAEA suggests that "In very long time frames . . . uncertainties could become much larger and calculated doses may exceed the

[9] The National Council on Radiation Protection and Measurements (NCRP) estimates that the average annual exposure in the U.S. is 620 mrem/yr. Approximately half that amount is due to natural background radiation. See NCRP Report No. 160: *Ionizing Radiation Exposure of the Population of the United States* (2009), as cited at http://www.epa.gov/radiation/understand/perspective.html

[10] The EPA's radon action level—the level below which the Agency does not recommend actions to further reduce radon levels—is 4 pCi/L. At that level of exposure over a lifetime, the increased risk of lung cancer is up to 62 in 1000. See *A Citizen's Guide to Radon*, U.S. Environmental Protection Agency, http://www.epa.gov/radon/pubs/citguide.html

dose constraint [of 100 mrem] Comparison of the doses with doses from naturally occurring radionuclides may provide a useful indication of the significance of such cases."[11]

In addition, several changes to the proposed regulatory language would also be needed to align the requirements with NRC's stated intentions if the protective assurance period is retained Importantly, the proposed regulatory language does not set forth 500 mrem as a "goal," but rather imposes requirements. As such, it is inconsistent with NRC's stated intent in the preamble and with the Commission's direction in its February 12, 2014 Memorandum, which calls for a "goal of keeping doses below a 500 mrem/yr analytical threshold". The use of the term "minimize" is also problematic and can be interpreted to be more stringent than the dose limits applied during the compliance period. See comments on §§ 61.41(b), 61.41(c), 61.42(b), and 61.42(c).

If the 500 mrem annual dose is properly conveyed as a target, then consideration of alternative levels is inherently included; that is, a goal allows some flexibility, especially in view of appropriate qualifying terms such as "reasonably achievable". Beyond 1,000 years after closure, measures to further reduce doses below the target level are not justifiable, because they may entail large costs for little change in modeled doses to a hypothetical future member of the public and a hypothetical future inadvertent intruder: such an approach is inconsistent with ethical principles that state that emphasis for the very long term should be on averting catastrophic consequences (NRC's "Technical Analysis Supporting Definition of Period of Performance," p. 10). We recommend changes to the proposed regulatory language to eliminate the protective assurance period or, in the alternative, to reflect that additional efforts need not be made to further reduce doses if the goal of 500 mrem is met.

As previously stated, NRC is making available the draft guidance document (see Docket ID NRC–2015–0003) for public comment concurrent with the publication of this proposed rule and is seeking comments on whether the approaches described in the guidance are adequate or if further specification for inadvertent intruder scenarios in the proposed rule is necessary. (80 FR 16091)

We recommend that several changes be made to the intruder assessment and inadvertent intruder definitions in the proposed regulatory language. These recommended changes provide important clarification and boundaries that should not be left to guidance. We support the clarification that the intruder assessment should consider only activities that are "realistic and consistent with expected activities in and around the disposal site at the time of site closure". We also support clarification in the inadvertent intruder definition regarding "reasonably foreseeable" pursuits; however, we recommend that the phrase "resource exploration or exploitation (e.g., well drilling)" be eliminated from the definition of "inadvertent intruder". We further recommend that the definition of "intruder assessment" be revised to clarify that consideration of the scenarios used originally in the development of Part 61 is sufficient to comply with the proposed requirements for intruder assessment. Refer to our comments on § 61 2, inadvertent intruder and intruder assessment definitions, for further explanation.

[11] "Geological Disposal of Radioactive Waste," DS154, IAEA, 2005, Section A.7.

NRC is seeking feedback on the proposed approach, especially with regard to whether a dose limit is needed for the long-term analyses or whether the proposed metric combined with barrier analyses is more appropriate. (80 FR 16092)

No dose limit is needed or appropriate for the timeframe beyond 10,000 years addressed by the performance period. We support the concept of extending performance analysis and intruder assessments over periods beyond the compliance timeframe There is value in considering, qualitatively, the results of modeling beyond the time when the results can be assigned quantitative meaning. Such an assessment can provide valuable information to guide waste acceptance criteria, design optimization, and defense-in-depth measures. We support, in principle, the performance period and the approach to use analytical results only qualitatively. As noted in our general comments, we recommend that the protective assurance period be eliminated and that the performance period, with no dose criteria, begins immediately following the compliance period, at 1,000 years after closure. In any case, the performance period should extend no longer than the time of peak dose or impact is reached or the period of surface geologic stability, whichever is sooner. See comments on § 61.2, performance period definition.

Regardless of whether a two-tier or three-tier approach is chosen, a dose limit or goal for timeframes encompassed by the proposed performance period would not be justified. Advisory bodies –including IAEA, NEA, ICRP, and ACNW—have cautioned strongly against quantitatively interpreting performance assessment and modeling results as health indicators for timeframes beyond even several hundred years. (Refer to our general comments, above, on the three-tiered approach for further details and citations.) To impose a limit for longer time periods is unsupportable, and no clear purpose is served by providing a reference dose for the performance period, whenever it is designated to begin. To do so would imply a degree of certainty and reliance on the quantitative modeling results that is unjustified for near-surface disposal over such timeframes. The proposed approach, with no dose limit or target during the performance period, is appropriate and reasonable.

However, no separate barrier analysis is appropriate as a complementary criterion, separate analysis of barriers constitutes sub-system performance criteria, which is widely discounted as a regulatory strategy for waste disposal, in which complex interactions between natural and engineered systems may be central to the maintenance of safety functions and the overall performance of the disposal facility. OECD NEA states, for example, "The detailed specification in regulation of requirements on system components is generally avoided; the current view is that this would unnecessarily reduce the flexibility of the implementer to adapt system components to the specific characteristics of the waste and the geological environment under consideration, and would potentially undermine the need for the implementer to take full responsibility for the safety case."[12]

Furthermore, retaining a separate barrier analysis would be inconsistent with a site-specific, performance-based approach. As NRC itself has said, "The Commission is confident that evidence for the resilience or lack of resilience, of a multiple-barrier system will be found by examining a comprehensive and properly documented performance assessment of the behavior

[12] NEA 2009 *Timescales Report*, p. 39

of the overall repository system." (66 FR 55759) See comments on § 61.13(b), intruder analyses.

NRC is seeking feedback on the proposed approach, especially with regard to whether a 5 milliSievert (500 mrem) annual dose goal is appropriate for the protective assurance period and whether it is appropriate to consider alternative, higher levels based on technological and economic considerations. (80 FR 16098)

As discussed in our general comments (above), we recommend that the protective assurance period be eliminated The imposition of an intermediate "protective assurance" period (from 1,000 to 10,000 years after closure) does not appropriately accommodate the uncertainties and limitations of modeling over very long timeframes. It establishes *de facto* requirements over very long timeframes without adding materially to an understanding of the relevant behavior of long-lived nuclides —depleted uranium, in particular. We recommend that a two-tiered approach be adopted that retains the proposed 1,000-year compliance period (and associated dose limit), eliminates the protective assurance period (and associated reference dose), and applies the qualitative performance period approach to modeling assessments beginning at 1,000 years after closure.

If the protective assurance period is retained, we support the use of 500 mrem as a dose target because it reflects, better than lower dose levels would, the uncertainty and speculative nature of calculations extending into timeframes beyond 1,000 years. A target dose of 500 mrem/yr is below the average annual dose for people living in the United States today and is on the same order as risks considered acceptable resulting from radon exposure in residences, for example.[13]

In addition, several changes to the proposed regulatory language—in both proposed § 61.41(b) and proposed § 61.42(b)—would be needed to align the proposed regulations with NRC's stated intentions, if the protective assurance period is retained. Importantly, the proposed regulatory language does not set forth 500 mrem as a "goal," but rather imposes requirements in both proposed § 61.41(b) and proposed § 61.42(b). As such, it is inconsistent with NRC's stated intent in the preamble and with the Commission's direction in its February 12, 2014 Memorandum, which calls for a "goal of keeping doses below a 500 mrem/yr threshold". The use of the term "minimize" is also problematic and can be interpreted to be more stringent than the dose limits applied during the compliance period See comments on §§ 61.41(b), 61.41(c), 61.42(b), and 61.42(c).

If the protective assurance period is retained, it is entirely appropriate to consider alternative, higher potential exposures that are reasonably achievable based on technological and economic considerations. Indeed, these factors are central to the concept of a target dose. If consideration of alternative, higher dose levels is excluded, the "target" becomes a *de facto* limit. Similarly, technological and economic considerations are essential components of an evaluation of what is "reasonably achievable". Measures to further reduce doses below the target level beyond 1,000 years are not justifiable, because they may entail large costs for little change in modeled doses to a hypothetical future member of the public and a hypothetical future inadvertent intruder: such an approach is inconsistent with ethical principles that state that emphasis for the

[13] See, as before, NCRP Report No 160 and *A Citizen's Guide to* Radon

very long term should be on averting catastrophic consequences ("Technical Analysis Supporting Definition of Period of Performance," p. 10). If the protective assurance period is retained, we recommend changes to the proposed regulatory language to reflect a goal dose level that is reasonably achievable based on technical and economic considerations, and that additional efforts need not be made to further reduce doses if a goal of 500 mrem per year is met.

Is the proposed three-tiered approach (a compliance period, followed by a protective assurance period, followed by a performance period, if applicable) appropriate? (80 FR 16106)

A three-tiered approach is not appropriate. As described in our general comments, we recommend that the protective assurance period be eliminated and that the performance period begin at 1,000 years after closure, ending once peak dose or impact is reached or the period of surface geologic stability, whichever is soonest We further note that the proposed regulations are inconsistent with the request for comment concerning the performance period; the request for comment includes the qualifier "if applicable" for the performance period, whereas the proposed regulations are written such that "performance period" is *always* applicable, with requirements that "effort *shall* be made to minimize ... to the extent reasonably achievable" [emphasis added]. See proposed § 61.41(c) (releases to general population), § 61.42(c) (protection of inadvertent intruders).

Is 500 mrem/yr an appropriate analytical threshold for the protective assurance period? (80 FR 16106)

As described in preceding comments, we support a 500 mrem/yr analytical threshold for the protective assurance period, if that period is retained. The 500 mrem/yr threshold should function as a dose target or goal—not a limit—and changes to the proposed rule language are needed to appropriately convey that intent.

Should there be a quantitative goal or dose limit associated with the performance period analysis, and if so, what should that goal or dose limit be? (80 FR 16106)

As described in preceding comments, no quantitative goal or dose limit should be established for the performance period. A quantitative, or even semi-quantitative, interpretation of modeling results for such timeframes is unjustified, unsupportable for near-surface disposal, and inconsistent with international guidance ("Technical Analysis Supporting Definition of Period of Performance," p. 10). Refer to our general comments on the three-tiered approach for further details.

NRC requests comment on the proposed rule with respect to the clarity and effectiveness of the language used. (80 FR 16114)

The proposed rule language merits significant attention to improve its clarity and effectiveness In our view, the proposed regulation is unnecessarily complex and difficult to understand. For example, requirements are found in multiple sections, with difficult-to-follow cross-referencing. In our view, sections such as "concepts" are excessively detailed (with much information that

would be more appropriately included in guidance) and contain some discussions that imply possible requirements; at the same time, the discussions omit clarifying details essential to bound the regulatory analyses and prevent unfettered discretion in implementation. The complexity and confusion throughout the proposed regulation are due in large part to a failure to fully implement a site-specific, performance-based approach. The proposed regulation would require new analyses while retaining (and even adding to) detailed criteria on aspects that would be addressed more appropriately by site-specific PA and intruder assessment analyses. Many of the analyses previously required to complement the table-based classification approach are unnecessary and burdensome in light of the new site-specific analyses, and should be eliminated We note such cases in our specific comments above.

Another source of confusion is that the proposed regulation would add new definitions for several terms, which do not follow well-established, internationally accepted concepts described clearly in published documentation. This leaves open questions about whether or not NRC's proposed definitions signify a meaningful departure from the accepted concepts, and for what reasons. It is suggested that NRC be consistent with established definitions as much as possible. We note specific instances on our detailed comments regarding definitions in § 61.2

Secretary, U.S Nuclear Regulatory Commission
301-415-1101

Subject: Docket ID NRC-2011-0012

Comments on 10CFR Part 61 Proposed Rule

It is our understanding that no way exists to neutralize the radiation given off by the waste by-products of nuclear facilities, either from the commercial use of nuclear fission in the generation of electricity.

The waste products of both types of nuclear operations require isolation from human beings, animals and plants life for hundreds, thousands, hundreds of thousands of years and longer.

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64

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Comment on FR Doc # 2015-06429

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General Comment

Please see attached comments from South Carolina Department of Health and Environmental Control. See attached file(s)

Attachments

SCDHEC Comments to 10 CFR Part 61 7-24-15 FINAL

D H E C
PROMOTE PROTECT PROSPER
Catherine E. Heigel, Director
Promoting and protecting the health of the public and the environment

July 24, 2015

Ms. Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Rulemaking and Adjudications Staff

RE: Proposed 10 CFR Parts 20 and 61 Rule (80 FR 16082)
Low-Level Radioactive Waste Disposal
Docket ID NRC-2011-0012

Dear Madam Secretary:

The South Carolina Department of Health and Environmental Control (SCDHEC) appreciates the opportunity to provide comments to the proposed 10 CFR Parts 20 and 61 rulemaking regarding low-level radioactive waste disposal, as published in the *Federal Register* on March 26, 2015 (80 FR 16082). SCDHEC believes the proposed revisions to the existing regulations directly impact the State of South Carolina as an Agreement State and as one of the four sited states, and looks forward to receiving the full consideration of the U.S. Nuclear Regulatory Commission.

1. Administrative Comments

Changes are proposed for the language in 61.28(a); however there is no listing for 61.28(a) in the "Proposed Compatibility Category for 10 CFR Part 61" on page 16112 of the Federal Register. There is, however, a listing for 61.28(a)(2) which also has proposed changes.

2. Applicability of Part 61 to Existing Licensed Facilities

NRC should provide clarification regarding the conflicting requirements in 61.1(a) and those in 61.13.

The applicability of the original rule published in 1982 was set forth in 61.1(a) which states, "Applicability of the requirements in this Part in effect on the effective date of this rule will be determined on a case-by-case basis and implemented through terms and conditions of the license or by orders issued by the commission." Many of the Part 61 requirements were eventually applied through license conditions to near-surface disposal facilities in operation on the effective date of the rule, and the applicability was determined on a case-by-case basis as stated in 61.1(a). This language afforded regulators of licensed disposal facilities the flexibility to consider when and if each facility should comply with the new requirements based on practical, economical and technical considerations.

Language is proposed to be added in 61.13 requiring that technical analyses shall be submitted by all "Licensees with licenses for land disposal facilities in effect on the effective date of this subpart…at the next license renewal or within 5 years of the effective date of this subpart, whichever comes first." The case-by-case decision making afforded by 61.1(a) is thereby taken away in the proposed language of 61.13.

At the very least, the proposed rule language should be clarified to reflect which requirement, 61.1(a) or 61.13, is the overarching one.

NRC should reconsider its interpretation of 61.1(a).

During a public meeting in Columbia, SC on June 2, 2015, an NRC representative indicated that the language in 61.1(a) was only intended to apply to the initial Part 61 requirements and not to subsequent revisions to Part 61. That interpretation is not made clear by the current or proposed language.

While the use of the term "case-by-case" may have been intended to refer to a facility, the proposed changes to Part 61 are the most significant since its promulgation and warrant flexibility for each existing requirement given the nature of the new requirements. It is unclear what flexibility exists in the applicability of the original and the proposed new Part 61 requirements.

The State of South Carolina does not support "grandfathering" as a means to relieve the licensee's regulatory obligation to protect public health and the environment without discretion. The applicability of the requirements should continue to be evaluated on a case-by-case basis.

The NRC suggested in the public meeting that states can exempt licensees from the requirements using the provision found in 61.6. This would seemingly shift the burden from the NRC to the states to determine whether such an exemption would be appropriate; however, this action would be subject to review by the NRC for adequacy during its formal Agreement State program evaluation.

NRC should clearly indicate that the applicability of individual requirements of the rule would be determined on a case-by-case basis. In support of the suggestion, note that the current and proposed language: "implemented through terms and ***conditions*** of the license", implies that the individual requirements of Part 61 may be applied separately, since only a single ***condition*** of a license is necessary to require compliance with Part 61 as a whole.

In summary, the NRC should revise the language to indicate that "case-by-case" refers to each individual licensed facility and to each individual requirement. It is understood that many of the requirements of Part 61 are related; therefore, the regulator would have to carefully consider how to individually apply the requirements of the regulation. NRC should structure the regulation to be amenable to individual application of requirements where practical. This could be accomplished by separating the proposed new requirements for technical analyses into an appendix or subpart.

Since the main reason for revising the requirements in Part 61 are related to the generation of unexpected new waste streams, the new requirements should focus on future disposal at all facilities and consider the relevancy to existing licensed facilities.

In the section titled, "Why do the regulatory requirements need to be revised?" (p. 16087 of the Federal Register), one of the reasons provided is related to new waste streams that were not envisioned during the development of 10 CFR Part 61. These waste streams include, but are not limited to, depleted uranium from enrichment facilities, LLRW from DOE operations, blended LLRW streams in quantities greater than previously expected, and the generation of different LLRW streams that may result from new technologies. The concerns related to the disposal of these waste streams are not entirely applicable to all existing facilities. For example, only two of the existing facilities are candidates for the disposal of Depleted Uranium (DU) from enrichment facilities or from DOE. Also, one of the disposal facilities disposes all waste with intruder barriers so the "large scale blending of Class B and C concentrations of LLRW with Class A to produce a Class A mixture that could result in a dose to an inadvertent intruder that is above 500 mrem" would not be relevant. Since the waste streams described will be considered for future disposal only, the associated new requirements should affect future disposal operations only.

The proposed amendments should not apply to closed portions of a facility undergoing post-closure care, where significant resources have been expended to achieve closure, and where additional engineering controls to meet the inadvertent intruder standard are technically and economically impracticable. Excavation of DU waste presents a real dose to workers, as opposed to a hypothetical dose to someone sometime in the geologic future.

3. Applicability of Part 61 to Waste Already Disposed

NRC should allow flexibility in determining the applicability of the proposed requirements to waste already disposed and future waste disposal taking into consideration established precedence, technical and economic considerations, and the effect on overall site design.

Although many Part 61 requirements were eventually applied to waste disposal facilities that had licenses in effect on the effective date of the original Part 61, the requirements were typically only applied to future waste disposal operations. Waste already disposed was not required to be evaluated to determine whether it may have been considered Class B or Class C waste under the then new waste classification system. Such an evaluation was not considered necessary since a decision to apply new stability and intruder protection requirements to waste already disposed would likely be disruptive to the disposal system, result in an increase in dose to workers and potentially the general population, and create an unnecessary technical and economic burden for the licensee and the regulator.

The proposed language in 61.7(f)(2) states that waste classified under 10 CFR 61.55(a)(6) may not decay to acceptable levels in 100 years and safety is provided by limiting quantities and concentrations of the material consistent with the disposal site design. Such limitations on quantities and concentrations can only reasonably be applied to future waste disposals.

Similarly, 10 CFR 61.7(f)(3) states that waste that will not decay to acceptable levels in 100 years "...must be stable and be disposed at a greater depth..." and "where site conditions prevent deeper disposal, intruder barriers such as concrete covers may be used." For waste already disposed, classified under 10 CFR 61.55(a)(6), and where site conditions prevent deeper disposal, the only option would be to use intruder barriers. The incorporation of such barriers into site design as a remedial measure could have negative consequences. For example, high integrity containers (special containers designed to provide stability) within the disposal unit have structural design requirements based in part on the overburden expected in the disposal environment. In this example, adding concrete barriers on the surface would be incompatible with the overall site design and could compromise the integrity of the high integrity containers. Also, for LLRW disposal facilities, one of the major activities is typically to install a final engineered cap as an engineered barrier and to enhance site stability. For one site, the final cap has been installed for the majority of the disposal area. Once the final cap is installed and the related drainage features of the site are designed, any modification such as adding concrete barriers would compromise the overall site design.

It is clear that at the time of the initial promulgation of the requirements in Part 61, NRC recognized the need to allow for flexibility in applying new regulations to existing facilities by explicitly addressing its applicability to existing facilities in 61.1(a). The language in 61.1(a) aligns with the philosophy that waste disposed in good faith and in accordance with applicable standards in place at the time should not necessarily be subject to new requirements that may be technically impractical and/or financially prohibitive. The reasons to adopt such a philosophy remain valid regardless of whether disposal facilities were able to eventually comply with some of the, then new, requirements. The NRC should continue to adhere to this philosophy.

4. Regulatory Analysis and Backfit Analysis

While backfitting is not required by regulation for the new proposed Part 61 revisions, NRC should consider performing a comparable analysis.

The NRC voluntarily performed a regulatory analysis and published **Draft Regulatory Analysis for Proposed Rule: Low-Level Radioactive Waste Disposal (10 CFR Part 61)** in February 2015. The NRC did not perform a backfit analysis as described in 10 CFR 50.109. Neither a backfit analysis nor a regulatory analysis is required by statute or regulation for 10 CFR Part 61. However, the NRC has been voluntarily performing regulatory analyses since 1976.

Given the significant costs to licensees, license applicants and regulators associated with implementing the new proposed requirements, and considering that the proposed revisions represent the most substantial changes to Part 61 since its promulgation, the NRC should consider performing an expanded analysis similar to a backfit analysis in order to assess whether the proposed revisions will provide for a substantial increase in the overall protection of the public health and safety and that the associated direct and indirect costs are justified by the benefits. In performing the expanded analysis, the NRC should address the pertinent items listed in 10 CFR 50.109 (c).

5. Long-term Stability Requirements

The proposed requirement to demonstrate stability for a period of 10,000 years seems incommensurate with the overall concept of near-surface disposal of LLRW.

The concepts section 61.7 refers to 100, 300 and 500 year timeframes in multiple instances, but not timeframes on the order of thousands of years. Specifically, 61.7(a)(2) for waste characterization requires that site characteristics should take into account the radiological characteristics of the waste and be evaluated for at least a 500 year timeframe and 61.7(f)(3) suggests that the effective life of an intruder barrier be at least 500 years. 61.7(f)(1) suggests that Class B and C waste forms or containers should be designed to be stable over 300 years. However, the language proposed in 61.44 requires long-term stability of the disposal site for the newly defined compliance (1000 years) and protective assurance periods (10,000 years) which are much longer timeframes.

The concept of stability for a period of 10,000 years is not realistic with the overall concept of near-surface disposal of LLRW given the constantly changing surface environment over time. In addition, engineered barriers for near-surface disposal have finite lifespans, which is inconsistent with the concept of surface stability for 10,000 years. Further, computational models that are required to determine whether a disposal facility can achieve site stability out to 10,000 years are only as good as the inputs that are used, and these inputs are probabilistic at best.

6. Adequacy of the Cost and Benefit Estimate developed in the Regulatory Analysis document [Executive Summary, Section III.M.(5)]

The Draft Regulatory Analysis for Proposed Rule: Low-Level Radioactive Waste Disposal (10 CFR Part 61) February 2015, Executive Summary states the following:

"Cost to the Industry. The proposed rule would result in an average undiscounted implementation cost per licensee of an estimated $1,000,000, followed by an estimated undiscounted annual cost of $4,000 per licensee. Overall, the industry will incur an estimated undiscounted implementation cost of $4.0 million, followed by an estimated annual cost of $16,000.

Cost to the Agreement States. The proposed rule would result in additional costs to the Agreement States with all costs resulting from implementation. On average, each Agreement State would incur an estimated undiscounted implementation cost of $525,000. Overall, the Agreement States will incur an estimated undiscounted implementation cost of $2.1 million."

Although this regulatory analysis does provide assumptions of the estimated costs for implementation of Revisions to Part 61, the estimated implementation costs presented are generic in nature and do not include site specific considerations that could substantially increase these costs. Also, there are potential additional costs that may not have been considered. These include, but may not be limited to, costs associated with procuring regulatory technical expertise required to review and comment on the performance assessments that utilize the new complex

methods proposed, and costs associated with potential remediation activities at existing sites under the current Part 61 requirements.

The regulators of existing facilities are estimated by NRC to expend substantial resources in implementing the proposed new requirements. Many states do not have the resources or expertise to review analyses that are substantially more complex than the current required analyses and will likely need to seek assistance from the NRC staff or private companies to perform the reviews. External review assistance is more expensive than internal reviews and most states do not have funds set aside for this. License fees could potentially be increased to support the more complex reviews but license fees are typically set in regulation and would require legislative support to increase and therefore could not be guaranteed. It is our understanding that actual costs incurred by licensees that completed similar performance analyses (to meet state requirements for DU acceptance that are already in place), and those incurred by Agreement States reviewing the analyses, substantially exceeded the NRC cost estimates published in the Regulatory Analysis document. NRC should reconsider the basis for these cost estimates and publish updated information.

Any site that does not intend to accept large quantities of DU waste (the main driver behind the proposed new regulations) at their licensed disposal facilities should not incur the significant expenditures necessary to review and implement proposed Part 61 requirements.

Thank you for considering these comments in finalizing the revisions to 10 CFR Parts 20 and 61.

Sincerely,

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Director, Division of Waste Management
Bureau of Land and Waste Management
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Comment on FR Doc # 2015-06429

Submitter Information

Name: anonymous anonymous

General Comment

Any radionuclides which are short-lived enough to be safely buried from a radiological perspective (half-life of one year or less) can be more safely held on site until they are no longer radioactive. Furthermore, many, like DU, act as chemical poisons (e.g. cause kidney damage). Thus, there should be no burial of radioactive waste at all.

For much less than what is being charged by these nuclear waste burial dumps, the radioactive waste could be put in good quality containers, inside a solid compound.

It must remain monitored for perpetuity, which is still cheaper than medical care for cancers caused if it is let loose into the environment. Also cheaper to monitor it than to care for the mentally and physically disabled children, born disabled due to genetic damage from letting the radionuclides into the environment. Cancers and disabilities caused by you refusing to do your job.

20 years of your 5 mSv, for instance, will lead to 1% or more having life-shortening cancer. Your 1 mSv will lead to 1% or more having a life-shortening cancer within a lifetime. So says the US government funded BEIR report.

Burying this falsely called "low level" waste, which includes things like plutonium, and other radionuclides which are deadly for hundreds, thousands and even millions of years is a major crime. You will eventually be put on trial for crimes against the American people and humanity, even in your 90s it can happen, like the Nazis and Nazi collaborators.

I agree with the NIRS, Sierra Club, and SEED when they say: "We call in NRC to stop wasting its resources

trying to come up with more ways to let nuclear waste out of control and to charge those who make the wastes with whatever costs are needed to isolate and regulate them for at least 10 to 20 half-lives of the radionuclides present."

RulemakingComments Resource

From: Kosson, David S <David.Kosson@Vanderbilt.Edu>
Sent: Friday, July 24, 2015 4:56 PM
To: RulemakingComments Resource
Cc: Clarke, James H; 'Stewart, Richard'; Kosson, David S; 'Charles Powers'; kathryn.higley@oregonstate.edu; craigbenson@gmail.com; 'lbliss@cresp.org'
Subject: [External_Sender] Comments on 2015 proposed LLW rule 80 FR 16802
Attachments: Final_CRESP comments on 2015 proposed LLW rule 80 FR 16802.pdf

Attached please find comments on the 2015 proposed LLW rule 80 FR 16802, which I am hereby submitting on behalf of the CRESP review team.

Sincerely,

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Cornelius Vanderbilt Professor of Engineering
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The Consortium for Risk Evaluation with Stakeholder Participation III

Consortium Universities: ***Vanderbilt University****, Howard University, Oregon State University, New York University, Robert Wood Johnson Medical School, Rutgers University, University of Arizona, University of Wisconsin - Madison*

CRESP Comments on 2015 Proposed NRC LLW Rule, 80 FR 16082, by
David Kosson on behalf of the CRESP Review Team

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July 24 2015

These comments on the NRC proposed Low-Level Waste Disposal Rule, 80 FR 61082 (March 26, 2015) are offered by David Kosson on behalf of a CRESP Review Team consisting of Craig H. Benson, James H. Clarke, Kathryn A. Higley, Charles W. Powers, Richard B. Stewart and him. Each of these commenters has extensive experience in nuclear waste management and environmental regulatory issues. They are senior researchers and members of the Management Board of the Consortium for Risk Evaluation with Stakeholder Participation (CRESP), and share CRESP's commitment to performance-based regulatory approaches, that are informed by risk, and are protective, science-based, flexible, and cost-effective.[1]

Experience and Qualifications of Commenters

David S. Kosson is Cornelius Vanderbilt Professor of Engineering at Vanderbilt University, where he has appointments as Professor of Civil and Environmental Engineering, Chemical Engineering and Earth and Environmental Sciences. He is principal investigator of the multi-university Consortium for Risk Evaluation with Stakeholder Evaluation (CRESP). Dr. Kosson has led the development of the US EPA Leaching Environmental Assessment Framework (LEAF) and leads the Cementitious Barriers Partnership which is a multi-institution initiative focused on developing advanced tools for predicting the long-term performance of cementitious materials in nuclear applications. Dr. Kosson also has been a member of the leadership

[1] CRESP works to advance cost-effective, risk-informed cleanup of the nation's nuclear weapons production facility waste sites and management of potential future nuclear sites and wastes. CRESP carries out multi-disciplinary research, education and review in waste processing and special nuclear materials; remediation, near surface disposal and long-term stewardship; nuclear waste management policy and strategy; and, stakeholder engagement and communication. Principal Investigator David Kosson and Co-Principal Investigator Charles Powers lead the multi-university consortium that has served the DOE and its stakeholders since 1995, currently through a cooperative agreement (2006-2017) awarded to Vanderbilt University. The CRESP Management Board is comprised of technical, engineering, scientific, medical and policy experts from eight university consortium member institutions: Vanderbilt University, Howard University, New York University School of Law, Oregon State University, Rutgers, The State University of New Jersey, University of Arizona, University of Wisconsin-Madison and Georgia Institute of Technology.

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committee for the Risk and Performance Assessment Community of Practice (formerly the Performance Assessment Community of Practice) and served as an advisor on several major projects for the DOE Office of Environmental Management.

Craig H. Benson is Dean of the School of Engineering and Applied Science and the Hamilton Professor of Civil & Environmental Engineering at the University of Virginia. Previously, he was Wisconsin Distinguished Professor and Chair of the Departments of Civil and Environmental Engineering and Geological Engineering at the University of Wisconsin- Madison. Dr. Benson has been conducting experimental and analytical research in geoenvironmental engineering for nearly three decades regarding containment of solid, hazardous, radioactive, and mining wastes. Benson directs the CRESP Landfill Partnership in collaboration with Professor Clarke. His research includes laboratory studies, large-scale field experiments, and computer modeling. Dr. Benson has received numerous awards for his work on containment systems modeling including the Ralph Peck Award in 2012 from the American Society of Civil Engineers and the Award of Merit from ASTM International. Dr. Benson is a member of the National Academy of Engineering, Past President of the ASCE Geo- Institute and former Vice Chair of the Executive Committee of ASTM Committee D18 on Soil and Rock. He is a participant and has been a member of the leadership committee of the Risk and Performance Assessment Community of Practice.

James H. Clarke is Professor of the Practice of Civil and Environmental Engineering and Professor of Earth and Environmental Sciences at Vanderbilt University. Dr. Clarke was a member of the former Nuclear Regulatory Commission (NRC) Advisory Committee on Nuclear Waste and Materials and is a consultant to the NRC Advisory Committee on Reactor Safeguards. He is a Board Certified Environmental Scientist (BCES) and a member of the American Academy of Environmental Engineers and Scientists, a Fellow of the American Academy of Forensic Scientists, and a member of the Association of Environmental Engineering and Science Professors. He is also a participant in the Risk and Performance Assessment Community of Practice and, with Professor Craig Benson, in CRESP's Landfill Partnership.

Kathryn A. Higley is Professor and Head of the School of Nuclear Science and Engineering at Oregon State University. She is a member of the National Council on Radiation Protection and Measurements, Vice-Chair of the International Commission on Radiological Protection's Committee 5 (Protection of the Environment), a Fellow of the Health Physics Society, and a Certified Health Physicist. She works extensively in the development and application of tools to assess environmental dose and impact from radionuclide releases.

Charles W. Powers is Professor of Environmental Management at Vanderbilt University, co-Principal Investigator and founding chief executive officer of the Consortium for Risk Evaluation with Stakeholder Participation and was active in the initial efforts to build the Risk and Performance Assessment Community of Practice. He has published extensively on how to achieve integrated, technically-based risk- informed environmental policy. In addition to having served on the faculties of Yale, Harvard and Princeton Universities and the Robert

Wood Johnson Medical School, he was chief environmental officer and Vice President for Public Policy at Cummins Engine Company. In addition to CRESP he helped create and was first chief executive officer of the Health Effects Institute, Clean Sites, Inc., and The Institute for Evaluating Health Risks and for a decade chaired the New York Academy of Sciences' New York/New Jersey Harbor Consortium.

Richard B. Stewart is University Professor and John Edward Sexton Professor of Law at New York University (NYU) and Director of NYU's Center on Environmental and Land Use Law. He has published extensively on environmental law and policy and administrative law and regulation, including (with Jane Stewart) *Fuel Cycle to Nowhere: US. Law and Policy on Nuclear Waste* (2011), the first comprehensive history and account of U.S. nuclear waste regulation and policy. During 1989-1991 Stewart served as Assistant Attorney General for Environment and Natural Resources at the US Department of Justice, where he was extensively engaged in the implementation of CERCLA and environmental issues at DOE defense facilities. He was formerly Chair and currently serves as Advisory Trustee of the Environmental Defense Fund.

Comments on the Proposed Rule

Risk-informed, performance-based low-level waste regulation

We strongly support and commend NRC's commitment, reflected in a number of recent decisions and statements, to a risk-informed performance-based approach to low-level waste (LLW) regulation. In its deft use of scientific methods and structure, this approach ensures protection while providing needed flexibility to tailor regulatory requirements to the characteristics of particular wastes and disposal sites in the context of managing risk. Consequently, the approach is pragmatic and cost-effective. CRESP has long espoused this approach and has worked with waste managers, regulators, and communities to implement it in a variety of settings. In January, 2013, CRESP filed comments on the preliminary proposed version of the LLW rule urging this approach.

Many key provisions in the proposed rule commendably reflect and implement the risk-informed performance-based approach. These include the provisions for a 1000-year compliance period rather than the 10,000-year period in the 2011 preliminary proposed rule, a risk-based approach to inadvertent intruder protection, site-specific waste acceptance criteria using risk-based performance assessments, and insistence on the use of updated dosimetry. In CRESP's 2013 comments on the preliminary proposed rule, we recommended just such provisions and are pleased to see that NRC has proposed their adoption.

Other provisions in the proposed rule, however, impose rigid and uniform requirements inconsistent with this same risk-informed performance-based approach. These include requirements for a three-tier regulatory structure that includes a 10,000-year period for all LLW that includes not only the 1000-year compliance period but an additional second tier "Protective Assurance" period extending to 10,000 years for all LLW, not just long-lived wastes, and a third

tier "Performance Period" for long lived LLW with concentrations exceeding those in Table A of 10 CFR 61.13(e), beginning 10,000 years after facility closure and extending for an indefinite period. Given the uncertainties presented and limits of knowledge regarding circumstances over millennial time periods, these proposed provisions are unrealistic and may well be lacking in technically-specifiable rigor while concealing the fact that they could result in unacceptably variable application. Hence, they should be deleted…. in favor of a single Tier 2 measure for the period after 1000 years that would use a qualitative analysis of the risks posed by specific quantities of wastes at specific sites and apply an ALARA approach for assessing protectiveness. This approach should be complemented with an appropriate and pragmatic performance monitoring requirement during operation and a limited post-closure period that ensures that permit assumptions are being met and provides early warning if key assumptions are not being achieved. Where appropriate and feasible, exposure goals may be used as a guideline for qualitative evaluation of risk and protectiveness.

As explained in the Federal Register discussion of the proposed rule, the rule must respond to the circumstance that long-lived LLW were not considered in the development of the LLW classification tables. This circumstance does not, however, justify imposing burdensome regulatory requirements for ordinary low level wastes extending beyond 1000 years. Further, the risks posed by depleted uranium (DU) and the potential risks posed by other such "unique wastes" that require additional analysis may, depending on circumstances, require special protective measures. But these risks should be addressed through a flexible, site-specific performance-based approach rather than specifying unrealistically long periods for demonstrating conformance with regulatory standards including quantitative exposure limits for a very diverse universe of LLW. The special issues posed by long-lived wastes should be resolved on a site-specific, waste-specific basis through a collaborative approach involving input from the Risk and Performance Assessment Community of Practice.

CRESP's comments on specific provisions of the proposed rule are as follows:

Proposed rule provisions that appropriately reflect and implement a risk-informed, performance-based regulatory approach and that accordingly should be adopted

Site-specific waste acceptance criteria. The proposed provisions for 10 CFR § 61.58 provide for development and implementation of waste acceptance criteria that will ensure compliance with the performance objectives of Subpart C, based either on waste classifications set forth in §61.55 or the technical analyses of the particular land disposal facility required by §61.13, including the information required by §61.12. Providing the option of using waste acceptance criteria based on analysis of the specific location, conditions, and design of a specific site appropriately provides site-specific flexibility while ensuring risk-informed performance-based protectiveness.

Site specific performance assessments. The provisions in the proposed rule, §§61.7 and 61.13 regarding performance objectives, technical analyses, and performance assessments, both for

sites using site-specific waste acceptance criteria and sites using the §61.55 waste tables, also rely on principles of risk-informed, performance-based protectiveness and will provide the basis for assessing and demonstrating compliance with the regulatory requirements . These assessments will serve as a sound basis for establishing waste acceptance criteria and site selection and design features that ensure compliance with the performance objectives in Subpart C, while taking site-specific variables into account.

Reducing the Tier 1 Regulatory Compliance period from 10,000 years to 1000 years. CRESP commends NRC for withdrawing the provision in §61.2 of the preliminary proposed rule for a uniform 10,000-year Tier 1 compliance period. As explained in CRESP's 2013 comments on the preliminary proposed rule, and as also acknowledged at various points in the proposed rule Discussion,[2] reliable demonstration of compliance with exposure limits for such a long period of time into the future is infeasible and unrealistic in the context of current scientific understanding. Demonstrating compliance-with a regulatory limit at 1000 years is at the limits of practicality associated with the current body of knowledge. Current experience and knowledge associated with engineered near-surface disposal facilities is limited to a few decades and only a limited number of studies have been conducted to determine whether these facilities are functioning in accordance with predictions. Consequently, a shorter Tier 1 period, in the range of around 500 to 1,000 years, is appropriate and consistent with the characteristics of typical LLW and the logic of a tiered approach. A 1000-year compliance assessment period has been used for low-level wastes at various sites by agencies such as DOE and Agreement States. For example, the State of Texas uses a 1000-year period for assessing the performance of a waste disposal facility, with a second tier analysis where needed in the case of long-lived highly mobile radionuclides.[3] A 1000-year period is provided in DOE's Radioactive Waste Management Manual, DOE Manual 435.1-1.

Inadvertent intruder provisions providing for site specific assessment of exposure potential. We strongly support the provisions in the proposed rule that provide for a site-specific, waste-specific assessment of potential risks to inadvertent intruders in place of the provisions in the preliminary proposed rule that assumed a 100% probability of intruder exposure in all circumstances.

Risks to inadvertent intruders are highly specific to particular sites, the character and design of the particular waste disposal facilities at a site including defense in depth measures, the specific wastes disposed of at a site, and the location of higher-hazard wastes within the site. The likelihood that an intruder will enter a site and engage in activities that may result in inadvertent exposure depends on the accessibility of the site and the likelihood that it may be used in the future for agriculture, construction, drilling, or similar activities. The likelihood

[2] See 80 FR 16089, 16090, 16091, 16092, 16108.

[3] The proposed compliance periods reviewed by ACRS were 20,000 years and 10,000 years (See ACRS Letters to the Commission dated September 22, 2011 and July 22, 2013, respectively).In both cases, the ACRS recommended a 1000 year compliance period.

that the intruder will be exposed to significant levels of radiation depends on the nature of the wastes disposed of, waste disposal depth, the presence and type of engineered barriers, and the location of higher-hazard wastes within the site. Further, depending on the nature of the intruder activity, any exposure that occurs may be lower or higher, short-lived or chronic. A site-specific and risk-informed, performance-based approach is needed to address all of these different variables, assess the resulting risk to inadvertent intruders, and provide the most practical means to manage any potentially significant risks in order to secure appropriate protectiveness. Among other matters, this allows the most appropriate intruder scenarios to be developed and applied on a site- and waste-specific basis.

The proposed rule provisions regarding inadvertent intruder assessments appropriately follow this approach and represent a very positive development. Assessments must assume an inadvertent intruder occupies the site and engages in normal activities or other reasonably foreseeable pursuits that are realistic and consistent with expected activities in and around the disposal site at the time of site closure and that might unknowingly expose the person to radiation from the waste, examine the capabilities of intruder barriers to inhibit an intruder's contact with the waste or to limit the inadvertent intruders exposure to radiation; and estimate an inadvertent intruder's potential annual dose, considering associated uncertainties. In the proposed rule Discussion, the NRC states: "In addition the NRC is not assuming the probability is 100% that contact with the LLRW by an intruder will occur. … engineered barriers and disposal practices, such as greater disposal depth, are to be included in the intruder assessment." 80 FR at.1609.

Defense in Depth. Defense in depth has always been a major tenet with nuclear power generation and we support explicit inclusion of defense-in-depth in the proposed rule for LLW disposal. The inclusion of a performance-based provision in the proposed rule can help ensure that appropriate protections are provided for the risks posed by long-lived wastes and for the potential risks to inadvertent intruders. We believe that the defense-in-depth analysis should follow a qualitative approach to assessing resilience, taking into account the nature and quantity of waste, the natural and engineered features of the site, the performance analysis, and the safety case.

Safety Case. Safety case and safety case evaluations, as developed and promoted by the International Atomic Energy Agency (IAEA) have been valuable concepts and tools and we support their use in the assessment of the management and disposal of LLW. We also strongly support provisions in the proposed rule requiring applicants and licensees to demonstrate a safety case that is updated on an ongoing basis to reflect new information and knowledge. The safety case provisions are another performance-based provision that can help ensure that appropriate protections are provided for the risks posed by long-lived wastes, and dealing with possible risks to inadvertent intruders.

Updated dosimetry. This is another notable provision in the proposed rule is S61.7(g), which requires licensees to demonstrate compliance with the Subpart C performance objectives,

using dose methodology specified in the standards for radiation protection set forth in 10 Part 20, that are based on more current dosimetry than that used in the development of the §61.55 waste tables. The proposed rule also allows applicants and licenses to use updated factors that have been issued by consensus scientific organizations (e.g., International Commission on Radiological Protection) and incorporated into federal radiation guidance by the U.S. Environmental Protection Agency (US EPA). Additionally, applicants and licensees may use the most current scientific models and methodologies (e.g., those accepted by the International Commission on Radiological Protection) to calculate the dose for site-specific circumstances. This provision represents an important step towards ensuring that LLW disposal is based on current science and is consistent with the objective of risk-informed, performance-based protectiveness.

Proposed rule provisions that are inconsistent with a risk-informed, performance-based regulatory approach and should accordingly be modified or deleted

Several other provisions of the proposed rule are unduly prescriptive, are not appropriately risk-informed, and preclude appropriate performance-based consideration of site- and waste-specific circumstances, as required ensuring implementation of risk-informed, performance-based protectiveness principles. These provisions should be modified or removed. They are as follows:

The Tier 2 and Tier 3 provisions in §61.2. These provisions, which provide for a second tier uniform 10,000-year protective assurance period for all LLW and third tier performance periods of indefinite duration beyond 10,000 years for long-lived wastes with concentrations exceeding the Table A concentration limits, are unrealistic, unsound, and should be deleted in favor of a single Tier 2 measure for the period after 1000 years that would use a qualitative analysis of the risks posed by specific quantities of wastes at specific sites and apply an ALARA standard to determine the need for further protective measures in cases where they are indicated.

As explained in our 2013 comments to the preliminary proposed rule, demonstrating compliance with exposure limits over many millennia exceeds our current capacities and knowledge. Any such demonstration, as required by the proposed Tier 2 provisions, would be an arbitrary and hypothetical exercise. For the same basic reason, we believe that the proposal for a post 10,000 year Tier 3 analysis and demonstration of risk minimization for long-lived wastes is unsound and should be removed. There may well be circumstances, particularly in the case of disposal of appreciable quantities of long-lived wastes, where consideration of risks and protective measures in the period after 1000 years is required. But these circumstances should be determined on a site-specific, waste specific basis. The time horizon for analysis should be determined on a case-by-case basis, as should any needed protective measures.

Another unjustified feature of the Tier 2 provisions is their imposition of across-the-board requirements, extending to 10,000 years, that are applicable to all LLW, most of which will have levels of radioactivity that have decayed to insignificance after 1000 years. Post-1000 year

analyses should be limited only to those wastes/sites for which convincing justification can be provided.

Finally, the proposed rule provisions unjustifiably introduce two novel standards, a Tier 2 standard based on a dose level that is "reasonably achievable based on technological and economic considerations," and the Tier 3 standard that exposures will be "minimized to the extent reasonably achievable." The substance of these respective standards is not clear. How these standards differ is also not clear. The ALARA standard is long-established and well understood through many years of application. There is no justification for introducing new and untried standards, which will introduce needless confusion and uncertainty, in place of ALARA.

In all these respects, the proposed Tier 2 and Tier 3 provisions depart from the regulatory policy that NRC has followed since issuing Part 61 in 1982, and are contrary to NRC's risk-informed, performance-based approach to protectiveness. We also believe that the Discussion accompanying the proposed rule does not provide sufficient justification for these departures from current policy and practice. These requirements are at odds with the explicit recognition elsewhere in the proposed rule Discussion of the grave uncertainties and difficulties in assessing exposures and performance over such long future time.[4] While we understand and commend NRC's concern with the potential risks posed by Unique Waste Streams that were not considered when Part 61 was adopted, these risks can be appropriately addressed without imposing highly prescriptive, burdensome and unrealistic requirements that are not risk-informed or justified in the case of typical low-level wastes and sites. The special issues presented by Unique Waste Streams can be in our view appropriately be addressed through a single Tier 2 provision for a qualitative assessment of post 1000 year risks and other provisions in the proposed rule, including the site-specific waste acceptance criteria using risk-based performance assessments, defense in depth measures for disposal sites, and requirements for demonstration of a safety case that is periodically updated. These safeguards can and will ensure that the risks posed by long-lived wastes will be analyzed and protected against on a site-specific, waste-suit specific basis.

*The provisions in in §61.42 for demonstrating compliance with respect to inadvertent intruder protection standards***.** These provisions require a showing of compliance with a regulatory limit of 500 mrem for a 1000-year Tier 1 period and for a 10,000 year Tier 2 period. They also represent an unnecessary and unjustified departure from regulatory policy that NRC has followed since issuing Part 61 in 1982, and are contrary to NRC's risk-informed and performance-based approach to protectiveness. We submit that instead, an ALARA standard should be adopted for inadvertent intruders for both Tier 1 and Tier 2 as the appropriate reference point for protective measures to be assessed and enhanced if necessary in particular site-specific circumstances. 500 mrem should appropriately be used as a guideline to be included in the evaluation, but not as a quantitative limit that requires compliance demonstration. In adopting Part 61.55, NRC had originally proposed a 500-mrem

[4] See 80 FR 16089, 16090, 16091, 16092, 16108.

inadvertent intruder regulatory exposure limit, but deleted it on US EPA's advice that operationalizing such a limit as a regulatory requirement was not feasible. NRC thereupon dropped this proposal, explaining in the Part 61 FEIS, p. 5-4:

> "The EPA commented that it was not appropriate to state the 500 mrem (whole body) dose limit as a regulatory limit in the Part 61 rule, since the licensee would not be able to monitor or demonstrate compliance with a specific dose limit that applies to an event that might occur hundreds of years from now. [5]

The Federal Register NPR discussion of the proposed rule fails to acknowledge or provide justification for reversing this longstanding decision. The reasons for EPA's objections to an inadvertent intruder regulatory limit remain valid today. ACRS in its comments on the preliminary proposed LLW rules also indicated opposition to an inadvertent intruder exposure limit, stating that the main objective of performance assessments is the avoidance of catastrophic consequences, rather than strict adherence to dose limits.[6]

Reinvigoration of a Risk and Performance Assessment Community of Practice

As discussed above, we find that, while many parts of the proposed rule exemplify the risk-informed, performance-based approach to regulation and waste management that the Commission has endorsed, the provisions requiring a 10,000-year compliance period in all circumstances and those relating to inadvertent intruders contain elements we find unnecessarily rigid and even unrealistic. We submit that these elements should be revised in favor of a more flexible approach geared to require performance more directly tied to circumstances of particular sites and wastes and the risks that they may pose.

In order to implement this approach, both in respect of this rule and the other elements of low-level waste regulation and disposition, we recommend that the NRC continue its commitment to mobilizing the professional judgment of regulators, the regulated community, and academic and other experts to define the sound science and risk-based assessments, determinations, and waste management decisions, and how they can best be applied in varying circumstances. The capacity to make such judgments would be greatly strengthened, and regulatory decisions significantly improved, if the professionals in different organizations, including NRC, DOE, and Agreement States along with non-government experts, collaborate closely and on a regular basis to share experience, best practice, and new developments in the relevant disciplines, including risk analysis and containment technologies. We believe that such a collaborative approach to low level waste regulation is necessary to ensure that regulations are practical and effective and minimize the potential inconsistency in low level waste management policies and practices. In particular, the Risk and Performance Assessment Community of Practice initiative, in which some of these commenters are active participants, has been revitalized and is regularly holding targeted web-based meetings, in which CRESP representatives have been presenters, on topics

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[5] http://pbadupws.nrc.gov/docs/ML0525/ML052590184.pdf, p. 136.

[6] ML11256A191, 3 (Sept 22, 2011), *ACRS Report on proposed Part 61 revision*, p. 4.

of importance to LLW management. We urge NRC (and its DOE counterparts as well) to continue to provide leadership to this effort. We are ready to work in any way possible to support such important collaboration, and believe it can achieve consensus risk-informed approaches that best meet the requirements of the different regulatory regimes that shape this complex area of waste management.

Respectfully submitted,

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RulemakingComments Resource

From: Dan Shrum <dshrum@energysolutions.com>
Sent: Friday, July 24, 2015 5:16 PM
To: RulemakingComments Resource
Subject: [External_Sender] Docket ID NRC-2011-0012 and NRC-2015-0003
Attachments: EnergySolutions Docket ID NRC-2011-0012 and NRC-2015-0003.pdf

Reference: Docket ID NRC–2011–0012 and Docket ID NRC-2015-0003

Subject: Comments to Proposed Rule and Part 61 Guidance, Low-Level Radioactive Waste Disposal, 80 FR 16082 and 80 FR 15930

Dear Ms. Bladey:

Please find our attached comments in response to the *Federal Register* notices regarding the U.S. Nuclear Regulatory Commission's (NRC) proposed changes to 10 CFR Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste* and Draft NUREG-2175, "Guidance for Conducting Technical Analyses for 10 CFR Part 61." We look forward to future opportunities to comment on this and other potential changes to Part 61.

Daniel B. Shrum

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July 24, 2015 CD15-0163

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Office of Administration
Mail Stop: OWFN-12-H08
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Reference: Docket ID NRC–2011–0012 and Docket ID NRC-2015-0003

Subject: Comments to Proposed Rule and Part 61 Guidance, Low-Level Radioactive Waste Disposal, 80 FR 16082 and 80 FR 15930

Dear Ms. Bladey:

Energy*Solutions* appreciates the opportunity to provide comments in response to the *Federal Register* notices regarding the U.S. Nuclear Regulatory Commission's (NRC) proposed changes to 10 CFR Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste* and Draft NUREG-2175, "Guidance for Conducting Technical Analyses for 10 CFR Part 61." The proposed rulemaking and guidance affects many aspects of Energy*Solutions* business operations. Our detailed comments on both the rule and the associated guidance are attached.

Energy*Solutions* appreciates the effort that the NRC staff has invested in this proposed rule. We also appreciate the degree of openness and receptivity to stakeholder comments that have characterized this proceeding. We believe that there are positive elements to the rulemaking, most notably the revisions to §61.58 that would allow for the derivation of site-specific waste acceptance criteria that could be used in lieu of the tables in §61.55. However, we believe that rulemaking as proposed is overly complicated and simply does not constitute the limited rulemaking that was envisioned by the Commission at the onset.

In SRM-SECY-08-0147 issued in March of 2009, the Commission directed the staff to undertake a limited rulemaking to "…specify a requirement for a site-specific analysis for the disposal of large quantities of depleted uranium…" While much has happened

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regarding the rule over the ensuing years, that fundamental basis has not changed. The broad and far from limited nature of the proposed changes would impose additional requirements that are not realistic and do not serve to provide added assurance in meeting performance objectives. Additionally, the proposed changes have generated confusion through inconsistent language when defining the technical analyses in both the proposed rule and the supplemental technical guidance document.

One of the most significant consequences of this increase in scope is that the rule would significantly and adversely affect the operations of LLW disposal facilities that have no desire to dispose of the waste streams that the NRC has concluded were not adequately evaluated in the promulgation of the original Part 61. Energy*Solutions* believes this is a regulatory overreach that is not justified, nor has the cost of this overreach been correctly assessed by the NRC. Energy*Solutions* recommends modification to either § 61.1 *Purpose and Scope* to include a provision for "grandfathering" active Agreement State sites, or that § 61.6 *Exemptions* be restructured to specifically exempt active sites that can demonstrate they have restricted and will continue to restrict access to their sites for the disposal of the waste streams in question.

While we do not agree with the extent of some aspects of the proposed rule, Energy*Solutions* applauds the adoption of an individual site-specific basis for the development of waste acceptance criteria that can be used in lieu of the tables in 10 CFR 61.55. We believe every aspect of that approach is superior to uniform use of the generically-derived classification tables and that their promulgation and use would constitute a significant advancement in protecting human health and safety and protection of the environment. We also compliment the NRC on proposing that the site-specific values be determined using contemporary guidance from the International Commission for Radiation Protection. This further enhances the technical credibility of the site-specific WAC approach. It is clear that the use of site-derived WAC is preferable over use of the classification tables no matter how well-informed their development.

Given the superiority of this approach, it is also clear that there is no value in the NRC revisiting the question of classification of any isotope, including uranium, or of restructuring the classification tables. There simply is no generic approach to defining waste streams or disposal sites that will be superior to the site-specific approach envisioned by the proposed 10 CFR 61.58. In addition to the benefits and technical

superiority of the site-specific approach, it enables a licensee or applicant to account for specific volumes of waste and associated radioactive isotopes, which is superior to the existing classification system that is concentration based. As such, there is no benefit, although there would be significant disruption and cost, to the Commission pursuing an additional Part 61 rulemaking following the completion of the ongoing proceeding.

We also appreciate the Commission's identification of defense-in-depth as constituting a safety case for the operation of a LLW disposal site. Unfortunately, the proposed rule goes far beyond the direction of the February 12, 2014 SRM that "…the proposed rule should include a **clear statement** [emphasis added] that licensing decisions are based on defense in depth (DID) protections..." and instead includes a new requirement for a defense-in-depth "analysis." The implementation of defense-in-depth strategies to improve robustness is not new in the nuclear industry; however, as articulated in the proposed rule it does represent a new requirement, one which is neither reasonable nor rationale.

By proposing the institution of a requirement for an analysis, the proposed rule suggests a quantitative assessment of multiple independent and redundant layers of defense. This concept of redundancy is misapplied in the context of a disposal site, where defense-in-depth is achieved by a reliance on the combined protection provided by proper siting, waste forms, and radionuclide content, engineered features, and natural geologic features of the disposal site (as contemplated by the SRM), such that no single layer, no matter how robust, is exclusively relied upon. In fact, the preparation of a performance assessment represents the analysis required to demonstrate the requisite level of protection and reasonable assurances that the performance objectives will be met are sufficient. No additional analysis to demonstrate defense-in-depth is necessary.

Another new requirement of the proposed rule that is not technically justified is the requirement in §61.44 to demonstrate site stability for 10,000 years. This requirement is related to the new requirement for a three-tier analysis, which in general contributes to the unreasonable complexity of the proposed rule. Previously the Commission, the Environmental Protection Agency and our federal legislators recognized in the Uranium Mill Tailings Radiation Control Act that demonstrating stability beyond 1,000-years was not achievable scientifically. There is no new evidence that would indicate that the science in this regard has changed. While there is no doubt that models can be run that

purport to demonstrate condition in deep time, the credibility of an analysis that pretends to demonstrate conditions of man-made materials over such time scales is questionable. This requirement should be eliminated from the proposed rule.

Finally, we would like to offer our comments on the proposed Agreement State Compatibility Category of B, with which we are in complete agreement. It is the responsibility and obligation of the NRC to establish credible limits for protecting human health and safety associated with the beneficial uses of atomic energy. It simply cannot be argued that having safety standards vary from state-to-state is scientifically or rationally justified. It also cannot be argued that the benefits of this rule change, a multi-year endeavor to regulate a waste stream that the NRC believes is not currently being effectively regulated, will even be realized if a lesser compatibility category is selected. Doing so would give states the latitude to ignore these important changes that have taken years even to come to the proposed rule stage.

This letter serves to highlight our concerns and most significant comments regarding the proposed rule. More detailed comments are contained in the attachments which delineate our specific comments, concerns and recommendations for your consideration.

Thank you again for this opportunity to comment. Questions regarding these comments may be directed to me at (801) 649-2109 or dshrum@energysolutions.com.

Sincerely,

Daniel B. Shrum
Senior Vice President, Regulatory Affairs

COMMENTS ON THE PROPOSED REVISIONS TO 10 CFR PART 61

Energy*Solutions* has reviewed the proposed rule and we are in general agreement with several of the proposed changes, principal among them:

- The proposed revision to include a 1,000 year compliance period.
- Including a specific dose limit of 500 mrem/y for the protection of inadvertent intruders.
- Adding an alternative to develop site-specific waste acceptance criteria (WAC) for use in lieu of the tables currently in §61.55. This approach clearly is superior to any generic approach that makes assumptions that will not accurately represent the disposal conditions at any given site.

The rule as proposed could have several unintended consequences, including the following:

- The NRC fails to identify or quantify potential liabilities and litigation risk for existing sites as closure plans are implemented. The NRC also fails to properly identify or quantify the potential burden the proposed rule will have on new sites.
- The staff, in its efforts to develop new requirements governing disposal of large quantities and concentrations of long lived radionuclides in a near surface disposal facility, has proposed a framework of requirements largely based on high level radioactive waste (HLW) guidance documents. Applying these prescriptive requirements, which are both unnecessary and overly restrictive, to all ***low*** level radioactive waste (LLW) disposal facilities is unreasonable and unnecessary. Existing sites could consider early closure to avoid litigation risks incurred by the proposed rule amendments. Furthermore, the burdensome and unnecessary new language included in the proposed rule could be a barrier for development of new sites for LLW disposal capacity. Only two sites have been developed since 10 CFR Part 61 was promulgated – the proposed rule will significantly impact future development.
- The complexity associated with the proposed rule will be to make it easier to dispose of LLW in RCRA or unregulated disposal sites using the 20.2002 exemption process, rather than at a LLW facility that is much better suited to manage radioactive waste. While this approach is acceptable for some waste streams, it is not desirable nor adequately protective of human health and safety to drive LLW into unregulated disposal sites.

Our specific comments below address these and other concerns with the proposed rule.

NRC's calculation of the average implementation cost of per licensee is incorrect. The proposed rule will be a significant burden on the Agreement States, licensees, and generators. Staff has significantly underestimated the burden and cost of implementation of the complex

proposal on the Agreement States, licensees, and generators. Energy*Solutions* is in the process of completing a performance assessment specifically designed to assess the impact of disposing of depleted uranium at its Clive site, and has already spent over $4,000,000 on this effort. It should be noted that this cost does not include the preparation of a stand-alone DID analysis.

Recommendation – Revise the implementation burden to correctly address the financial impact to licensees and Agreement State regulators.

Implementation of the proposed rule would place an undue burden on Agreement States – Currently, the Agreement States do not have the resources or capabilities needed to review the PA requirements set forth in the guidance document. There are a limited number of experts who can effectively perform these analyses. While the NRC alludes to the fact that they can provide technical expertise to States for their reviews in the guidance document, historically, these resources have not been made available to assist Agreement States even when requested. For example, when the state of Utah requested support from the NRC to review Energy*Solutions*' Clive DU PA, NRC did not provide this support on the basis that they cannot act on behalf of an Agreement State unless the Agreement State relinquishes their authority to them.

Recommendation – Energy*Solutions* proposes that NRC explicitly clarify in the rule the availability of its PA resources to assist in the review of licensee submittals. This would not only help address the availability of necessary expertise, but it would also address the issue of the undue burden imposed on the states.

The Licensing Process as proposed is not clear and is too complex to be consistently applied. In general, the process for development of the safety case for licensees and applicants is unclear. The language throughout the proposed regulation and the technical guidance needs to be minimized and clarified. Specific comments are provided below.

We attempted to create a flowchart to fit the pieces of the proposed rule together (see Figure 1). This flowchart clearly illustrates the cumbersome nature of the process. We recommend several changes that should streamline the process, including using a two-tier system. These are discussed in further detail in the following sections.

Recommendation – We propose that the NRC include a flowchart of the process so that an applicant or licensee can understand the components, requirements, key decision points, and how they fit together.

The language used to describe the technical analyses is inconsistent throughout the rule and the technical guidance contained in NUREG-2175. In the proposed rule, the analyses are discussed in some form in sections 61.2, 61.7, and 61.13. The types and number of analyses and how they are referred to are different in each section. In addition, the guidance document uses inconsistent language when referring to the analyses. The FRN has yet another way of referring

to (and ordering) the analyses (80 FR 16089-16093). The end result is confusing and difficult for an applicant or licensee to follow. Examples of these inconsistencies include:

- The Inadvertent Intruder Assessment is referred to using several different names throughout the rule and guidance document (e.g. Intruder Assessment, Inadvertent Intrusion Assessment, Inadvertent Intrusion);
- The long-term stability analyses is referred to using different names in the rule and guidance document (Long-Term Stability in the rule, Site Stability Analyses in the guidance document)
- The Protective Assurance Analyses is only referred to in the guidance document.
- Section 16.13(e) is entitled "Long-Term Radiological Impacts" but Table A refers to the Performance Period Analysis. The guidance document also refers to the Performance Period Analysis.

Recommendation – The definitions included in §61.2 should be consistently applied throughout the rule and guidance documents.

The language regarding the inadvertent intruder should be revised to more accurately account for site-specific conditions. As written, the proposed rule requires the analysis of an intruder who occupies the site and "…engages in normal activities including agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling)…" It goes on to require consideration of "…other reasonably foreseeable pursuits that are consistent with activities in and around the site at the time of closure…" The requirement that potential activities be "consistent with activities in and around the site" should apply to all elements of the intruder analysis. One might infer that this is the intent of the proposed regulation, but the wording does not make this clear. To remove doubt and avoid confusion, the section should be revised to move the modifying language regarding site-specific activities to the beginning of the description of activities.

Recommendation – Revise this section to clarify that all aspects of the intruder analysis should account for site-specific conditions.

Remove the requirement for a protective assurance period analysis. We do not agree that a three tier approach is needed. The performance assessment and inadvertent intruder analyses are good tools for evaluating long-term risks at a site. However, as discussed in more detail in following sections, there is unnecessary confusion and complexity added to these analyses due to the three-tiered assessment timeframe. The three tiers make for a cumbersome and overly burdensome process. Establishing a three tier approach is not efficient, clear or reliable, nor is there any evidence that it would contribute meaningfully to human health and safety. Implementation of a three tier approach will be a significant burden on Agreement States, licensees, and generators without added safety protection.

Recommendation – A two tier approach with a compliance period of 1,000 years and an analysis out to peak dose as a second tier would be protective and is much clearer, more efficient and reliable. A two tier approach out to peak dose will close the current gap for risks that increase for long lived radionuclides that are not adequately addressed by the current regulations.

There is no technical basis for a stability requirement of 10,000 years, nor is it possible to credibly demonstrate compliance with such a requirement. Proposed revisions to §61.44 require a disposal site to "…achieve long-term stability … for the compliance and protective assurance periods." While we agree that stability is an important component to the ability of a disposal site to properly isolate waste, 10,000 years is not a reasonable stability standard for a LLW disposal site. NRC, EPA and congress (Uranium Mill tailings control act legislation) have recognized that requiring stability beyond 200 to 1,000 years cannot be proven. Current stability requirements for Part 61 sites are largely met by complying with guidance developed for uranium recovery facility sites that implement a 200 to 1,000 year standard consistent with the URMCA requirements. Requiring stability for a 10,000 year period is unworkable. No other regulatory agency has a comparable requirement for LLW disposal. No Agreement State or licensee would be able to demonstrate stability for 10,000 years because the data to assess engineered features over this time period simply do not exist.

Recommendation – Reduce the stability requirement to 1,000 years. §61.44 should be revised to delete the words "and protective assurance."

The timeframes associated with the Site Stability and Site Characteristics analyses are unclear and inconsistent. Section 61.44 says the site stability must be analyzed over the compliance ***and*** protective assurance periods (10,000 years after closure); Section 61.50(a)(2) talks about characteristics the site must have over 500 years; Section 61.50(a)(3) and (4) say that the hydrogeological characteristics must not affect the ability to meet the performance objectives, which cover all three time frames including the performance period. Section 2.3.2.4 of the guidance document gives concentration based criteria for determining the timeframe to evaluate the site characteristics with three tiers: 500 years, 10,000 years, and the performance period. The required time period must be clarified in order for a licensee to even begin the process of evaluation.

Recommendation – Simplify the time period for site characteristics to either 500 or 1000 years. Make clear where the analyses of site characteristics fits into the safety case.

The requirement for a defense-in-depth "analysis" should be removed. Energy*Solutions* is in agreement with the direction from the Commission in SRM-SECY-13-0075 that licensing decisions be based on defense-in-depth (DID) protections such as siting, waste forms and radionuclide content, engineered features, and natural geologic features of the disposal site. We also agree that taken together with the PA, DID can help form the safety case for licensing. Where the proposed rule deviates from the Commission's direction, however, is in the

requirement for a DID analysis. The SRM articulates no such requirement, and in fact there is no basis for a DID "analysis." The requirement to perform an analysis suggests the need for a quantitative analysis of redundant safety systems, such as would be the case in a nuclear power plant.

The requirement to perform a DID analysis is neither appropriate nor necessary. The effect of the various elements that provide DID for a waste disposal site (siting, engineered features, etc.) is to ensure compliance with the performance objectives in Subpart C. The analysis to demonstrate compliance with the performance objectives is the PA and the intruder analysis. Staff seemingly acknowledges as much by inclusion of the following statement in NUREG-2175, the proposed guidance for implementing the rule:

> Therefore, licensees should be able to draw, principally, upon the results and risk insights gained from those other analyses to identify and describe defense-in-depth protections at the land disposal facility rather than developing separate analyses for demonstrating defense-in-depth.

And yet in the very next sentence in the guidance, staff states:

> In some cases, licensees may need to consider whether additional features, events, and processes or alternative scenarios might be appropriate to consider solely for demonstrating that defense-in-depth protections are included.

This is a perfect illustration of our concern that the requirement for an "analysis" will lead to additional modeling that will be time consuming and expensive without contributing meaningfully to demonstrating the suitability of a site or compliance with the performance objectives. Defense-in-depth for the sake of defense-in-depth renders the concept meaningless. Each defensive element of the disposal system contributes to the safety of the site, which is demonstrated by compliance with the performance objectives. If the value of a given element, e.g., a site feature or engineered barrier, cannot be demonstrated in the PA, then it has no merit.

Recommendation – Delete the requirement for a separate DID analysis. Revise the proposed rule to clarify that DID is an important element of the safety basis and that each applicant or licensee must address how DID has been accounted for in its technical analyses.

The requirement to update the technical analyses at closure for existing sites that have met all previous requirements to date should be deleted. This is a significant and unnecessary burden on both licensees and regulators and no basis for this new requirement has been provided. As we have discussed repeatedly in our comments and in testimony before the Commission, the technical analyses required by the rule are expensive to prepare and to review. To require them to be updated for a site that is at the end of its licensed life and has operated in accordance with the regulations and the technical analyses that provide the licensing basis for the site simply makes no sense. It is not apparent what different outcome might be expected from repeating

analyses given no change in operating conditions previously analyzed. The only reasonable rationale for such a requirement is when conditions have changed, whether they be related to site conditions or waste inventory.

Recommendation – Revise the proposed rule so that this requirement applies only to sites that have encountered new, unanalyzed conditions.

The proposed rule should be revised to grandfather existing sites that do not dispose of the unanalyzed waste streams that led to the development of the proposed changes. The rule makes clear that the new requirements apply to all currently operating sites. However, the NRC has provided no justification for revising the rules currently in effect for licensed sites unless they accept waste streams that were not sufficiently analyzed in the development of Part 61 as originally constituted. In fact, the agency has gone to great lengths to state that the current rules are sufficiently protective of human health and safety.

The intent of section §61.1 is that "Applicability of the requirements in this part to Commission licenses for waste disposal facilities in effect on the effective date of this rule will be determined on a case-by-case basis." This language recognizes that new requirements introduced after a site is sited, licensed and operated under previous requirements would not be binding on either Agreement States or licensees that committed to specific site conditions and licensing requirements in good faith. This is a reasonable regulatory approach where there has been no demonstration of a need for a change to reflect changed conditions or the scientific understanding of a particular condition. It also is consistent with the NRC's *Principals of Good Regulation*, which in reference to Efficiency, state:

> Regulatory activities should be consistent with the degree of risk reduction they achieve. Where several effective alternatives are available, the option which minimizes the use of resources should be adopted.

Requiring additional costly analyses that provide no reduction in risk is in direct conflict with the agency's own principals.

The NRC staff indicates that a currently operating site, or a newly proposed LLW disposal site, could choose to continue to use and apply the existing waste classification system and associated waste form and disposal requirements set out in Part 61, or could apply a new set of WAC developed through the analyses prescribed in the proposed rule changes. For example, the staff states:

> In defining LLRW streams with acceptable radionuclide concentrations or activities and waste forms, licensees or license applicants would be allowed to use either the results of the site-specific technical analyses set forth in 10 CFR 61.13, or the LLRW classification requirements in 10 CFR 61.55. (80 FR 16100)

Staff goes on to state:

> In the proposed rule, the NRC is proposing the hybrid waste acceptance approach (Option 3) as the regulatory LLRW acceptance framework for the near-surface disposal of LLRW. The hybrid waste acceptance approach provides a framework for the use of either the generic LLRW classification system specified in 10 CFR 61.55 or the results of the technical analyses required in 10 CFR 61.13. (80 FR 16101)

Currently operating sites already have had to conduct technical analyses as required by §61.13 to demonstrate that they will comply with the performance objectives of Subpart C when disposing of LLW that meets the concentration limits in §61.55. As written, the proposed rule would require these sites to prepare new technical analyses at the cost of millions of dollars even if they do not propose either to accept new waste streams or to derive new operating limits as would be allowed under the proposed revisions to §61.58. Thus, the rule changes, as proposed, impose an unreasonable regulatory burden on the existing operating sites and existing Agreement State regulatory agencies who desire to remain under the current regulatory regime set out in existing Part 61. These new requirements should only apply to existing sites and any new sites that accept and dispose of new waste streams containing higher concentrations and larger total quantities of long lived radionuclides.

Recommendation – Provide an exemption for sites that are currently operating under approved licenses, as discussed in detail in the following section.

Energy*Solutions* agrees with the NRC proposal to make significant portions of the proposed rule be Agreement State Compatibility Category B. In undertaking the rulemaking to revise Part 61 to address waste streams not previously accounted for in its regulatory scheme, NRC has recognized the importance of requiring Agreement States to implement these regulations as proposed. Energy*Solutions* emphatically concurs in this conclusion. This is true for two reasons:

1) The benefits of this proposed rule, a multi-year endeavor to regulate a waste stream that the NRC believes is not currently being effectively regulated, may not be realized if a lesser compatibility category is selected. Agreement States should not have the latitude to ignore these important changes that have taken years just to bring to the proposed rule stage.
2) Human health and safety standards do not vary from state-to-state. It is incumbent upon the federal regulator to ensure scientific defensibility and consistency in the establishment of standards that are important to human health and safety. It also is important for the credibility of the regulatory framework to clearly acknowledge that there can be only one scientifically-based standard.

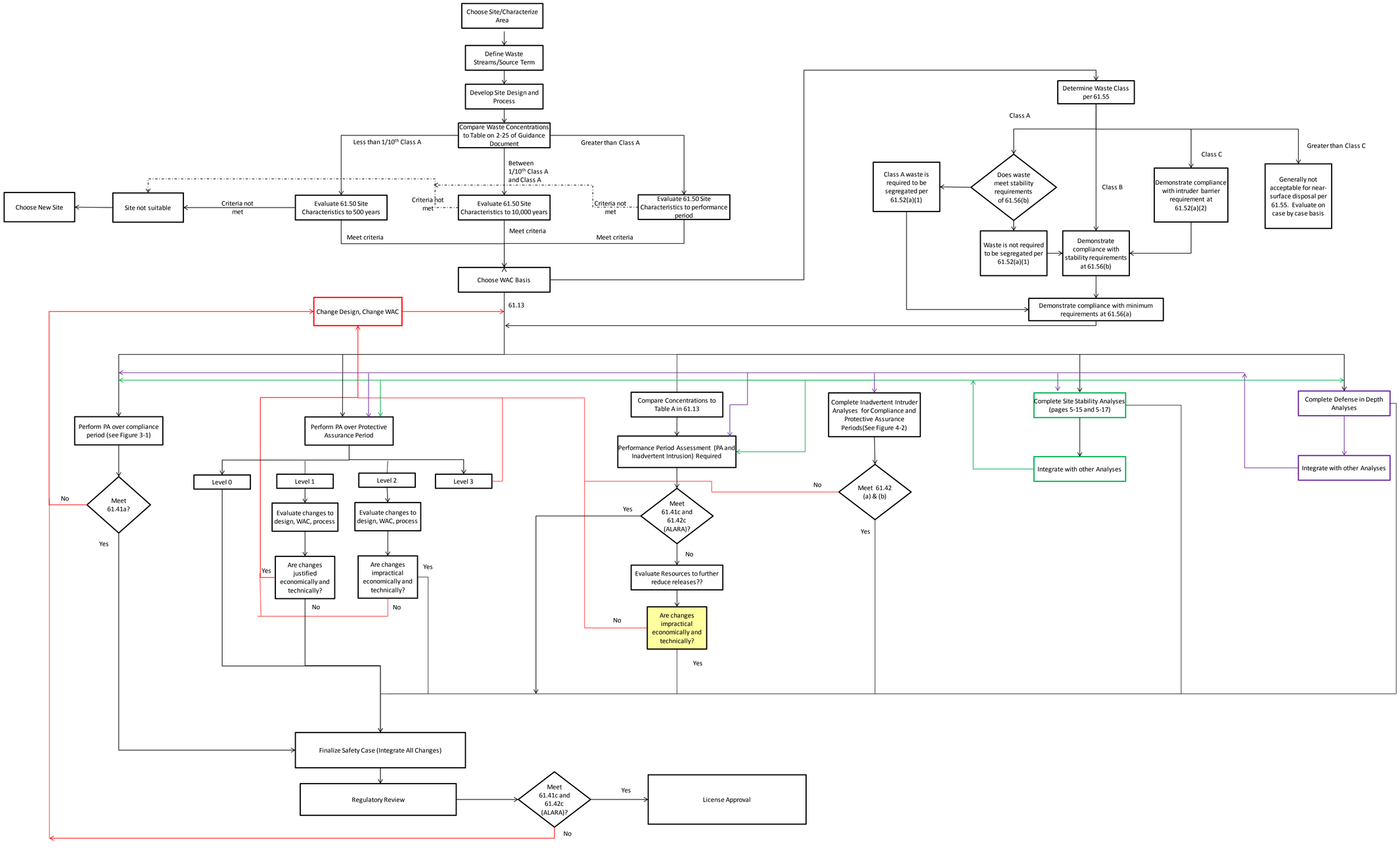
This is not a matter of flexibility for the states, it is a matter of scientific credibility, protecting human health and safety, and maintaining regulatory consistency in what is undoubtedly and indisputably a nationwide enterprise.

Recommendation – Retain the Compatibility Category B as published in the Federal Register request for comment notice.

SPECIFIC COMMENTS BY SECTION

Section	Comment	Comment Type
61.7	This section needs to be reconfigured. The flow of concepts is not logical, it is too detailed, and there is overlap with §61.13. The proposed language includes excessively prescriptive language that is not appropriate for regulation and should be removed to guidance. Specific comments are given by subsection below.	Technical
61.7€	Remove the majority of this language and replace with language to describe the new structure and requirements governing acceptance and disposal of the newer and additional waste streams containing higher concentrations of long-lived radionuclides. Provide a brief, concise summary of the technical analyses and refer to §61.13 for details.	Technical
61.7€	This is a good example of clear, concise language that then refers to a different section for details.	
61.12	In subsection (j)(2) include a reference to §61.13 after "technical analyses."	Editorial
61.13	This section should be the one section where the technical analyses are defined. Any subsequent reference to the analyses in the rule or guidance should use the identical names used in this section. Each subsection describing an analysis should begin with the name of the analysis underlined. The details of the analyses, such as subsections (a)(1) – (a)(10) should be removed and placed in the guidance, and only minimal, concise language used in this section.	Technical
61.13	In the first paragraph of this section, delete the text: "Licensees with licenses for land disposal facilities in effect on the effective date of this subpart must submit these analyses at the next license renewal or within 5 years of the effective date of this subpart, whichever comes first." The applicability of the new rules is addressed in §61.1, which properly notes that their applicability to existing licenses will be considered on a case-by-case basis.	
61.13(a)(9)	Delete. This requirement to consider "alternative conceptual models of features and processes" is illogical and unjustified. The applicant or licensee has the obligation to submit and justify its modeling approach, and the regulatory agency has the responsibility to confirm the technical suitability of the approach. To require a NEPA-esque alternatives approach is excessive, overly burdensome regulation that would be ripe for abuse. This requirement invites the prospect of incessant regulatory "what ifs?" that are not productive, protective, or justified.	Technical
61.13(b)(3)	Revise to read as follows: "An intruder assessment shall: (i) Assume that, at any time after the period of institutional controls ends, an inadvertent intruder engages in pursuits that are	

	consistent with activities in and around the site at the time of closure, potentially including agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling) or other reasonably foreseeable pursuits and that unknowingly expose the intruder to radiation from the waste.	
61.13(e)	This section is not clear and will be very difficult to implement. Table A is unclear and subject to interpretation, which will be a burden on states and operators. This section should be reworded and clarified so that it is clear that the Table A is to be solely used to determine whether or not a Tier II analyses is required.	Technical
61.13(f)	Revise by deleting the phrase "Analyses that demonstrate" and replacing it with "Description of how."	Technical
61.28(a)(2)	Revise so that the revised analyses for §61.13 are only required for sites that have identified new unexpected conditions.	Technical
61.41	Delete subsection (b) to be consistent with the two-tier system.	Technical
61.42	Delete subsection (b) to be consistent with the two-tier system.	Technical
61.44	The words "and protective assurance" should be removed so that the stability analyses is only required for the compliance period.	Technical
61.51(a)	Delete the phrase "defense-in-depth." This wording suggests that a site would have multiple layers or redundant systems built into the design. This is a misapplication of the concept of defense-in-depth for a disposal site. Defense-in-depth is provided by the additive protection arising from proper site selection and design and there should be no specific requirement for DID to be built specifically into the site design. The extent to which design features are necessary to ensure compliance with the performance objectives should be driven by the overall technical analyses, not a DID focused "analysis."	Technical


Choose Site/Characterize Area
Define Waste Streams/Source Term
Develop Site Design and Process
Compare Waste Concentrations to Table on 2-25 of Guidance Document
Less than 1/10th Class A
Between 1/10th Class A and Class A
Greater than Class A
Choose New Site
Site not suitable
Criteria not met
Evaluate 61.50 Site Characteristics to 500 years
Criteria not met
Evaluate 61.50 Site Characteristics to 10,000 years
Criteria not met
Evaluate 61.50 Site Characteristics to performance period
Meet criteria
Meet criteria
Meet criteria
Choose WAC Basis
61.13
Determine Waste Class per 61.55
Class A
Class B
Class C
Greater than Class C
Class A waste is required to be segregated per 61.52(a)(1)
Does waste meet stability requirements of 61.56(b)
Demonstrate compliance with intruder barrier requirement at 61.52(a)(2)
Generally not acceptable for near-surface disposal per 61.55. Evaluate on case by case basis
Waste is not required to be segregated per 61.52(a)(1)
Demonstrate compliance with stability requirements at 61.56(b)
Demonstrate compliance with minimum requirements at 61.56(a)
Change Design, Change WAC
Perform PA over compliance period (see Figure 3-1)
Meet 61.41a?
No
Yes
Perform PA over Protective Assurance Period
Level 0
Level 1
Level 2
Level 3
Evaluate changes to design, WAC, process
Evaluate changes to design, WAC, process
Are changes justified economically and technically?
Are changes impractical economically and technically?
Yes
No
Yes
No
Compare Concentrations to Table A in 61.13
Performance Period Assessment (PA and Inadvertent Intrusion) Required
Meet 61.41c and 61.42c (ALARA)?
Yes
No
Evaluate Resources to further reduce releases??
Are changes impractical economically and technically?
No
Yes
Complete Inadvertent Intruder Analyses for Compliance and Protective Assurance Periods(See Figure 4-2)
Meet 61.42 (a) & (b)
No
Yes
Complete Site Stability Analyses (pages 5-15 and 5-17)
Integrate with other Analyses
Complete Defense in Depth Analyses
Integrate with other Analyses
Finalize Safety Case (Integrate All Changes)
Regulatory Review
Meet 61.41c and 61.42c (ALARA)?
Yes
No
License Approval

COMMENTS ON NUREG-2175, GUIDANCE FOR CONDUCTING TECHNICAL ANALYSES FOR 10 CFR PART 61

CHAPTER 1

Summary Comment – The document introduces designations for individual technical analyses that are not cited in the proposed rule and inconsistently refers to these analyses in multiple chapters. This lack of consistent language throughout the documents would create an opportunity for the user community to misinterpret or possibly misapply the Commission's intent when developing the safety case.

Recommendation – Align guidance document section/subsection titles with analytical designations in §61.13 and ensure they are consistently cited through its entirety.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	1.0	The document would be improved by providing detailed guidance on how to prepare a technically defensible safety case and this would be best stated in Chapter 1. This section describes the approach for implementing the requirements for the technical analyses and the waste acceptance criteria to demonstrate compliance with the performance objectives, although never fully describes the underlying basis for the developing the safety case.
2	1.1	In each subsection, the titles should match the terminology in the proposed rule, and any repetitive, unnecessary content should be removed.
3	1.1.2	Because the WAC is relied upon to ensure that the performance objectives are met, the WAC should be included as part of the safety case.
4	1.1.2	Updating the safety case as part of the application for site closure is unwarranted and unnecessarily burdensome for licensees with sites having conditions that have been determined to adhere to the existing safety case. The section should be modified to discuss circumstances which an update is required, and to make an allowance for facilities with no changes to retain the existing safety case.
5	1.1.3	The placement of this subsection implies that defense in depth is a separate analysis, yet the text itself re-iterates our position that the concept of defense-in-depth should be incorporated into the other technical analyses and is not an independent analysis. This section should focus more on how the Commission would like the defense in depth protections highlighted throughout the other technical analyses.
6	1.1.4	The term "technical analyses" is redefined in this section differently than in the rule. It is technically careless to intentionally use the same term to mean different things in the context of a single regulatory application. Uniform terms and designations for technical analyses should be used throughout the rule and guidance.
7	1.1.4	To align with our comment that the rule should only contain definitions of

		the analyses and the discussion around the analyses should be relocated to the guidance, we suggest that much of the language in §61.13 of the proposed rule be removed and relocated to this section, which provides explanations of the technical analyses required.
8	1.1.4.2	The background regarding the basis for an inadvertent intrusion is helpful by citing the corresponding technical basis for the analyses. We recommend including a similar basis for each analysis referenced in this section.

CHAPTER 2

Summary Comment – The requirements outlined in this chapter are overly burdensome, and the staff did not adequately assess the time and effort for licensees to complete the technical analyses. The level of effort required to evaluate FEPs and perform technical analyses with respect to the performance objectives rivals high level waste geological repositories. The technical analyses for the Yucca Mountain Repository required over 20 years to complete. Appendix C, referenced in this chapter, provides examples of FEPs to consider for repositories, including Energy*Solutions*' site in Clive, Utah. As Staff state in this section, the level of effort required to perform technical analyses should be commensurate with the risk associated with the waste. LLW, including LLW with long-lived radionuclides, still poses significantly less risk to the public and environment than HLW. Therefore, the technical analyses requirements outlined in this guidance should be reduced. Specifically, requiring a licensee to consider alternative scenarios and provide model validation and uncertainty quantification for analyses beyond 1,000 years provides little benefit to providing assurance of results, especially given the level of effort required to perform these tasks, and is not commensurate with the risk.

Recommendation – Staff should reassess the requirements for technical evaluations, eliminating overly burdensome suggestions, such that the anticipated level of effort and costs associated with the technical analyses are more appropriately aligned with the associated risk. The requirements for model validation, data adequacy review, and uncertainty quantification should be significantly reduced or eliminated.

Summary Comment – The content regarding the considerations of FEPs, scenarios, model development presented in this chapter are too prescriptive, unnecessarily conservative, and in some instances circular. The iterative processes suggested can lead to a never-ending analyses period that provide little return with respect to providing greater confidence that performance objectives are met. Such requirements include requiring the licensee to consider and run multiple models when data are sparse, to validate efforts by modeling similar sites modeled by alternative agencies, and to update FEPs when new information is found. Overall, the considerations in this chapter ask the licensee to go beyond providing "reasonable assurance" of long-term site stability and adequate protection of the public. These specific examples are expanded upon in the specific comments below.

Recommendation – The level of detail describing how to perform the technical analyses should be reduced, such that the chapter describes a clear path for performing technical analyses that allows licensees flexibility in the overall approaches used to demonstrate compliance objectives are met.

Summary Comment – Time periods for analyses and additional considerations based on waste concentration are introduced in this chapter, including for example those in §2.3.4, that are not included in the rule.

Recommendation – Revise the guidance and rule to ensure consistency throughout both documents. Analysis requirements should not be in the guidance that are not included in the rule.

Summary Comment – Accounting for uncertainty is a theme that is addressed numerous times throughout this chapter in separate subsections. In many cases, the discussions and examples for addressing uncertainty are incomplete. In other cases, redundancy and over-conservatism in the design and analyses are presented as necessary to address the uncertainties. As a result, the proposed guidance is overly prescriptive, particularly in light of there being other techniques available to address uncertainty which are considered leading practices in the nuclear power industry.

Recommendation – Instead of weaving comments and requirements around uncertainty through the text, we recommend the Staff draft a subsection to specifically address how to perform an uncertainty quantification analysis. The uncertainty quantification should be used to inform the numerical models and overall design such that the licensee and regulator have confidence that the site meets or exceeds performance objectives while minimizing the costs associated with model development and validation and overall site construction costs.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	2.1	The discussion around accounting for uncertainty is overly simplistic and incomplete. Model uncertainty cannot be accounted for simply by developing and analyzing conceptual models. Accounting for model uncertainty is an iterative process that requires evaluation of the model form, parameters, and representation of parameters within the model in order to address and potentially correct bias and calibrate parameters. Because the assessment process relies upon multiple models with some model outputs being inputs of other models, uncertainty quantification becomes a computationally expensive and time consuming exercise. Researchers specializing in uncertainty quantification are only now developing defensible techniques to address uncertainty propagation through multiple models. The guidance should include a more thorough discussion on uncertainty quantification and propagation.
2	2.2.1	Parameter uncertainty is described in §2.2.2.1.3, not §2.2.2.1.2 as referenced in the text
3	2.2.2	The italicized emphasis on scenario uncertainty when describing uncertainties in the performance assessment is confusing and might lead the licensee and/or reviewer to place a greater emphasis on scenario

		uncertainty. We recommend staff provide better support for the emphasis or eliminate the use of italics.
4	2.2.2	Figure 2.2 is oversimplified does not provide an adequate representation of uncertainty analysis and the treatment of uncertainty. The figure seems to imply that the same parameter sets might be used in all models, potentially modeled using the same distributions and or discretization, and that all parameter sets will be incorporated into making a decision, which might not be appropriate. Additionally, the figure does not depict model interaction and parameter interaction which is common to model building for performance assessments. The performance assessment can be comprised of many submodels interwoven together to ultimately predict radiation release. We recommend the figure be updated to reflect the true level of effort required to account for future, model, and parameter uncertainty, or the figure should be removed the text.
5	2.2.2.1.2	The requirement that when data are sparse, multiple conceptual models should be evaluated and the most conservative model selected is overly burdensome. It is difficult to assess which model is actually the most conservative for the data considered without actually constructing and running the model. This requirement should be eliminated.
6	2.2.3	We agree with Staff that the technical analyses required by the performance assessments and site stability analyses cannot be validated. We also agree with comments that the greatest sources of uncertainties in the performance assessment are due to projecting out models calibrated with relatively brief histories across periods of time that are orders of magnitude greater than the calibration periods. Given the level of effort required to perform the technical analyses, including the iterative process of parameter characterization, model calibration and model verification, we question the validity and benefit of performing quantitative analyses beyond 1,000 years. For example, post-audit reviews of groundwater models show that the predictive capability of groundwater models is generally poor. Prediction accuracy is even poorer in models that are recalibrated to better fit historical data, even with calibration periods of 40 years.
7	2.2.3	With respect to the quantity and quality of model support being dictated by consistency with past experiences in similar conditions, the example presented using an engineered barrier is nonsensical and should be removed from the text. Little evidence (if any) is available showing the performance of an untouched engineered barrier beyond 1,000 years, as required by the performance assessment and site stability analysis for sites accepting long-lives radionuclide waste. Because no such examples exists, the example is superfluous and licensees will still have to provide a great amount of model support for engineered barriers.
8	2.2.3	The guidance suggesting that licensees might have to prepare analyses and provide comparisons of results to similar sites modeled by other organizations is not reasonable. Such a suggestion goes against the concept of site-specific analyses, and poses an unjust burden on

		licensees that have been provided the flexibility to model sites differently than other organizations in order to provide reasonable assurance of site stability and public health protection at their site. We recommend that the suggestion be removed from the text.
9	2.3.2	The guidance that licensees should perform quantitative analyses for the protective assurance period contradicts the guidance in Chapter 6.0, which states that for dose limits below 0.25 MSv/yr, qualitative or quantitative analyses can be performed. The guidance should remain consistent throughout the entire document.
10	2.3.4	The introduction of additional requirements for the assessment of site characteristics based on waste concentration adds additional confusion to an already burdensome and convoluted process. It is unclear how these time frames for analyses based on concentration limits should be incorporated into other analyses including site stability, intruder analysis and protective assurance period compliance analyses. As the requirements are not included in the rule, they should be removed from the guidance.
11	2.3.5	The table for required analyses based on site characteristics again adds confusion to the burdensome licensing process. It is unclear if the analyses required are dependent upon the waste concentration as prescribed in §2.3.4. We recommend providing additional context for the table and including guidance regarding the site characteristic requirements.
12	2.5.3.1.1.1	The iterative process for FEP identification and the consideration of additional FEPs when information is available is unnecessarily burdensome. Staff should provide guidance regarding when it is acceptable for the licensee to stop the iterations. Without such information, the FEP identification process is circular and has no clear end point.
13	2.3.5.1.2.1	The quality of the hazard maps in Appendix B related to features and phenomena that can be used to screen FEP's are of poor quality and can easily be misinterpreted by both the regulator and licensee. We recommend removing the hazard maps from the Appendix and as an alternative, providing digital map files (such as ESRI Shapefiles) that allow for viewing on a finer scale.
14	2.5.4.1	The statement that "a licensee should use scenarios to describe the scenario uncertainty associated with the system" is circular and confusing. We recommend revising the statement or removing it from the text, as it is ripe for misinterpretation by both licensees and regulators.
15	2.5.4.1	The paragraphs describing alternative scenarios is confusing and seems to be in contradiction to the descriptions of FEPS that can be excluded based on regulations. The benefit of developing and analyzing highly improbable scenarios has not been demonstrated and poses unnecessary burdens on both the licensee and reviewer. The requirement should be removed from the guidance.

CHAPTER 3

Summary Comment – The majority of this chapter is devoted to describing modeling efforts for radionuclide release and subsequent transport to receptor locations. Each subsection focuses on a specific model, and primarily referencing existing guidance or literature to consult for more in-depth specifications while providing commentary on general considerations. The focus on existing guidance is understandable and warranted, but the reader could benefit from additional context describing the referenced sources.

Recommendation – Develop a table, similar to Table 11-4, which references existing guidance or literature by model/topic and also provides a description of the source and its potential use. Given the current layout of the chapter, it would be beneficial to create two of these tables: one for source term modeling and another for transport modeling.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	3.1.1, Line 14	The reference to "Step 8" should be revised and corrected to "Step 9."

CHAPTER 4

Summary Comment – Generic scenarios do not inherently account for site-specificity, and numerous viable disposal sites across the country can be seen to demonstrate the inaccuracies in NRC staff's claim on line 28 of page 4-11 that such generic scenarios represent *"normal activities that humans typically engage in . . ."* For example, Clive Utah's groundwater is of extremely poor quality and very low yield. The generic inadvertent intruder scenarios not only completely misrepresent any potential inadvertent intruder exposure from Clive Utah's groundwater, the generic scenarios also arbitrarily underestimate the sites' ability to comply with the inadvertent intruder protection performance objective. Such arbitrary support of generic inadvertent intruder scenarios by NRC staff is also dramatically inconsistent with NRC staff's own claim on line 38 of page 4-11 that "depending on the method used, licensees should provide justification for their selection." Similarly, simple reliance by a licensee on the generic inadvertent intruder scenarios is also contrary to NRC's own guidance on line 20 of page 4-7 that the inadvertent intruder analysis is an "iterative process involving site-specific, prospective modeling evaluations . . ."

Recommendation – Place greater emphasis throughout the text on the importance of considering reasonably foreseeable and site-specific scenarios at the site location. A table of lines from the text that we recommend be edited to provide such additional clarity are shown below.

Table 4.1 Lines Needing Additional Clarity

No.	Section	Page	Line
1	4.1	4-3	28

2	4.2.3	4-6	26
3	4.3	4-9	8
4	4.3.1	4-11	7
5	4.3.1	4-13	40
6	4.3.1	4-16	1
7	4.3.1	4-19	3
8	4.3.2	4-26	33
9	4.3.2	4-27	2
10	4.3.2.2	4-30	10
11	4.3.2.2	4-34	35
12	4.3.2.4	4-35	37
13	4.3.2.4	4-25	43

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	4.0, Line 14	Figure 4-1 is inconsistent with the text of Section 4.0. The caption in the top circle of the Figure should be revised to "*Demonstrate Compliance with Waste Acceptance Requirements*" to remain consistent with the text.
2	4.2	For added clarity, Section 4.2 could be adjusted to reinforce that the chapter's focus is for protection of an inadvertent intruder.
3	4.3.1	Line 26 of page 4-11, regarding the assessment that generic receptor scenarios are reasonably conservative should be deleted.
4	4.3.1	The intent behind NRC's justification of generic inadvertent intruder receptor scenarios provided on line 9 of page 4-13 does not automatically equate to their projection of conservatisms and bounding results without adaptation to reasonably-expected site-specific analysis and justifications suggested throughout subsection 4.3.1.2. Rather, the generic receptor scenarios provide conservative bounds for the sites that existed at the time 10 CFR 61 was first promulgated. Such qualifications should be added to the text.
5	4.3.1	We appreciate that NRC staff realizes that when drilling resistance is encountered (as part of the Intruder-Driller Receptor Scenario), a driller will typically adapt by moving the drill rig to a more suitable location. It is recommended that the guidance also note in subsection 4.3.1.1.2 that when extremely low yield or extremely poor quality groundwater is encountered, the driller will also adapt by moving sufficiently far to be located over completely different hydrogeologic conditions of higher yield and quality.
6	4.3.1	Since Staff recognizes that prior to construction and dwelling intrusion scenarios, the inadvertent intruder must first excavate a viable production groundwater well, the text should be revised to note that when failing to do so, it can be reasonably expected that neither the construction, dwelling, nor agricultural intrusion receptors will represent site-specific conservatisms.

7	4.3.1	Licensees should only be allowed to adopt generic receptor scenarios after providing justification that facility design, operations, and site are reasonably represented in the generic scenario characteristics. Line 22 should be revised to reflect this position.
8	4.3.1	Estimated exposures from generic receptor scenarios might not always be higher than site-specific scenarios. A generic scenario does not automatically equate to conservativism without appropriate consideration and analysis of reasonably expected site-specific conditions. It should be the burden of the licensee to demonstrate, and the reviewer to confirm, whether or not results produced by the application of generic-receptor-scenarios are more conservative (e.g., higher projected doses). The statement on line 17 of page 4-17 should be revised to reflect that the generic scenarios represent greater exposure estimates.
9	4.3.1.2.	The main advantage of site-specific intruder receptor scenarios is not the flexibility provided the licensee; rather, the main advantage to the licensee and the reviewer is that site-specific intruder receptor scenarios more closely reflect reality. This adds to the degree of confidence that a technically-based and reproducible assessment is achieved. Statements within this section should be edited to reflect the true advantages of site-specific analyses.
10	4.3.2.2 Page 4-30 Line 44	Because the statement regarding conservative estimates of waste inventory is given without qualification, it is easily misinterpreted by reviewers. The statement should be removed or better qualified.
11	4.3.2.2	This section (and this chapter in general) is replete with references to "conservatives;" conservative designs, scenarios, estimates, limits, assumptions, parameters – the list goes on and on. It is inappropriate to urge conservatism at every step, particularly in the case of site parameters. Staff should promote site-specific input parameters and only use (conservative) default values where the input parameters either don't matter (based on sensitivity) or are impossible to obtain. It also is important to recognize that an input parameter that is conservative for one analysis may not be conservative for another (take, for example, staff's own caution of using conservative releases for 61.41 compliance vis a vis 61.42 compliance). Incessantly compounding conservatisms is a reflexive and inappropriate approach to preparing an analysis with a suitable safety margin.
12	4.3.2.2	The first clarification for appropriate inadvertent intruder assessment source term on line 33 of page 4-34 should be revised to clarify that environmental contamination generated by the inadvertent intrusion is not included in demonstration of the protection of the general public.
13	4.3.2.2	Line 45 of page 4-34 describing the importance of assessing waste accessed via excavation by the intruder should be clarified so that it is clear that performance assessment demonstrating protection of the general public does not require and should not include an assessment of the transport of waste via intruder excavation.

14	4.3.2.3	The two examples cited in this section of gaseous diffusion and an intruder well inappropriately imply that these transport mechanisms are always reasonably expected. If non-potable and of extremely low yield, a site's aquifer may not be a viable target for an intruder well. It is suggested to remove the sentence beginning on line 17 of page 4-35.
15	4.3.2.3	General public exposures are not modeled for any radionuclides transported off-site due to the actions of an inadvertent intruder. Line 20 of 4-35 should be amended to include this qualification. For example, if an inadvertent intruder drills into disposed waste in preparation for a garden, the dust generated from doing so is not modeled when projecting doses to the general public nor included when comparing to regulatory limits for post-closure general public exposures.
16	4.3.2.4	The statement beginning on line 25 of page 4-35 is misleading. Any contact by anyone (whether on the site or downstream) with waste that has transported away from its original disposal placement will be the result of "*onsite releases from the LLW disposal facility.*" The reference to direct contact with waste should be removed.
17	4.3.2.4	The inadvertent intruder methodology summarized on line 30 of page 4-35 should be revised to clarify, "Dose modeling consists of converting radionuclide concentrations <u>generated</u> in environmental media <u>from the inadvertent intrusion onto the licensed site and/or into the waste</u> to dose through various <u>onsite</u> exposure pathways."
18	4.4	The statement made on line 10 of page 4-37 stating that licensees may assume institutional controls provide durable site protection seems to contradict the entire theme of this chapter, which is a guidance on how a licensee can demonstrate, through analyses not assumptions, reasonable assurance that performance objectives are met. This statement should be eliminated from the text.

CHAPTER 5

Summary Comment – The guidance for proving site stability is convoluted and limits the ability of an applicant or licensee to determine how to develop a site stability analyses. Adding to the confusion already considered in the guidance, Chapter 2 presents new time periods for analyses, and then this chapter introduces another time period based on waste concentration.

Recommendation – Clarify the time period for analyses**.** The licensee and reviewer would both greatly benefit from the addition of a table or flow diagram that outlines all analyses considerations and time frames for analyses presented in the rule in Section 61.44, Section 61.50(a)(2), Section 61.50(a)(3), and guidance in Chapter 2.3.2.4, and this chapter.

Summary Comment – Requiring quantitative analyses periods beyond 1,000 years for low-level waste is unreasonable, unprecedented, and without scientific merit. The use of natural analogues, though helpful to support the design and technical basis for engineered barriers, cannot be used to prove with confidence stability of a man-made or engineered barrier

Recommendation – Remove requirements to prove site stability past 1,000 years**.**

Summary Comment – The frequent shifts between the requirements and scope of "site stability analysis" and "stability analysis" is confusing and in some instances seem to be used interchangeably and in other instances "stability analyses" seems to reference a larger analysis of which "site stability analyses" are a component. This is also demonstrated in Chapter 2, which provides guidance for analyses required with respect to site characteristics.

Recommendation – Use language that is consistent throughout both the rule and the guidance.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	5.1	Staff should eliminate or provide context for the requirement that licensees that choose to use site-specific scenarios over generic receptor scenarios must consider low frequency natural events in the site stability analyses. An explanation of why generic receptor scenarios "may bound the impact" from these events, and site-specific scenarios would not is missing.
2	5.1.1.3	The guidance suggests that site stability against other disruptive processes should include climate change for sites accepting waste with long-lived isotopes. The concept that climate change is a disruptive process and should be modeled as such is never referenced in the proposed rule. Furthermore, the guidance suggesting climate change should be considered within the site stability analyses seems to directly contradict guidance in §5.1.2 which states that licensees should evaluate natural climate cycling, but are not required to evaluate "anthropogenic climate change." There are no conservative scenarios with respect to the concept of climate change, and as such any climate change projections cannot be considered reasonably foreseeable at the individual site. The suggestions around climate change should be stricken from the guidance. This also is in direct conflict with Commission direction that analyses beyond the compliance period ***not*** rely on such assumed conditions: "Given the significant uncertainties inherent in these long timeframes, and to ensure a reasonable analysis, this performance assessment should reflect changes in features, events, and processes of the natural environment such as climatology, geology, and geomorphology only if scientific information compelling such changes from the compliance period is available." (SRM-SECY-13-0075)
3	5.2.2	The suggestion that refinement of a model with results showing a FEP to be significant could lead to new results showing the FEP is actually insignificant, and thus site stability is proved, should be eliminated from the text. The suggestion encourages the licensee to massage data, parameterization, boundary conditions, and model form to produce satisfactory compliance results.
4	5.3.1	If as suggested, the existing guidance for uranium mill tailings is applicable to LLW disposal sites, and as such, the limitations of the

		existing guidance should also be applicable. Comments on the uranium mill tailings analyses recognized that stability over 1,000 years cannot be proven. We reiterate our comments that the licensee should not be required to make attempts to demonstrate site stability from 1,000 to 10,000 years.
5	5.3.1	The comment that the Staff "plans to periodically assess the sufficiency" of the guidance around proving engineered barrier stability and "supplement it when necessary" is disturbing. NRC's *Principles of Good Regulations* state that regulation should be reliable and not in a state of transition. The proposed actions to reassess the guidance goes against this principle. If Staff lack technical confidence in the actions outlined in the Guidance, then the steps should be stricken from the text.
6	5.3.1	Additional content is needed discussing how the requirement to provide a technical basis for engineered barriers are to be incorporated into the overall site stability assessment. The engineered barrier technical basis considerations are only referenced in the discussion of design based approach, yet the text in this section suggest it is a requirement, and thus, not subject to the type of analyses approach used.
7	5.3.2	The concept of defense-in-depth is implied in this section, demonstrating as we suggest that defense-in-depth is adequately woven throughout the analyses such that a separate independent analyses is not required. That said, we do not agree with the Staff that licensees should have to consider "multiple, independent, and redundant barriers" in the design of engineered barriers for long-term waste disposal. Redundancy is demonstrated in the multiple layers of defense including proper site selection, waste inventory, natural barriers and engineered barriers. The suggestion should be removed from the text.
8	5.3.3	We agree with Staff in the benefit of site monitoring and that site monitoring results can be used to assess both site performance and evaluate model predictions and performance. When monitoring results for the institutional control period support initial analyses, the technical analyses should not have to be updated upon site closure

CHAPTER 6

Summary Comment – The protective assurance analysis, as it is described in the guidance, is based on both engineering and economic theory that cannot be defended. As we discussed in Chapter 5, site stability cannot be proven with confidence past 1,000 years. Additionally, very long-term discounting has not been demonstrated beyond 1,000 years. With the uncertainties that surround economic models, calculating the net present value of an asset out to 10,000 years should not be used as a decision basis to prove that a design alternative minimizes dose exposure with respect to what is economically feasible. Furthermore, the guidance in Chapter 6 is too prescriptive with respect to methodology, and falls short with respect to providing clear examples of how to implement the detailed methodologies. Though licensees have the liberty to

perform alternative cost-benefit analyses to demonstrate protective assurance compliance, most of the chapter is dedicated to describing a singular approach that is suspect.

Recommendation – Eliminate this chapter and the entire protective assurance analysis requirement from both the rule and the guidance in favor of a two-tiered assessment, with the second tier requiring analyses out to peak dose. Alternatively, the requirement to provide comparisons out to 10,000 years can be eliminated, requiring only the comparison of peak dose of design alternatives.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	6.2	Figure 6-1 should be removed from the guidance, or a detailed legend should be provided to help convey the meaning. As it is currently presented, the color gradation and gradient size can be subject to multiple inaccurate interpretations of required level of effort by both the regulator and licensee.
2	6.2.1.2	The minimization analysis as it is presented in the guidance is not optimized with respect to mathematics, nor does it provide assurance that a design to reach a true minimum dose has been reached, as suggested in the guidance. A mathematical optimization requires the evaluation of function with alternative values to find a maximum or minimum, which is potentially restricted to a domain based on variable or value constraints. The analysis presented in the guidance is a comparison of viable and reasonable alternatives, and should be renamed as such.
3	6.2.1.2	The prescribed discount rates of 1 to 7 percent for the long-term net present value analysis have no basis in economic research. Additionally, requiring licensee to perform the analysis with multiple discount rates is overly burdensome and only serves to add additional confusion to decision making. The suggested discount rates, and the requirement to perform economic discounting across very-long time periods is a misapplication of the singular research source presented to defend the suggested approach. The reference only demonstrates economic discounting out to 999 years and provides no basis for extending analyses beyond 1,000 years. These concepts should be removed from the guidance.
4	6.2.1.2	The term “prohibitively large” with respect to uncertainties is used as a metric or quantity to determine when inventory limits might be warranted. This definition for this term is not found within the rule or guidance. We recommend defining this term.
5	6.2.1.2	We believe Example 6.1 is flawed in the use of significant digits and evaluating precision in dose predictions. For example, the time periods to peak dose are calculated out to the single digit, while net present value costs are rounded to the millionth. The assumption that peak dose calculations can be computed with a precision of one digit is misguided and does not adequately address the uncertainties associated with the peak dose calculations. The rounding of net present value costs seems reasonable given the extreme uncertainties associated with long-term

		discounting. We recommend using the same conservatism with peak dosage estimates and time to peak dosages.

CHAPTER 7

Summary Comment – The subtitles and text in this section are inconsistent when referring to required analyses. These inconsistencies exacerbate the confusion around how licensees can adequately demonstrate compliance. The rule specifically states that a "qualitative analysis covering a performance period of 10,000 years or more" is required. Contradicting the proposed rule, the guidance requires a "quantitative risk assessment" which is never detailed, but includes a section around "quantitative analyses." Edits to enhance the clarity and content of this chapter are suggested.

Recommendation – Develop a more detailed approach to better inform licensees in demonstrating performance period compliance when the results initial screenings necessitate additional analyses.

Summary Comment – The requirements to evaluate additional FEPs that are the result of scenarios that have "as low as a 10 percent chance of occurrence over the analysis timeframe" is in direct conflict with the direction given by the Commission in SRM-SECY-13-0075. Regarding the analyses for the Protective Assurance Period, the Commission directed the staff as follows:

> Given the significant uncertainties inherent in these long timeframes, and to ensure a reasonable analysis, this performance assessment should reflect changes in features, events, and processes of the natural environment such as climatology, geology, and geomorphology only if scientific information compelling such changes from the compliance period is available.

The comments made by Staff in §7.3.1 state that the information regarding FEPs will be "limited" and "more susceptible to bias," implying that the additional FEPs considered in this time frame would not have a scientific basis for supporting the frequency estimates. This clearly is a standard far below "compelling," and based on the direction from the Commission, is inappropriate.

It is unclear if these less likely but plausible FEPs represent "key" FEPs as described on page 7-12, line 6. The guidance suggest that the existence of these FEPs might require the licensee to modify conceptual and numerical models, rather than extending calculations or the analyses period. Requiring the licensee to develop alternative conceptual and numerical models for scenarios that lack a defendable scientific basis is unreasonable and overly burdensome.

Recommendation – Remove the requirements for consideration of less-likely but plausible FEPs.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	7.3.3	The recommendation to perform a side-by-side comparison of generic receptor scenarios to the assumed characteristics of the receptors should be limited to the performance period. If this comparison is necessary for other evaluation periods, then the suggestion should be explicitly made in the appropriate sections of the guidance and rule.
2	7.4	The site-specific conditions that warrant the performance analyses listed in Figure 7-1 should be explicitly written into the guidance.
3	7.4	The use of "quantitative risk assessment" should be removed as a quantitative risk assessment is not warranted by the proposed rule. The caption in Figure 1 should be revised to read "Qualitative Analyses."
4	7.4	The guidance to perform additional analyses with bounding values when reasonable averages are available is not reasonable. As stated in the guidance, bounded values, especially those that span many values, can result in illogical and impossible model results. These additional analyses would add nominal value if any to the assessment.
5	7.4.1.1.1	The required evaluations for screening of potential waste streams should be limited to site-specific and reasonably foreseeable radiation exposure pathways.
6	7.4.1.12	It is unclear what additional analyses can be performed to demonstrate 10 CFR 61.41(c) and 10 CFR 61.42(c) requirements will be met when the screening analyses results are unacceptable. This section requires far more explanation and context than what is currently included.
7	7.4.1.1.2	The section title, "Quantitative Analyses" should be renamed to "Qualitative Analyses" to remain consistent with the proposed rule. The content in the section should reflect the shift in the type of analyses required.
8	7.4.1.1.2	Additional content is needed to describe how the analyses in Chapter 6.0 can be applied to the performance period analyses, when there is no dose goal available. The crux of Chapter 6 is the minimization analyses, which includes leveling scale factors based on dosage goals for 10 CFR 61.41 and 10 CFR 61.42. Without a dose context for the leveling scale factor, viability of the design cannot be evaluated using the prescribed methods.
9	7.4.1.1.3	Additional time periods for analyses are presented, including the 500 year, Class C waste intruder barrier period. The Class C waste intruder barrier period is never explicitly referenced in the proposed rule and as such should be removed from consideration.
10	7.4.1.1.3	Performing cost analyses over multiple time frames is not justified, and these suggestions should be removed the guidance. Requiring cost analyses for time periods that pre-date the performance period does not align with the scope of the performance period analyses
11	7.4.1.2	The barrier analyses again models the defense-in-depth concept, requiring that multiple, independent, redundant barriers be included in the design and consequentially analyzed. Again, we do not see the merit in requiring

		a separate, independent, defense-in-depth analysis, when it is already woven into the requirements for the compliance period analyses.

CHAPTER 8

Summary Comment – Much of Chapter 8 is general language about the meaning and usefulness of defense-in-depth (DID) and is appropriate for inclusion even should the Commission adopt our recommendation that the requirement for a DID "analysis" be removed. However, section 8.3 is focused on analytical elements necessary for compliance, and is in need of extensive reduction and revision, if not complete elimination. Its description of analyses necessary to prove the efficacy of DID have not been shown to provide any additional protection for health and safety beyond that provided by preparing the other analyses required by the new regulations. In fact, the guidance itself, although inconsistently, implies the acceptability of this approach (relying on the other analyses) to some extent.

Many of the concepts of DID are misapplied in this document. We highlight a few merely to illustrate the point.

Independent Layers – The individual elements that provide defense-in-depth for a LLW site are by their very nature inherently independent. For example, the location of a site is dependent upon no other aspect of the design and operation of a site in terms of the protection it provides. A site that is distant from potentially affected populations or sensitive environments is protective by virtue of this distance and isolation. Should a container fail earlier than projected, the time for its contents to reach a receptor and provide a dose to the member of the public is increased by (among other things) this distance. The extent to which this distance mitigates or eliminates the potential hazard is determined by fate and transport modeling in the performance assessment. But the extent to which this proximity-derived protection can be diminished by some other aspect of the design or operation of the site is zero. The same is true for each of the other elements of the disposal system. There is no "analysis" necessary to demonstrate independence.

Redundant Layers – The concept of redundancy is misapplied in the guidance. In a more traditional application, e.g., a nuclear power plant, redundancy is important because there are certain systems that perform a function that is vital to maintain, thus the concept of duplication. If the principal method of keeping water in the core is lost, another – redundant – method is necessary because keeping the reactor core cooled is essential. It is not acceptable to simply default to relying on the containment to retain the release of radioactivity because the consequences of its failure are potentially very high. There is no comparably important system in a LLW disposal site and certainly no comparable risk in the event of failure.

There is not now and should not be imposed a requirement for redundancy of anything at a LLW site because there is no implicit need for redundancy per se. It is understood that there are varying times for which LLW must be isolated from the environment. For waste that decays quickly, this may be a very short time period. It is the role of the performance assessment to demonstrate that any given waste stream can be isolated from the environment for an adequate period of time. The components of the waste disposal system are evaluated to assess their contribution to this task and to ensure that the overall operation of the system is acceptable. There is no element of the system that is so essential that the risk of its failure is intolerable.

This is not to say that a given applicant or licensee should not be allowed to propose and take credit for redundant systems, e.g., multiple liners, at its discretion. However, there should be no requirement for an analysis that proves that redundancy has been incorporated into the design of a LLW disposal site.

Our complaint is not that it is unreasonable to expect an applicant or licensee to demonstrate that its disposal can be expected to properly isolate waste, operate safely, and demonstrate compliance with the performance objectives. Our complaint is in the requirement that a separate analytical exercise – a DID analysis – is necessary to demonstrate safety, or that an "analysis" is necessary to demonstrate that defense-in-depth has been accounted for in the siting and design of the site. In addition, we do not believe that a DID analysis was the direction given by the Commission in SRM-SECY-13-0075. Instead, the Commission directed that the rulemaking and guidance document include, "a clear statement that licensing decisions are based on DID protections."

In section 8.3.2, staff states that:

> In some cases, layers of defense may not be amenable to representation in one of the other 10 CFR 61.13 analyses.

We reject that logic. Layers of defense that cannot be accounted for in the other analyses should not be relied upon for demonstrating compliance.

Recommendation – Energy*Solutions* submits that this section requires extensive editorial revision and as such should be revised and published again in draft form for public comment.

CHAPTER 9

Summary Comment – A clear explanation of the hybrid WAC system is not presented in this Chapter. The process for using either the generic waste classification tables in 61.55 or the results of the technical analyses in 61.13 as a basis for the WAC is unclear, and the chapter is dense with unnecessary language. As previously noted, the distinction between the application of these two approaches is unclear in the regulation, and the guidance seems to indicate that these two options are not mutually exclusive. In fact, in reviewing this section of the guidance, we are not able to conclude that there is a way for an applicant or a licensee to choose to comply with the classification tables in §61.55 in lieu of developing WAC that would be used for regulating the site. We do not believe this is the intent of the revised regulations and we are not in agreement that this is reasonable. The two options are intermingled in the chapter so that the path for using one versus the other remains unclear (as is the case with the proposed rule.)

Recommendation – Outline the waste acceptance process clearly for each approach. We suggest that Chapter 9 be split out into two chapters, one dealing with using the old classification system and the other outlining the process for developing the WAC from the technical analyses. A section should be provided at the very beginning of the chapter that discusses the applicability of the new requirements to existing or new sites which desire to accept and dispose of newer waste streams with higher concentrations and quantities of long-lived radionuclides.

Provide a clear description of the waste acceptance process for sites that do not dispose of waste containing significant quantities of long-lived radionuclides. As with our companion comments on the proposed rule, the guidance should be revised to provide current and future disposal sites that do not dispose of significant quantities of long lived isotopes with the alternative to operate under the existing regulatory regime. The guidance should be revised to include a clear discussion of the process for such sites that does not include the preparation and regulatory review of extensive new technical analyses that provide no public benefit or improvement in human health and safety.

SPECIFIC COMMENTS BY SECTION

No.	Section	Comment
1	9.1	This section does not provide a clear distinction between the technical analyses required to generate site-specific WAC and those required to demonstrate compliance with the classification tables in 61.55. As stated above, everything discussed in this section should be specifically focused on one option or the other to eliminate confusion.
2	9.1.1.1	In general, the language in this section is not clear should be simplified as much as possible.
3	9.1.1.1	This section should include a more detailed summary regarding the development of allowable limits from the technical analyses. Clear guidance is missing, while obvious information is repeated (i.e. paragraph 1 of the section). A flow chart, similar to Figure 9-4 should be created to outline the documentation process for proposed waste classification limits determined using technical analyses in order to satisfy the requirements in §61.13 of the rule.
4	9.1.1.2	The first paragraph in this section includes statements that are in direct conflict with the regulations in 10 CFR Part 61 and are not appropriate for including in guidance. Take for example the last sentence in this paragraph: "Guidance on developing limits on radionuclides not listed in the waste classification tables is also provided in this section." Given that the regulations impose no limits on nuclides not listed in the tables, but rather designate them as Class A waste, it is not acceptable that the NRC would issue guidance that essentially imposes limits on other nuclides.
5	9.1.1.2	Another issue with the language cited in the point above is that it creates a significant unintended consequence of the rule in that it fundamentally undermines the either-or (WAC or classification tables) approach that is created in §61.58. It is anticipated that in the process of developing a WAC to comply with §61.68, an applicant or licensee would have to create a matrix of nuclides, including concentration and inventory limits, that would go beyond the isotopes listed in the tables in §61.55. However, if the result of the new regulations is to require applicants and licensees who propose only to comply with the tables in §61.55 to also calculate limits for nuclides not listed in the tables, then what is the point of the tables? In fact, there would be no circumstance where an applicant or licensee ***could*** comply only with the tables. This is a fundamental

		change to the status quo that extends far beyond what is suggested by the proposed rule language or has been discussed by the staff in the many public meetings on the proposed rule.
6	9.1.1.2	The statement that existing limits "are not intended to provide reasonable assurance that all of the performance objectives are met" and that technical analyses might also be required for sites that rely on the current waste classification limits negate the purpose of retaining the current classification system. It could be argued that Part 61 licensees and applicants always have had to prepare analyses (a performance assessment by any other name) in order to demonstrate compliance with §61.41 (performance objective for the protection of the general population); but compliance with §61.42 (performance objective for the protection of the inadvertent intruder) ***was*** demonstrated by compliance with the classification tables. The suggested requirements in this section place an unnecessary burden on facilities that intend to rely on the current classification system and not dispose of long-lived radionuclides. A process by which the facilities can simply rely on the current classification system is needed in order to have a true hybrid system, otherwise there is no use for the current classification system. These comments should be eliminated and a discussion of a streamlined process for facilities relying on the existing classification system should be added.
7	9.1.1.3	The concept of "insignificant radionuclides" introduced in this section appears arbitrarily. There is no mention of this concept in the proposed rule and the concept is only implied, but not explicitly referenced in one other place in the guidance, under the Inadvertent Intruder scenario. The sum of radionuclide contribution concept is presented in the rule and Chapter 4 of the guidance. The definition of "insignificant radionuclides" should be added to the proposed rule and discussed in further detail in Chapter 2.
8	9.1.2	The two approaches for waste classification are again intermingled in this section, specifically regarding the applicability of stability requirements, wasteform characteristics, and wasteform test methods. As stated previously, these approaches should be discussed separately.
9	9.1.2	The three approaches for demonstrating stability requirements should be made obvious to the reader through edits such as highlighting, bulleting or some other mechanism.
10	9.2	The format of this section is easy to follow, and could be useful to help streamline other sections that have been noted to be unclear or wordy.
11	9.2	Another new term "significant radionuclides" is introduced that is not reference anywhere else in the regulation or guidance. It is suggested that the concept be discussed in Chapter 2.
12	9.2	Page 9-16 lines 20-22 state: "For waste acceptance criteria developed from the waste classification requirements specified in 10 CFR 61.55, *waste characterization methods should be commensurate with the assumptions and approaches* employed to develop the waste classification requirements." As mentioned previously, these "assumptions and

		approaches" need to be presented and discussed in the document, since they are so critical to the use of the waste classification system. One example is provided later in the text but additional detail is required.
13	9.2.1.1	The use of the new term "significant radionuclides" appears again in this section.
14	9.2.1.1.1 and 9.1.1.2	We commend the staff for providing a clear delineation of the processes for using each different basis for the WAC in this section.
15	9.2.1.2	The content in this section should be divided into a discussion for waste classification and separate discussion for technical analyses.
16	9.5	Mitigation is a concept that is applicable to more than just the WAC. This section should be moved to Chapter 2 and a flowchart would help clarify the process.
17	9.5	This section refers to the updated technical analyses at closure, which we do not agree with. This section should be modified to explain circumstances when this requirement applies, which as when new unexpected conditions are identified at a site.

RulemakingComments Resource

From: Helene Cuomo <helenecuomo@hotmail.com>
Sent: Friday, July 24, 2015 7:10 PM
To: RulemakingComments Resource
Subject: [External_Sender] Comment on Waste Rules: Docket ID NRC-2011-0012

Please, DEPLETED URANIUM SHOULD NOT BE CLASSIFIED AS CLASS A. IT CONTINUES TO GROW MORE RADIOACTIVE AS TIME GOES ON and this needs to be seriously considered, especially when some companies who are allowed to accept Class A waste will be then be having depleted uranium buried in not the proper way for such a potentially high level waste. It's really scary for my family and future generations.

I have some significant concerns about the proposed revisions to Part 61, but first wanted to express my support for one part: The proposed revisions appear to allow Utah to maintain its reliance upon classification tables, to enforce its long-standing ban on Class B&C wastes. Thank you for including that in the final rules. Utah must have the right to keep hotter wastes out of our state.

There are several key concerns that I'd like to highlight.

1. The new regulations reduce the compliance period. At first staff chose a 10,000 year period, but that's been reduced to only 1,000 years. This is less protective of public health and the environment. It may be hard to look so far ahead, but we owe it to future generations to model in detail to ensure safety.

2. We are concerned that licensees (such as EnergySolutions) can choose to simply order a study if they want to bring a new waste stream. This move towards the WAC approach has the potential to transfer decision-making power to consultants and overwhelm states with complex models.

3. Next, I disagree with the dramatic limitations placed on the number of intruder scenarios to be considered. This approach is not appropriate for long-lived nuclear waste streams that will require more advanced predictive modeling. Just looking at scenarios happening now is absurdly restrictive given the potential for harm for millennia.

Thank you for the opportunity to comment.

Helene Cuomo
3627 E. hermes DR
Salt Lake City, UT 84124

RulemakingComments Resource

From: Dennis Welch <blakeprof@gmail.com>
Sent: Saturday, July 25, 2015 8:40 AM
To: RulemakingComments Resource
Subject: [External_Sender] Proposed rule change for nuclear waste dumps

The NRC's proposed rule change applying to operations of waste dumps in SC, TX, UT, and WA as well as future dumps should be more protective of the environment and human health--NOT less, as the rule change would be

As human populations increase and the resulting assaults on the environment and human health worsen, federal agencies such as the NRC will have to regulate and limit pollution more stringently, not less. Otherwise, this world will eventually become uninhabitable.

Please avoid contributing to this eventuality.

Sent from my iPad

RulemakingComments Resource

From: Dennis Welch <blakeprof@gmail.com>
Sent: Monday, July 27, 2015 1:06 PM
To: RulemakingComments Resource
Subject: Re: Proposed rule change for nuclear waste dumps

Office of the Secretary
Nuclear Regulatory Commission

Dear Secretary:

Thank you for your request of clarification. My previous note of concern relates to the updated radiation regime called EDE (Effective Dose Equivalent).

The updating would allow more radioactivity per millirem for many radionuclides. This would allow doses to the public to be raised from the current 25 millirems a year to 100, 500 or more millirems EDE per year.

Such elevated exposures will harm both the environment and human health, increasing in particular the number of cancers n the pathways of the updated exposure regime.

Sincerely,

Dennis Welch, Ph.D.
701 Eldridge Loop
Cary, NC 27519

Sent from my iPad

> On Jul 27, 2015, at 12:20 PM, RulemakingComments Resource <RulemakingComments.Resource@nrc.gov> wrote:
>
> Mr. Welch,
> The Nuclear Regulatory Commission's Office of the Secretary has received your e-mail below. Please verify which rulemaking this comment is in reference to so that we may process the comment properly to the correct NRC staff for review.
>
> Thank you.
>
> -----Original Message-----
> From: Dennis Welch [mailto:blakeprof@gmail.com]
> Sent: Saturday, July 25, 2015 8:40 AM
> To: RulemakingComments Resource
> Subject: [External_Sender] Proposed rule change for nuclear waste dumps
>
> The NRC's proposed rule change applying to operations of waste dumps in SC, TX, UT, and WA as well as future dumps should be more protective of the environment and human health--NOT less, as the rule change would be
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>

> Please avoid contributing to this eventuality.
>
> Sent from my iPad

PR-20, 61
80FR16081 70

PUBLIC SUBMISSION

As of: 7/28/15 2:58 PM
Received: July 24, 2015
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Comments Due: July 24, 2015
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Docket: NRC-2011-0012
Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0138
Comment on FR Doc # 2015-06429

Submitter Information

Name: Diane D'Arrigo NIRS
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6930 Carroll Ave # 340
Takoma Park, MD, 20912
Email: dianed@nirs.org
Organization: NIRS + over 100 organizations-see comment

General Comment

See 2 attached file(s) on NRC20110012; NRC20150003
10 CFR 61 Proposed Rule 10 CFR 61 Radioactive Waste Disposal Regulations

Comments Opposing Proposed NRC Regulations on so-called Low-Level Nuclear Waste Disposal which would allow more than 33 times higher radiation than from high level dumps and 20 times more than from operating nuclear power reactors.

The Comments are from over 100 organizations:

Nuclear Information and Resource Service, Physicians for Social Responsibility, Sierra Club, Friends of the Earth, Beyond Nuclear, Greenpeace, Nuclear Energy Information Service, Public Citizen, Food and Water Watch, Coalition for a Nuclear Free Great Lakes, Crabshell Alliance, Alliance for Environmental Strategies, Indian Point Safe Energy Coalition, SEED Coalition, Rachel Carson Council, Three Mile Alert, Inc., Southern Alliance for Clean Energy, Nukewatch, Public Citizen TX, Nuclear Watch South, SUN DAY Campaign, Tennessee Environmental Council, Don't Waste Arizona, Work on Waste, USA, American Environmental Health Studies Project, Inc., Citizens Allied for Clean Energy, Inc., Fluoride Action Network, Arise for Social Justice, Citizens Resistance At Fermi Two (CRAFT), New England Coalition on Nuclear Pollution,

Columbus Free Press, Alliance for a Clean Environment, California Communities Against Toxics, The Stella Group, Ltd., Natural Capitalism Solutions, North American Water Office, Ecological Options Network, Cape Downwinders, Citizens Action Coalition, Tallahassee Area Community, Utah Physicians for a Healthy Environment, Institute of Neurotoxicology & Neurological Disorders, Nuclear Hotseat, Tri-Valley CAREs, Don't Waste Michigan, Oregon and Washington Physicians for Social Responsibility Joint Task Force on Nuclear Power, Physicians for Social Responsibility-KC, San Francisco Bay Area Chapter Physicians for Social Responsibility, Physicians for Social Responsibility Western North Carolina Chapter, Environmental Priorities Network, Colorado Citizens Against Toxic Waste, Inc., Georgia Women's Action for New Directions (Georgia WAND), Concerned Citizens for SNEC Safety, California Safe Schools, Concerned Citizens of Lake Twp./Uniontown IEL Superfund Site, Pax Christi Florida, Residents Organized For a Safe Environment (ROSE),
PRESS Portsmouth/Piketon Residence for Environmental Safety and Security, Grandmothers, Mothers and More for Energy Safety, Energa Ma, Chez Sven Bed & Breakfast, West Shore Unitarian Universalist Faith Communities Together
Michigan Safe Energy Future, Redwood Alliance, Peace and Freedom Party, Rocky Mountain Peace and Justice Center
Heart of America Northwest, San Luis Obispo Mother for Peace; Concerned Citizens Ohio/Hiram, Ohio/Shalersville
Ohio Organizing Collaborative; Pilgrim Coalition, Hilton Head for Peace, Citizens for Alternatives to Chemical Contamination, Alliance to Halt Fermi 3, SBLDF, Breathe Easy Susquehanna County, RadiationTruth.org, Citizens for Clean Water, Mid-Missouri Peaceworks/Missourians for Safe Energy, Waste Action Project, Connecticut Coalition Against Millstone, Mother's Milk Project, Vermont Yankee Decommissioning Alliance, People Against a Radioactive Chesapeake
The Enviro Show, Southern Maryland CARES (Citizens Against Radioactive Energy Sources), World Business Academy
Peace Action Wisconsin, Peace Education Project of Peace Action, Topanga Peace Alliance, Hudson River Sloop Clearwater, Inc., Concerned Citizens for Nuclear Safety, Council on Intelligent Energy & Conservation Policy, DDMT Concerned Citizens Committee, Oregon Conservancy Foundation, Citizens for Safe Water Around Badger (CSWAB)
Nuclear Age Peace Foundation, Promoting Health and Sustainable Energy, NY Citizens Environmental Coalition
Lone Tree Council, Detroit Branch Womens International League for Peace and Freedom
Northwatch, Durham Nuclear Awareness (DNA), Justice and Global Issues Committee Toronto South East Presbytery of
The United Church of Canada Friends of Bruce

Attachments

100+ Groups' Comments 10CFR61 Prop Nuclear Waste Disp Regs 7-24-15 NRC–2011–0012; NRC–2015 –0003 [1of2]

Washington Post Paducah Articles 1999-2000 (2 of 2; Attachment to 100+Organizations comments NRC-2011-0012)

RulemakingComments Resource

From: Diane D'Arrigo <dianed@nirs.org>
Sent: Saturday, July 25, 2015 12:08 AM
To: Dembek, Stephen
Subject: [External_Sender] additional commenters NRC–2011–0012; NRC–2015–0003
Attachments: 100+ Groups' Comments 10CFR61 Prop Nuclear Waste Disp Regs 7-24-15 NRC–2011–0012; NRC–2015–0003 [1of2].pdf

Comment: NRC–2011–0012; NRC–2015–0003

Please add to the 100+ Organization Comments on Radioactive Waste Disposal Regulation

William Peil
Calvert Citizens for a Healthy Community (CCHC).
Lusby, Maryland

and

Ted Robinson
Citizen Power
Pittsburgh, Pennsylvania

Thank you

Diane D'Arrigo
NIRS
dianed@nirs.org
301 270 6477 x 15

RulemakingComments Resource

From: Diane D'Arrigo <dianed@nirs.org>
Sent: Monday, July 27, 2015 5:18 PM
To: Dembek, Stephen
Subject: [External_Sender] 2 More additional commenters NRC–2011–0012; NRC–2015–0003
Attachments: 100+ Groups' Comments 10CFR61 Prop Nuclear Waste Disp Regs 7-24-15 NRC–2011–0012; NRC–2015–0003 [1of2].pdf

Patricia Ameno
Citizens' Action for a Safe Environment
Hyde Park, PA

Nancy Braus
Clean and Green
Brattleboro, VT

From: Diane D'Arrigo
Sent: Saturday, July 25, 2015 12:08 AM
To: Dembek, Stephen
Subject: additional commenters NRC–2011–0012; NRC–2015–0003

Comment: NRC–2011–0012; NRC–2015–0003

Please add to the 100+ Organization Comments on Radioactive Waste Disposal Regulation

William Peil
Calvert Citizens for a Healthy Community (CCHC).
Lusby, Maryland

and

Ted Robinson
Citizen Power
Pittsburgh, Pennsylvania

Thank you

Diane D'Arrigo
NIRS
dianed@nirs.org
301 270 6477 x 15

Comments of Over 100 Organizations* to NRC on 10 CFR 61 Proposed Radioactive Waste Disposal Regulations

Federal Register / Vol. 80, No. 58 / Thursday, March 26, 2015 / Proposed Rules
10 CFR Parts 20 and 61 [NRC–2011–0012; NRC–2015–0003] RIN 3150–AI92
Low-Level Radioactive Waste Disposal AGENCY: Nuclear Regulatory Commission. ACTION: Proposed rule.

New NRC so-called "Low-Level" Nuclear Waste Dump Rules Would Allow More than **33** Times Higher Radiation than High Level Dumps! And **20** Times more than from Operating Nuclear Power Reactors!

The banner on the webpage of the US Nuclear Regulatory Commission flashes "Protecting People and the Environment." Critics of the NRC have challenged this claim and the proposed 10 CFR 61 regulation changes substantiate that challenge.

The proposed rule flies in the face of common sense and weakens already-inadequate regulations for licensed disposal of radioactive waste.

The proposed regulations allow more than 33 times higher radioactive releases and exposures from so-called "low-level" radioactive waste dumps than from a high level waste dump formerly proposed at Yucca Mountain. Federal regulations[1] for a high level waste repository allow the site to release radioactivity that would deliver doses of up to15 millirems/year [2] for the first 10,000 years. From 10,000 to 1 million years, the annual dose limit is 100 millirems. The NRC proposed regulations allow 25 mr/year during operation but *up to and beyond 500 millirems per year* from so called "low-level" radioactive waste disposal sites. The proposed rule allows so-called "low-level" nuclear waste disposal sites, after closure, to emit more than 20 times more radioactivity than operating nuclear power reactors[3] under the Environmental Protection Agency's regulations. 1 in 25 adults exposed to 500 mr/year will get cancer,[4] assuming a lifetime dose (which is permitted by the rule).

We oppose the proposed rule 10 CFR 61 and demand that NRC actually enforce its current minimum regulations at existing sites.

The EnergySolutions-operated site in Barnwell, South Carolina which has been leaking for decades, despite a court order against both the company and the agreement state regulator (DHEC), has no plan to stop or prevent future leakage.

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[1] EPA 40 CFR 197
[2] Millirems are units of dose that cannot be verified or enforced but that are used to justify planned routine releases from nuclear facilities.
[3] EPA 40 CFR 190
[4] 500 millirems per year for a lifetime equals 1 in 25 adults getting cancer (higher for females). Environmental Protection Agency Blue Book EPA 402-R-11-001 April 2011, Page 59: Cancer incidence risk for "age averaged" adult = 1160 cancers per 10,000 person-Gy; 1 Gy= 100 R; 1 R= 1000 mr; 0.5 R=500 mr; 1160 cancers per 1,000,000 person-R is the same as 1.16 cancers per 1000 person-R. The proposed 10 CFR 61 would allow 500 mr per year. Assuming a 70 year life, that is 500 mr x70 years = 35,000 mr over a 70 year lifetime =35 R; 1.160 cancers per 1000 person-R = X cancers per 35 person-R; X=(1.16x 35)/1000=.4060 or 40.6 in 100 or ~1 in 25. (1 millirem= 1 millirad for gamma emitters.)

The Waste Control Specialists (WCS) waste site was licensed by two out of the three politically-appointed Texas Commission on Environmental Quality (TCEQ) Commissioners, despite the technical review team recommending denial or additional changes needed to protect water. A request by the Sierra Club for a contested case hearing was denied by the TCEQ Commissioners and Sierra Club has appealed to the Texas Supreme Court, arguing that TCEQ denied a legitimate hearing request. Since the license was granted and the site started receiving commercial and federal radioactive waste, WCS has changed the license through a series of amendments. First, they asked for and received an amendment allowing disposal of waste even if water is present in the area. Second, more recently, an amendment (known as Number 26) allows the WCS to increase the amount of waste, lowers financial assurance requirements and adds new waste streams to the site, including Depleted Uranium (DU). This amendment was approved with minimal public input and allows "flexibility" for how DU is to be disposed, including potentially allowing it go into non-containerized units.

The proposed rule makes the existing 10 CFR 61 even worse and makes radioactive waste dumps more dangerous. The current rule does not require isolating the waste for the entire time it is radioactively hazardous but the proposed rule enables increasing the amount, radioactivity and longevity of the waste while removing dose limits "based on technological and economic considerations."[5] *It dubs future populations "intruders*" and allows *unlimited* doses in the future from nuclear waste generated and buried today.

The proposed rule allows private dump-operators to do "black box" calculations to allegedly justify putting whole new kinds and amounts of radioactive wastes to existing waste sites, clearly a conflict of interest—profit for them and not in the interests of the public or environment. It overrules states that have or might set stricter than federal standards for public and environmental protection. NRC appears to be lowering its own federal standards for public and environmental protection and for democratic participation, possibly in order to facilitate weaker standards at one or more existing radioactive waste facilities. At a time when NRC should be enforcing its own administrative and technical regulations, it is weakening them.

Some of the provisions in the proposed rule violate common sense, the Atomic Energy Act, the Low-Level Radioactive Waste Policy Act, the Administrative Procedures Act, the National Environmental Policy Act and the International Declaration of Human Rights. We insist that NRC correct these errors.

Many of our groups have long advocated for better public protection in regulations for nuclear waste disposal, including:

- ➔ No waste that lasts longer than the sites are actively monitored, repaired and institutionally controlled (with resources to remediate) should be allowed into a disposal site. We support redefining "radioactive waste" eligible for shallow land burial under 10 CFR 61 and Agreement State regulations to keep long-lasting wastes out of near-surface burial.

[5] Proposed 10 CFR 61.41b allows the dump operator to do a calculation projecting a dose "…level that is supported as reasonably achievable based on technological and economic considerations…"

10 CFR 61.55 Definitions: The A, B, C, >C waste classifications in 10 CFR 61.55 make assumptions that have never been publicly accepted but have become the norm. We continue to oppose the use of those misleading classifications, thus are more strongly opposed to allowing even more longer lasting and hazardous radionuclides into 10 CFR 61 disposal sites.

For example, there is no level of plutonium that is "safe" or acceptable. Yet Class A waste, supposedly only dangerous for 100 years, the shortest lasting and least concentrated class, includes plutonium-239, hazardous for a quarter to half million years, up to 10 nanocuries per gram, with no limit on the number of grams. It also includes iodine-129 hazardous for 160 to 320 million years. Clearly adding the proposed DU which decays into other, even longer-lasting radioactive elements, with its long decay chain has no business in 100 year Class A disposal.

- ➔ NRC should define the appropriate class, if there is one, for DU. Initiate plans to consider it as high level waste.

- ➔ Keep uranium (including DU), irradiated fuel reprocessing waste (including WIR--Waste Incidental to Reprocessing—a downward reclassification of high level waste), and other long-lasting wastes out of so-called "low-level" waste 10 CFR 61 disposal sites.

- ➔ Make a goal of isolating radioactive waste, not legalizing releases. Do not increase allowable radioactive releases or the projected doses to people during or after the operational period.
  Under the existing 10 CFR 61the sites can legally leak into "the general environment in ground water, surface water, air, soil, plants and animals," an amount calculated to deliver up to 25 millirems to the whole body, 75 millirems to the thyroid and 25 millirems to any other organ of the body of members of the public, annually. By adopting the 10 CFR 20 definitions of radiation dose (doing away with organ dose limits), the proposed rule increases the radioactivity per millirem for many of the radionuclides. The proposed rule makes this much worse, as it allows not 25 but up to 500 millirems (EDE) or more per year, from a *closed* site. The unspecified doses are based on technical and economic considerations of the waste site operator. See the proposed 10 CFR § 61.42. 500 millirems/year is an amount that is expected to cause cancer in 1 in 25 exposed[6], clearly an unacceptable risk from closed nuclear waste sites. This is criminal and disgraceful for an agency claiming to protect the public and environment.

  The existing radioactive waste sites have historically leaked – some in less than 20 years and well before site closure. One can only hope that institutional controls will exist for 100 years post-closure, keeping in mind that institutional controls are not accompanied by resources to capture or control leaks and releases when they are revealed.

- ➔ No Preemption of State Authority; Require States to Regulate as Strictly as NRC -

  The proposed rule supersedes the rights and authority of states to set more protective standards for facilities in their boundaries by making the entire 10 CFR 61 Level B

[6] Op.cit.4

Compatibility. As public interest advocates who participated in the setting of state regulations and siting of radioactive disposal sites, we strongly oppose this compatibility designation and support and encourage all state level opposition to this designation.

NRC should drop the proposed requirement that all provisions of the new rules be adopted verbatim, Level B Compatibility, by Agreement States. The 'Low-Level' Radioactive Waste Policy Act and its Amendments (PL 99-240) makes states responsible for so-called "low-level" radioactive waste that is generated within their boundaries (although the provision requiring states to take title to the waste if disposal was not provided was overruled by the US Supreme Court in 1992). NRC should not undercut states by preempting their ability to set standards that are more protective than federal requirements. This undercuts states' ability to be responsive to its citizens and residents.

NRC should retain and expand the ability for states to be more protective, to regulate more strictly than the federal 10 CFR 61 regulations. This was part of the commitment and incentive to encourage and enable states to site new nuclear waste disposal sites. Changing the rules now looks a lot like a broken promise. It is predicted that there will be a need for new waste sites in the decades to come. Reneging on previous commitments and insisting that states adopt the more lax regulations that NRC is proposing will make that more difficult.

Rather than relaxing standards and advocating for more hazardous and long-lasting waste going into waste sites, the US NRC, at minimum, should be enforcing the existing requirements and regulations and holding states to those.

In cases in which the state or states that are increasing the risks to the public or providing weaker protections that 10 CFR 61 currently allows, NRC should assert its authority to maintain federal standards and require Agreement States to do so. This rulemaking appears to be an effort by NRC to join the lower common denominator, at least with DU, projections of long term doses from closed facilities and possibly other provisions.

➔ "Below Regulatory Concern-"
deregulates, exempts and releases radioactive waste and materials from radioactive regulatory control. NRC under its 10 CFR 20.2002 process allows radioactive waste, material and sites to be managed without radioactive regulatory controls on a case by case basis. Applications for these exemptions are not easily publicly available thus devoid of necessary options for public input and intervention. We are not aware of public reporting of 10 CFR 61.6 applications and call on NRC to stop treating nuclear waste, property and materials as if not radioactive whether it goes to solid, hazardous or other facilities and especially if it is allowed into the recycling streams or is released for unrestricted or restricted use.

DELETE the added phrase in proposed rule under §61.7 Concepts …"Alternative methods of disposal may be approved on a case-by-case basis as needed under § 61.6." (*Page 9 of the Comparison between Current Rule Language and Rule Language in Proposed Rule, "Low-Level Radioactive Waste Disposal" (80 FR 16082)*). The NRC

must not forget that the American public and our elected officials have repeatedly rejected the deregulation of nuclear waste. It should not be inserted into this rule which is about licensed radioactive disposal. The proposed rule re-asserts the publicly rejected concept of deregulation and we demand the deletion of this and any provisions that allow for manmade radioactive waste, materials, emissions and practices to be released from **radioactive** regulatory control. Deregulation, release, exemption, clearance and deminimus are completely unacceptable.

DELETE the existing § 61.6 Exemptions[7] from the regulations. If it is retained, at minimum, CLARIFY that there is must be advance public notice, comment and opportunity for hearing, adjudicatory hearing and intervention, as with other license amendments and changes in regulations. Public notice, comment and opportunity for intervention should be required for any and all exemption, clearance, release of radioactive waste or materials from radioactive regulatory control.

➔ We oppose increasing the amount and longevity of radioactivity that goes into shallow land burial.
The proposed rule would allow even longer-lasting waste into unlined soil trenches than the current regulations—waste that will be dangerous much longer than the sites will be controlled or monitored. These include:

- Plutonium-239 (240,000 to 480,000 year hazard) and iodine-129 (160 to 320 million year hazard) from nuclear power reactors are already allowed in set concentrations in dumps that can be institutionally controlled for up to just 100 years. Sierra Club and other public interest and environmental groups have called for limiting the waste that can go into these dumps to that which is hazardous for 100 years or less. Pennsylvania extended the institutional control period so if a facility is opened in that state, the site would be tracked longer than NRC assumes. Rather than consider the public demands for letting only shorter-lasting waste into the burial grounds, NRC is now opening the door to very large amounts of long-lasting waste and waste that gets more radioactive as it decays into other more radioactive materials. We direct that NRC analyze and adopt stricter disposal site requirements, keeping long-lasting waste out of shallow burial sites.

- Uranium, referred to as Depleted Uranium (DU) after much of the uranium-235 is removed to make nuclear power and weapons fuel, because it is "depleted" of that one isotope, is biologically hazardous and radioactive due to all the other uranium isotopes present and the decay products of those isotopes increase in radioactivity over time. Thus DU can deliver increasing doses to the public, giving the peak or highest dose in more than 2 million years. (See http://www.deq.utah.gov/businesses/E/EnSolutions/depleteduranium/ and http://www.healutah.org/campaigns/nuclear-utah/nuclear-waste/) We support

[7] Existing regulation: 10 CFR § 61.6 Exemptions. The Commission may, upon application by any interested person, or upon its own initiative, grant any exemption from the requirements of the regulations in this part as it determines is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest.

HEAL Utah, Institute for Energy and Environmental Research's (IEER) and all other technical comments throughout this entire rulemaking process against allowing DU into shallow land burial sites and opposing its de facto inclusion in Class A with no justifiable, technical analysis. NIRS and IEER challenged the commercial generation of more DU during the licensing of the LES uranium enrichment facility now operating in New Mexico. We continue to hold that DU is not "low-level" waste or Class A, and that there is no safe permanent way to "dispose" or isolate it from the public and the environment. Because of the longevity of the hazard, it must be considered high level radioactive waste, or at least Greater than Class C, unsuitable for shallow land burial. We oppose the default and pretense NRC is making to allow it into shallow land burial where it cannot be isolated for the length of it hazard.

- "Dirty" DU:
  So-called Depleted Uranium or DU could have and has had fission products present which exacerbate the health effects even further. Uranium recovered from the reprocessing of highly radioactive irradiated nuclear fuel, became highly radioactive and was sent back through enrichment facilities without notifying or protecting the workers from this deadly additional hazard. The DU generated during that subsequent enrichment processes was contaminated with fission products as well as the heavier transuranic residue that came with the "dirty" uranium. Absolutely no calculations have been done for this rulemaking by NRC nor are there requirements for disposal licensees to include such information in their Performance Assessments.

  This is a clear example that the process will not protect the public and environment. There is no justification for failing to incorporate this reality into the rulemaking, further discrediting the inadequate assessments of harm this proposed rule presents.

  We submit as attachments to these comments emails between NIRS and NRC regarding this omission including the actual Washington Post investigative reports on this scandal which resulted in involuntary, uninformed exposures of workers to fission products at enrichment facilities and failure to provide protection. Many other parameters of the Performance Assessments would change with this correction. Accurate inclusion of this "dirty" DU must be required in the assumptions NRC Staff and disposal companies have made about inadvertent intruder doses and the timeframes and amounts of "peak exposure." There may be several peaks that should be factored.

- High level radioactive waste from reprocessing of irradiated fuel—dubbed "Waste Incidental to Reprocessing" or even other high level waste could theoretically be disposed in shallow land burial grounds. Commercial reprocessing is not happening now in the US and NRC should not change its rules to accommodate reprocessing.

In 2002 NRC had to admit that the only commercial reprocessing site in the US, at West Valley, NY, which only operated for 6 years, could not comply with the NRC License Termination Rule (10 CFR 20 subpart E), thus stated that it would require significant "flexibility." In the intervening years, DOE's has solidified much the primary extraction liquid into 275 high level radioactive waste "logs" at West Valley and generated huge amounts of waste in other waste streams with unknown but large amounts of radioactive sludge in underground tanks. It is been projected to cost roughly $5 Billion to clean up the reprocessing waste part of the site and another ~$5 Billion to clean up the commercial "low-level" radioactive burial ground, which operated for about a dozen years, at West Valley. NRC is failing to consider the long term costs of its weakened 10 CFR 61 regulations as it facilitates new reprocessing and waste sites that can take more kinds of waste.

- Other "unique" waste streams never originally intended for such unlined shallow land burial grounds have no business being thrown in the ground at the behest of the profit-making operators of waste sites. We understand that NRC wants to "solve" as many waste problems as it can, but pretending burial will isolate waste, and removing dose limits that could prevent burial are not acceptable. We demand that NRC strengthen the dose limits…make them low enough to protect the reproductive stage of our life cycle from not only cancer but all other radiation-induced negative health effects, including but not limited to teratogenic and genetic.

- Blended waste and Averaging

  Years after the 1982 rule10 CFR 61 was adopted, NRC reinterpreted that rule to mean that classifying of waste (into A, B, C or >C) should be done at the point of disposal. This facilitated all sorts of waste processing, largely done in Tennessee but also in other states including Ohio. This has led to unnecessary transport and routine radioactive releases to the environment around processing facilities.
  A disturbing idea is being considered of bringing waste to disposal sites and then mathematically averaging the amount of radioactivity with the amount of radioactivity already at the site to allow much more radioactivity and higher concentration waste to be buried. We object to these practices.

➔ NRC is not abandoning the A B C and >C concentration tables 10 CFR 61.55 but providing many other methods to comply and apparently leaving it up the waste operator, not the state or the public.

➔ NRC creates and exacerbates a serious conflict of interest by encouraging and permitting profit-making dump-operators to do their own computer models and projections to allow more radioactive and longer lasting waste into trenches. NRC's claim that computer-generated "Performance Assessments" can predict a "Safety Case" is false. Increasing hazards does not provide greater protection.

- NRC admitted that it had not considered that some uranium is laced with fission products. As we stated above, some reprocessed uranium was put through uranium enrichment facilities. NRC should be aware of this well documented and publicly disclosed history at Paducah and reflect it and other such historical knowledge. It is not clear if other sites may also have similar wastes, and certainly if the ill-advised prospect of reprocessing is pursued, there will be more.

- NRC admits that Waste Incidental to Reprocessing possibly could go to shallow land burial.

- Greater-that Class-C waste and Transuranics above 10 or 100 nanocuries per gram, previously guaranteed NOT to go to these facilities would be allowed.

- Dump operators will make more money; generation of more new waste will be encouraged; the public will not be protected. The NRC, some Agreement state regulators and the waste site operators are making no "safety case" for us, the public.

➔ NRC's proposed rule would allow higher amounts of radioactive exposure --higher doses and in some cases, unlimited radiation doses to the public, as mentioned above.

- First, this done by "updating," using a different way to calculate doses which allows *more radioactivity per millirem* or unit of dose for many of the radionuclides. Depending on which radionuclides are being considered, there can be different amounts in each new *millirem EDE* (the 'updated' dose units) than in each of the existing millirems in the current rule. Neither of these are ever measured, verified or enforced. They serve to justify allowing more radioactivity in the waste and waste sites. We oppose the adoption into 10 CFR 61 of the 10 CFR 20 methods of dose calculation in all cases that increase radioactivity per millirem, or increase allowable concentrations, releases and exposures.

- Second, NRC is increasing and allowing unlimited millirems/year. The existing rule limits doses to the public during operations to 25/75/25 millirems per year and does not expressly specify higher amounts post-closure. This would be an enormous relaxation of the standards and must be dropped.

  NRC opening these sites to DU is a mistake since the radioactivity/radiation levels will rise over time. At one time DU was expected to be part of wastes that should be permanently isolated from our environment like irradiated fuel. NRC should adopt that plan for DU.

➔ Radiation is more dangerous for females, youth, and threatens the reproductive stage of the human and other life cycles.
The proposed rule ignores the now-known reality that external ionizing radiation causes 50% more cancer and fatal cancer in female adults compared to male adults and 7 times

more cancer incidence when the exposure happens in very young females, compared to exposure of adult males.[8] Young males and females are both at higher risk, but half of the global population needs greater protection and NRC dodges this in its role as regulator. This is irresponsible. Juvenile females are not a "subpopulation" they are an inextricable link in the human lifecycle. There is no biological "Reference Man" who did not come from someone who was in this most sensitive age group. NRC continues to unacceptably ignore non-cancer health effects, synergistic effects with other toxic exposures and reproductive effects.

➔ NRC should not "*update*" the radiation dose part of this regulation 10 CFR 61 by incorporating its 10 CFR 20 standards because those are *less protective* than 10 CFR 61 current limits**.** Any change should "update" the scientific reality that radiation is more harmful than previous assessments identified and *reduce allowable releases and exposures*.

NRC is failing to protect the reproductive phase of the human lifecycle (and that of all other species as well). We have commented on this in the 10 CFR 20 rulemaking and oppose expanding those failures to protect from radiation into this regulation 10 CFR 61. Radiation is clearly being found to be more harmful every time it is reviewed (rather, each batch of new data shows that regulators have failed repeatedly to honestly report the true hazards of ionizing radiation) yet NRC stubbornly moves to let the radioactive pollution levels rise as it increases allowable concentrations and emissions into air and water and doses to this and future generations. Scientifically, it is unacceptable.

➔ There is no meaningful limit on the Performance Assessment. Allowing the option of the waste site operator choosing his or her own allowable dose level, means pretty much any kind of waste can go to these sites. This is worsened by the fact that allowable dose limits are used for calculations only, never enforced or verified; It is not scientifically justifiable for NRC allow Performance Assessments and Safety Cases to be done by those who stand to profit, inevitably allowing more dangerous and long lasting wastes into shallow land burial sites.

It is a conflict of interest to allow those who profit from disposal, the waste site owners and or operators, to do essentially "black box" calculations to allow more dangerous nuclear waste into their own facilities. The rule should not have this provision and any provision it does have should have a requirement for public notification, comment, intervention and intervenor funding.

➔ The Emergency Access Clause, Section 6 of the Low Level Radioactive Waste Policy Act, provides that in emergency situations, operating nuclear waste facilities could be required to take waste not normally designated or intended. We have always contended

[8] See: "Atomic Radiation is More Harmful to Women" October, 2011: http://www.nirs.org/radiation/radhealth/radiationwomen.pdf as well as other items on radiation and gender posted: http://www.nirs.org/radiation/radhealth/radhealthhome.htm

that sites must not be required, forced, or allowed to take wastes for which they were not originally intended or characterized. The proposed regulations could do the exact opposite, provide for any kind of radioactive waste to be accepted. Under the Environmental Protection Agency's Protective Action Guides, such facilities could be expected to take large amount of waste from emergencies. States should not be forced to accommodate the nuclear industry polluters in this way. It is time for the federal regulators to adopt a role of incentivizing waste reduction, not the opposite.

➔ Performance Assessments are tools that can easily be used to justify polluting practices and facilities, not just radioactive. They are not practically transparent or reviewable by the public. We support HEAL Utah's comments on 10 CFR 61 against Performance Assessments.

Performance Assessments are only predictions and especially not trustworthy when carried out by those who stand to profit from the conclusions.

NRC highlights the Performance Assessment proposed for the West Valley nuclear waste site in its 10 CFR 61 Technical Guidance,[9] but the public opposes the Performance Assessment being planned for that site because the Agencies responsible refuse to provide transparency and the public is being denied input on the contractor, real time access to the necessary assumptions, documents, expert declarations, computer programs and codes and resources to hire independent reviewers. The West Valley experience should be a warning for communities and states where other nuclear waste sites are located. The site itself has been estimated to cost $9.7 to $10 billion to fully clean up and it threatens to release its contents into the surrounding streams and the Great Lakes. The performance assessment is being carried out to justify leaving waste in rapidly eroding unstable ground.

➔ Both the current and proposed 10 CFR 61 allow for unlined soil trench burial of radioactive wastes that will inevitably leak out. Both fail to protect the public. The current regulations should be strengthened and the proposed rule which allows higher radiation exposure to the public than operating nuclear reactors or a high level radioactive waste repository should be scrapped.

Submitted by Over 100 Organizations* listed below, pages 11-15.
Contact: Diane D'Arrigo, Nuclear Information and Resource Service dianed@nirs.org

Attachments: NRC-NIRS Correspondence re Washington Post series on fission product and transuranic contamination at uranium enrichment facilities and in depleted uranium; Washington Post series (by separate submission on regulations.gov)

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[9] D. Esh, C. Grossman, H. Arlt, C. Barr, P. Yadav, "Guidance for Conducting Technical Analyses for 10CFRPart 61." Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, 2015. http://pbadupws.nrc.gov/docs/ML1505/ML15056A516.pdf>.file:///U:/My%20Documents/LLRW/10-cfr-part-61%20redline%20changes.pdf

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ATTACHMENT 1 to 100+ Organizations' Comments to NRC on 10 CFR 61 Proposed Radioactive Waste Disposal

Regulations From: "Grossman, Christopher" <Christopher.Grossman@nrc.gov>
Date: June 16, 2015 at 2:56:18 PM EDT
To: "'maryo@nirs.org'" <maryo@nirs.org>
Cc: "Dembek, Stephen" <Stephen.Dembek@nrc.gov>, "McKenney, Christepher" <Christepher.McKenney@nrc.gov>, "Yadav, Priya" <Priya.Yadav@nrc.gov>, "Comfort, Gary" <Gary.Comfort@nrc.gov>, "Esh, David" <David.Esh@nrc.gov>
Subject: Correction Regarding a Question at June 2, 2015 10 CFR Part 61 Public Meeting in Columbia, SC

Ms. Olson -

During the June 2, 2015 public meeting on the rulemaking for 10 CFR Part 61, you inquired about whether U.S. Nuclear Regulatory Commission (NRC) staff considered contaminated depleted uranium from U.S. Department of Energy (DOE) facilities in its analysis to support the Commission Paper, SECY-08-0147. In response at the meeting, I replied that we had considered contaminated depleted uranium. I have had some time to review our analysis and would like to correct my response to your question. While we considered the quantities of depleted uranium associated with DOE's facilities in the analysis, we, in fact, did not consider radionuclides associated that might result from contamination of depleted uranium with reprocessed materials at DOE facilities. Rather our analysis only considered radionuclides associated with clean depleted uranium. As indicated during the meeting, Enclosure 1 to SECY-08-0147 includes a description of our analysis including the specific radionuclides considered.

I apologize for any confusion my response may have created. NRC staff plans to correct the public record in the future, but I wanted to let you know personally as the originator of the question. In the near future, staff will also be placing this email in the NRC's Agencywide Document Access and Management System (ADAMS) and on the NRC's Low-Level Radioactive Waste Disposal public website for the 10 CFR Part 61 rulemaking. ADAMS is available at http://www.nrc.gov/reading-rm/adams.html. NRC's 10 CFR Part 61 rulemaking public website is available at http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html. You will be able to find it under "2015 Public Workshop Information", "Public Meeting 5 — June 2, 2015 (Columbia, SC)" once it is available. If you have any further questions about our analyses or the rulemaking, please feel free to contact me or any of the project managers for the rulemaking.

Respectfully,

Christopher J. Grossman
Risk Analyst
Division of Decommissioning, Uranium Recovery, & Waste Programs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
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From: Mary Olson
Sent: Thursday, June 18, 2015 9:46 AM
To: Grossman, Christopher
Cc: Dembek, Stephen; McKenney, Christepher; Yadav, Priya; Comfort, Gary; Esh, David; Tim Judson; Diane D'Arrigo
Subject: RE: Correction Regarding a Question at June 2, 2015 10 CFR Part 61 Public Meeting in Columbia, SC

Second Reply:

Mr. Grossman,
Cc above list; adding Diane D'Arrigo and Tim Judson at NIRS,

I would like this reply, and the attached document to be also posted with public access in ADAMs.

I asked NRC the question about whether it had considered DU (Depleted Uranium) originating from Paducah (and possibly other process sites) because of the history of the US Department of Energy sending uranium from plutonium separation (reprocessing) back through the enrichment phase as documented in the attached file by the "Paper of Record" the Washington Post. The uranium that was sent back through post-reprocessing was laced with fission products and activation products, including plutonium and other transuranics.

In its discussion of the proposed changes to Part 61, which anticipate the inclusion of DU in so-called "low-level" radioactive waste trenches, NRC has assumed that the DU is pure 238 and while somewhat radioactive itself would only contribute other radioactivity as decay products over time (a long time) to the inventory at the site.

The DU from Paducah is not pure DU. The enrichment process results in a more pure U235, not a more pure U238.

The attached file contains a series of 9 articles that together are the report of an independent investigation of the impact of the contaminated uranium on workers at Paducah. The impacts were not trivial. It is very important that NRC as a regulator not fall into the trap of using broad assumptions that are purely theoretical with no "process history."

A broad policy change such as proposing to call material with a 4.5 billion-year half-life "low-level," should not overlook the actual history of this material, nor the possible implications for the future since reprocessing is one of the reasons NRC cites for making changes at this time. An inventory of cesium, strontium and plutonium as well as the rest of the fission-product soup riding as "hitch hikers" on uranium must be factored since the impact would be today, not in the distant future of radioactive decay.

I am sure that the over-all plan to allow the dump-operator to make a "safety case" will compensate for any possible material that it wants to bury…but, on behalf of the drivers, waste handlers, dump workers, and the groundwater, please do not assume all DU is only U238.

Sincerely,
Mary Olson

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ATTACHMENT 2 to 100+ Organizations' Comments to NRC on 10 CFR 61 Proposed Radioactive Waste Disposal being submitted separately as support for the concerns raised in these comments.

The 9 Part Washington Post Series re Uranium Enrichment

The Washington Post, Joby Warrick, Washington Post Staff Writer

August 8, 1999 through February 11, 2000

In Harm's Way, And in the Dark; Workers Exposed to Plutonium at U.S. Plant

Richardson Orders Probe Of Uranium Plant in Ky.

A Deathly Postscript Comes Back to Life; After Being Rejected, Warnings of Paducah Atomic Worker Now Hailed as Heroism

Paducah's Silent Witness; Excessive Uranium Level Found in Worker's Bones

U.S. Will Propose Payments to Sick Paducah Workers; $20 Million Fund Eyed For Radiation Cancers

Radiation Risks Long Concealed; Paducah Plant Memos Show Fear Of Public Outcry

Energy Dept. Faults Paducah Contractors; Deficient Plant Hazard Warnings Cited

Plant Hid Risk From Workers; Paducah Bosses Knew Some Had High Radiation Levels

Bomb Part Storage at Ky. Plant Disclosed; Nuclear Agency Is Told of Hazards In Secret Program

1 of 9 DOCUMENTS

The Washington Post

August 8, 1999, Sunday, Final Edition

In Harm's Way, And in the Dark; Workers Exposed to Plutonium at U.S. Plant

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 4790 words

DATELINE: PADUCAH, Ky.

Thousands of uranium workers were unwittingly exposed to plutonium and other highly radioactive metals here at a federally owned plant where contamination spread through work areas, locker rooms and even cafeterias, a Washington Post investigation has found.

Unsuspecting workers inhaled plutonium-laced dust brought into the plant for 23 years as part of a flawed government experiment to recycle used nuclear reactor fuel at the Paducah Gaseous Diffusion Plant, according to a review of court documents, plant records, and interviews with current and former workers. The government and its contractors did not inform workers about the hazards for decades, even as employees in the 1980s began to notice a string of cancers.

Radioactive contaminants from the plant spilled into ditches and eventually seeped into creeks, a state-owned wildlife area and private wells, documents show. Plant workers contend in sealed court documents that radioactive waste also was deliberately dumped into nearby fields, abandoned buildings and a landfill not licensed for hazardous waste.

The sprawling Kentucky plant on the Ohio River represents an unpublished chapter in the still-unfolding story of radioactive contamination and concealment in the chain of factories across the country that produced America's Cold War nuclear arsenal. Opened in 1952 in an impoverished region, the 750-acre plant built a fiercely loyal work force of more than 1,800 men and women who labored in hot, stadium-sized buildings turning trainloads of dusty uranium powder into material for bombs.

Today, the Department of Energy contends that worker exposure was minimal and that contamination is being cleaned up. A lawsuit filed under seal in June by three current plant employees alleges that radiation exposure was a problem at Paducah well into the 1990s.

The Post's investigation shows that contractors buried the facts about the plutonium contamination, which occurred from the mid-1950s to the mid-1970s, in reports filed in archives. Plutonium, a core ingredient in nuclear bombs, is a highly radioactive metal that can cause cancer if ingested in quantities as small as a millionth of an ounce. The Paducah plant was designed to handle only uranium, a mildly radioactive metal.

"The community to this day has no idea of the kinds of contaminants they were exposed to," said James W. Owens, a Paducah lawyer representing residents whose water has been polluted by the plant.

Health consequences remain unclear. No comprehensive study of worker medical histories has been attempted at Paducah. In neighborhoods where older workers live, stories abound of cancer clusters and unusual illnesses. One 20-year veteran worker who died in 1980 compiled a list of 50 employees he worked with who had died of cancer.

"Everything was so safe, so riskless," the worker, Joe Harding, said in an interview just before his death. "Today we know the truth about those promises. I can feel it in my body."

Even though the plant's procedures and purpose have changed -- **Paducah's** enriched uranium is now used in commercial nuclear power plants -- problems have continued. Workers weave between makeshift fences that cordon off hundreds of radioactive "hot spots" scattered across the complex. In one corner of the plant, mildly radioactive runoff trickles from a nearly half-mile-long mound of rusting barrels that still contain traces of uranium.

"The situation is as close to a complete lack of health physics as I have observed outside of the former Soviet Union," Thomas Cochran, nuclear program director for the Natural Resources Defense Council, said in documents filed in the lawsuit.

The Department of Energy, which owns the plant, said it could not comment on allegations made in the suit because of the court-ordered seal. The agency is investigating the charges and dispatched a team to **Paducah** to determine if conditions posed an immediate threat to workers or the public.

Energy Secretary Bill Richardson said the agency's national security goals had "sent many of our workers into harm's way," but he said the agency must now live up to its responsibility to "right the wrongs of the past." Two weeks ago, Richardson pledged millions of dollars for medical monitoring of nuclear workers who were exposed to beryllium, a highly toxic metal.

"The Department of Energy will continue to take any actions that are necessary to ensure the protection of public health, the workers and the environment," he said.

Still, agency officials, in a written response to questions from The Post, strongly defended past safety practices at **Paducah** and said no workers are at risk today.

"The plant's monitoring data did not indicate an accumulation of [plutonium and other highly radioactive wastes] in the workplace or the environment that would be a health concern to workers or to the public," the DOE said.

That position is vigorously contested in more than 2,000 pages of documents filed in the lawsuit by two of the plant's health physicists, or radiation safety experts, and a veteran worker who had his esophagus removed after three decades of work inside contaminated buildings. Copies of the documents were obtained by The Post from government sources.

"The management line for years has been there was an insignificant amount" of plutonium at **Paducah**, said Mark Griffon, a health physicist at the University of Massachusetts at Lowell who is participating in a federal study of radiation conditions at nuclear weapons plants, including **Paducah**. Griffon reviewed plant documents provided by The Post.

"If the levels were this significant," he said, "it raises an important question: Why weren't workers ever monitored?"

The two health physicists suing the plant say in court documents they tried to call attention to the radiation problems but were confronted by a culture of unconcern.

"I was told by my superior . . . in so many words that 'this is **Paducah** -- it doesn't matter here,' " said one of the physicists, Ronald Fowler, 50, who came to the plant in 1991.

The suit was brought under a law that allows employees to collect payment for exposing fraud against the government. It was filed under seal to give Justice Department officials an opportunity to decide whether to join the suit or begin a criminal investigation.

The suit names Lockheed Martin and Martin Marietta, which managed the uranium enrichment plant during the 1980s and 1990s. It does not name the original manager, Union Carbide, which ran the facility for a 32-year period during which the bulk of the contamination occurred. None of the companies had been served with the suit and none would comment on the allegations.

The current plant operator, U.S. Enrichment Corp., a government-chartered private company that assumed management this year, concedes past problems but says safeguards are now in place. USEC, which sold

shares to the public last year, says it has fully disclosed the plant's environmental problems to regulators, workers and stockholders.

"It was acknowledged by all sides that contaminated conditions existed, . . . but USEC wasn't responsible for them," said Jim Miller, USEC executive vice president.

Paducah is the latest DOE facility to be rocked by lawsuits and revelations of contamination. Cleaning up the complex is expected to cost $ 240 billion and take at least 75 years.

Measured by the gram, the contamination at **Paducah** isn't nearly as extreme as that in plutonium production plants such as Washington state's Hanford Nuclear Reservation, where vast swaths of land have been sealed off from humans. But unlike the workers at those plants, employees at **Paducah** did not know of the risks in the uranium dust they breathed every day.

Worker exposure to such dust has cost the government in the past. The Energy Department paid a $ 15 million settlement five years ago to former workers who had breathed uranium dust at the Fernald Feed Materials Production Center near Cincinnati.

The difference between the dust at Fernald and that at **Paducah** comes down to one word: plutonium.

For 2 Decades, Freight Cars

Brought Unknown Danger

The **Paducah** complex was the second of three U.S. government plants designed after World War II to create enriched uranium. The plants were operated for the government by private contractors who over time were paid bonuses for running safe, efficient facilities.

In the beginning, uranium ore was scarce. The Atomic Energy Commission, forerunner of today's Energy Department, tried to fill the gap by "recycling" leftover uranium -- from nuclear reactors that made plutonium for bombs -- through the enrichment process at **Paducah**.

From 1953 to 1976, more than 103,000 metric tons of used uranium was shipped to **Paducah**, records show. It arrived in freight cars as a fine black powder. Unknown to workers, the powder contained dangerous substances left over from the plutonium-making process -- fission byproducts such as technetium-99 and heavy metals known as "transuranics": neptunium and plutonium.

"Plutonium is roughly 100,000 times more radioactive per gram than uranium," said Arjun Makhijani, president of the Institute for Energy and Environmental Research.

Over time, through spills and waste discharges, the contaminants accumulated in the miles of pipes used to gasify and enrich uranium, around loading docks and in ditches, documents show.

Plant officials were aware of the plutonium and other contaminants as early as the mid-1950s -- it made their recycled uranium less efficient. But they believed the amounts were too small to pose a health threat.

Today, the DOE is able to rely only on a contractor's estimate of the total amount of contaminants introduced in that period: 12 ounces of plutonium, 40 pounds of neptunium and 1,320 pounds of technetium-99.

The government today takes the same position as it did in the 1950s: The amounts were most likely not enough to harm workers. "The general protection provided to workers from the hazardous effects of uranium would have provided adequate protection" from the contaminants, the DOE statement said.

But documents obtained by The Post show that plant officials became increasingly concerned about the contaminants. A 1992 report by Martin Marietta concluded that they caused "significant" environmental problems and "also pose a radiation hazard to the workforce." A 1988 study done for the DOE by a private contractor said the plutonium could "represent a significant internal dose concern even at very low mass concentrations."

Plant records draw an instructive comparison that underlines the hazards posed by plutonium: The 12 ounces of plutonium in the black powder delivered more than twice as much radiation into the environment as the 61,000 pounds of uranium that flowed out of the plant in waste water into the Ohio River between 1952 and 1987.

Bosses Took Threat

With a Grain of Salt

In the noisy, cavernous buildings where uranium was processed, workers did not receive the warnings. The conditions there were "extremely dusty . . . sometimes to the point where it was very difficult to see or breathe," said Garland "Bud" Jenkins, 56, a 31-year-veteran uranium worker and one of the three employees involved in the lawsuit against Lockheed Martin.

To protect their skin from the uranium dust, workers wore cotton coveralls and gloves. But respiratory protection was optional -- old Army gas masks, which fit poorly and were seldom used, former and current workers said.

At lunchtime, workers brushed black powder or green uranium dust off their food. "They told us you could eat this stuff and it wouldn't hurt you," said Al Puckett, a retired union shop steward. To dramatize the point, he said, some supervisors "salted" their bread with green uranium dust.

The workers took the dust home at shift's end.

"We frequently discovered that our bed linens would be green or black in the morning, from dust that apparently absorbed into our skin," Jenkins said.

Exposure to uranium dust decreased after the late 1970s, when the plant stopped receiving the black powder and began processing a more refined form of uranium. In 1989, the DOE adopted more stringent worker safety rules.

By then the plutonium had permeated the land around the plant. In the 1960s and 1970s, when the powder spilled, workers would shovel it up and wash the remnants into the nearest ditch, Jenkins said. More than a dozen ditches flow directly from the plant onto state property and private lands.

There are no nationwide limits for plutonium in soil; cleanup standards depend on modeling the degree of public access to the contaminated spot. But the DOE has set cleanup limits at nuclear blast sites in the South Pacific of 15 picocuries of plutonium per gram of soil.

Contractors measured plutonium at levels up to 47 picocuries in ditches outside the plant and 500 picocuries on plant grounds.

Those measurements were made after the first evidence of environmental problems outside the plant surfaced in 1988, when a county health inspector found technetium and chemical carcinogens from the plant in a farmer's well. The discovery of the poisoned wells prompted a multimillion-dollar ground-water cleanup under the Environmental Protection Agency's oversight.

Although plant managers posted creeks and ditches with warning signs in the early 1990s, the signs do not refer to plutonium or any other radioactive contaminants. Some warn of possible contamination with cancer-causing chemicals; others merely caution against eating local fish.

Lawsuit Alleges

Deliberate Dumping

In addition to the substances that flowed or spilled out of the plant through the drainage ditches, the employees contend in their lawsuit that a wide variety of contaminated substances were deliberately dumped into the environment. Spilled black powder and empty radioactive waste containers allegedly were placed in dumpsters and trucked to a sanitary landfill on DOE property licensed only for trash and garbage. Rubble from demolished buildings and contaminated railroad ties allegedly were dumped in nearby woods and fields. Slag from uranium smelters was put in abandoned concrete bunkers in a state wildlife area outside the plant, according to the lawsuit.

"There was only one dumpster for all waste, whether radioactive, hazardous, toxic or ordinary," Jenkins said.

Plant records describe at least two dozen unlicensed radioactive debris piles on state lands outside the plant. Last year, ground-water tests turned up technetium directly beneath the sanitary landfill.

A 1990 DOE audit of **Paducah** found inadequate controls over waste disposal and a faulty system for tracking contamination that forced managers to rely on "word of mouth."

Charles Deuschle, 56, a health physics technician and the third employee in the lawsuit, said he was "shocked" when his surveys discovered radioactive contamination in such places as the plant's cafeteria.

"I saw conditions that would never have been tolerated in any other nuclear location where I have worked," Deuschle, who came to **Paducah** in 1992, said in court documents.

Internal plant surveys included in the suit found high levels of radiation on street surfaces, manhole covers and loading docks and in locker rooms as recently as 1996.

The plant's current managers maintain that all significantly contaminated areas have been addressed. "Hot" surfaces have been coated with absorbent paint, and warning signs have been posted, they said. Rope fences keep passersby away from radioactive equipment rusting in the open. Drain pipes and fire hydrants are coated with warning paint. Two dilapidated buildings where the black powder was once processed are padlocked. In 1997, regulatory oversight of the plant was transferred to the Nuclear Regulatory Commission, which declined to comment on allegations in the sealed lawsuit.

Even the employees involved in the suit concede that safeguards have improved recently. But they insist that problems remain. This spring, elevated radioactivity was found in a parking area near the administration building, plant documents show.

Soil collected from a ditch outside the plant's fence by The Post in June and analyzed at a commercial lab contained 2.6 picocuries of plutonium, slightly higher than the NRC's suggested guideline for cleaning up nuclear sites.

The Post, using two hand-held detectors, also found sharply elevated radiation levels in the debris piles on the state wildlife lands. One such area was an unmarked pile of rotting railroad timbers near fishing ponds and campgrounds.

Public Reports Tell

Only Part of the Story

Environmentalists, plant workers and neighbors claim that plant officials play down the hazards.

"They cloak it in jargon," said Mark Donham, a member of a citizens advisory board that meets monthly with plant cleanup officials. "You have to order the documents and then spend hours and hours looking at them to learn anything."

DOE officials say the facts and figures about the plutonium contamination inside the plant have been duly recorded since 1991 in thick inspection reports. But these are kept in archives rarely visited by the public.

In the annual environmental reports that circulate to the public, the contamination is described as "trace" amounts of "radionuclides," a catchall term that can include mildly radioactive uranium as well as highly radioactive plutonium.

A 1991 "site investigation" report, done by the plant's contractor and stored in the archives, shows much higher levels of plutonium than the annual environmental reports. The DOE said the reports use different methods and measure different things.

The result has been that the DOE can claim full disclosure about the contamination while plant workers and neighbors remain in the dark, said Owens, the attorney for the plant's neighbors.

"The company has engaged in a cynical disinformation campaign that centered on downplaying risks and presenting confusing and misleading information," he said.

Inside the plant, the first disclosure of plutonium to workers came around 1990 after managers summoned top union leaders to discuss the results of tests ordered after the state found the poisoned wells.

"They took it seriously," a union official, speaking on the condition of anonymity, said of Martin Marietta's presentation. But "the health effects weren't viewed as serious. We just vehemently stressed that the contamination should be cleaned up."

Plant managers insist that workers today are fully aware of the potential hazards. USEC cites worker training programs that it says include a briefing on plutonium and other radioactive hazards at the plant.

But officials with the union's Washington office contend workers still don't know a fraction of what they were exposed to. "What we're seeing now," said Daniel Guttman, former staff director of the federal Advisory Committee on Human Radiation Experiments, "is the outcropping of the glacier."

Deficient Monitoring

Compounded the Risk

The health effects for **Paducah** workers remain an open question.

The DOE said 442 **Paducah** workers were tested in 1997 and only 8 percent displayed measurable amounts of radiation. It said screening tests since 1992 have found no evidence of plutonium exposure in workers.

But the greatest exposure to workers would have occurred before the enhanced monitoring that began in the late 1980s.

In 1990, the DOE audited safety practices at **Paducah** and found scores of deficiencies in radiation monitoring and worker protection. The audit team said **Paducah** failed to properly monitor radiation to workers' internal organs -- even though plant managers had been repeatedly warned to do so.

Radiation-measuring equipment was either missing or not properly calibrated, the report said, and workers weren't being tested for the kinds of radiation known to exist at **Paducah**. Whether the plant's equipment and personnel were even capable of detecting exposure to plutonium and other transuranics was "questionable," the audit said.

Bolstering claims by workers that they had been left in the dark about radioactive hazards, the report found no mention of transuranics in plant safety procedures.

"Onsite environmental radiological contamination conditions are largely unknown," the report said. "A formal program with well-defined monitoring, sampling and analysis requirements does not exist."

Independent experts are investigating **Paducah** as part of two national studies of environmental and safety issues in the U.S. nuclear weapons complex. Both studies are relying primarily on data supplied by the plant. Officials brought in two years ago to review past radiation hazards told The Post they were not informed that **Paducah** workers may have been exposed to significant amounts of plutonium.

Neither was Harold Hargan, a plant worker for 37 years. Hargan was one of about six workers who he says were told in 1990 that a test had found plutonium in their urine.

"It surprised me. Hell, it surprised the doctor," Hargan said. "Everybody knew there was no plutonium at **Paducah**."

What Happened Inside the Plant

Uranium is a naturally radioactive element that comes mainly in two forms, or isotopes: uranium-238 and a small amount of uranium-235. Only U-235 is fissile, or capable of being split in a nuclear chain reaction. To make bombs or nuclear fuel, uranium must be "enriched" by increasing the proportion of U-235.

The Mission: Uranium Enrichment

1. Uranium ore from mines is milled in a process to extract uranium oxide, known as yellowcake. The yellowcake is sent to **Paducah**.

2. At the **Paducah** plant, yellowcake is burned with hydrogen to form uranium dioxide, a black powdery substance called "black oxide."

3. The black oxide is mixed with hydrofluoric acid to make uraniun tetrafluoride, known as greensalt.

4. The greensalt is burned with fluorine to make uranium hexafluoride

Since the late 1970s, **Paducah** has purchased uranium hexafluoride from other companies. Today, the enrichment process begins here.

5. Finally comes the gaseous diffusion process for which the plant is named: The liquid uranium hexafluoride is heated and passed through a series of barriers, which separate and concentrate the U-235 isotope. The low-enriched uranium is condensed to a solid and packed into drums for shipping.

The enriched uranium is shipped to another plant for further enrichment to make commercial nuclear fuel. In the past, some was converted to highly enriched uranium for bombs.

4%-5%U235 Nuclear fuel for power plants

90%U235 Nuclear weapons

Enormous amounts of uranium are left over after enrichment.

The processes used at **Paducah** also can move backward, turning uranium hexafluoride back into greensalt, or into depleted uranium metal for use in armor-piercing munitions or armor plating.

Uranium hexafluoride mixed with magnesium yields greensalt,uranium metal and slag.

Contamination Spreads

Beginning about 1953, uranium from spent nuclear fuel was sent to **Paducah** to be enriched. Each shipment contained small amounts of plutonium and other radioactive contaminants.

Worker exposure

Processing uranium generated large amounts of contaminated airborne dust inside the buildings. Also, radioactive material often was spilled, then swept up by hand, hosed into gutters or placed in regular trash receptacles, whistle-blowers say.

Workers carried uranium home on their skin and clothes.

Metals Recovery

Old nuclear warheads were dismantled at **Paducah**, where the radioactive material was extracted and gold and other precious metals were recovered.

The recovered gold was melted into bars. Whistle-blowers allege some was shipped away without being measured for radiation.

Tens of thousands of drums used to ship uranium are stored outdoors at the plant. Many drums still contain radioactive material.

This "depleted" uranium -- still radioactive -- is stored in tens of thousands of cylinders in open lots.

The plant continues to store significant amounts of various recovered metals deemed too contaminated to ship.

The concrete-like gray slag, a contaminated

byproduct of the process, allegedly was trucked to sanitary landfills and dumped in public areas near the plant. Large amounts of contaminated slag remain on the site.

Hazards Inside the Plant

For decades, plutonium and other radioactive hazards quietly spread through this Kentucky uranium plant, exposing unsuspecting workers to an invisible and potentially lethal threat. Red areas on this diagram denote contamination that was detected around the main work areas in 1992.

'Barrel Mountain': A nearly half-mile mound of large piles of rusted metal scrap and other waste materials, some of it contaminated.

Classified burial ground: This landfill contains nuclear weapons components. Workers who dismantled weapons may have been exposed to beryllium, a highly toxic metal.

Burial pits: Enormous amounts of radioactive material lie in shallow landfills on plant grounds, and some are believed to be leaching into ground water. One pit contains hundreds of barrels of a highly flammable form of uranium stored in PCB-tainted oils.

Waste-water discharges: Company documents acknowledge the release of tens of thousands of pounds of uranium into creeks. Toxic chemicals and metals also were discharged in waste water.

Dirty runoff: Rain washes uranium and other hazards into ditches that flow past outdoor scrap yards. Some of the ditches are posted as radioactive inside the plant fence, while just outside the fence there are no such warnings.

Fouled ditches: Uranium, plutonium and other radioactive materials were flushed into ditches, such as this one, that flow into tributaries of the Ohio River. A test commissioned last month by The Washington Post found plutonium here. Earlier tests of the ditch inside plant grounds found plutonium at a level 100 times above what the government certifies as safe.

One of the most contaminated buildings still in use, C-400 contained chemical solvent tanks for cleaning radioactive equipment. Workers this year found an old canister that contained radioactive technetium at levels millions of times above the safety standard.

Outdoor hazards: Plant officials recently discovered radioactive contamination in this gravel parking lot near the main administration building. Dozens of "hot spots" around the plant grounds mark the sites of old spills or dumps.

Buildings 410 and 420: Hundreds of workers were exposed to radioactive dust in these buildings, which were used to process uranium before enrichment.

Contaminated buildings: Elevated radiation levels have been found in hundreds of areas frequented by workers, including a cafeteria.

Tainted wells: Two large plumes of contaminated ground water extend more than a mile north of the plant into residential neighborhoods. The water is contaminated with chemical and radiological wastes.

Cylinder piles: More than 30,000 metal tanks containing a toxic mix of depleted uranium and fluorine are stacked in open lots. Until recently, some were stored in a nearby residential neighborhood.

Process buildings: The heart of the plant, these stadium-sized buildings now enrich uranium for commercial nuclear fuel. The truck alleys along the sides of each building are contaminated from spills during deliveries.

Chemical spills: Thousands of gallons of toxic chemicals -- including suspected carcinogens -- were released into the environment in a series of leaks and spills. Some ended up in nearby creeks.

Airborne releases: Exhaust fans vented radioactive dust into the atmosphere. Workers say the biggest releases were always at night.

Switchyards: The plant requires enormous amounts of electricity -- two generating plants are dedicated to its needs. As recently as 1996, the plant also was the nation's largest single emitter of freon, the coolant blamed for damaging the Earth's ozone layer.

SOURCES: "Radiological Survey of Selected Outdoor Areas, **Paducah** Gaseous Diffusion Plant, **Paducah**, Kentucky," prepared by Oak Ridge Associated Universities, April 1992; Washington Post research. Satellite photo from U.S. Geological Survey.

Spreading Toxins

Radioactively contaminated slag and rubble from demolished buildings was dumped outdoors in more than two dozen places around the plant. For decades, waste water containing uranium, plutonium and cancer-causing chemicals was discharged into ditches and creeks that flow into the Ohio River, three miles away.

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2 of 9 DOCUMENTS

The Washington Post

August 9, 1999, Monday, Final Edition

Richardson Orders Probe Of Uranium Plant in Ky.

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 893 words

Energy Secretary Bill Richardson ordered an immediate investigation yesterday into reports that thousands of unsuspecting employees at a Kentucky uranium plant were exposed on the job to cancer-causing plutonium.

Richardson said he would meet with workers at the **Paducah** Gaseous Diffusion Plant and would request a National Academy of Sciences study to probe the links between worker illnesses and exposure to radioactive materials that occurred over decades at the federally owned plant.

He also called for expanding a newly created program to bring health screening and medical treatment to thousands of workers who may have been put in harm's way at **Paducah** and similar facilities that were part of the government's nuclear weapons complex.

"I have long maintained that we must correct the sins of the past by compensating workers who have been medically damaged," Richardson said in an interview. "I don't want this to be known as the department of excuses for not dealing with workers who have been harmed."

His remarks came after The Washington Post reported that workers at the **Paducah** plant had been unwittingly exposed to plutonium and other radioactive metals that entered the plant over decades in shipments of used uranium from military nuclear reactor fuel. The report was based in part on sealed court documents filed as part of a lawsuit by workers and an environmental group, the Natural Resources Defense Council. The suit alleges that government contractors concealed evidence of the exposure for decades while allowing plutonium and other hazards to spread into the environment.

The workers also allege that former plant managers allowed contaminated waste to be dumped into a state-owned wildlife area and a landfill not licensed for hazardous waste. They further contend that radioactively contaminated gold and other valuable metals may have been shipped out of the plant without being properly tested.

Thomas Cochran, a nuclear expert with the NRDC who reviewed conditions at the plant, said health and safety practices there were the worst "outside the former Soviet Union." Former plant operators had not been served with the suit and declined to comment. The whistleblowers and their Washington attorney, Joseph Egan, said they also could not comment because of the judge's seal on the case.

Energy officials sent a team to **Paducah** for an initial probe after the documents were first filed in June, Richardson confirmed. "They did not uncover any imminent threats . . . but we are continuing to investigate these concerns," Richardson said.

The expanded investigation he announced yesterday would seek to uncover "what actually occurred, who was responsible and what must be done to assure that it never happens again," he said.

Among the specific measures:

Top Energy Department officials will be dispatched to **Paducah** this week to check compliance with environmental and safety regulations. The agency's Office of General Counsel will assess whether former contractors, including Lockheed Martin Corp. or Union Carbide Corp., had fulfilled their responsibilities to protect workers and the environment.

Besides the health study by the National Academy of Sciences' Institute of Medicine, the Energy Department will institute a medical surveillance and screening program for employees. A screening of former **Paducah** workers is just beginning as part of the Former Worker Program, a congressionally ordered study of past exposures of employees in the U.S. nuclear complex.

The department's fiscal 2000 budget request will be reassessed and revised as necessary to include money to probe and rectify environmental and health concerns at the government's uranium enrichment plants.

Richardson will ask the White House to expand a newly created program to provide millions of dollars in medical screening and other benefits to Energy Department workers who were exposed to beryllium, a highly toxic metal used in nuclear weapons. "These actions are warranted given the concerns raised . . . and I will not rest until these issues are fully dealt with and any injured workers are fairly compensated," Richardson said.

Paducah workers were exposed to plutonium through shipments of contaminated uranium that arrived at the plant from 1953 to 1976, a period when national security priorities often surmounted concerns over risks to workers and the environment. The plutonium shipments stopped, but contaminants remain spattered over hundreds of acres of buildings and grounds. Workers did not learn of the problems until at least 1990, and some contend they were never told.

The U.S. Enrichment Corp., a government-chartered private corporation that took over management of the plant this year, contends that all significantly contaminated areas have been cleaned up or marked with warning signs.

Although no comprehensive study of worker medical histories has been conducted, current and former workers at the plant have linked past exposures to a string of cancers and other diseases.

Richardson said although many of the exposures at **Paducah** were historical, the government bears responsibilities for those who may have been injured.

"Even though it was the 1950s and everyone was gung-ho," he said, "it doesn't mean that you can forget about workers who have been made sick."

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The Washington Post

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A Deathly Postscript Comes Back to Life; After Being Rejected, Warnings of Paducah Atomic Worker Now Hailed as Heroism

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 1595 words

DATELINE: PADUCAH, Ky.

Stricken with cancer, his body mottled with painful sores, uranium worker Joe Harding picked up a pen for a final postscript to his nine-year struggle against the U.S.-owned factory he blamed for his fatal illness. "It is absolutely futile," he wrote just before his 1980 death, "like fighting a tiger with a toothpick."

Two decades later, Harding is being proclaimed a "Cold War hero" by the same government that brushed aside his claims of dangerous radiation inside the **Paducah** Gaseous Diffusion Plant in western Kentucky.

Revelations this week of worker exposure to plutonium at the **Paducah** plant have rekindled interest in the Harding case, which was championed briefly by anti-nuclear groups in the early 1980s as an example of the human cost of building America's nuclear arsenal. Although experts at the time linked Harding's ailments to radiation, the Department of Energy in 1981 dismissed Harding's reports of dangerous working conditions and declared the plant to be safe. Harding's disability pension and medical insurance were dropped and he was left nearly penniless.

Energy Secretary Bill Richardson, who has launched a probe into worker exposures at **Paducah**, said yesterday the government owed Harding and other workers a thorough investigation into whether their service in the nation's nuclear weapons complex had placed them in harm's way.

"Joe Harding was a hero of the Cold War," Richardson said in statement to The Post. "But in the past, I believe that the government basically said -- without any review -- that there is no established linkage between the exposure these workers had and their illness. The Clinton administration is saying that's not our policy. We're going to make sure these workers are taken care of."

The renewed interest in Harding came amid a flurry of calls for an expanded probe into environmental and safety problems at the plant. Sen. Mitch McConnell (R-Ky.) Monday demanded a congressional hearing into reports that contaminated material was dumped outside the plant. Kentucky Gov. Paul E. Patton (D) has appointed a state task force to examine claims of environmental damage. And Rep. Ted Strickland (D-Ohio) has asked the Department of Energy to account for contaminated uranium from **Paducah** that was shipped to a sister plant in Portsmouth, Ohio.

David Michaels, the department's assistant secretary of environment, safety and health, told workers at **Paducah** the agency had let them down in failing to inform them about contaminants in the workplace. "There's been a real communications problem here," he told a news conference Monday.

The Washington Post reported on Sunday that plutonium and other highly radioactive metals slipped into the plant over 23 years in shipments of recycled uranium from U.S. plutonium production factories.

Sealed documents filed as part of a lawsuit against the plant's former operators allege that workers were exposed to plutonium-laced dust through the 1970s in the hot, smoky buildings where uranium was turned into fuel for bombs and nuclear power plants.

One of those workers was Joe Harding, whose case has emerged as a powerful symbol of environmental and bureaucratic ills that allegedly plagued the facility. Although no comprehensive medical studies have been done of the health effects on plant workers, union officials and others have been tracking cases of cancer at the plant. Harding himself kept a list of more than 50 cancers among 200 people who began working with him at the plant in the early 1950s.

Richardson has ordered a comprehensive medical review of current workers and an investigation of links between radiation exposures and illnesses.

Union officials said yesterday the government not only failed to protect Harding, but also fought vigorously to prevent the worker and his widow from receiving a pension or medical insurance.

"The DOE took the Joe Harding case very seriously: No dollar was spared in seeking to deny his claims," said Richard Miller, a policy analyst for the Paper, Allied-Industrial, Chemical & Energy Workers International Union,

which represents workers at the plant. "No effort was spared in their scorched-earth campaign to deny what was overwhelmingly obvious."

In the months before succumbing to cancer at age 58, Harding meticulously documented environmental problems at the plant in tape recordings and in letters and journal entries obtained by The Post.

It was "important, patriotic, secret work," Harding wrote of the job he started in 1952, the year the plant opened. "Brainwashing started in training school: 'Don't talk to anyone. Never mention radiation. The public is stupid about radiation.' "

Soon Harding was put to work as a "process operator," mixing powdered uranium with fluorine and other chemicals. Inside the buildings, he wrote, the air was "heavy" with uranium dust, which is mildly radioactive and toxic if ingested or inhaled. Unknown to workers at the time, it also contained small amounts of plutonium and other radioactive metals that are thousands of times more dangerous than uranium.

"I spent all those years breathing uranium hexafluoride gas so thick and heavy that you could see the haze in the air," Harding said in a hand-written account in 1979. "You could taste it coated on your teeth and in your throat and lungs. . . . Powder on the floor was thick enough that you would leave tracks."

If workers worried about radioactive exposure from the dust, their concerns were brushed aside, Harding said. He said the official line from supervisors was: "You will not get any more radiation in this work than you would get from wearing a luminous dial wristwatch."

Harding had worked at the plant less than a year when the first medical symptoms appeared, according to records made available by his widow. Lesions appeared on his legs, and slowly spread through the rest of his body. His weight dropped from 175 to 125 pounds. Searing pain radiated from his stomach and he vomited so frequently his co-workers mockingly called him "Joe Erp."

Later, fingernail-like calcium growths began emerging from his finger joints, elbows and knees. X-rays of his lungs turned up odd-looking pockmarks. He lost most of his stomach to cancer.

Physicians were mystified by Harding's ailments, though privately, he recalled, some suggested a possible cause: Radiation exposure. Harding didn't believe it.

"Radiation? Hell, no!" he remembered saying. Later, though, as the symptoms worsened, Harding began to doubt assurances by Union Carbide, the plant operator, about safety. He remembered feeling nervous about maintenance jobs that required him to crawl inside large pipes used to carry radioactive uranium gas between buildings.

"Pitch dark, full of UF6 [uranium hexafluoride] smoke and powder," he said of the pipes. "Felt like saying 'Goodbye, world,' on entering."

Eventually Harding's increasingly vocal complaints about working conditions earned him a reputation as a troublemaker, and he bounced around from one section of the plant to another. Finally, in 1971, the plant offered him a full-disability pension, citing a leg injury that Harding had received on the job.

Harding accepted the offer and went home to wait for his first check. It never came. He later learned that his disability claim had been rejected, and along with it his pension and medical insurance.

"This left me 50 years old with no job, and a crippled leg to get worse," he wrote. "No stomach. Bad lungs. No way to get a job, no way to make a living."

Months after his death from stomach cancer in 1980, Harding's medical records were reviewed by Karl Z. Morgan, an internationally known radiation expert who concluded Harding's health problems were "strongly suggestive" of radiation exposure from chronic inhalation of uranium dust. Later, Harding's body was exhumed for testing, and uranium was found in his bones.

Meanwhile, Energy Department officials were conducting their own investigation, at Harding's request. After 18 months and a two-day visit to **Paducah**, the department concluded that Harding's illnesses were more likely caused by smoking and by the fact he "frequently ate country ham," according to the 1981 report. Based on computer modeling, the report's writers said the radiation exposures at **Paducah** were not sufficient to cause illnesses.

"The presence of thick dust in the air which Mr. Harding stated occurred . . . is not consistent with the mode of operation," the report said.

The department's findings are now contradicted in court documents and interviews with current and former workers who also describe high exposures to uranium dust in the plant. Workers say the dust clung to their hair and skin and even contaminated the food they ate.

Whether the new evidence from whistleblowers will ultimately vindicate Harding is unclear. If it does, it will provide little consolation for his widow, Clara, who lost both a husband and the financial security that was supposed to see her into twilight years.

Clara Harding sold her house and moved to a small duplex on the outskirts of town. She continued to fight for the pension in court for several years before finally settling the case for $ 12,000.

For her, the battle was clearly over from the first hearing, when Harding and her lawyer arrived in court to find a phalanx of attorneys and experts from the plant and the Energy Department representing the other side.

"There were 14 of them and only two of us," she remembered. "So that was pretty much that."

NAME: JOE HARDING

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The Washington Post

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Paducah's Silent Witness; Excessive Uranium Level Found in Worker's Bones

Joby Warrick, Washington Post Staff Writer

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The exhumed bones of a long-dead uranium worker have given a powerful boost to current employees' claims of dangerous exposures inside a government-owned Kentucky plant that supplied radioactive fuel for the nation's nuclear bombs.

The long-overlooked medical evidence from the case of Joseph Harding suggests that for some workers radiation doses at the **Paducah** Gaseous Diffusion Plant were far higher than previously believed, and may have been dozens of times above federal limits, according to one analysis of the data.

The hazards for uranium workers are further underscored by unpublished research from a sister plant in Tennessee. A draft study of workers at the K-25 plant in Oak Ridge shows unusually high death rates for former uranium workers, as well as sharply higher rates of lung and bone cancers.

The results of Harding's posthumous tests, conducted as part of a lawsuit in 1983 but never published, offer the strongest corroboration to date of hazardous conditions inside the **Paducah** plant, where workers labored for decades in a haze of radioactive dust that was sometimes laced with deadly plutonium.

"Uranium content of the bone was far in excess of normal expectations," wrote Alice Stewart, an internationally known British researcher who reviewed the results of laboratory tests of Harding's remains for his estate. "The terminal finding overrules all earlier impressions [from U.S. government officials] of NO internal depositions of uranium."

Lab technicians were unaware of the presence of plutonium at the plant and did not test for it. Plutonium is about 100,000 times more radioactive per gram than uranium and can cause cancer if inhaled in microscopic amounts. Workers only recently learned that plutonium and other highly radioactive metals entered the plant in contaminated uranium shipments from the early 1950s to the mid-1970s.

The Department of Energy has launched an extensive investigation into claims of worker exposures at the **Paducah** plant as well as the K-25 plant and a third facility in Ohio. While the department had not evaluated the results of Harding's bone tests as of last week, agency officials said it is now clear that uranium workers were not properly protected until at least 1990, when new safety guidelines were implemented.

"This reaffirms our decision to get out of the business of fighting sick workers," David Michaels, assistant secretary for environment, safety and health, said in an interview Friday. "This case is an example of how the DOE placed mission and secrecy in a paramount position in the past. Right now, we should be bending over backward to help those workers who helped win the Cold War for us."

Both the **Paducah** and K-25 plants were owned by the federal government and operated by the same group of corporate contractors: Union Carbide from the 1950s to the early 1980s, followed by Martin Marietta and Lockheed Martin Corp.

The latter two are the targets of a lawsuit filed by a group of current employees who allege unsafe working conditions and environmental contamination. Former workers also have alleged that radiation monitoring equipment at the **Paducah** plant was defective; in some cases, they say, "film" badges used to monitor exposures contained no film.

"The dose evidence corroborates our allegations that the health physics program at **Paducah** has been essentially nonexistent," said Thomas Cochran, nuclear program director at the Natural Resources Defense Council, which joined workers in the lawsuit. "The contractors have been operating in callous disregard for the health and safety of the work force."

Harding, an 18-year veteran plant worker who died of cancer in 1980, was hailed last week by Energy Secretary Bill Richardson as a "hero of the Cold War." But for the nine years before his death his claims of radiation exposure were vigorously challenged by contractors and Energy Department officials, who said conditions in the plant were safe.

The department disputed Harding's allegations -- verified years later by other workers -- of a dense fog of uranium dust and smoke that would cling to workers' skin and coat their throats and teeth. A department study in 1981 attributed Harding's death to a combination of smoking and eating country ham.

Eventually Harding developed stomach cancer along with an array of unusual maladies that are sometimes linked to radiation exposure, including perforations in his lungs and strange fingernail-like growths on his palms, wrists and shoulders. But after being discharged from the plant in 1971, Harding was denied a disability pension and lost his medical insurance. His widow's efforts to reclaim the pension were opposed by lawyers for Union Carbide and the Energy Department, and she eventually settled her claim for $ 12,000.

The exhumation of Harding's remains in 1983 was a final attempt by Harding's widow to verify his assertions of exposure to radioactive uranium dust in the plant. His bones were analyzed by a Canadian lab for uranium, but for reasons now unclear the results were never published.

The lab report -- obtained last week by The Post -- not only supported Harding's claims of radiation exposure but also suggested hazards at the plant were far greater than previously believed: More than a dozen years after Harding left the plant, his body contained uranium at levels up to 133 times higher than is normally found in bones.

Moreover, the type of uranium found was "not from natural sources," and apparently came from the plant's uranium enrichment process, the report said.

Because uranium is slowly purged by the body over time, the levels in Harding's bones would have been "several-fold higher" during the time he was employed, the lab report stated.

Exactly how much higher is unclear. But Carl Johnson, a Colorado physician and radiation consultant who analyzed the test results for Harding's widow in 1983, said Harding's uranium "bone burden" in the 1970s would have been between 1,700 and 34,000 times higher than normal. Based on those levels, the annual radiation dose to Harding's bone tissue would have been 30 to 600 rems a year. Under current standards, U.S. nuclear industry workers are allowed a maximum full-body dose of 5 rems a year.

Radiation experts who reviewed the data for The Post said the results could have been skewed by a number of factors, including the possible presence of plutonium in Harding's bone tissue. But by any measure, the exposure was certainly high.

Arjun Makhijani, president of the Institute for Energy and Environmental Research, said conditions at **Paducah** appear to have been similar to an Energy Department site at Fernald, Ohio, where concentrations of radioactive particles in the air are now known to have far exceeded then-allowable limits, in one instance by 97,000 times.

"The DOE and its contractor Union Carbide committed a gross injustice on Joe Harding," Makhijani said. "The DOE is perpetuating that injustice upon the half-million people who worked in the nuclear weapons complex since it has not yet provided the vast majority of the survivors among them with medical monitoring and medical help."

Energy Department officials are now pledging increased medical tests and possibly compensation to thousands of men and women who were exposed to chemical and radiological hazards at **Paducah** and other facilities in the U.S. nuclear weapons complex. The department's investigative team at **Paducah** in coming weeks will attempt to determine exactly what the hazards were, and who was exposed.

The task is fraught with obstacles, including a dearth of monitoring data from the early years when radiation exposures were likely to be highest. Unlike the K-25 plant, no comprehensive study of worker histories has been attempted at **Paducah**.

The draft study of uranium workers at the K-25 plant appears to offer further support for concerns about hazards inside such facilities. The mortality study of about 11,000 former workers at the plant was conducted by the Oak Ridge Institute for Science and Education. Although the research essentially was completed in 1994, funding for the study was dropped before it could be peer reviewed and published in a scientific journal.

The draft report, obtained by The Post, shows higher rates of death for all causes among former workers, a finding that is significant in itself, given that government workers are typically healthier than the general population because of higher salaries and access to health care.

The study also shows higher rates of cancers of the lung (19 percent) and bone (82 percent) among white male workers compared with the general population. Both cancers are sometimes linked to radiation exposure.

Researchers point to several factors that could have skewed the results, including the inclusion in the survey of a sample of thousands of people who worked at the K-25 plant for a relatively brief period during World War II.

Since many able-bodied men were in the military during that period, the remaining work force may have been less healthy than the general population, the authors said.

A new study is underway to track death rates among K-25 workers who were exposed to the highest amounts of radiation. Similar mortality studies at the Portsmouth Gaseous Diffusion Plant in Ohio have shown relatively low rates of cancer.

Another possible problem in evaluating risks for **Paducah** workers is the reliability of the data. Previous Energy Department audits of the plant's safety records cited extensive problems with monitoring programs and equipment. And former and current workers at the plant say they believe radiation monitoring was shoddy in the past.

Al Puckett, a retired union shop steward who worked at the gaseous diffusion plant in the 1960s and 1970s, said workers would sometimes open their "film" badges only to find no film inside. Suspecting that no one ever examined workers' radiation monitors, Puckett and his colleagues sometimes exposed the badges to radiation by leaving them for hours on top of barrels of enriched uranium.

"We turned the badges in and that was the last we heard of it," he said. "No one ever said anything to us."

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U.S. Will Propose Payments to Sick Paducah Workers; $20 Million Fund Eyed For Radiation Cancers

Joby Warrick, Washington Post Staff Writer

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The Clinton administration today will propose spending tens of millions of dollars to compensate ailing workers at the government's **Paducah** Gaseous Diffusion Plant in what is described as a step toward acknowledging abuses committed against thousands of men and women who helped build America's nuclear arsenal.

The proposed pilot program, which eventually could be expanded to encompass other Energy Department facilities, will be unveiled by Energy Secretary Bill Richardson during a visit to the plant, department officials confirmed to The Washington Post.

If approved by Congress, the program would compensate current and former employees who have developed specific cancers related to radiation after working at the western Kentucky plant, which has made enriched uranium for nuclear weapons and power plants since 1952. In addition, Richardson will propose $ 21.8 million in new spending to pay for cleanup and for expanded medical monitoring of workers at **Paducah** and at sister plants in Ohio and Tennessee.

"I'm going to **Paducah** to hear firsthand from the community and workers," Richardson said in an interview.

The visit to **Paducah** comes two days after the release of preliminary findings from a month-long investigation of safety practices at the plant. A team of Energy Department inspectors cited numerous weaknesses in environmental programs and criticized federal managers and cleanup contractors for a "lack of discipline, formality and oversight" in the plant's management of radiation risks.

The team found no evidence of imminent health threats to workers or the public but said radiation controls should be strengthened. In response, Richardson ordered immediate upgrades in safety practices, including enhanced training for workers.

A separate investigation is examining alleged illegal dumping of radioactive waste, as well as claims of worker exposure to harmful levels of plutonium and other radioactive metals before 1990.

Energy Department inspectors were due to report additional findings at a House Commerce subcommittee hearing on the **Paducah** plant, scheduled for today but canceled because of Hurricane Floyd's approach toward Washington. The hearing was rescheduled for Wednesday.

Details of the proposed compensation package for **Paducah** workers had not been completed, but Energy Department officials said the cost of the program could exceed $ 20 million, depending on how many workers qualified.

But the program's initially narrow limits have drawn criticism from the plant's union. The critics noted that workers at other plants were exposed to similar hazards and also deserved to be compensated.

"You've got a worker population at risk, but the administration wants to triage this thing," said Richard Miller, a policy analyst with the Paper, Allied Chemical and Energy Workers International Union who was briefed on details of the plan. "How do you justify compensating workers at one plant, while saying another plant across the river doesn't merit the same compensation?"

Limits on compensation for exposed workers have been the subject of debate in the administration for weeks. Earlier in the summer, the Energy Department announced plans to separately compensate workers who had been exposed to beryllium, a highly toxic metal that was widely used in making nuclear weapons components. The White House also has launched an interagency review that will look at a wide range of workplace hazards at Energy Department plants, especially uranium plants in Piketon, Ohio, and Oak Ridge, Tenn.

Richardson ordered the probe at the **Paducah** plant on Aug. 8 after a Washington Post investigation highlighted radioactive contamination at the plant, including worker exposure to plutonium. Documents filed in a worker lawsuit accuse the plant's former operators of failing to protect workers from -- or even to warn them of -- radioactive hazards.

The **Paducah** plant is owned by the Energy Department but has been managed by a series of corporate contractors. In May, management of uranium processing passed to U.S. Enrichment Corp., a government-chartered private company that is regulated by the Nuclear Regulatory Commission. The Energy Department's investigation at **Paducah** has focused mainly on policies and practices of department managers, as well as separate government contractors charged with cleaning up contamination.

The $ 21.8 million that Richardson will announce includes $ 7 million for environmental health programs to analyze past safety risks and current health hazards. The information will be provided to the National Academy of Sciences' Institute of Medicine to help determine compensation for worker illnesses.

Yesterday, an Ohio newspaper reported that workers at the **Paducah** facility's sister plant in Piketon also handled a greater amount of the type of plutonium-laced uranium oxide that caused widespread problems in **Paducah** than was previously acknowledged.

Like the **Paducah** facility, the Portsmouth Gaseous Diffusion Plant in Ohio received shipments of contaminated recycled uranium directly from nuclear power plants, the Columbus Dispatch quoted Energy Department officials as saying. The uranium contained small amounts of plutonium and other radioactive material normally not present at gaseous diffusion plants.

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Radiation Risks Long Concealed; Paducah Plant Memos Show Fear Of Public Outcry

Joby Warrick, Washington Post Staff Writer

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Managers of the government's **Paducah**, Ky., uranium plant knew for decades of unusual radiation hazards inside the complex but failed to warn workers because of fears of a public outcry, according to documents to be released by a congressional panel this week.

Faded memos unearthed by workers and federal investigators shed new light on what early plant officials knew about the presence of plutonium and other highly radioactive metals in the plant -- knowledge that was kept from the workers for nearly four decades.

In one 1960 document, a government physician wrote that hundreds of workers should be screened for exposure to "transuranics" -- radioactive metals such as plutonium and neptunium -- but he said plant officials feared such a move would cause alarm and lead to higher labor costs.

"They hesitate to proceed to intensive studies because of the union's use of this for hazard pay," says the memo, discovered by Energy Department officials investigating the plant.

The documents from government archives have been turned over to a House Commerce Committee panel, which is holding hearings Wednesday into allegations of unsafe conditions at the **Paducah** Gaseous Diffusion Plant. The Washington Post obtained advance copies of the documents and prepared testimony of some current and former plant officials.

Accounts of plutonium contamination and illegal waste dumping at the facility have triggered an Energy Department investigation and a class action suit by employees who believe the plant put them at risk.

Energy Secretary Bill Richardson toured the plant on Friday and formally apologized to workers for the government's failure to fully inform them about the risks. He pledged millions of dollars in new spending to compensate ailing workers and to accelerate the cleanup of the plant. And he presented an award to the family of the late Joe Harding, an employee who had tried vainly for years to convince Energy officials that hazards in the plant had caused his fatal illness.

"On behalf of the government I'm here to say I'm sorry," Richardson said. "The men and women who have worked in this facility helped the United States win the Cold War and now help us keep the peace. We recognize and won't forget our obligation to them."

Plant officials, while acknowledging the presence of plutonium at **Paducah**, have said the amounts were small and were likely of little threat to workers.

Government contractors who ran the plant over the last 47 years have declined to comment because of pending litigation. A Union Carbide Corp. spokesman, in a statement last month, said the alleged acts at **Paducah** occurred long ago, and none of the current managers had any detailed knowledge of what had happened. Union Carbide operated the plant from 1952 to 1983.

The documents and testimony to be presented at the congressional hearing suggest that the federal government and private contractors running the plant ignored decades of warnings to protect workers from plutonium, a man-made metal that can cause cancer if inhaled in amounts as small as a millionth of an ounce.

"What is clear is that the [government] contractors knew of the need to protect workers from plutonium and other transuranics . . . as early as 1952," Jim H. Key, the ranking environmental and safety official for the plant's unionized employees, states in prepared testimony to be delivered Wednesday.

Key, who has not yet spoken publicly about the allegations of workers' exposure, alleges "widespread, systematic and documented failures" by the government and its contractors to control the spread of radioactive hazards. He describes smoky, radioactive fires inside the plant and thick clouds of radioactive uranium dust -- workplace hazards for which workers were neither trained nor equipped.

Former workers also have come forward with evidence suggesting that past managers viewed the contamination as a practical and economic problem. John Tillson, a hydrologist who analyzed early operations at the plant while working for a cleanup contractor, said **Paducah** managers tried to recover the transuranics from the plant's waste stream in the 1950s and 1960s, when the metals were in high demand for nuclear materials research.

By 1970 the prices had dropped, and the recovery programs were halted, he said.

Plant officials even began processing sewage sludge from the plant after it was found to contain high levels of uranium. Harold Hargan, a 37-year employee who was detailed to the recovery program, said the uranium in sludge came exclusively from the plant's sanitary system, which included lavatories, wash rooms and laundry facilities. "All that uranium was either on workers' clothes or bodies -- or inside their bodies," he said.

Although no formal epidemiological study has been completed for **Paducah**, some workers have long raised questions about what they believe are unusual rates and types of cancers in their communities. Those fears have risen sharply in the wake of reports that plutonium and other highly radioactive metals were also present in the workplace, Key, the union safety officer, says in his statement.

"The majority of current and former workers are afraid that they may have been exposed to substances like plutonium without proper protection and that they will, as a result, be stricken with a fatal disease," Key wrote. "I myself have this fear from my 25 years at **Paducah**."

Hired by the plant's original contractor, Union Carbide, in 1974, Key said he began witnessing safety problems almost immediately. During his first year on the job, he was engulfed in radioactive smoke after helping dump drumloads of highly flammable uranium metal into an open pit on the plant's grounds.

"The uranium spontaneously ignited . . . and a pungent and irritating smoke enveloped us," said Key, an hourly worker and officer in the local chapter of the Paper, Allied-Industrial, Chemical and Energy Workers International Union. "To my knowledge this dumping ground has never been characterized."

Workers inside the building where powdered uranium was processed were not required to wear respirators, even though the dust at times was so thick it was difficult to see, Key said.

"I recall having to hold my breath to get through clouds of unknown fumes," he said.

In the 1970s, Key would observe workers cleaning up spills of "black powder," which he later learned consisted of recycled uranium from the government's plutonium production facilities. Not until 1990 did plant officials tell the union that the powder contained small amounts of "transuranics" -- a class of highly radioactive metals that includes neptunium and plutonium. Plutonium is 100,000 times more radioactive per gram than uranium.

Key cited a 1952 Union Carbide memo that suggests the need for special labeling of "plutonium contaminated locations."

Years later, in a 1985 memo, Energy officials advised **Paducah's** managers to test workers who handled the recycled uranium for exposure to transuranics. Key notes, "We have no evidence that these recommendations were acted upon or communicated to the workforce."

In 1991, Martin Marietta Energy Systems, which was now operating the plant, began a voluntary program to test workers for exposure. Thirty workers participated, but the test results were "invalidated" due to what the company termed "concerns and discrepancies" regarding the testing lab, Key said.

He said the company refused to release the results to the union, explaining in a memo that "management is reluctant to release this information due to concerns about how it would be used."

Concerns about public reaction were echoed in the 1960 memo from H .D. Bruner, a physician, to Union Carbide and Atomic Energy Commission medical officials. He expressed concerns about relatively large

amounts of neptunium in recycled uranium delivered to the **Paducah** plant. "But I am afraid the policy of the plant is to be wary of the unions and any unfavorable public relations," the memo states.

Although workers in some buildings were furnished with gas masks, Bruner said the respirators were not used and did not appear to be effective against the tiny uranium particles in the air.

"The human factor in handling [the recycled material] should be considered a source of potential exposure," he wrote.

LOAD-DATE: September 21, 1999

LANGUAGE: ENGLISH

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The Washington Post

October 21, 1999, Thursday, Final Edition

Energy Dept. Faults Paducah Contractors; Deficient Plant Hazard Warnings Cited

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A02

LENGTH: 540 words

The Energy Department, ending the first phase of its investigation of the troubled **Paducah**, Ky., uranium plant, faulted contractors yesterday for failing to properly warn the public about radioactive hazards, including "relatively high" levels of plutonium in ditches outside the plant.

Investigators zeroing in on the plant's current environmental and safety problems also pointed to the "theoretical" risk of an accidental nuclear chain reaction at the plant, citing large quantities of "uncharacterized" radioactive material stored there.

The problems were among dozens uncovered in the first of two department probes of current and past hazards at the **Paducah** Gaseous Diffusion Plant, one of two U.S.-owned facilities that produce enriched uranium. Yesterday's report gives the plant's managers 30 days to come up with a plan for addressing problems ranging from lax safeguards to radioactive seepage from a half-mile-long pile of contaminated scrap metal.

"We have concerns about exposure, but we don't think any of them reach the level of imminent danger," said David Michaels, assistant energy secretary for environment, safety and health.

Michaels promised quick action to eliminate any risk of a "criticality"--an inadvertent nuclear reaction similar to last month's serious accident at the Tokaimura uranium plant in Japan. Agency officials said the chances of such a reaction were remote.

Energy Secretary Bill Richardson launched investigations at **Paducah** in August after reports of worker exposure to and sloppy handling of radioactive waste. Preliminary findings released last month faulted the agency and its contractors for weaknesses in identifying and cleaning up contaminants--hazards that included highly radioactive plutonium.

Yesterday's report contained the first results from independent laboratory tests that confirmed the presence of plutonium and other radioactive metals in ground water as well as in ditches and streams outside the plant fence. The agency's tests found new areas of off-site contamination and also documented "relatively high levels" of plutonium, thorium and cesium in two ditches that feed a tributary of the Ohio River.

The contaminated areas had not been properly controlled or marked with signs, the report said. Plutonium can cause cancer if inhaled in minuscule amounts.

Although plant officials discovered off-site plutonium contamination in the early 1990s, most public reports listed plutonium levels at near zero. The discrepancy has been a sore point with lawmakers who have grilled former contractors as part of their own **Paducah** probe.

Rep. Thomas J. Bliley Jr. (R-Va.), chairman of the House Commerce Committee, expressed dismay yesterday after one former contractor, CH2MHill, insisted in a letter that the plutonium problem was contained within the plant's security boundaries.

"For many years the **Paducah** community has been plagued by misinformation and outright deceit," Bliley said. He vowed to press for "full accountability and the highest level of safety" for **Paducah** workers and residents.

Energy Department investigators pointed to the "theoretical" risk of an accidental nuclear chain reaction at the **Paducah** Gaseous Diffusion Plant.

LOAD-DATE: October 21, 1999

LANGUAGE: ENGLISH

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The Washington Post

December 23, 1999, Thursday, Final Edition

Plant Hid Risk From Workers; Paducah Bosses Knew Some Had High Radiation Levels

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 2883 words

DATELINE: PADUCAH, Ky.

One worker collapsed on the factory floor, his body ravaged by lymphoma. Two others died within 105 days of different forms of leukemia. By the time Challie Freeman came down with a rare bone disease in the fall of 1979, questions had morphed into suspicions:

Was something at the U.S. government's uranium plant making workers sick?

One possible answer--radiation exposure--seemed persuasive to Freeman's doctor. He fired off a letter to the **Paducah** Gaseous Diffusion Plant. "It is imperative," he wrote, "that we learn as soon as possible the extent, nature and type of radiation to which he was exposed."

The reply--"no significant internal exposure"--was brief and emphatic. It was also false.

While the plant was denying knowledge of significant hazards to Freeman's doctors, confidential records showed the opposite: Freeman had tested positive multiple times for exposure to radioactive uranium and had even been restricted from working around uranium, an internal company memo shows.

In August, The Washington Post reported that **Paducah** workers were unwittingly exposed to highly radioactive plutonium and neptunium on the job from the 1950s to the 1970s. A subsequent four-month Post investigation has found additional evidence that plant officials kept employees uninformed about chemical and radiation hazards. In some cases, such as Freeman's, the plant withheld accurate medical information on radiation exposure--even while it privately tracked cancer deaths among workers.

A limited review of **Paducah** employee death records also turned up rates of leukemia among workers that appear higher than normal, based on government mortality statistics. Epidemiologists who reviewed the findings described the data as intriguing but cautioned that a much more intensive scientific study was needed, involving investigators with full access to employee records and medical histories, to establish whether a pattern existed. Such a study has not been done at **Paducah**.

The 48-year-old uranium plant is the subject of an Energy Department investigation into worker health and safety practices. Union Carbide Corp., which allowed its operating contract to expire in 1984, declines to comment, saying its **Paducah** managers are long gone from the company. Energy Secretary Bill Richardson, whose agency owns the facility, has apologized for the failure to disclose plant hazards and has promised compensation for sick workers.

Any outside attempt to review medical issues at **Paducah** is complicated by a lack of complete information. The Energy Department, citing privacy laws, declined to release lists of workers and their assignments. But The Post obtained company rosters listing more than 200 **Paducah** employees who were hired to work in some of the plant's most dangerous uranium-handling areas between 1951 and 1971. Scores of death certificates were examined and more than 120 surviving employees who worked in those areas were interviewed.

Professional help was retained to categorize deaths, and a software program developed by the National Institute for Occupational Safety and Health was used to compare incidences of cancer to national rates.

The result: The incidence of leukemia at **Paducah** appeared elevated, according to epidemiologists who reviewed the data. Of the 211 people on the lists who could be located--about 13 percent of the plant's work force in an average year--10 died of cancers of the blood and lymphatic system, including six of leukemia. By comparison, government mortality statistics suggest that only a single leukemia death would be expected in a group of adults of that size.

Cancer clusters are difficult to document, and cancers are not necessarily caused by radiation. Some studies at other Energy Department plants have suggested links between workplace hazards and cancers; others have not. Whether chronic exposure to low doses of radiation causes cancer has been hotly debated for decades.

Still, several epidemiologists who reviewed the results said the unusual incidence of leukemia and other rare diseases suggests the need for a closer look.

"The findings are interesting and noteworthy and are grounds for a more complete study of the question," said David Richardson, an epidemiologist who is researching radiation health effects for the World Health Organization.

Senior Energy Department officials said the findings highlight a major policy dilemma for the agency: whether to pursue more studies or to expand pilot programs to directly compensate workers who get sick. Yesterday, the department announced that it had shifted spending priorities in its fiscal 2000 budget to increase money for health studies and medical monitoring at **Paducah**. However, officials worry that studies may not be the right approach.

"Epidemiology is not going to answer the questions precisely enough," said David Michaels, an epidemiologist and the assistant energy secretary for environment, safety and health.

Energy Secretary Richardson said he has proposed legislation to change the way his agency deals with its sick workers.

"Instead of fighting claims, we're actually helping workers without the debate about the rates of illness," he said. "The legislation we sent to Congress takes the burden of proof off those who are sick."

Documents obtained in October under the Freedom of Information Act show that Union Carbide began tracking the repeated cancer cases in its work force in the 1970s.

The first to die was Wade McNabb, a 20-year veteran who succumbed to chronic leukemia in 1972. That same fall, another worker died of multiple myeloma, a bone marrow disease.

Alton Henson died of leukemia in 1976. Two years later, three workers--Arvil Bean, Leonard Lindblad and David Wilson--died of leukemia or bone marrow diseases within a span of six months.

By 1982, the company had counted 13 fatal cancers of the blood or lymphatic system out of a relatively stable work force that ranged from 1,200 to 2,000 people. The list appears on a single sheet of paper--stamped "confidential" and copied to senior plant officials--identifying workers sometimes by initials. How Union Carbide intended to use the list is unclear, but the plant's records show no attempt by contractors to investigate possible links between the deaths and workplace hazards.

Meanwhile, plant workers were told everything was fine. When Challie Freeman fell ill with his deadly bone marrow disease at 59, plant officials offered a lot of sympathy but little truth, family members say.

Responding to a hematologist's queries about possible radiation exposure, a plant physician in a letter described Freeman as a "very fine man" whose exposure to hazardous materials had been near zero. Medical records produced by the plant showed "no significant internal exposure," based on years of weekly urine tests for uranium.

Not until 15 years after his death in 1984 did family members obtain his medical records from the Energy Department and learn the full story: Company tests had indeed found high levels of uranium in his body in the 1950s--so much, in fact, that Freeman once had to be moved to a different work area. His widow, Sue, recalls that he was transferred to a different job in the 1950s after being told simply that his urine was "hot."

Freeman's physician, Nashville hematologist John Flexner, remembered that the company's response "downplayed the exposures."

"They made you think there was no way this could be a case of cause-and-effect," Flexner said. "I guess I was naive to think they were telling the truth."

Union Carbide said that it did not have the ability to respond in the Freeman case because of the 20-year passage of time.

Plant policies required that workers exposed to certain amounts of radiation be moved to other, less hazardous jobs. But new records show this was ignored in some cases in which workers received up to twice the maximum dosage.

One who never got the word was A.B. Burris, a 74-year-old retiree who learned of his past exposures when he asked the Energy Department for his medical files this fall.

"They say I was put on 'strict restriction,' but I never found out about it until weeks ago," he said. "I can tell you they never changed my job or said anything to me about it."

Workers knew even less about potentially deadly plutonium and neptunium that spread through the plant in shipments of recycled nuclear reactor uranium fuel from the 1950s to the 1970s, plant documents show.

Confidential, 40-year-old memos released by the Energy Department in September showed that Union Carbide officials had decided against testing workers for exposure to the radioactive metals because of fears that workers would "use it . . . as an excuse for hazardous-duty pay."

Newly released memos show that senior managers were aware of the plutonium and neptunium problem as early as 1959 but concluded in classified studies that contaminants were not a health hazard because the amounts in each shipment were small--a maximum of 10 parts per billion of plutonium in each uranium shipment.

But over the years, the two metals began accumulating in soil and waste materials.

In a survey of **Paducah** plant buildings conducted in the early 1990s, more than half of the work areas sampled exceeded the plant's safety limits for plutonium and neptunium--in some cases by a factor of 10. A survey of a men's locker room found high levels in shower stalls and even on toilet seats.

Workers did know enough about radiation hazards to formally request additional safeguards.

When Union Carbide decided to stop providing mechanics with coveralls, the plant's union demanded in 1986 that the company take responsibility for "radiation carried into our homes, autos and other areas." Union Carbide denied the request, although in 1975 the union negotiated the right to protective clothing on demand.

The union was less successful in efforts to secure workers' rights to take regular breaks in a radiation-free lunchroom. In a written grievance in 1979, the union said workers "should not have to eat in a contaminated area."

The company denied the request.

Ailing workers in the past have had difficulty proving harm because they lacked accurate monitoring data, David Fuller, president of the **Paducah** chapter of the Paper, Allied-Industrial, Chemical & Energy Workers Union, testified at a Senate hearing on **Paducah** in October.

While applauding government promises to financially aid ailing **Paducah** workers, Fuller and other union officials called for a compensation program for all workers that "reverses the burden of proof onto the government" while expanding medical monitoring for those most at risk.

"Monitoring is imperative," Fuller said, "but without any other remedy, monitoring is simply a process to watch people get sick and die."

Director of computer-assisted reporting Ira Chinoy, database editor Sarah Cohen, and staff researchers Alice Crites, Nathan Abse and Nancy Shiner contributed to this report.

Challie Freeman

Job: Cascade worker, security officer

Age at death: 64

Illness: Myelofibrosis

Did radioactive exposure on the job make Challie Freeman sick? His doctor suspected a link, but plant managers said no. Asked by doctors to provide details of Freeman's work history, a Union Carbide memo described light exposure to the skin but "no significant internal exposures."

Fifteen years after Freeman's death, the family obtained confidential plant memos that showed the opposite: Freeman had been restricted from uranium work in the 1950s because of "repeated positive urine samples" for radioactive uranium. The uranium remained high after weekends away from the job, the memo said.

Freeman became sick from a slowly progressing bone marrow disease in the 1970s and died in 1984. Near the end his weight plummeted from 190 pounds to 100 and he was in constant pain, said his wife, Sue, who quit her job to care for him. 'We always wondered if it was the plant that made him sick,' she said. 'Now I have no doubt.'

David R. Wilson

Job: Cascade operator

Age at death: 54

Illness: Lymphosarcoma

Like most **Paducah** workers, Wilson said little about his job, though sometimes he'd confide to his wife when he was exposed to unusually high levels of radiation. "He would say just he had been 'hot,'" remembers his widow, Winnie. One day in early 1978 he was rushed to the hospital after becoming ill at work. Tests confirmed he suffered from a form of lymphoma, which ended his life just four months later.

Wade McNabb

Job: Cascade operator

Age at death: 55

Illness: Leukemia

The doctor's eyes spoke volumes. After breaking the awful news to McNabb -- a diagnosis of leukemia at age 40 -- he asked the ailing man where he worked. The reply, "Atomic Energy Plant, **Paducah**," prompted a nod and a knowing look. "Oh, yes," the hematologist said, "I'm treating several patients from Oak Ridge," **Paducah's** sister plant in Tennessee. McNabb began treatment and returned to the same job to preserve his salary and health benefits. "We didn't know what else to do," Dove, his widow, says. "You couldn't even talk about it at work, not if you wanted to keep your job."

Jack Owens

Job: Cascade operator, emergency crew

Age at death: 36

Illness: Rare blood/bone marrow disease

Owen's emergency crew job brought him into some of the most dangerous areas to clean up spills of chemicals and radioactive material. "Some days he'd come home with chemical burns at every orifice," remembers his widow, Norma Rebik. "Later, when his doctor asked what he had been exposed to, he said, 'Everything.'" In 1961, at 36, he died of a form of thrombocytopenia, a condition sometimes linked to environmental exposures. "He went from perfectly well to dead in a week," his widow said.

Leon Lindblad

Job: Cascade supervisor

Age at death: 62

Illness: Leukemia

An avowed believer in **Paducah's** "mission," Lindblad was ambivalent about whether the plant posed risks. "He'd say the radiation levels were not that high," remembers his widow, Virginia, and yet, he always "took his shoes off at the door because he didn't want to bring that stuff inside the house." Lindblad's suspicions multiplied after he became sick with leukemia. He drew up a list of accidents and dates. "If I die, you can sue them," Lindblad explained to his wife, "because they're the ones who did this to me." Virginia never got the chance: On a Friday in 1976, Linblad stashed the list in his desk, never suspecting that he would become gravely ill over the weekend. He never returned to work.

C. Arvil Bean

Job: Process maintenance

Age at death: 64

Illness: Leukemia

Bean's retirement plans included firing up the '49 Cadillac he was restoring and taking his wife on a trip to the Dakotas, where he was once stationed with the Army. Those ambitions faded the day he was diagnosed with acute leukemia at age 55. He replayed in his mind the times he had been exposed to radiation -- like the day he worked 16 hours cleaning up radioactive debris from a 1962 explosion. Despite his illness, Bean clung to his vacation dreams to the end. "Every few days he'd go out there and crank up that old car," daughter Nita said, "even in the snow."

Charles Edward Harris

Job: Machinist

Age at death: 62

Illness: Cancer, multiple organs

For 25 years, Harris worked in the plant's machine shop, grinding down and repairing the nickel-plated pipes and gear used to convert uranium powder to nuclear fuel. Unknown to Harris and most other workers at the time, the metals were contaminated with small amounts of plutonium and neptunium, radioactive elements far more dangerous than ordinary uranium. His son, David, may have been exposed to the same hazards during summer jobs at the plant: College students mowed grass and cleaned up pond sludge in areas now known to be contaminated with the highly radioactive metals. "At the time they told us point-blank there was nothing there but uranium," David said.

Eugene Ragland

Job: Chemical operator

Age at Death: 49

Illness: Lung cancer

The accident and Ragland's death will always be connected, at least in the mind of his widow, Marie. She still remembers his worried voice the night in March 1978 when he called to say he wouldn't be coming home from work. Ragland had been exposed to radiation during a mishap and had been asked to stay overnight for testing. Four months later, a separate medical test found "something wrong" with his blood, she said -- a result that led to the discovery of a rapidly spreading cancer in his lungs and chest. His death on Aug. 4 came so suddenly that Ragland had little time to ponder his illness, or the possible causes. "He always thought he was safe at the plant," Marie said. "They never let him know differently."

When Challie Freeman got sick, **Paducah** managers claimed he had suffered "no significant" radiation exposure, above, even though years earlier they had restricted his work near uranium, as noted below, because his urine had tested "hot." The body of **Paducah** plant worker Joe Harding was exhumed in November for tests. He had feared that the cancer that eventually killed him in 1980 was caused by radiation exposure.

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February 11, 2000, Friday, Final Edition

Bomb Part Storage at Ky. Plant Disclosed; Nuclear Agency Is Told of Hazards In Secret Program

Joby Warrick, Washington Post Staff Writer

SECTION: A SECTION; Pg. A01

LENGTH: 1290 words

More than 1,600 tons of nuclear weapons parts reportedly lie scattered around the Energy Department's **Paducah**, Ky., uranium plant, a safety manager informed regulators yesterday in a new disclosure of potential hazards unknown to workers or civilian plant supervisors.

Some of the bomb parts are stored in above-ground shelters and could pose a risk of exposure or even an accidental nuclear reaction at the plant, if the components are contaminated with radioactive substances such as enriched uranium and plutonium, the official reported in a signed statement to the federal Nuclear Regulatory Commission.

The U.S. Enrichment Corp. (USEC), the government-chartered private company that now runs the plant, acknowledged yesterday that its senior officials recently discussed the issue with the Department of Energy.

"USEC has been assured that DOE is not aware of any conditions that create a radiological hazard to USEC personnel at the site beyond those already known and controlled," company spokeswoman Elizabeth Stuckle said.

Energy Department officials involved with the country's classified nuclear weapons program apparently were aware of the shipment of bomb components to **Paducah** over many years, but the department did not until recently inform the plant's civilian overseers and safety officials who were in charge of evaluating threats to workers.

The statement by Raymond G. Carroll, a senior manager of health and safety programs at the plant since 1992, quotes a conversation with another senior civilian plant official who reportedly told Carroll he was worried about the bomb parts after hearing of their existence from a DOE official.

Carroll also said he was told that DOE officials recently began hauling away documents related to weapons dismantlement.

A DOE spokesman confirmed that the department is investigating "classified national security programs" conducted at **Paducah** in the past, along with the Justice and Defense departments.

"This review includes the examination of potential worker exposures and any safety, health and environmental issues associated with these national security programs," the official said.

Carroll's statement was obtained by The Washington Post yesterday as the government was making its most detailed acknowledgment to date of historically unsafe practices at the **Paducah** Gaseous Diffusion Plant, a hulking industrial complex that has produced enriched uranium for nuclear bombs and power plants since 1952.

The 77-page DOE report faults a "climate of secrecy" for keeping workers and neighbors uninformed and unprotected while radioactive contaminants spread through factory buildings and surrounding areas. A few volunteers were deliberately exposed to uranium in a series of previously undisclosed human experiments, the report said.

The DOE report does not mention nuclear bomb parts. A worker lawsuit against plant contractors last summer revealed that some weapons parts had been melted down at the plant to recover gold and other metals. But details of the scope and purpose of the bomb program have remained shrouded in secrecy.

Both DOE and Justice are investigating whistleblower allegations of improper handling of radioactive waste at the plant.

Yesterday's disclosure by Carroll suggests the bomb program may have introduced yet another unknown hazard at a facility where workers had been lulled by assurances that their jobs were virtually risk-free.

"Personnel could conceivably encounter highly enriched uranium or plutonium (or even tritium) without even knowing it," said Carroll, a 30-year veteran of the nuclear safety field who now works for USEC. Tritium is a radioactive component of the hydrogen bomb.

Carroll, in a five-page memo filed with NRC and DOE officials, said he learned about the bomb parts from a senior USEC supervisor, radiation protection manager Orville Cypret. Carroll wrote that Cypret said he learned about the bomb parts from Dale Jackson, the former DOE manager of the **Paducah** site.

Carroll said Cypret told him that 1,600 tons of weapons components had been shipped to **Paducah** since the 1950s. Although some parts were buried, others were dispersed in various storage areas across the sprawling complex, according to Carroll's statement.

Cypret became alarmed after a Justice Department investigator told him "he would not ask about a 'classified tritium project' or past nuclear weapons handling at **Paducah**," Carroll wrote in his statment.

In keeping with security policy, the weapons parts were not labeled, though "DOE thinks it knows where most of the material is," Carroll wrote.

Cypret and Jackson did not return phone calls from The Post. A Justice Department official in Louisville said he could not comment on the department's investigation into whistleblower complaints at the plant.

Carroll said he was told that "large quantities" of plutonium and highly enriched uranium had been brought into the plant, and "not just in reactor tails." Last summer, following allegations by current and former workers, DOE acknowledged for the first time that radioactive plutonium and neptunium had entered the plant in uranium "tails," recycled uranium metal from military reactors that produced plutonium.

Carroll said in his statement that Cypret said a team of DOE officials had been assembled to investigate the matter but their findings "would not be voluntarily shared" with the plant's civilian managers. Instead, as records relating to the bomb program were found, they were held in a special vault for classified material.

"Someone from [the DOE's Oak Ridge, Tenn., site] would drive down each night to pick them up," Carroll wrote, quoting Cypret.

Carroll said the new disclosures had left him deeply concerned about the safety of the plant's workers. Besides the risk of radioactive contamination, improperly stored nuclear material could trigger a lethal "criticality," an accidental nuclear reaction.

"A decision had apparently been made that national security would take precedence over personnel radiological safety," Carroll wrote. "I find this situation to be unconscionable."

The risk posed by weapons parts could range from high to minimal, depending on the materials and how they are stored.

DOE's report on historical practices at **Paducah** wraps up the second of two major probes ordered by Energy Secretary Bill Richardson in August. DOE officials described it as one of the most thorough in the department's history.

The report concludes that the plant's lapses in worker safety in many ways reflected the culture of the time. "The Cold War was a reality," and federal oversight of the plant "was primarily directed at cost, schedule and production," the report said.

Although the "intention to protect workers was apparent," plant managers frequently failed to meet even the relatively lenient safety and environmental standards of the day, the report states.

The risks posed by plutonium and neptunium were "neither fully understood or appreciated," the report states. "The presence of these materials, the increased risks involved and the rationale for additional controls was not shared with workers."

In addition, radioactive and chemical wastes were routinely discharged into the water and air. Investigators documented nighttime smokestack emissions--dubbed "midnight negatives"--involving tens of thousands of pounds of uranium dust and smoke.

Richardson said the findings underscore his efforts to win compensation and other aid for ailing workers.

"I'm going to continue to be up front with the **Paducah** workers and the community about environmental, safety and health conditions at our sites during the Cold War," he said.

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LANGUAGE: ENGLISH

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RulemakingComments Resource

From: John Tauxe <jtauxe@neptuneinc.org>
Sent: Friday, July 24, 2015 4:58 PM
To: Gallagher, Carol
Cc: pblack@neptuneinc.org
Subject: [External_Sender] RE: comments submittal
Attachments: NRC Comments Neptune 2015-07-24 - 10 CFR 61.pdf; NRC Comments Neptune 2015-07-24 - NUREG-2175.pdf

Ms Gallagher -

Neptune is submitting the two attached memoranda in response to NRC's call for public comment on 10 CFR 61 and NUREG-2175.

Please see to it that these are appropriately entered into the NRC Docket.

Thank you!

- John

::::::::::::::::::::::::::::::::::::::
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24 July 2015

Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Rulemakings and Adjudications Staff

Subject: Comments on Proposed Revisions to Low-Level Waste Disposal Requirements 10 CFR part 61, 10 CFR part 20, and NUREG/BR-0204

Reference: Docket IDs NRC–2011–0012 and NRC-2013-0035

Dear Ms. Vietti-Cook:

Neptune and Company, Inc. (Neptune) is submitting the attached comments in response to the notices published in the 26 Mar 2015 Federal Register Vol. 80, No. 58, pp. 15930 *et seq*. and 16082 *et seq*. We appreciate the opportunity to comment on the proposed language for 10 CFR part 61 and 10 CFR part 20. We are also including comments on the associated *Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest* (NUREG/BR 0204, Rev. 2) of July 1998, as requested by NRC staff.

We believe that the revision to 10 CFR 61 and associated documents is a worthwhile endeavor that will lead to radioactive waste disposal decisions that are more beneficial for and protective of current and future generations.

Thank you again for this opportunity to comment. Questions regarding these comments may be directed to Dr. Paul Black at (720) 746-1803 ext 1001 (pblack@neptuneinc.org), or Dr. John Tauxe at (505) 662-0707 ext 15 (jtauxe@neptuneinc.org).

Sincerely,

John Tauxe, P.E., Ph.D. and Paul Black, Ph.D.
Neptune and Company, Inc.

Comments on Proposed Revisions to Low-Level Waste Disposal Requirements 10 CFR part 61 and 10 CFR part 20, and to Possible Revisions to NUREG/BR-0204

Neptune and Company, Inc. (Neptune) appreciates the opportunity to provide comments on the U.S. Nuclear Regulatory Commission (NRC) proposed language for Code of Federal Regulations Title 10 Part 61 *Licensing Requirements for Land Disposal of Radioactive Waste*, on 10 CFR part 20 *Standards for Protection Against Radiation*, and on NUREG/BR-0204, *Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest* (Rev. 2, July 1998). We believe the NRC efforts are timely, and that revisions to these documents are sorely needed.

Comments on Proposed Revisions to 10 CFR Part 61

The document entitled *Comparison between Current Rule Language and Rule Language in Proposed Rule, "Low-Level Radioactive Waste Disposal" (80 FR 16082)* was provided for comment, and it contains sections of proposed revisions to the text of Part 61. Revisions are indicated in the document by the use of underlined text, and changed or omitted text is identified with strikeout. The proposed revisions have implications for most of the rule, and so we consider the entire rule to be "proposed". Some of the following comments therefore are oriented toward parts of 10 CFR 61 that are not proposed for revision, but are nevertheless in need.

Neptune has provided comments on previously proposed revisions to 10 CFR 61, in a memo dated 7 January 2013. While many of the issues raised in that submittal remain, we are pleased to see that many suggestions were adopted in the current proposed changes. This submittal focuses on the latest proposed revisions, but in some cases reiterates issues that were pertinent in 2013 and remain so today.

The comments below are organized into a General Comments section, with application to the overall rule, and a Specific Comments section, with comments following the same order as they appear in the proposed revisions document.

General Comments

Neptune is pleased to see most of the proposed changes to the regulation. We applaud the invocation of site-specific technical analyses and WAC development, and the incorporation of the structure of compliance and performance periods. While we still see little value in intruder assessments in supporting decision making, we are glad to see that these are no longer part of the performance assessment. Splitting these into separate analyses allows decision makers to more cleanly evaluate each on its merits.

The language of Part 61 could still use tightening up. A significant example of this is in the definition of the performance objectives, which apply in the title of §61.41 to the "general population", but in the text of the same subsection refer to "any member of the public". These

terms are quite different from each other, but are sprinkled throughout Part 61 as if they were equivalent. Protection of the "general population" implies that a population risk assessment should be developed, and protection of "any member of the public" implies protection of anyone, including the most vulnerable members of the public. This is different from protecting an "average" member of the public, such as the "reference man" that is commonly used. It is good that the regulation strives to protect both the general population and any member of the public, and this can be done in a site-specific performance assessment, but the language needs to be cleaned up so that the two concepts are made to be clear and distinct. While the dose to any member of the public can be assessed against the performance objective of an annual maximum of 0.25 mSv, the population dose must be expressed differently. Note also that the term "general population" needs to be better defined in terms of the potentially affected population. The "general population" is too vague. That said, it may be that with the proposed site-specific performance assessment analysis both the individual and population doses can be assessed together. A population dose assessment will be required at any rate in order to assess whether doses are as low as reasonably achievable (ALARA).

We are encouraged to see explicit references to site-specific analysis of features, events, and processes, (FEPs), but would like to suggest that rather than FEPs being used to define exposure scenarios, that such possible scenarios be included in the analysis itself, making it an analysis of features, events, processes, and scenarios (FEPSs). Not all exposure scenarios results from an analysis of FEPs—some need to developed at the same fundamental level, rather than being an outcome of the FEPs analysis. Please consider adoption of the acronym "FEPS" in place of "FEP," in recognition of the evolution of this concept.

Other items relevant to radioactive waste disposal under the purview of the NRC include the effects of the disposals on the environment. Since NRC is tasked with "protecting people and the environment", one might expect that the analyses required in 10 CFR 61 would include ecological risk assessment as well as assessments of human health effects.

We also note that this is intended to be a regulation, but also contains guidance that should be removed to the supporting guidance document. The proposed regulation would benefit from being concise with supporting guidance in a separate document, instead of interspersing the regulations with text that is, essentially, guidance. Some examples are provided in our comments below.

Specific Comments

§61.2 Definitions.

Several terms are used in the existing and the proposed rule language that require definition in this section. These are

- member of the public
- general population
- reasonable assurance
- unacceptable risk

- disposal facility, disposal site, disposal unit (though these are covered in §61.7(a))
- low-activity waste
- high-activity waste
- radiation from the waste

The following existing definitions are proposed for revision, with specific comments following each. We note, again, that if a proper risk assessment is applied, then some of these terms are unnecessary, and the regulation could be simplified and brought in line with modern risk assessment practices.

Proposed definition:

Inadvertent Intruder means a person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling) or other reasonably foreseeable pursuits that might unknowingly expose the person to radiation from the waste.

Comments:

We maintain that the distinction between an inadvertent intruder and any other member of the public should be dissolved. It is a completely unhelpful distinction that obfuscates a proper risk assessment.

The separation of the analyses for site-specific performance assessment and site-specific intruder assessment has ameliorated the problems introduced by previous use of generic intruder scenarios, but the definition of the inadvertent intruder remains troublesome for the following reasons.

Use of the word "person" (twice) becomes immediately problematic when the definition of "person" is considered:

> *Person* means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the Commission or the Department of Energy (except that the Department of Energy is considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to law), any State or any political subdivision of or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.

Given this definition of "person", it is hard to imagine that this is all to be considered in the definition of inadvertent intruder, or anyone receiving a dose. A clarification is in order, perhaps by substituting another word for "person".

What is the meaning of the word "occupy" in this context? Does it mean that someone must set up residence on the site, or is a temporary visitation of the site considered an occupation? If a recreational hunter, for example, crosses the site and is unknowingly exposed to waste, or radionuclides that migrated from the waste, is that considered an occupation? Is such a visitor considered an inadvertent intruder? How is an analyst to consider the case where an intruder occupies the site, and while not receiving exposures, causes changes to the site that would

expose some other member of the public? This could happen if the intruder triggers an erosional event that could expose waste and subsequent off-site migration of radionuclides that could result in exposures to a member of the public. The intruder is not exposed, but the member of the public is exposed due to actions of the intruder. This could potentially all be accounted for as a scenario (see FEPSs issue above) in a site-specific performance assessment, but it would not come to light in an intruder assessment.

Use of the terms "reasonably foreseeable" and "might" makes this definition quite vague in practice. Is it left up to the applicant to determine what constitutes "reasonable foreseeable pursuits", and what "might" means in this context? Is an inadvertent intruder one who "might occupy the disposal site", or one who actually "occupies the disposal site"? Our recommendation is that the "foreseeable future" should be defined site-specifically by the local (potentially affected) population and by considering economic arguments. This is how society operates in practice in our everyday lives.

Finally, the phrase "radiation from the waste" remains problematic in the context of inadvertent intrusion. Does this mean radiation only from the waste that is still in place as it was disposed? What if the waste has migrated, or what if the radionuclides that originated in the waste have migrated to a location where the intruder might come into contact with it, or at least be irradiated by it? Consider that radionuclides from the waste may have migrated to the ground surface, or to surface waters, and that such radionuclides would irradiate anyone who might traverse the area. Is such an individual to be considered an inadvertent intruder?

Ultimately, the distinction between an inadvertent intruder and other members of the public, or the general population, becomes blurred. We recommend that the concept of the inadvertent intruder be abandoned, replaced by a performance assessment that assesses risks to populations of individuals that are expected to occur at any given site. Such an approach would be far easier to communicate to the stakeholders, which is very important to gain approval and hence be able to open a disposal facility.

Proposed definition:

Intruder assessment is an analysis that (1) assumes an inadvertent intruder occupies the site or contacts the waste and engages in normal activities or other reasonably foreseeable pursuits that might unknowingly expose the person to radiation from the waste; (2) examines the capabilities of intruder barriers to inhibit an inadvertent intruder's contact with the waste or to limit the inadvertent intruder's exposure to radiation; and (3) estimates an inadvertent intruder's potential annual dose, considering associated uncertainties.

Comments:

Given our views on the concept of the inadvertent intruder (above) it will be no surprise that we feel that the definition of an "intruder assessment" as distinct from a "performance assessment" is still not needed. If a performance assessment examines all site-specific exposure scenarios, then it will naturally account for all receptors as part of the general population, be they "intruders" or "members of the public". This is overcomplicating what should be a straightforward problem.

Proposed definition:

Long-lived waste means (1) waste where more than ten percent of the initial radioactivity remains after 10,000 years (e.g. long-lived parent), ...

Comments:

We are glad to see that this definition has been clarified to the point where it can be clearly included in a technical analysis.

Proposed definition:

Site closure and stabilization means those actions that are taken upon completion of operations that prepare the disposal site for custodial care and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

Comments:

It is not clear how such assurance can be provided. The language should be softened to explain the true intent. It is not possible to guarantee (assure) that stability will be maintained and that ongoing active maintenance will not be needed. Inserting the word "reasonably" in front of "assure" would at least make this consistent with other language in the rule.

Proposed definition:

Stability means structural stability.

Comments:

This definition is self-referential, and not particularly useful, even though we realize that the proposed revision is simply to correct a spelling error. The definition begs for discussion. What is the issue, actually? Is it exposure of the waste that is of concern? What about structural changes that do not release waste? What if waste is exposed to the environment through a structural failure but no one is exposed, and there is no dose or risk? Is the concern about stability simply for stability's sake?

This issue is raised again in §61.7(f)(1) below, which further defines stability as minimizing contact with water (not really a structural stability issue), and also states that stability "isn't necessary from a health and safety standpoint for most waste..." Well, if it is not necessary, what is the need for stability?

Since the regulation is supposed to support risk-informed decision making, it seems that the subject of site stability should also be framed in terms of risk. The basic definition in §61.44 indicates that the intent is to "eliminate to the extent practicable the need for ongoing maintenance of the disposal site following closure, so that only surveillance, monitoring, or minor custodial care are needed". This, by itself, is a far better definition of site stability. Although it would be better again to regulate such that measures of site stability correspond to risk (dose).

§61.7 Concepts.

Proposed language:

§61.7(a) The disposal facility. [The contents of (1) and (2) are not reproduced here.]

Comments:

Sections 61.7(a)(1) and (2) clearly define the terms "disposal facility", "disposal site", and "disposal unit", but the use of these terms in the entire Part 61 seems to be inconsistent at times. Inconsistencies are identified in the comments below as they are identified. The entire text should be carefully reviewed to assure consistency in the use of these terms.

Proposed text:

§61.7(a)(2) ... In choosing a disposal site, site characteristics should be considered in terms of the indefinite future, take into account the radiological characteristics of the waste, and be evaluated for at least a 500-year timeframe [in order] to provide assurance that the performance objectives can be met.

Comments:

It is not clear what this means. How does this relate to the concept of a Compliance Period or a Performance Period? If a performance assessment is to estimate doses or risks for 10,000 years into the future, why would site characteristics be evaluated for only a 500-yr time frame?

§61.7(b) Performance objectives. Disposal of radioactive waste in land disposal facilities has the following safety objectives: protection of the general population from releases of radioactivity, protection of inadvertent intruders, protection of individuals during operations, and ensuring stability of the site after closure. Achieving these objectives depends upon many factors including the design of the land disposal facility, operational procedures, characteristics of the environment surrounding the land disposal facility, and the radioactive waste acceptable for disposal.

Comments:

We think that the concept of an inadvertent intruder should be removed, and the performance assessments should be aimed at doing a reasonable risk assessment. Protection of individuals during operations is handled through worker safety, and site stability can be folded into the risk assessment. Presumably a site would be judged sufficiently stable if the risks are low enough, or is there another reasonable approach to evaluating site stability?

Protection of the "general population" is called for, but, as pointed out above, this is different from protection of "any member of the public", which is required in §61.41. Again, a clarification of terms is needed. This seems to imply that the performance assessment should perform a population risk assessment, as opposed to (or perhaps in addition to) an assessment of dose to an individual. This is in concordance with the title of §61.41: Protection of the general population from releases of radioactivity. That title also seems to suggest that a population dose assessment is in order. As discussed in the comments below for that section, however, this is in conflict with the text within that section, which mentions dose to "any member of the public". The point of this comment is that the "general population" is in practice quite different from "any member of the public". Since §61.7 discusses concepts, it would be good to clarify the intent of the rule here as well as in §61.41.

Note that we support the need to perform a population risk (dose) assessment to support decision making, whether performed using the principles of ALARA or otherwise. Ultimately, siting of disposal sites was done by considering population risks.

The proposed text also neglects to identify the significance of human behavior and demographics in the assessment of risk to the general population and inadvertent intruders. These are among the "many factors" that should be mentioned specifically.

Proposed text:

§61.7(c)(3) ...some form of intruder barrier that is intended to prevent contact with the waste.

Comments:

This phrase appears at the end of the paragraph for (3). The problem here is that "receiving radiation exposure" is different from "contact with the waste". A future human could be some distance from the waste, at least from where it was originally placed, and still be exposed to radiation, while being exposed to radionuclides that have migrated away from the waste, or the progeny of those radionuclides. This begs the question of what is meant by "waste". Is it the waste form itself as disposed, or is it the radionuclides that were at one time part of the waste? This lack of firm definition plagues the bulk of part 61. These details may seem trivial to the casual reader, but they are critical to the analyst who must develop assessments that address the performance objectives in detail.

This could be perhaps rephrased, "...some form of intruder barrier that is intended to prevent contact with the disposed radionuclides."

Proposed text:

§61.7(f)(1) A cornerstone of the waste classification system is stability of both the waste and the disposal site, which minimizes the access of water to waste that has been emplaced and covered. Limiting the access of water to the waste minimizes the migration of radionuclides, which may avoid the need for long-term active maintenance and reduces the potential for release of radioactivity into the environment. While stability is desirable, it isn't necessary from a health and safety standpoint for most waste because the waste doesn't contain sufficient radionuclides to be of concern.

Comments:

This seems contradictory, in saying that stability is both a cornerstone of the waste classification system and that stability is not necessary. It also extends the original definition of "stability" (in §61.2, which says that stability means "structural stability") to claim that stability minimizes the access of water to waste. This seems to be confusing different concepts. Structural stability means that the site will not collapse, as in subside or erode—that it will retain its shape and strength. That really has little to do with keeping water out. Further, this focus on water belies a humid site bias—that water is universally the most significant process for contaminant transport in radioactive waste disposal. There are sites where water has a minor or even insignificant role to play—where, for example, biotically-induced transport or gas phase diffusion is of far greater significance than waterborne transport.

Structural stability has another unspoken but much more significant role: It keeps the waste from being exposed to the environment and especially from being directly exposed to human receptors. That function of stability is not even mentioned in this section.

It is somewhat jarring to read that "most waste ... doesn't contain sufficient radionuclides to be of concern." If that is the case, when what is all the fuss about in creating regulations for it in the first place? Perhaps this is just a confusion generated by poor presentation of context, however, as this section eventually seems to identify the waste under discussion as Class A waste, in the next part.

Why is site stability an issue? If it's tied to potential risk (dose), then that could make sense. But requiring stability with no metrics does not make sense, and the metrics should be dose (or release of radionuclides to the environment), which should be evaluated against the long term costs. Note that the Utah rule contains language that essentially suggests the intent of the stability requirement is to ensure that long-term maintenance is not needed—this suggests the need to evaluate risk and cost, which makes sense. The language in §61.44 already provides the necessary impetus for framing site stability in the context of risk (dose): "The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required."

Proposed text:

§61.7(f)(1) [continued] This lower-activity waste (e.g. ordinary trash-type waste) tends to be unstable. If unstable waste is disposed with the waste requiring stability, the deterioration of unstable waste could lead to the failure of the system. The failure of the system could permit water to penetrate the disposal unit, which may cause problems with the waste that requires stability.

Comments:

This further confuses concepts. The real concern seems to be stability, which again is couched in terms of water even though it should not be assumed that water is the principal mode of contaminant transport at any given site. But, water aside, stability of the system (meaning the site, one presumes) may be compromised by unstable waste. Fair enough—so the operator should not mix structurally unstable waste with structurally stable waste. Activity has nothing to do with it, except that apparently we are not to be overly concerned with unstable low-activity waste, since it is not "of concern". If the classification of waste is driven by stability, which this section seems to imply, then let it be defined by stability, and not by concentration of specific radionuclides. Having classification tables based on radionuclide concentrations does not make sense if the real driving factor is structural stability of the wastes. Also, a properly formed risk assessment would take care of all of this, since it should factor in stability of waste.

Isn't "ordinary trash-type waste" what goes in a municipal landfill? This term is undefined and potentially misleading.

The language in this section goes on to discuss unstable Class A waste as opposed to stable Class

A waste, but makes no formal definitions of what "stability" means. §61.2 defines stability only as "structural stability", which is insufficient. Here, at least somewhat more of a definition is provided ""to maintain gross physical properties and identity [for] over 300 years." And, is this "stability" meant to apply to the waste form itself, or to the disposal unit (or perhaps even disposal site) as a whole?

It's interesting that 300 years is chosen. What is the basis for this value? Why is this different from other periods of concern in the proposed regulation? Consideration of dose to humans beyond 200 to 300 years has been documented as inappropriate in some articles. Is this the basis? Or, is the basis more simply that guaranteeing sufficient engineering for longer is not possible. This raises a few issues: Stability should be evaluated through risk, and if we cannot guarantee stability for more than 300 years, then why is a dose assessment needed much further out than that? An approach that is based on a revolving window of evaluation of shorter time frames would be preferable. Such an approach implicitly would acknowledge discounting, but in a reasonable way, and would need to be tied to funding guarantees.

Proposed text:

§61.7(f)(3) Waste that will not decay to levels which present an acceptable hazard to an intruder within 100 years is typically designated as Class C waste. Class C waste must be stable and be disposed of at a greater depth than the other classes of waste so that subsequent surface activities by an intruder will not disturb the waste. Where site conditions prevent deeper disposal, intruder barriers such as concrete covers may be used. The effective life of these intruder barriers should be at least 500 years.

Comments:

If it is true that "waste that will not decay to levels which [sic—should be "that"] present an acceptable hazard to an intruder within 100 years is designated as Class C waste", how is DU not a Class C waste? It decays to levels that are increasingly hazardous for over 2 million years. "Decay" does not imply a reduction in hazard.

It is also not clear why Class C waste must be disposed at greater depth. This statement is too general. A performance assessment should be performed, no matter the waste stream, to determine if a waste stream can be disposed in a given disposal configuration or engineered system. This also seems to presume that the pathway of interest is unvaryingly upwards. This might not be the case—for example, it is not clear that disposing deeper in a system that has potable groundwater at, say 5 meters below ground surface, would make sense.

Proposed text:

§61.7(g)(3) During the period when the final site closure and stabilization activities are being carried out, the licensee is in a disposal site closure phase. Following that, for a period of 5 years, the licensee must remain at the disposal site for a period of post-closure observation and maintenance to assure that the disposal site is stable and ready for institutional control. The Commission may approve shorter or require longer periods if conditions warrant. At the end of this period, the licensee applies for a license transfer to the disposal site owner.

Comments:

In the context of a 10,000-year Compliance Period, it is not clear how it is helpful to have a five-year post-closure period. In general, the language in §61.7(g) is very vague. Time frame is not well defined, and the nature and intent of the monitoring program is not well defined. It would be better to use some of the concepts from the DOE and from NUREG/CR-6948 on long-term PA maintenance, reduction in uncertainty, etc. to provide a technical framework and basis for long term monitoring and maintenance.

Proposed text:

§61.7(g)(4) After a finding of satisfactory disposal site closure, the Commission will transfer the license to the State or Federal government that owns the disposal site. If the U.S. Department of Energy is the Federal agency administering the land on behalf of the Federal government the license will be terminated because the Commission lacks regulatory authority over the Department for this activity. Under the conditions of the transferred license, the owner will carry out a program of monitoring to assure continued satisfactory disposal site performance, perform physical surveillance to restrict access to the site, and carry out minor custodial activities. During this period, productive uses of the land might be permitted if those uses do not affect the stability of the site and its ability to meet the performance objectives. At the end of the prescribed period of institutional control, the license will be terminated by the Commission.

Comments:

In this section, a "program of monitoring to assure continued satisfactory disposal site performance" is specifically mentioned. NRC would do well to broaden the concept of monitoring to encompass more than simply sampling for radionuclides that are headed for the fence line. As pointed out in NUREG/CR-6948, monitoring can and should include key elements of those processes that are known to be sensitive in the performance assessment in contributing to migration of radionuclides, and ultimately to receptor exposures. This could include, for example, monitoring for excessive water content in unsaturated materials, or a particularly dense population of deeply-rooted plants, if these are known to contribute to human exposures. This is addressed further in §61.12(l).

If a decision analysis structure based on a properly formed risk assessment were required, then all decisions concerning disposal of radioactive waste could be optimized (disposal, closure) and long term monitoring programs could be designed with stopping rules. Otherwise, long-term monitoring could continue indefinitely. As such, the performance assessment would become the decision document that it should be.

What happens to the site after the license has been "terminated by the Commission"? Is it assumed that the site poses no further risk to the public? How can the license ever be terminated in a case where radioactivity concentrations continually grow in time, such as for the disposal of DU?

§61.12 Specific Technical Information

Proposed text:

§61.12(a) A description of the natural and demographic disposal site characteristics as determined by disposal site selection and characterization activities. The description must

include geologic, geotechnical, geochemical, geomorphological, hydrologic, meteorologic, climatologic, and biotic features of the disposal site and vicinity.

Comments:

The second sentence should also include the word "demographic". We also suggest adding this sentence: "These features, events, processes, and exposure scenarios (FEPSs) must be related to their respective roles in both migration of and human exposure to radionuclides originating in the disposed waste."

Proposed (existing) text:

§61.12(b) ... For near-surface disposal, the description must include those design features related to infiltration of water; integrity of covers for disposal units; structural stability of backfill, wastes, and covers; contact of wastes with standing water; disposal site drainage; ...

Comments:

Somewhere in there should also be added "occurrence and activity of biota;".

Proposed (existing) text:

§61.12(l) A description of the environmental monitoring program to provide data to evaluate potential health and environmental impacts and the plan for taking corrective measures if migration of radionuclides is indicated.

Comments:

As mentioned above in the discussion of §61.7(g)(4), NUREG/CR-6948 demonstrates that monitoring can and should include key elements of those processes that are known to be sensitive in the performance assessment in contributing to migration of radionuclides, or more to the point, risks to future humans.

The change to §61.12(l) that we would recommend, then, is to include more than simply monitoring for the migration of radionuclides. Once a sensitivity analysis of a probabilistic performance assessment is completed, the most significant features, events, processes, (FEPs) and exposure scenarios (FEPSs) in contaminant transport and human exposure can be identified, and it is these FEPSs that can be monitored (perhaps indirectly) to flag conditions that would lead to migration of radionuclides. It is best to mitigate migration pathways before migration has occurred. Language to this effect could be added to this section.

§61.13 Technical Analyses

Proposed text:

§61.13 The specific technical information must also include the following analyses needed to demonstrate that the performance objectives of subpart C of this part will be met. The technical analyses are one of the elements of the safety case. Licensees with licenses for land disposal facilities in effect on the effective date of this subpart must submit these analyses at the next license renewal or within 5 years of the effective date of this subpart, whichever comes first.

Comments:

We agree strongly that including all existing LLRW facilities in the regulatory update is important. If a facility is not able to demonstrate compliance with performance objectives as outlined in part 61, then they must engage in remedial actions that will bring about compliance, even if (or especially if) the facility is poised to be closed. Anything short of that is not fully protective of human health and the environment.

Proposed text:

§61.13(a)(1) Consider only features, events, and processes that might affect demonstrating compliance with §61.41(a).

Comments:

This language implies a scoping analysis, commonly known as a FEPs analysis. We would modify the language to include phenomena related to human exposures, as in "features, events, processes, and exposure scenarios": FEPSs. As discussed above, the inclusion of human exposure scenarios should be considered at this fundamental level of laying out the groundwork for the technical analyses, rather than developing scenarios based on just the features, events, and processes at work. Many scenarios do not naturally result from an analysis of FEPs alone, and are foundational in their own right, and they deserve a place in the expanded acronym, FEPS.

Proposed text:

§61.13(a)(5) Provide a technical basis for either inclusion or exclusion of degradation, deterioration, or alteration processes (e.g., of the engineered barriers, waste form, site characteristics) and interactions between the disposal facility and site characteristics that might affect the facility's ability to meet the performance objective in §61.41(a).

Comments:

It's not clear why this is being separated out, as this is a natural part of the FEPs scoping process. It could be eliminated because it is already covered by the FEPs process additions, and because Part 61 is meant to be regulation, not guidance. This entire section has become guidance it seems. The regulation would be better served by requiring a reasonable risk assessment (which should naturally include a scoping analysis) and providing performance objectives for comparison. This type of technical guidance should be removed.

If it is to remain, the word "naturalization" should replace "degradation, deterioration, or alteration", since it does not have a negative connotation. As discussed extensively during the NRC Workshop on Engineered Barriers in August 2010, the change of engineered barriers (and other parts of the system) to move toward natural conditions is not always detrimental to performance, and in any case must be recognized.

Proposed text:

§61.13(a)(4) Provide a technical basis for models used in the performance assessment such as comparisons made with outputs of detailed process-level models or empirical observations (e.g., laboratory testing, filed investigations, and natural analogs).

Comments:

This is a surprise as well. Why is this in the regulation? It is worthwhile, but not as part of the regulation. This is technical guidance.

It also would be good to specify what sorts of models are meant, here. It seems that it would mean computational models, but it could apply to conceptual models or mathematical models as well. Perhaps it should.

Proposed text:

§61.13(a)(7) Evaluate pathways including air, soil, groundwater, surface water, plant uptake, and exhumation by burrowing animals.

Comments:

There is a mix of categories, here. Some of these are contaminant transport processes (plant uptake and exhumation by burrowing animals) but the others (air, soil, ground water, and surface water) are environmental media, rather than pathways or processes. Contaminant transport processes within these media might be diffusion, advection, chemical partitioning, etc. This distinction could be made. One drawback to include these, and only these, is that the list may become dated. As we learn more about the world of radionuclide contaminant transport, we find previously unknown or at least underappreciated mechanisms. For example, the only biotic pathways mentioned here are for plants and animals, but the potentially significant roles of mycological and microbiological entities are only now beginning to be appreciated.

Again, this is technical guidance and not regulation (it opens the door to dealing with biota, which is a good thing, but should be in guidance rather than regulation). As such, its presence in the regulation may not be appropriate. If it is retained, it should use more general language, rather than calling out specific mechanisms or materials.

Change “groundwater” to “ground water” in keeping with established NRC style.

Proposed text:

§61.13(a)(6) Account for uncertainties and variabilities in the projected behavior of the disposal system (e.g., disposal facility, natural system, and environment).

Comments:

This implies that the performance assessment be probabilistic. However, nothing else in the regulation explicitly requires this accounting for uncertainty. Obviously, we think this is needed, but some other adjustments to the regulation are really needed to go along with this.

As a companion section, we would also propose the following (to follow §61.13(a)(6):

§61.13(a)(8½) Account for uncertainties and variabilities in the projected demographics and behavior of human receptors.

Since the principal performance objectives for future humans is one of dose (or risk) to any member of the public (and/or to the general population), uncertainties and variabilities in the

human element must be considered. These have the potential to be of greater significance than disposal system behavior in determining the risk and its uncertainty.

Proposed text:

§61.13(a)(9) Consider alternative conceptual models of features and processes that are consistent with available data and current scientific understanding, and evaluate the effects that alternative conceptual models have on the understanding of the performance of the disposal facility.)

Comments:

In addition to alternative conceptual models, alternative implementations as mathematical models could be considered (e.g. various representations of porous medium tortuosity). This could further be extended to alternative computational modeling implementations. The same system could be modeled as a system model, or as a process model using finite-difference, finite-element, or some other discretization paradigm. Solutions could be implicit, explicit, or hybrid. All of these variations could produce somewhat different results, and all will no doubt evolve as better technologies are developed. The question is how far do we want to take this evaluation of alternative approaches? Perhaps the proposed language is sufficient.

At any rate, this is guidance, not regulation. It is not useful for the regulation to instruct analysts to merely "consider" an approach, but it would also be inappropriate to here require that specific approaches be tried.

If this section is to remain, then we would further suggest that "features and processes" be expanded to "features, events, processes, and exposure scenarios" so that alternative conceptualizations of events and of the human element would be considered.

Proposed text:

§61.13(a)(10) Identify and differentiate between the roles performed by the natural disposal site characteristics and design features of the disposal facility in limiting releases of radioactivity to the general population.

Comments:

While this is an important activity to be performed as part of performance assessment, this is again guidance, not regulation.

Proposed text:

§61.13(b) Inadvertent intruder analyses that demonstrate there is reasonable assurance that:

(1) the waste acceptance criteria developed in accordance with § 61.58 will be met,

(2) adequate barriers to inadvertent intrusion will be provided, and

(3) any inadvertent intruder will not be exposed to doses that exceed the limits set forth in § 61.42 as part of the intruder assessment. An intruder assessment shall:

(i) Assume that an inadvertent intruder occupies the disposal site at any time after the period of

institutional controls ends, and engages in normal activities including agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling), or other reasonably foreseeable pursuits that are consistent with activities in and around the site at the time of closure and that unknowingly expose the intruder to radiation from the waste.

(ii) Identify adequate barriers to inadvertent intrusion that inhibit contact with the waste or limit exposure to radiation from the waste, and provide a basis for the time period over which barriers are effective.

(iii) Account for uncertainties and variability.

Comments:

NRC is moving in the wrong direction with respect to assessing inadvertent intrusion. It's not that inadvertent intrusion should not be evaluated—it must be—but rather that it be considered fundamentally different from other types of site occupation. Rather than develop or suggest particular scenarios as done in (i) above, and rather than develop a separate "intruder assessment," a site-specific performance assessment can cover all of this by evaluating likely future scenarios of who might occupy the site and what they might be doing. It must be recognized that agriculture, dwelling construction, and resource development are not universally normal activities. There could be disposal sites where none of these would be considered likely enough to survive a scoping analysis, let alone become part of a model. On the other hand, there are sites where all of these could happen, although with some likelihood that is probably less than 1 every year for in 10,000 years. There are still other activities that could lead to future waste releases or exposures, but would not of themselves be considered intrusive—consider the recreationalist who may intrude into the site and, while not being exposed, causes future failures of waste containment that might expose others in the future. The variation in likely activities between sites is part of what makes them different, and is important information for a site-specific performance assessment to incorporate.

Future humans who would intrude inadvertently into the waste should be considered just as any future member of the public would be considered, and with the same dose or risk metrics. However, the likelihood of any activity should also be considered, as the risk to future individuals is consolidated into a composite risk for the general population. There will be some individuals who experience greater exposures through their behavior or the activities of others, and there will be differences in how each individual responds to a given exposure. The language of risk to the general population and to any member of the public has been in Part 61 all along, but it has never been adequately spelled out. More of this discussion follows in comments to §61.41 below.

Under our recommendation it would still be possible to distinguish between receptors that are deemed MOP or IHI, but only for the purpose of comparison to the appropriate performance objective. This would, however, assume that an inadvertent intruder should not be as protected as a MOP, which might not make sense when performing a proper risk (dose) assessment.

In the proposed construction of both a PA and an IA, the decision making driver is not clear. How will the IA be used to support decision making? Since an IA is by design likely to be highly conservative, it is important that the results of the IA be used to provide insights into the disposal system, rather than to supplant, or even append to, the decisions that are supported by a properly

formed PA. Too often in the past intruder analyses have been used to set WACs, for example. This is very unfortunate, since it unnecessarily limits disposal capability, and disposal systems are a precious commodity under current regulation and licensing requirements.

Proposed text:

§61.13(e) Analyses that assess how the disposal site limits the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses shall be required for disposal sites with waste that contains radionuclides with average concentrations exceeding the values listed in table A of this paragraph, or if necessitated by site-specific conditions. For wastes containing mixtures of radionuclides found in table A, the total concentration shall be determined by the sum of fractions rule described in paragraph 61.55(a)(7). The analyses must identify and describe the features of the design and site characteristics that will demonstrate that the performance objectives set forth in §§ 61.41(c) and 61.42(c) will be met.

Table A - Average Concentrations of Long-lived Radionuclides Requiring Performance Period Analyses

Radionuclide	Concentration (Ci/m^3)[1]
C-14	0.8
C-14 in activated metal	8
Ni-59 in activated metal	22
Nb-94 in activated metal	0.02
Tc-99	0.3
I-129	0.008
Long-lived alpha-emitting nuclides[2]	[3] 10
Pu-241	[3] 350
Cm-242	[3] 2,000
[1] Values derived from § 61.55 Class A limits. [2] Includes alpha-emitting transuranic nuclides as well as other long-lived alpha-emitting nuclides. [3] Units are nanocuries per gram.	

(f) Analyses that demonstrate the proposed disposal facility includes defense-in-depth protections..

Comments:

Clarification is needed for use of the term "waste" in the phrase "waste that contains radionuclides with average concentrations exceeding the values listed in table A of this paragraph". Is the waste to be the waste that was originally disposed, but has gone through 10,000 years of decay and ingrowth? Or is it the concentration of radionuclides that remain in the waste zone (that volume where the waste was originally disposed) at 10,000 years, or something else? This requires clarification for analysts to be able to implement it properly.

With respect to Table A formatting: In other parts of part 61, the NRC has adopted metric units, as it should by Executive Order 12770 (56 FR 35801, 1991), but switching dose units from rem to Sieverts. The same approach needs to be taken here, replacing Curies (which are not SI) with

Becquerels (Bq, or GBq, as appropriate.) For reference, 1 Ci/m^3 = 37 GBq/m^3. It may be permissible to include units in Ci for transitional use, as is done with mrem. Further, to have part of the table in volumetric concentration units GBq/m^3 (or Ci/m^3) and part in mass concentration units Bq/g (or nCi/g) with the title in volumetric units is confusing. A clearer version of this table follows, though our preference would be to remove the decremented Ci units altogether:

Table A - Average Concentrations of Long-lived Radionuclides Requiring Performance Period Analyses

Radionuclide	Concentration[1]
C-14	30 GBq/m^3 (0.8 Ci/m^3)
C-14 in activated metal	300 GBq/m^3 (8 Ci/m^3)
Ni-59 in activated metal	810 GBq/m^3 (22 Ci/m^3)
Nb-94 in activated metal	0.74 GBq/m^3 (0.02 Ci/m^3)
Tc-99	11 GBq/m^3 (0.3 Ci/m^3)
I-129	0.3 GBq/m^3 (0.008 Ci/m^3)
Long-lived alpha-emitting nuclides[2]	370 Bq/g (10 nCi/g)
Pu-241	13,000 Bq/g (350 nCi/g)
Cm-242	74,000 Bq/g (2,000 nCi/g)
[1] Values derived from § 61.55 Class A limits. [2] Includes alpha-emitting transuranic nuclides as well as other long-lived alpha-emitting nuclides.	

§61.41 Protection of the general population from releases of radioactivity

Proposed text:

§61.41(a) Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 0.25 milliSievert (25 millirems) to any member of the public within the compliance period. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable during the compliance period. Compliance with this paragraph must be demonstrate[d] through analyses that meet the requirements specified in §61.13(a).

(b) Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals shall be minimized during the protective assurance period. The annual dose, established on the license, shall be below 5 milliSieverts (500 millirems) or a level that is supported as reasonably achievable based on technological and economic considerations in the information submitted for review and approval by the Commission. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a).

(c) Effort shall be made to minimize releases of radioactivity from a disposal facility to the general environment to the extent reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Comments:

This is a welcome direct invocation of ALARA, which is appropriately applied to assessments of dose (or risk) to the general population. But while the term "general population" is used in the title, the text of this section uses the phrase "any member of the public". These are conceptually different. If we are to accept the phrase "any member of the public" at face value, then this implicitly means that the most vulnerable members of the public should be protected. This would include children, for example, who generally incur higher risks from exposure to radionuclides in the environment than do adults, due to both behavioral and physiological differences.

In performing a risk assessment of the general population, such members of the public should be considered, as should anyone else deemed to be exposed to radionuclides disposed at the site. This is where the so-called "inadvertent intruder" can be included as well, as a member of the public (i.e., as a potential receptor), rather than couched in some distinct assessment. The proper way to go about doing a population risk assessment is to consider who the receptors would be, what activities they would be pursuing, and what exposures they would encounter. Each receptor has its own likelihood of encountering radioactivity, for different amounts of time, in different exposure media, and with different physiological responses based on age, for example, as outlined in ICRP documents. This approach evaluates risks to each individual member of the public as well as the general population, and is required to satisfy the language of the title and text of this section.

The same comments (see response to §61.13(a)(7)) about using language that considers only part of the biotic spectrum applies here as well.

An additional problem is presented with the use of the term "effluents" in §61.41(a). It seems to be assumed that the only mechanisms for the migration of radionuclides from the waste into the larger environment involves effluents, but this is not the case. Plants translocate chemicals (including radionuclides) within their tissues, though the fluids in plant tissues might be considered effluents. Burrowing animals move bulk soils, which are not effluents. Erosion can cause bulk movement of solid materials as well—again, not effluents. Atmospheric dispersion transports radionuclides from the ground surface that are not "effluents". Perhaps this language can be remedied by substituting something like "...effluents and other mechanisms of contaminant transport...". Alternatively, a sentence structure could be used that does not use the word "effluents" at all, as in §61.41(c).

This is another instance of guidance being included in the proposed regulation.

§61.42 Protection of inadvertent intruders

Proposed text:

§61.41(a) Design, operation, and closure of the land disposal facility must ensure protection of any inadvertent intruder into the disposal site who occupies the site or contacts the waste at any time after active institutional controls over the disposal site are removed. The annual dose must not exceed 5 milliSieverts (500 millirems) to any inadvertent intruder within the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b).

(b) Design, operation, and closure of the land disposal facility shall minimize exposures to any

inadvertent intruder into the disposal site at any time during the protective assurance period. The annual dose, established on the license, shall be below 5 milliSieverts (500 millirems) or a level that is supported as reasonably achievable based on technological and economic considerations in the information submitted for review and approval by the Commission. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b).

(c) Effort shall be made to minimize exposures to any inadvertent intruder to the extent reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Comments:

This language clarifies the allowable dose to an inadvertent intruder, but still we have members of the public who might be considered intruders who "fall through the cracks". Consider the case where an initial visitor to the site causes a disturbance to the engineered or natural barriers, and a later visitor is exposed to radioactivity. The initial visitor is not considered an intruder by the definition in this part, since s/he does not actually come into contact with the waste. Assume that this initial disturbance, however, compromises the integrity of the site in such a way that it causes radioactivity to be released after some time. A later visitor to the site, who would be a member of the public because s/he would cause no disturbance of the site, could be exposed to that released radioactivity, or conceivably to the waste itself. How is this case to be considered given the definitions of "inadvertent intruder" and "member of the public" in this part? Here we have what seems to be an inadvertent intruder who is not exposed and a member of the public who could come into direct contact with the waste.

As described in comments made above, it would be far more straightforward to dispense with these definitions, and consider this receptor as someone who should be protected to the standard presented in §61.41.

§61.50 Disposal site suitability requirements for land disposal.

Comments:

Neptune has only two editorial comments for this section:

§61.50(a)(1)(ii): Change "which" to "that".

§61.50(a)(4)(i): Remove the superfluous phrase "Within the region or state where the facility is to be located,".

§61.58 Waste Acceptance

Proposed text:

§61.58(b) Waste characterization. Each applicant shall provide, for Commission approval, acceptable methods for characterizing the waste for acceptance. The methods shall identify the characterization parameters and acceptable uncertainty in the characterization data. The

following information, at a minimum, shall be required to characterize waste:

(1) Physical and chemical characteristics;
(2) Volume, including the waste and any stabilization or absorbent media;
(3) Weight of the container and contents;
(4) Identities, activities, and concentrations;
(5) Characterization date;
(6) Generating source; and
(7) Any other information needed to characterize the waste to demonstrate that the waste acceptance criteria set forth in § 61.58(a) are met.

Comments:

This gets to the practical approach of defining a methodology. It is good to require "acceptable methods for characterizing waste for acceptance", and the data required are reasonable for supporting development of a WAC, in addition to a site-specific performance assessment. Since these data will change as disposal operations proceed, however, it is not sensible to require the data itself as part of a license application. It is reasonable to indicate that these data could be made available, and it is reasonable to indicate how the data would be used in developing a WAC.

Section 61.58 (b)(7) asks for "any other information", leading to two issues that we think need to be addressed in waste manifesting. Those are lower limits of detection (LLDs) and an estimate of uncertainty in reported values. The lack of uncertainty information frustrates the ability of a probabilistic performance assessment to "provide reasonable assurance of compliance with the performance objectives of subpart C of this part," as required in §61.58(a). Further discussion of these issues is developed in our comments on NUREG/BR-0204 included in this submittal.

Proposed text:

§61.58(c)(1-4) Waste certification. Each applicant shall provide, for Commission approval, a program to certify that waste meets the acceptance criteria prior to receipt at the disposal facility. ...

Comments:

We interpret this as asking for a program that will need to be statistically based in order to justify that the waste that is accepted is properly characterized for disposal. We are pleased that NRC encourages better characterization and specification of waste concentrations so that disposal can be more effectively managed. With improved characterization and manifesting, including appropriate reporting of LLDs, radioactive waste disposal resources can be better utilized.

This concludes comments from Neptune and Company, Inc. on the proposed revisions to 10 CFR part 61.

Comments on Proposed Revisions to 10 CFR Part 20

Neptune has but one substantive comment on the proposed changes to 10 CFR part 20. We encourage NRC to consider the inclusion of language regarding uncertainty in the characterization of radioactive wastes manifested for disposal. Uncertainty in reported estimates is certainly present, and understanding the degree of uncertainty is critical to efficient use of disposal resources and to estimations of risks to workers and to the public.

Other issues that seem to be unaddressed include the role of LLDs in determining compliance with WACs, and methods for establishing WACs based on a probabilistic performance assessment. If WACs are based on mean concentrations (for example) from a PA, then it is not clear that all manifested waste needs to meet the WAC, but only that on average the waste needs to meet the WAC. Perhaps the intent is to determine a WAC such that satisfying the WAC for each waste manifest guarantees that the mean will be less than the WAC, but the guidance is not clear on this issue.

This concludes comments from Neptune and Company, Inc. on the proposed revisions to 10 CFR part 20.

Comments Regarding Revisions to NUREG/BR-0204

Neptune and Company, Inc. (Neptune) appreciates the opportunity to provide comments on possible changes to the U.S. Nuclear Regulatory Commission (NRC) *Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest* (NUREG/BR-0204, Rev. 2) of July 1998. Comments were requested by NRC as part of the *Public Workshop to Discuss Potential Revisions to NUREG/BR-0204 Rev. 2* on 1 March, 2013, in Phoenix, AZ. This seems to be associated with Docket ID NRC-2013-0035.

The comments below are organized into a General Comments section, with application to the overall document, and a Specific Comments section, with more specific and editorial comments.

General Comments

Definition and use of the lower limits of detection

Comment:

Discussion of using the lower limit of detection (LLD) occurs on page 12 of the Brochure. This discussion is a bit confusing in that the LLDs get reported in different ways, but the larger problems are 1) how the values reported on the manifests are used by radioactive waste disposal operators, and 2) how the LLDs are defined in the first place.

It is our understanding that some operators enter the LLD values, as reported, into their waste inventory databases, and other enter values of zero for reported LLD values. This has the potential of introducing error and uncertainty into the waste inventory for a disposal site, which runs counter to the efficient use of the site. Uncertainties in this case are difficult to quantify, and so must be overestimated. This obfuscates effective decision making on the part of the disposal site operator and regulator.

There are other issues that need to be addressed in manifesting or reporting waste concentrations. These include the number of samples that need to be taken on a waste stream, and when and where in the waste cycle those samples should be collected. This could be framed in terms of EPA's DQO process. This could also address scaling (which should be done statistically between lab data and screening measurements so that uncertainty is honored, and the necessary relationships can be formed – single values for scaling factors are insufficient).

The main focus of the changes to BR-0204 is the "phantom four", and issues that arise when measuring low quantities, or counts. An apparent challenge for the environmental/waste industry is understanding the power of statistical methods, and how they should be used. Chemists tend to censor data, essentially making datum-based decisions (this is natural since chemists are trained to think about each individual sample). However, it is rare that decisions are made on a datum rather than on data. Enough data should be collected for a waste stream to evaluate the data collectively. This is also appropriate from the perspective of supporting risk (dose) assessment, which is based on averages (i.e., data, not datum). If this approach were taken, then the need for LLDs for low-level radioactive measurements could be removed. Radioactivity data include ambient background subtractions, which can cause negative responses. Statistical methods can

account for this properly. In fact, statistical methods are better suited to handle such uncensored data than censored data. Censoring implies loss of information, which is difficult to overcome. So, an option is to abandon LLDs in favor of straightforward waste characterization.

Otherwise, if LLDs continue to be entertained, the approach that Currie first described for estimating LLDs is reasonable, but was not adequately implemented in NRC's NUREG/BR-0204. The challenge, which Currie addressed, is that multiple samples of LLDs should not be combined.

The more complicated situation is waste that is characterized through scaling factors. Low counts then present different challenges, because the regression between lab data and (field) screening data can depend on the relationship at low counts, and the screening instruments are not usually set up for ambient subtractions. In effect, applying scaling at the sensitivity of the methods is unlikely to work very well.

In general, these types of statistical issues need to be addressed, and, based on this research, some simple, better, rules for manifesting are needed that will better support Performance Assessment.

Specific Comments

Existing text, p. 3:

Note: The NRC requires all uses of the Uniform Manifest forms to report information in metric units, and all the forms have been developed for the use of metric units.

Comment:

The manifest forms themselves go so far as to specify use of SI units in many cases, which is even more strict than "metric". This is all to the good, and we appreciate that NRC has adopted metric and SI units (and metric units, where SI is impractical, such as the use of "yr" rather than "s" for time) in its work. This needs to be extended into the revisions of 10 CFR part 61 and part 20 as well.

Existing text, p. 9:

13. Transport Index – See DOT regulations at 49 CFR 173.403. This is a dimensionless number which, for nonfissile material packages, is equivalent to the radiation dose in millirem per hour at one meter from the surface of the package.

Comment:

This is inconsistent with NRC's use of SI (or metric) units, and is also somewhat nonsensical. Rather than being dimensionless, this number indeed has dimensions of dose rate, and even specifies the units as millirem per hour. However, it is recognized that this may stem from a DOT regulation, and that the linkage to 49 CFR 173 needs to be maintained. Unfortunately, if the "Transport Index" is enshrined in that regulation and is reported as a dimensionless number, (even though it is not) then changing its basis from millirem per hour to milliSieverts per hour would introduce significant confusion. So, it may be best left alone. At any rate, NRC could

provide in this brochure the SI equivalent to millirem, as in "...millirem per hour (equivalent to 10 microSieverts per hour) at one meter..."

Existing text, p. 11:

1. Manifest Totals - ... and the total net weight (kilograms).

Comment:

Kilograms are not a unit of weight, but rather mass, so the text should be changed to "...and the total net mass (in kilograms)." This error is repeated in several places in the Brochure, including two in the second paragraph on page 12. Just search on "weight" and find the others. This is also incorrectly referred to as "weight" on Forms 540 and 541, even when the units of "kg" are specified.

Existing text, p. 18:

15. Radiological Description – This information may be presented in either of two ways. First, list all significant radionuclides...

Comment:

The definition of "significant" is provided on p. 20, with several trigger concentrations that make it so. But all these trigger values are given in terms of activity concentration, such as MBq/cm^3. It needs to be clarified what is in the denominator of this calculation—that is, cm^3 of what, exactly? Is it a local concentration within the larger package, or is it a bulk concentration considering the entire volume of the shipped package?

Existing text, p. 19:

[15. Radiological Description – continued] **OR**, alternatively, for container containing a single waste type, enter the total megabequerels [sic] in the container ... and enter the percentage of each radionuclide.

Comment:

The problem here is that what is not specified is percentage by *what*? These values could have radically different values depending on if they are reported as percentage by volume, percentage by mass, or percentage by activity. This needs to be clarified.

Also, "megabecquerels" is misspelled in the Brochure.

This concludes comments from Neptune and Company, Inc. on revision of NUREG/BR-0204.

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24 July 2015

Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Rulemakings and Adjudications Staff

Subject: Comments on Guidance for Conducting Technical Analyses for 10 CFR Part 61 (NUREG-2175, Draft Report for Comment)

Reference: Docket ID NRC–2015–0003

Dear Ms. Vietti-Cook:

Neptune and Company, Inc. (Neptune) is submitting the attached comments in response to requests for comment on the proposed *Guidance for Conducting Technical Analyses for 10 CFR Part 61*, NUREG-2175 (Draft Report for Comment).

We believe that the revision to 10 CFR 61 is a worthwhile endeavor that will lead to radioactive waste disposal decisions that are more beneficial for and protective of current and future generations, and that the supporting guidance is important for achieving consistent and effective implementation of part 61.

Thank you again for this opportunity to comment. Questions regarding these comments may be directed to Dr. Paul Black at (720) 746-1803 ext 1001 (pblack@neptuneinc.org), or Dr. John Tauxe at (505) 662-0707 ext 15 (jtauxe@neptuneinc.org).

Sincerely,

John Tauxe, P.E., Ph.D. and Paul Black, Ph.D.
Neptune and Company, Inc.

Comments on Guidance for Conducting Technical Analyses for 10 CFR Part 61 (NUREG 2175)

Neptune and Company, Inc. (Neptune) appreciates the opportunity to provide comments on the U.S. Nuclear Regulatory Commission (NRC) proposed *Guidance for Conducting Technical Analyses for 10 CFR Part 61* (NUREG-2175), provided as a draft report for comment.

The comments below are organized into a General Comments section, with application to the overall rule, and a Specific Comments section, with comments following the same order as they appear in the proposed revisions document.

General Comments

This guidance for technical analyses required by the proposed revisions to 10 CFR 61 is welcome. The bulk of the document is well written, and it is clear that the authors put a lot of thought and care into its development.

The draft NUREG-2175 suffers from occasional redundancy, and some disconnects in the flow of development of concepts, especially in the early sections, but these shortcomings could be addressed with some additional careful technical editing.

Specific Comments

§ 1.1.2 Safety Case

It remains unclear how the safety case is to be constructed. It seems that this is a collection of documents and analyses required to demonstrate adequate protection of public health, but the mechanics of how all these analyses are to be collected into a Safety Case is lacking. Admittedly, this is a new concept (for US regulators) and will require vetting and the development of examples. Is the Safety Case a document that serves as a wrapper for the performance assessment (PA), intruder assessment (IA), defense-in-depth analysis, etc.? Please provide clarity on what is expected in terms of a license applicant's submittal.

§ 1.1.4.1 and 3.0 Performance Assessment

Bullet (8): Uncertainty addresses the contaminant transport part of a PA, whereas the exposure part is better addressed through variability (population characteristics per EPA's description of probabilistic risk assessment). Variability should not be used directly in the projected behavior of the system except to inform the uncertainty in the mean estimates.

An issue with section 1.1.4.1 is that it addresses modeling for the sake of modeling. Modeling should be performed in some context of the decisions to be made. Compliance decisions are insufficient for evaluating the efficacy of a disposal system and optimizing disposal, which are critical for maximizing use of these precious resources (disposal systems). Modeling should be performed to evaluate options, in which case a framework for options analysis is needed within

which the modeling implied here should be performed. The beginnings of addressing this appear in Item (10) of Section 1.1.4.1, but this does not go far enough.

§ 1.1.4.2 and 4.0 Inadvertent Intrusion Assessment

Consider this text from p. 1-5: "Because there is no scientific basis for quantitatively predicting the probability of a future disruptive human activity over long timeframes, an inadvertent intruder assessment does not consider the probability of inadvertent intrusion occurring."

This simply is not true. This has been done before and can be done again (at NNSS and WIPP, for example). We are not in the role of prediction, we are in the role of modeling. We are modeling a reasonable facsimile to provide insights into what might happen, while conditioning on current knowledge of the system. Otherwise, a dose assessment beyond a few decades (let alone hundreds of years, or even thousands) is futile.

We do not know what the future holds—we know that it will be different from today, but all we can do for decisions that depend on the long term future is to project current conditions as we best understand them. This applies just as much to inadvertent intrusion scenarios as the environmental system.

Using IA to establish WACs is a mistake. This will not allow the nation to effectively use the limited disposal facilities that we have, and will arbitrarily cause disposal facilities to function sub-optimally. The arbitrariness is palpable. For example, this would cause sites in less populated areas to be evaluated the same as sites in more populated areas, since the probability of intrusion is assumed to be 1 for either case in the IA. This approach subverts the idea that site-specific analyses should drive decisions. Forcing the probability of intrusion to be unity removes the site-specific nature of the probability of intrusion, which can be a significant discriminator of between sites. WAC should be based on site-specific PA, not on IA.

The IA should be folded into the PA, and intruders should be addressed as potential receptors just like any other MOP, with probability of occurrence included in the analysis. All animals are equal, and some should not be more equal than others. Our approach in developing models has been to develop appropriate probabilities of exposure for all receptors, without labeling them as MOP or IHI, which is an artificial and sometimes misleading distinction. Models can provide for a special case in forcing the probability of an even (e.g. drilling through waste) in order to examine the consequences of that event in detail, but those consequences should not enter in decision making out of context, which is what the IA does. We expect that this approach will fit into the proposed requirement of having both a PA and an IA by using the very same model, with the only difference being forcing of a particular (and otherwise potentially unlikely) event. That special case of the PA modeling would be an IA, but the resulting IA should not be considered out of context of its probability of occurrence.

It is therefore curious that the last statement in Section 1.1.4.2 is that "An intruder assessment shall... Account for uncertainties and variability" when the largest uncertainty may be whether an intrusion event would occur at all.

On a positive note, it is encouraging to see the language that an inadvertent intruder is in fact a member of the public (§2.2.4.2, p. 2-14, lines 39-41.)

§ 1.1.4.3 and 5.0 Site Stability Analysis

The point of the stability analysis is not clear. How will it be evaluated? It needs metrics. We strongly suggest that risk (dose) be used to evaluate stability, along with cost. That is, this should be folded into the PA, with potential options for stability evaluated. Stability for the sake of stability, removed from the context of risk, is not useful except for appearances.

§ 1.1.4.4 and 6.0 Protective Assurance Period Analyses

This statement is most welcome: "The primary purpose of the protective assurance period analyses is to provide information that demonstrates that releases of radioactive from a LLW disposal facility are minimized during the protective assurance period..." What is refreshing here is the use of the term "releases", which makes the analyses reminiscent of the Containment Requirements for transuranic waste, in EPA's 40 CFR 191. Given the long time frame of these analyses, it is good to be rid of the term "dose", since this is burdened with the unfathomable uncertainties of human behaviors past 10,000 years.

Later discussions of the protective assurance period analyses sometimes revert to the use of the term "dose" as a performance metric, and we encourage that such references be modified to make reference to "releases" instead.

§ 1.1.5 and 9.0 Waste Acceptance Criteria

As mentioned above, a site-specific WAC should be based on a site-specific PA, and not on an IA, or even on the classification tables.

At the end of section 1.1.5 is a bulleted list of requirements for a certification program. Missing from this list is the characterization of uncertainty in waste documentation. In our experience, having developed PA models for over half a dozen radioactive waste disposal sites, the uncertainty in inventory is the most significant and most irreducible variable in the model. Unless positive steps are taken to require generators to characterize uncertainty in their wastes, this will continue to be the case. Without this uncertainty characterization, decisions about waste acceptance and disposal site operations will continue to be clouded, leading to inefficiencies in the *de facto* national radioactive waste disposal program and a squandering of the precious resources that are waste disposal facilities.

§ 1.4 Risk-Informed Approach

The term "risk-informed" is promising, but there is little of substance here. How should a risk-informed decision be made? This guidance sets up an approach based on *ad hoc* decision making—some people get together and make a decision. We have the technology to do better than that. "Risk-informed" would have meat if it were framed in a decision analysis context. This is the paradigm shift that is needed to support effective decision making, and remove the confusions that stigmatize this industry.

§ 2.2.1 Data Adequacy

It is unclear what is meant by "some amount of incompleteness in the data may be overcome by appropriately accounting for parameter uncertainty." This indicates a confusion of ideas.

Incompleteness of data leads to greater uncertainty in the sense that there is less data than there might have been otherwise. Parameter uncertainty is based on the amount of data available. Hence, this sentence makes no sense. We suggest it be deleted.

Note also that there are other ways to obtain data to support a specific parameter. These include model abstraction and meta analysis. It's not clear what is meant by "last resort" for expert elicitation. There is nothing inherently problematic with expert elicitation. If "last resort" is meant to imply cost-effectiveness, then this should be stated, but it is incorrect to imply that expert elicitation is not a reasonable approach, which seems to be the intent here.

Upscaling is not needed only to achieve representativeness. It is critical to the whole approach of modeling fate and transport of the radionuclides. A probabilistic PA must be built around averaging over large spatial and temporal scales, which is the essence of upscaling (though the analyst needs to be careful about what is being averaged, per the precipitation example). This is how a contaminant fate and transport model ultimately characterizes and addresses uncertainty. Then receptors are exposed to average concentrations and the uncertainty associated with that average.

§ 2.2.2 Uncertainty

The final sentences of Section 2.2.2 state, "For example, an uncertainty analysis could provide information about where a licensee should focus model support activities, which in turn could reduce uncertainty. Parameter uncertainty is uncertainty in the parameters used in the technical analyses." This is not the role of uncertainty analysis—this is the role of *sensitivity analysis*, which is not discussed much in this document. Uncertainty analysis (UA) addresses uncertainty in the decision. Sensitivity analysis (SA) addresses what drives the outcome and how to reduce uncertainty. There should be a separate and distinct discussion of sensitivity analysis to clarify the different roles of UA and SA.

§ 2.2.2.1 General Structure of Uncertainty

It is not clear that uncertainties are greater for long-lived waste. In fact some things become certain for long-lived waste even if the exact time frame is uncertain (the exact time frame is not very relevant in deep time). For example, in the Clive DU PA Model, it is relatively clear (not uncertain) that in 2 million years (My) all waste disposed below grade will be part of an organically developed geologic repository (i.e., under about 300 m of sediment). Whereas, for short lived waste disposed above grade, for example, the waste will be dispersed at some point well before 2 My. DU does not actually reach secular equilibrium until about 2.1 My—there is a lot of certainty then, even if the exact time is not known. The sentence needs to be qualified.

§ 2.2.2.1.1 Scenario Uncertainty

A challenge here is that probabilistic modeling essentially considers a continuum of scenarios. For example, climate variation spans a continuum of possibilities, which can be handled through probabilistic modeling (i.e., through probabilistic specification of input parameters). Scenarios are best left for truly discrete distinctions that cause the system to move in a different direction, and not for changes that are unknown but possible across a continuum.

§ 2.2.2.1.2 Model Uncertainty

In this case, different distinct models could be proposed. So, model uncertainty should involve evaluation of distinct models (for example, there are several models of tortuosity in the literature—which one is best for a specific PA and site?) For this type of model uncertainty, some model averaging could be brought in to support the PA effort.

Conceptual model uncertainty, on the other hand, can probably be handled for the most part through uncertainty characterization of the parameters. Simulation uncertainty is different yet again, and should be separated into its own section. Model uncertainty, conceptual model uncertainty, and simulation uncertainty are really all different enough that they need separate sections.

§ 2.2.2.1.3 Parameter Uncertainty

Parameter uncertainty is not reducible or irreducible. Parameter uncertainty is simply reducible by collecting more data/information. It could be argued that variability is irreducible, but variability should not be applied to the fate and transport model (except to support development of uncertainty estimates—more or less standard deviation (variability measure) divided by *n*). This is always a difficult discussion because of the number of literature articles on the subject, most of which cause greater confusion. It would be better to define terms here, and, since these are statistical/probabilistic issues, that should be the basis for the definitions.

Note that the approach to parameter uncertainty depends on how the simulations are performed. Most models involve drawing random numbers at the beginning of time, and then using those as deterministic values through the model's propagation in time. If, instead, random numbers are pulled at each time step, then some further thought needs to be put into how parameters are probabilistically specified.

Note also that in a probabilistic risk assessment (which is essentially what a probabilistic PA is), the exposure parameters need to cover the potentially exposed population, in which case they are based on variability rather than uncertainty. If the terms uncertainty and variability are not palatable here, then at least it should be recognized that some parameters (fate and transport leading to concentration assessment) are addressed through upscaling (distributions of means, essentially, which implies characterizing uncertainty), whereas, some are addressed without upscaling (because PRA is about addressing all members of the population, not the average member).

§ 2.2.2.1.4 Uncertainty Example—Transfer Factors

Applying conservative values *does not address uncertainty*. It addresses misplaced value judgments. It obfuscates effective decision analysis and decision making.

This document would benefit from further sections that specifically address upscaling and correlation. Why do large variances only require careful treatment in an intruder analysis—this makes no sense. Since transfer factors are applied to fate and transport components, they address uncertainty and upscaling. The degree of skew in the supporting data (or expert opinion) is mitigated to some extent through upscaling. It is important that the fate and transport parameters (those that are used to lead towards estimation of concentrations in various media, locations, etc.) are established as upscaled (averaged) quantities. The care that needs to be taken in upscaling

must address the dilution effect mentioned. The role of inter- and intra-site values is not made clear. This is an issue of ability to generalize data from one site to another. In general, we probably do not assign sufficient uncertainty to that generalization, but a combination of data from another site and expert opinion can be used to at least address some of the missing uncertainty. Note again that this must be in terms of uncertainty in the upscaled values.

Conservative values should not be used. One is reminded of the question asked Charles Babbage: "Mr. Babbage, if I provide you the wrong inputs, can your machine produce the right output?" His answer was, "I fail to understand the confusion of ideas that led to such a question." And yet, that is what is proposed here. If there are no data, then use expert elicitation. If there are no experts, then put a wide distribution in, and let the sensitivity analysis determine if it matters. If it matters, then put more effort into it (at greater cost.) If it doesn't matter, then leave it alone and move on.

Page 2-10, line 24: Replace "uncertainty" with "sensitivity". This is an example of the confusion between the UA and SA concepts that exists in this document.

If this section is to remain, it should be re-cast as a section on data generalization issues, instead of being presented as an uncertainty example.

Also, the NRC Regulatory Guide 1.109 (NRC 1977) should not be cited as an example, as it is quite dated and has values in it with no support.

§ 2.2.3.1 Peer Review, Expert Judgment, and Expert Elicitation

Peer review does not belong in a section with expert judgment and elicitation. Peer review is a form of model support (which could be described in Section 2.2.3), whereas expert judgment and elicitation are methods to specifying a model (akin to data collection). These are different concepts that do not belong in the same section.

§ 2.2.4.1 Human Activity - Scenarios

Receptor scenarios should be based on site-specific knowledge, and projected into the future based on that knowledge (i.e., conditioning on current knowledge). The point is made more effectively on page 2-16, line 11, but should be reinforced in this section. This is also an example of how use of the term "FEPS" works better than merely "FEP" (see editorial comments below.)

§ 2.3.1 Context of the Performance Assessment

Although the data quality objectives (DQO) process has some problems in its implementation, philosophically it is a sound rendition of the scientific method. It basically starts with the question, "What decision needs to be made?" The same should be true here. The decisions include compliance, but much more importantly, should include optimization of waste disposal: the best cover design, best placement of waste, best institutional controls, etc. Rather than DQOs, it would be better if this were all framed in a decision analysis construct. More specifically, it should be framed as a stakeholder-engaged structured decision making process—this is the paradigm shift that is needed so that the public is protected rationally and defensibly, while allowing for the disposal of waste in responsible ways.

§ 2.3.2 Approach to Different Time Frames

Evaluation against these time periods is unfortunate. It is not clear why radionuclides are treated so differently technically than wastes that will never change and might pose greater hazards (lead, arsenic, asbestos), and other wastes that have effective decay sequences that lead to more hazardous waste (PCE to TCE to VC, for example). There are several reasons why 1,000 years is too long—these include reasonableness of evaluating dose beyond 200 to 300 years, change that is inevitable, vastly increased uncertainty with time, and economic considerations (e.g., discounting, which is a natural phenomenon) coupled with the need for long term financial planning. There is a great confusion of regulations and guidance across different radioactive waste issues, let alone expanding further to include hazardous waste regulations. There are occasional opportunities to make real effective change. This is one of them, but this is not being achieved.

§ 2.3.2.3 Performance Period

The reference to "releases" (p. 2-23, line 24) is appropriate, but that positive is quickly negated with mention of the metric "peak annual doses that are projected to occur after 10,000 years" (p. 2-23, line 30, and again on p. 2-24, line 15). We recommend sticking to the "releases" or "activity concentrations or fluxes" concept, as invoked again at the top of p. 2-24.

§ 2.3.2.4 Site Characteristics

The term "C" in the equations on p. 2-25 (lines 26 – 28) requires a careful definition in order for it to be implemented consistently. Is this the activity (or mass) concentration in disposed wastes at the time of closure? At 1000 years after closure, accounting or decay and ingrowth? Some other time? IS it radionuclides that are in the original waste volume, or would it account for radionuclides that have been transported elsewhere in the environment? These questions must be answered, or an analyst will be forced to guess what the intent is.

§ 2.5 Scenario Development

The use of stylized scenarios is potentially problematic. Their use implies conservatism, which is essentially misplaced value judgments. It is perfectly fine to make conservative decisions, but it is not fine to make important decisions based on conservative models. Conservatism should be addressed through value judgments, so that it is properly characterized.

FEPS screening should take place, and should be based on an understanding of probability and consequence. Refer to *The Foundations of Statistics* (Savage, 1954). This reference lays out exactly how models should be built, what considerations should be given, etc. It addresses both marginalization (ignoring distinctions between events), and conditioning (ignoring events), and offers useful insight for how a FEPS screening process could be implemented.

§ 2.5.3.1.2.2 Probability

Page 2-42, last bullet, lines 3-4: It's interesting that FEPSs that do not have information or data, and nothing is known about the process, are included automatically here. There are many processes that are never included in a PA because we don't know how to include them. For example: microbiological degradation of containers, colloid transport. However, NRC implies

here that they should be included.

Uncertainty associated with probability: Possibly most FEPSs evaluations would have to be evaluated based on expert elicitation. It is difficult to see how the FEPSs can be evaluated probabilistically otherwise. At the very least, expert elicitation is likely to play an important role. Perhaps this can be noted and referenced to the section on expert elicitation. Some more explanation is needed here. The Yucca Mountain Project evaluated the probability of volcanic hazard as part of the FEPSs process (at very large cost). This was done by building a complex model that led to (uncertain) estimates of this probability.

§ 2.7.4 Analysis and Evaluation of Results

This section discusses, among other things, the concept of SA, but subtly mischaracterizes it in saying that "...the purpose of sensitivity analysis is to evaluate uncertainty and variability in the assessment. (p. 2-61, lines 16-17.) The purpose of an SA is to identify which model input parameters contribute most to that uncertainty. Further discussion on this page revolves around the flawed approach of on-at-a-time (OAT) SA, which will not allow one to thoroughly evaluate the contributions of input parameters to uncertainty in the model results. The text on p. 2-62, while a bit garbled, attempts to put OAT-SA in its appropriate context, identifying its limitations, but this OAT-SA approach needs to be more forcefully deprecated.

§ 3.2.7 Direct Release

It is interesting to see the reference to "Anthropogenic direct releases..." (p. 3-16, line 41.) This would suggest that releases of radionuclides that might occur from intrusion into wastes should be considered as part of the contaminant transport in a model. For example, drill cuttings brought to the surface should be incorporated into the larger contaminant transport calculations, as they could result in exposures to not only the drilling crew but to other receptors as well, perhaps much later in time. We agree with this approach.

§ 4.0 Inadvertent Intrusion

See our comments above about why the IA is not useful for making decisions about radioactive waste disposal.

§ 4.3.1.1 Generic Intruder Receptor Scenarios

A generic IA is of even less use than a site-specific one.

At lines 12-13 on p. 4-13, the statement is made that "Loss of intuitional control is not expected..." Quite the opposite is true. Loss of IC is certain—it is only a matter of when control is lost.

§ 4.3.1.1.2 Intruder-Drilling Receptor Scenario

The drilling referred to in this scenario is for water wells. It should be made more generic to include drilling for petroleum resources (gas and oil) as well.

§ 4.3.2.2 Source Term

Included in an exposure source term should be not only radionuclides in the original waste layers, but those that have migrated upwards into the column above the waste, towards the ground surface. These, especially the decay products of ^{222}Rn which may have diffused upward, can add significantly to the receptor dose.

§ 4.3.2.2.1 Inventory

The last paragraph on p. 4-31 has problems. It says that licensees "may conservatively assume no decay." This is at odds with the very next sentences, which recognizes the "impacts of significant progeny", and that "radioactive decay can result in significant ingrowth of progeny at future times." ("at future times" should be deleted, as it is redundant.) As we know, using depleted uranium as an example, assuming no decay is in some cases definitely not conservative. The following sentence attempts to make this clear, but should be changed from "For example, doses from depleted uranium may increase for more than one million years due to ingrowth of shorter-lived and more highly mobile decay products." to "For example, activities from depleted uranium will increase for more than two million years due to ingrowth of shorter-lived and more highly mobile decay products."

§ 5.0 Site Stability Analyses

As stated above, we do not see the need for a special site stability analysis. Site stability and its consequences should simply be modeled as part of the PA. If an unstable site produces no added risk, then why should we care? We agree that all the processes that contribute to loss of stability, as discussed in the subsections of 5.0, should be included in the FEPS analysis, and if they survive screening, in the PA modeling. The consequences to receptor dose will then naturally fall out of the PA.

Lines 17-19 contain an adequate definition of "stability" that should be used as a definition in 10 CFR 61.2. The current definition in 61.2 is self-referential and wholly inadequate.

§ 6.2.1.1 Alternatives Analysis

An alternative analysis as described is a decision (options) analysis. It should be described this way, and should describe how such an analysis is performed. It seems that this is simply a comparison of doses, but, if so, that is inadequate. Doses can be reduced to zero if money is no object (put a titanium box around the whole facility), but in reality the costs can be prohibitive, and still might not satisfy all stakeholders (because in that simple example, the waste is still there). Based on this approach, the titanium box is the best alternative, because cost doesn't come into it. This discussion should be deleted, or merged with the next section while maintaining the title of this section (that is, alternatives analysis should include costs).

This section also references "peak of the mean". This is a very poor decision metric for sites that have no receptors for long periods of time. This is why PA decisions should be based on population risk instead of individual risk (which was part of the original basis for the selection of many of the disposal sites in the country anyway).

We applaud the consideration of alternative sites for disposal. The final paragraph of this section hints at a larger scope of decision making with respect to radioactive waste disposal for the nation. IT is appropriate to consider that one site may be more suitable than another for disposal

so specific wastes, and yet this has received very little discussion in the waste disposal community. We are happy to see the issue raised here.

§ 6.2.1.2 Minimization Analysis

Discounting is difficult to deal with, but perhaps because of how little research has been done to date. A reframing of the decision problem to address both discounting and a long-term financial plan. With discounting, including discounting of receptor doses (contrary to bullet 2 on p. 6-8), compliance periods become unnecessary. Recall Neptune's presentation at the Spring 2013 meeting of the LLW Forum in Charleston, SC.

While we understand NRC's position, some further research on discounting coupled with financial planning seems warranted. At the moment the effective discount function on dose is zero discounting until the end of the compliance period, and then complete discounting (zero value) thereafter. (NRC has inserted one more step in there potentially with the second period having a different dose limit). This is not a reasonable discount function, so some research is needed.

A better approach would be to shorten compliance periods, and have financial planning that implies discounting. The net effect of the revolving time window that this approach would engender would be longer term management of the disposal facility. Under current regulations, at the end of institutional control the Government can simply walk away—does it make sense to make decisions under that paradigm? A paradigm shift is needed.

Also, decision analysis for radioactive waste disposal should depend on population dose rather than individual dose. Or, better, it should depend on risk. Even better, it should depend on mortality and morbidity, as is done in risk assessment within the medical community. Dose is used as a proxy for these, but it is not a good proxy.

§ 6.2.1.3 Other Decision Analyses

It is not clear how this would differ from what is presented in Section 6.2.1.2. Please clarify.

§ 7.0 Performance Period Analyses

p. 7-1, line 26 contains the statement, "The level of detail in the assessment should be risk-informed". It is not clear at all what that means. The term risk-informed has been used for several years now, but without definition. Metrics are needed to make decisions. What are the risk-informed metrics in this case?

The footnote to Table 7-1 says "Any isotope [sic] that is to be disposed of in sufficient quanitites should be considered as part of the LLW PA inventory." Please define "sufficient quantities".

Top of p. 7-4: It is not clear why more expert judgment is needed in this case. This seems to be a continued "knock" on expert elicitation as a "poor man's data analysis". This is not the case. Expert elicitation should be used when it is most cost-effective to do so. Since these long-term models essentially project today's conditions into the future, it is not clear why longer term modeling requires more expert elicitation. Most of the input distributions will not change from the 1,000-year model.

Further, why would simple conservative analyses be used? The model is already set up for 1,000 yr (unless there are new events)—it is trivial to project out the same model for 10,000 yr or longer. This section should be re-written. As former Commissioner Magwood once said a problem we face in waste management is "conservatism on top of conservatism on top of conservatism". Conservatism has no place in modeling for important decisions. Its place is in specification of value judgments in a complete decision analysis, based on realistic—not conservative—analysis.

Otherwise this section seems to ramble some, and might benefit from some reorganization and deletion of material.

p. 7-4, line 28: Change "is variability in hydrogeology" to "may be variability in hydrogeology". There are sites where hydrogeology is simply unimportant.

Editorial Comments

"FEPS", not "FEP"

This is not merely an editorial comment. We strongly recommend that the traditional term "FEP", for features events, and processes, be replaced with the term "FEPS", which includes receptor scenarios. Receptor scenarios are not merely the result of the assessment of other FEPs—they are fundamental to the scoping of analyses, and deserve "top billing", in the principal acronym. The development of modeling scenarios indeed is the product of the analysis of FEPs, as the document discusses, but such scenarios are also dependent on the receptor scenarios that are identified as being fundamental to the scoping of a PA. As an example, section 2.6, Conceptual Model Development, should include receptor scenario development as a foundation leading to CSM development.

This guidance is a great opportunity to start making this point more clear to the PA community. Please consider replacing all instances of "FEP" with "FEPS".

"radionuclide", not "isotope"

The word "isotope" is used throughout the document, in most cases incorrectly. There are a few cases where it is used appropriately to mean various isotopes of a single chemical element (e.g. p. 2-25 line 32, in reference to "uranium isotopes"), but in most cases, "isotope" should be replaced with "radionuclide", or even simply "nuclide". This is something NRC should strive to correct in general. Isotopes have the same number of protons, and hence the same atomic number. Isotones are chemical elements having the same number of neutrons. Isobars have the same atomic mass, meaning the same sum of protons + neutrons. All are nuclides, and radioactive ones are radionuclides. The difference in usage is perhaps best illustrated by example. These are isotopes: ^{234}U, ^{235}U, and ^{238}U (same number of protons, therefore same atomic number. These are not isotopes, though they are isobars: ^{238}Pu, and ^{238}U (same atomic mass, P+N). These are also *not* isotopes, but are isotones: ^{29}K and ^{37}Cl (same number of neutrons). These are none of the above, but are radionuclides: ^{3}H, ^{36}Cl, ^{99}Tc, ^{222}Rn. All of the above examples are radionuclides, and that is the best term to use, unless there is a specific reason to use "isotopes", as in, "All isotopes of uranium share the same geochemical

characteristics."

"naturalization"

In the context of the degradation, deterioration, and alteration of engineered features of a disposal facility, such as the cover, we would promote use of the term "naturalization," first introduced at the NRC Workshop on Covers. "Naturalization" includes all these processes, and more, and suggests the idea that these processes are natural and inevitable, and that engineers should work with nature in developing designs that will age well.

"disposed" not "disposed of"

Inclusion of the word "of" in essentially all occurrences is superfluous.

minor edits

p. 2-4, line 38: Remove "large quantities of", since depleted uranium "may pose a long-term risk to the public" in even small quantities. Don't let previous disposals of DU hide behind the "large quantities" terminology.

p. 2-5, line 2: Change "predominately" to "predominantly".

p. 2-24, line 2: Remove "rate". A flux is already a rate, as in mass per time. A "flux rate" is nonsensical, and would mean mass per time per time . See: Stauffer, P.H. (2006). "Flux Flummoxed: A Proposal for Consistent Usage". Ground Water 44 (2): 125–128.

p. 2-28, line 42: Change "which to "that". There are other instances of this grammatical error throughout the document. Fortunately, you got most of them (though introduced some new instances) in the proposed 10 CFR 61 rule changes.

p. 2-30, line 24: Change "Sandia National Laboratory" to "Sandia National Laboratories".

p. 2-42, line 20: Change "phenomena" to "phenomenon".

p. 2-42, line 32, and p. 2-55, line 43: Change "are" to "be".

p. 2-47, line 41: Replace "less" with "fewer".

p. 2-49, line 13: Remove "a"

p. 3-22, line 17 and p. 12-7, second reference: The last name of Ghislain de Marsily is "Marsily, not "de Marsily", and certainly not "deMarsily". He told me this personally. He should be referenced as "Marsily, G. de"

p. 7-8 *et seq.*, Examples 7.2 and 7.3: Use SI units: Bq (or MBq) instead of Ci.

This concludes comments from Neptune and Company, Inc. on the proposed *Guidance for Conducting Technical Analyses for 10 CFR Part 61* (NUREG-2175).

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Submitter Information

Name: Shane Gallagher
Submitter's Representative: Shane Gallagher
Organization: Brigham Young University American Nuclear Society student Chapter

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General Comment

-See Attached-

Attachments

BYUANS_NRC_comments

American Nuclear Society
Brigham Young University

The American Nuclear Society Student Section at Brigham Young University has reviewed the proposed rule for 10 CFR Parts 20 and 61 regarding Low-Level Radioactive Waste Disposal and have concluded that when approaching this decision with the correct perspective the NRC's proposed rules are sufficient to safely regulate the disposal of low-level radioactive waste without overbearing costs to industry. Of particular interest to our student section was the question posed by the NRC for public feedback on whether 5 mSv (500 mrem) per year is an appropriate analytical threshold for the protective assurance period. Based on calculations and appropriate references, we have concluded that 5 mSv per year is a reasonable and safe threshold.

Some would argue that any exposure to radiation is harmful. However, 5 mSv represents a radiation dose comparable to 1 CT chest scan, and is less than the dose we receive in the U.S. as reported by the NCRP. Utah experiences even higher doses because of higher elevation. Therefore, we believe 5 mSv is a reasonable and safe threshold.[1]

We have also performed calculations suggesting that the activity of DU does not increase significantly until around 100,000 years after its disposal (see included charts). These calculations are based on the analytical solution to the differential equations governing the radioactive decay of uranium-238 and uranium-235. Our calculations also show that more important than the increase in radioactivity per se is maintaining a long-term barrier between the public and the alpha emissions of the decay products (especially 222 Rn). This is why, once again, we approve of the NRC taking steps to ensure such a barrier is in place to limit the public dose rate to 5mSv.Also, we believe that the best way to protect the public is to move this waste from its current on site storage to a long term storage facility such as Energy Solutions.

Furthermore, we believe that if EnergySolutions passes the NRC's proposed three tier performance assessment, the threat to the general public will be sufficiently mitigated while concurrently providing Utah with a valuable resource. Depleted Uranium can be used as fuel in advanced reactor designs and so even though this waste can be safely disposed of for thousands of years, this waste will likely be used as fuel well before the disposal facility degrades. Utah already has a well-established nuclear fuel industry. According to Energy Fuels, a uranium mining company, its White Mesa Mill in Blanding UT can produce 8 million lbs of uranium annually.[2] Extending Energy Solutions ability to store this low level waste would provide Utah with a potential fuel source could potentially benefit Utah's economy for decades.

Some have raised concerns that in the case of the return of Lake Bonneville there is a chance of exposure to the public. We believe this is not a concern. If Lake Bonneville were to return, there would be major complications that heavily outweigh the threat of radiation including major cities being

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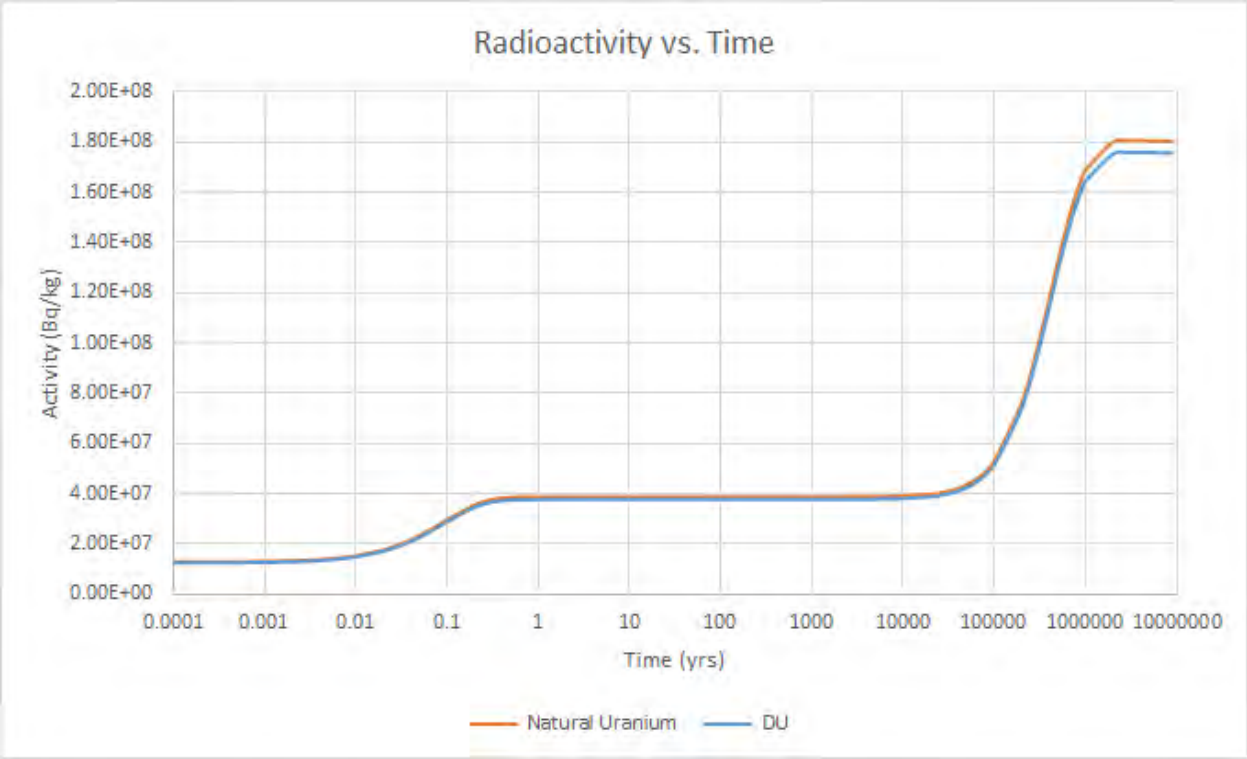
[1] http://www.ncrponline.org/PDFs/Poster.pdf
[2] http://www.energyfuels.com/mobile/white_mesa_mill

submerged. The Salt Lake City International Airport standing at 4227 ft in altitude would be submerged before the Clive facility standing at 4288 ft.[3]

In conclusion, we believe that the 5 mSv exposure limit is a safe and reasonable limit. Moreover, we believe that the NRC's proposed performance assessment is sufficient to protect the public from any potential harm.



[3] http://www.mappery.com/map-of/Lake-Bonneville-Levels-Map

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General Comment

Public Comment to the Nuclear Regulatory Commission Regarding the Proposed Rule Changes for Low-Level Waste Disposal (10 CFR Part 61; Docket NRC-2011-0012)

Tami Thatcher
July 24, 2015

The US Nuclear Regulatory Commission (NRC) is proposing to amend regulations that govern low-level radioactive waste disposal facilities. These are shallow land burial facilities that bury radioactive materials. These facilities will be allowed to bury large amounts of long-lived radionuclides radionuclides that do not substantially decay away within 500 years. Long half life or the increase of radioactivity due to ingrowth of decay progeny will cause these disposal sites to eventually leach radioactive contaminants into our groundwater for hundreds of thousands of years.

We appreciate that the NRC has acknowledged shortcomings in its current regulation of low level radioactive waste burial regulations due to waste blending. We appreciate that the NRC recognizes that its current focus on the first 100 or 500 years of operation of these facilities is inadequate to protect the public from the large amounts of long-lived radionuclides being disposed of. But the proposed rule changes are not protective of human health or the environment.

The NRC is recognizing how inadequate the capability of limiting the migration of these radionuclides into the environment is over the long term. But despite nice-sounding phrases like defense-in-depth disguise the fact that significant amounts of radioactive contaminants will leach into our groundwater over time.

The NRC is recognizing the inadequacy of attempts to model the performance of these waste sites for anything past a few hundred years. They know that these performance assessments depicting unrealistically slow and constant trickle out of contaminants are indefensible and unsupportable. The NRC is requiring that a performance analysis be conducted yet accepting unlimited contamination and radiation dose levels as long as there was the pretense to minimize the contamination.

This is a regulation that pretends to be concerned with protecting human life. But this is a regulation concerned only with protecting the nuclear industrys ability to dispose of radioactive materials in the most unfettered way possible.

The Compliance period (within 1000 years following closure of the disposal facility), the Protective Assurance Period (between 1000 and 10,000 years following closure of the disposal facility) and the Performance Period (after 10,000 years) have varying performance objectives. It is an immoral act to pretend to regulate the disposal of radioactive material with concern for human health but to actually not provide any assurance of this protection.

After the initial compliance period, the proposed rule requires only that an effort be made to minimize releases to the extent reasonable achievable at any time Do only what is reasonably achievable based on technological and economic considerations. Doses greater than 25 mrem/yr? No problem. Doses greater than 500 mrem/yr? No problem, says the NRC. Yet, we know that these levels will damage children and shorten lives. A limit of 25 mrem/yr is barely protective. Anything above 4 mrem/yr is going to damage health. The proposed rule could accurately be called the anything goes rule and it is not protective of human health. In fact, the proposed rule practically guarantees extensive contamination of our country.

The public has not been provided an adequate description of the devastating ramifications of this inadequate proposed rule. NRC presentations and descriptions of this rule have been inadequate to explain the extensive contamination that will be allowed and actually encouraged by this proposed regulation. Anyone concerned with human health and the environment cannot be satisfied with the proposed lowlevel waste disposal anything goes rule.

This regulation will permit unlimited contamination of our groundwater for millennia despite the charade of lengthy discussions that would make it appear otherwise.

The NRC must not be allowed for make the proposed rule into law. In this regulation the NRC claims to be addressing public health and safety and the requirements for meeting health and safety standards. But instead the NRC throws existing and future health standards out the window after the initial compliance period. The NRC wants to allow any level of contamination by the disposal of long-lived waste as long as the dumper tried to minimize the inevitable migration of contamination. Throwing all health standards out the window is not responsible and is not protective of human health or the environment.

I submit these comments with Chuck Brocious, Environmental Defense Institute, Troy Idaho
www.environmental-defense-institue.org

PR-20, 61
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Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0136
Comment on FR Doc # 2015-06429

Submitter Information

Name: Jeffery Taylor
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1186 South 1680 West
C/O Dymicron, Inc.
Orem, UT, 84058
Email: jktaylor.med@gmail.com

General Comment

I appreciate the opportunity to provide a comment on the proposed rule change reclassifying depleted uranium as as Class A Waste, with all of the consequences which may follow.

The successful long term disposal and storage of toxic materials is a challenge which we may not ignore. In the case of depleted uranium, the challenge is particularly troubling and complex. The long term safety of our community and environment are not the only consideration. This material will retain its toxic potential for millions of years. We cannot disregard the potential impact it may have in the far future. Generations to come who shall inherit the consequences of our actions.

As a physician and scientist, I would suggest that the long term toxicity of depleted uranium is far from being well characterised and understood. Critical unresolved issues of toxicity have been raised with regard to DU in multiple government and private studies. With that persistent uncertainty, it is extremely unwise to propose its disposal under the Class A Waste rules. To do so prematurely could lead to severe long term problems of health risks and environmental degradation which may be unmitigatable.

I urge you to set this reclassification aside for the time being while the critical issues that have been raised may be adequately addressed. We cannot afford to make a potentially colossal mistake in the disposition of this extremely long-lived waste material.

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Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0137
Comment on FR Doc # 2015-06429

Submitter Information

Name: Rusty Lundberg

General Comment

Utah Division of Waste Management and Radiation Control comments on the proposed Part 61 rulemaking.

Attachments

UDWMRC_Comments_Part61_ProposedRule_2015-7-24

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL
Scott T. Anderson
Director

July 24, 2015

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTN: Rulemaking and Adjudications Staff

Subject: Docket ID NRC-2011-0012 (Proposed Rule Changes, 10 CFR Part 61)
Filed Online via www.regulations.gov

Dear Madam Secretary:

The Utah Division of Waste Management and Radiation Control appreciates the opportunity to comment on the U.S. Nuclear Regulatory Commission's (NRC) proposed changes to Title 10, *Code of Federal Regulations* (CFR), Part 61. We commend the NRC's efforts to engage stakeholders throughout the entire rule development process.

We especially appreciate the recent public meetings NRC held during the public comment period in each of the sited states of South Carolina, Texas, Utah, and Washington. This afforded the public in each of these states an opportunity to meet or interact directly with the NRC staff who have been closely involved with this rulemaking proposal. This type of public/stakeholder involvement certainly fosters greater public awareness and understanding of important regulatory matters associated with the proper management of low-level radioactive waste (LLRW) in the U.S. Public outreach, information availability, and overall government transparency are key elements of our agency's efforts and commitment to protect the health and safety of the residents of Utah. We also commend the NRC staff for their extensive work and tireless dedication in preparing the proposed changes to Part 61 as well as the accompanying technical guidance document and regulatory analysis.

Following this letter are our comments on the proposed changes to the radioactive waste land disposal requirements found in Part 61. Additionally, as a member of the Part 61 Working Group of the Low-Level Waste Forum, we also express support for the comments submitted by that group.

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We further express appreciation to the NRC for its time and consideration of our comments in developing the final rule changes. Please feel free to contact me regarding any questions regarding our comments.

Sincerely,

Rusty Lundberg
Deputy Director

Email: rlundberg@utah.gov
Phone: 801-536-4257

Enclosure: UDWMRC Comments

July 24, 2015

UTAH DIVISION OF WASTE MANAGEMENT AND RADIATION CONTROL COMMENTS ON THE PROPOSED CHANGES TO 10 CFR PART 61 (DOCKET ID: NRC-2011-0012)

The Utah Division of Waste Management and Radiation Control (UDWMRC) appreciates the opportunity to provide the following comments that address the proposed changes to 10 CFR Part 61 as published in the *Federal Register* on March 26, 2015 (80 FR 16082).

GENERAL COMMENTS

As noted in the cover letter, the UDWMRC is a member of the Low-Level Waste Forum's Part 61 Working Group and as such expresses support for the comments submitted by the working group.

PART 61 CHANGES

The proposed rule changes incorporate the need for various technical analyses, including a site-specific performance assessment in order to determine appropriate waste acceptance criteria, particularly for low-level radioactive waste (LLRW) that was not considered in the development of the current rules governing LLRW disposal. In comparison, the existing rules establish a regulatory framework that, in part, is premised on a LLRW classification system that serves as a means to ensure protection of the public health and safety with respect to the management and disposal of LLRW. More specifically, the waste classification system is designed to protect an individual who unknowingly encounters the contents of a closed LLRW disposal site from a potential unsafe exposure to radioactive material. In constructing the waste classification system, various generalized assumptions were made in order to provide a level of confidence and consistency in the requirements governing the actual disposal of LLRW.

The NRC is now proposing to revise the existing disposal requirements in order to provide a less "generic" approach by taking advantage of various site-specific analyses to determine the acceptability of LLRW for disposal at a commercial facility.

It is well known that for about a decade, Utah has had in place a law that prohibits the receipt, management, and disposal of Class B and Class C LLRW. Consequently, the waste classification system is vital to Utah's low-level radioactive waste management program. Given this importance, we support NRC's proposed "hybrid" approach that allows the use of waste acceptance criteria (WAC) derived from the proposed technical analyses requirements while preserving the use of the existing waste classification system for determining the acceptability of LLRW for disposal at a commercial facility. The proposed hybrid approach will allow Utah the ability to maintain its reliance on the waste classification system in administering its LLRW program.

Although a licensee or license applicant can determine whether to develop waste acceptance criteria as a result of the technical analyses or use the current waste classification system, as

noted in the preamble to the proposed rulemaking, the appropriate regulatory agency, in accordance with the proposed language of § 61.58, will have the authority to approve (or disapprove) the licensee's or applicant's waste acceptance approach.

We believe that the national implementation of the hybrid approach has the potential to create a significant resource impact on a sited state. LLRW generators and brokers will have a choice in commercial disposal options that may differ in their waste acceptance requirements, i.e., waste classification based or waste acceptance criteria based. This has the potential to create some confusion among waste generators and brokers in complying with the applicable waste classification and packaging requirements and may result in added oversight resources for monitoring incoming shipments.

COMPATIBILITY

The rulemaking proposal identifies several changes to the compatibility designation for selected areas of Part 61. As an Agreement State, Utah supports the need for national consistency among state programs. However, it is equally vital to afford states the ability to address and tailor regulatory standards and requirements that are not less stringent than the NRC in order to meet specific or unique needs and circumstances that exist within a state.

Such was the case when the Utah Radiation Control Board adopted two important rule changes related to performance assessments. Both rulemakings are similar in nature to NRC's proposed Part 61 rulemaking. The first rulemaking specifically addresses depleted uranium and the second establishes criteria for when other performance assessments are required—such as LLRW not previously analyzed in the development and adoption of the radioactive waste land disposal requirements. Based on NRC evaluations of the rules, both were determined to meet NRC's criteria of being adequate and compatible.

Specifically, for this proposed rulemaking, UDWMRC requests the NRC to re-designate those areas that are compatibility category B to category C in order to preserve the flexibility necessary to maintain our existing performance assessment rules. This will provide greater public confidence in our efforts to address a proposal to dispose of large quantities of depleted uranium and a separate proposal to dispose of large quantities of wastewater treatment resins near the Class A limits. Similarly, compatibility category C will avoid having to redo, at a significant cost, the technical analyses (performance assessments) now nearing completion. To perform a complete re-evaluation of these analyses within the relatively short time horizons proposed by the rulemaking will not be productive, beneficial, or more protective of health and safety.

POTENTIAL WASTE CLASSIFICATION CHANGES

During the recent public meetings the NRC held in each of the sited states, NRC staff noted that the Commission expressed an interest in receiving comment on the need for a second rulemaking addressing the waste classification system and more specifically, the classification of depleted uranium. We appreciate the Commission's ongoing interest in addressing such an important and

critical matter for Utah with respect to LLRW management in the U.S. The management and disposal of unique waste streams, such as depleted uranium, at commercial facilities places the importance of this matter at the forefront of the regulatory agenda.

While the current approach is to complete the site-specific performance assessment rulemaking before initiating a waste classification rulemaking, we believe it is more reasonable to pursue and complete the waste classification rulemaking, or at least the classification of depleted uranium, in advance of the current site-specific rulemaking. NRC staff have stated the reason for the current sequence of the rulemakings is that completing the site-specific rulemaking will serve to inform the need for and/or determine the scope of the waste classification rulemaking.

However, we believe that the overwhelmingly significant differences in the radioactive characteristics of depleted uranium (tens of thousands of years of increased radioactivity due to progeny ingrowth) and traditional Class A LLRW (one or two hundred years of decreased radioactivity), including other long-lived radionuclides, justifies the need to determine the classification of depleted uranium before completing the site-specific rulemaking. Classifying depleted uranium will actually better inform the site-specific rulemaking since depleted uranium is used so frequently as the primary example of how the site-specific rulemaking proposes to address long-lived radionuclides. The unique nature of depleted uranium compared to all other LLRW, particularly Class A wastes, seems to compel the need for an earlier waste classification action rather than later.

SPECIFIC COMMENTS

§ 61.1 PURPOSE AND SCOPE

During the recent public meetings the NRC held in each of the sited states, NRC staff stated that although no specific changes are being proposed to § 61.1 for the current rulemaking proposal, the requirements of paragraph (a) newly apply to the proposed changes. Although noted above and for added emphasis, UDWMRC concurs with the comments of the Low-Level Waste Forum Part 61 Working Group on this matter.

§ 61.2 DEFINITIONS

COMPLIANCE PERIOD – UDWMRC recommends that the definition for compliance period be revised to indicate that for purposes of applying the required analyses for the performance period, the compliance period is considered to be a minimum of 10,000 years.

§ 61.7 CONCEPTS

While helpful and instructive in setting the context of the Part 61 requirements, the proposed changes emphasize the value of placing this entire section within the accompanying guidance document ("Guidance for Conducting Technical Analyses for 10 CFR Part 61," NUREG-2175). The section could possibly then be retitled and used to reference the guidance document.

The proposed revisions to this section, particularly paragraph (f) regarding waste classification and near-surface disposal, underscore the need to perform the waste classification of depleted uranium in advance of completing this proposed rulemaking. It is clear that depleted uranium does not fit within or is consistent with the waste classification description within this section.

§ 61.12 SPECIFIC TECHNICAL INFORMATION

Paragraph (j)(2) – Requiring the submittal of a "description of the quality assurance program…for the development of technical analyses" is overly broad and ambiguous and will create confusion in its implementation. A suggested revision would be:

"(2) The development of the applicable technical analyses required in § 61.13; and"

§ 61.13 TECHNICAL ANALYSES

Performance Assessment (PA)

From our experience, we recognize the difficulty in conducting a technical analysis over extreme time periods that inherently create a significant level of variability and uncertainty. We appreciate the flexibility in addressing such critical factors. While § 61.13 does not explicitly prescribe the analytical approach (i.e., deterministic vs. probabilistic), the regulatory agency will need the authority to approve (or disapprove) the approach selected by the licensee or applicant.

Paragraph (3) may be difficult to address since a licensee or applicant is required to consider the likelihood of disruptive or other unlikely items.

Paragraph 61.13 (a)(9) "consider alternative conceptual models" How to address and evaluate, as a regulator and how to determine the acceptability of the licensee's or applicant's consideration?

The UDWMRC concurs with the value of performing a site-specific technical analysis since it moves away from a more generic or one-size-fits-all approach and fosters greater confidence in the results.

Exclusions, limits, or boundaries are based on site conditions and critical or key dynamics over the appropriate time periods associated with a given waste. This is especially valid for depleted uranium.

The UDWMRC supports requiring a PA at closure, but only to capture any significant changes such as the source inventory or key dynamics associated with the operational life of the facility, but should not be automatically required if the waste inventory primarily consisted of traditional LLRW envisioned and analyzed at the time of the development of Part 61 (61.28)

Table A – may be difficult to implement due to the likelihood of incorrectly determining the appropriate/applicable waste concentration.

§ 61.41 PROTECTION OF THE GENERAL POPULATION FROM RELEASES OF RADIOACTIVITY

The UDWMRC recommends for those paragraphs where the proposed compatibility category is designated as category A or B to be revised to category C in order to allow the flexibility an Agreement State will need in order to address site-specific needs/conditions, as described in additional detail in the "Compatibility Section" above.

§ 61.42 PROTECTION OF INADVERTENT INTRUDERS

The UDWMRC recommends for those paragraphs where the proposed compatibility category is designated as category A or B to be revised to category C in order to allow the flexibility an Agreement State will need in order to address site-specific needs/conditions, as described in additional detail in the "Compatibility Section" above.

§ 61.58 WASTE ACCEPTANCE

The UDWMRC recommends the compatibility category of this section be revised from the proposed category B to category C in order to allow the flexibility an Agreement State will need in order to address site-specific needs/conditions, as described in additional detail in the "Compatibility Section" above.

Paragraph 61.58(f) – UDWMRC recommends requiring the licensee to prepare a report of the annual review of the required items and submit the report to the Commission (Agreement State) in order to determine the adequacy of the licensee's implementation and determine any necessary revisions.

Paragraph 61.58(h) – As currently written, the proposed changes in paragraph 61.58(h) create at least four important concerns. First, it inappropriately predetermines the outcome of a decision about the use of waste acceptance criteria by using the phrase "will be approved." Second, with the apparent certainty in the approval of the waste acceptance criteria, it limits flexibility and undermines the ability to exercise the option proposed by the hybrid approach, which allows for the continued use of the existing waste classification system. Third, it creates regulatory confusion by implying that with the approval of waste acceptance criteria, application of the waste classification system is unnecessary or even completely moot. Fourth, the reference to applying the criteria of § 61.23 is overly broad and should at least specifically exclude paragraph (h), which addresses financial surety, and is not directly tied to a determination of the approval of waste acceptance criteria. Additionally, given the proposed language in § 61.7, "Concepts," regarding waste acceptance, the reference to using the criteria of § 61.23 is inconsistent. As described in § 61.7, waste acceptance is based on meeting the performance objectives and is not specifically linked to the criteria of § 61.23.

REGULATORY ANALYSIS

In association with the proposed rule changes to Part 61, the NRC prepared a regulatory analysis to evaluate the potential costs of the proposed changes. Based on our experience with evaluating and reviewing a performance assessment for the potential disposal of large quantities of depleted uranium in a near-surface disposal facility, the implementation cost estimate for Agreement States is significantly understated. The NRC should re-evaluate the rationale and assumptions made to determine the implementation costs since such costs can be difficult to cover under state budgets.

As frequently noted in the proposed rulemaking, the various site-specific technical analyses that will be required are complex, complicated and typically encompass large amounts of data and information. Consequently, the resources associated with the review and evaluation process are extensive and easily exceed the estimated costs in the regulatory analysis. Additional implementation costs also stem from public and stakeholder outreach efforts. Perhaps equally important are the potential added costs incurred by a sited state to enhance its compliance oversight of incoming shipments from LLRW generators and brokers that may be confused as to which waste acceptance requirements (waste classification limits or WAC) apply at a given commercial disposal facility.

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Comment On: NRC-2011-0012-0077
Low-Level Radioactive Waste Disposal

Document: NRC-2011-0012-DRAFT-0139
Comment on FR Doc # 2015-06429

Submitter Information

Name: Stephen Taylor

General Comment

Regarding Docket ID NRC-2011-0012

Dear United States Nuclear Regulatory Commission,
I am writing regarding the proposed rule change on Low-Level Radioactive Waste.
I appreciate the opportunity to voice my concerns.

Classifying depleted uranium as Class A waste:
The classification of depleted uranium as Class A was is demonstrably false. That classification is intended for low level nuclear waste that will become benign in a relatively brief period of time. Depleted uranium becomes more radioactive over time.

Considering the chemical toxicity of uranium oxides as equivalent to its present radioactive toxicity:
The present radioactivity of the material is relatively low, of course, but the chemical toxicity of uranium oxides is anything but. Numerous studies available on the internet demonstrate that the toxicity of DU is at best unresolved. In fact, the history of the effect of this material on soldiers and civilians in theaters of war where it has been used for projectiles demonstrates that its long term effects include death and chronic illness and perhaps birth defects. It is unfortunate that the NRC has been amenable to Energy Solutions requests to lessen the protections that the proposed Clive disposal site will afford by a factor of ten, and that unfriendly agencies could fairly easily create conditions leading to the dispersal of finely pulverized DU oxides into the atmosphere. The chemical toxicity of hte material would cause widespread health effects downwind in the heavily populated Wasatch Front communities.

Failing to consider the possibility of terrorist intrusion into the Clive site:

In fact, airborne or rocket intrusion by use of explosives could cause DU to be finely pulverized and expelled into the air, as just stated. The Clive site has no means of protection from such actions.

Lining the excavation with a thin layer of clay:
Such a lining provides a minimum of protection from intrusion by animals, insects and covert personnel action.

Thank you for consideration of the foregoing points.

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 20, 2015

Secretary, U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Rulemakings and Adjudications Staff

Re: Docket ID NRC-2011-0012

Dear Sir or Madam:

The Texas Commission on Environmental Quality (TCEQ) appreciates the opportunity to comment on the United States Nuclear Regulatory Commission's (NRC) proposed revisions to 10 CFR Part 61 provided in Request For Comments on The Draft Proposed Rule: Low-Level Radioactive Waste Disposal (10 CFR PART 61)(RIN 3150-Al92). TCEQ previously advised NRC staff that comments would be submitted.

Enclosed please find the TCEQ's detailed comments relating to the NRC's proposed revisions referenced above. If you have any questions concerning the enclosed comments, please contact Mr. Brad Broussard of the Radioactive Materials Division, at (512) 239-6380, or at brad.broussard@tceq.texas.gov.

Sincerely,

Richard A. Hyde, P.E.
Executive Director

Comments on Proposed Revisions to 10 CFR Part 20 and 10 CFR Part 61
Docket ID NRC-2011-0012

Overview:

The Texas Commission on Environmental Quality (TCEQ) values the opportunity to provide comments on the Nuclear Regulatory Commission's (NRC) proposed revisions to 10 CFR Part 20 and 10 CFR Part 61. The TCEQ supports the proposed changes to 10 CFR Part 20 and has no comments on those revisions at this time.

The TCEQ supports the proposed revisions to 10 CFR Part 61 requiring technical analyses and the associated compliance period, protective assurance period, and performance period. The TCEQ also supports the proposed requirement for development of waste acceptance criteria based on site-specific analysis. There is further support for conducting an intruder analysis and the related dose/dose target for protection of human health. Further, the TCEQ supports identification and evaluation of features, events, and processes (FEPs) and a demonstration of defense-in-depth through engineering design and site characteristics.

The TCEQ has the following comments as noted below in both a general and specific context.

General Comments

The TCEQ suggests adding definitions in the regulations for defense-in-depth and the safety case, which were always present in the performance objectives and facility design and location requirements. This will explain more clearly to the public the methodology used to ensure that a LLRW disposal facility will protect public health and safety while providing a means for taking care of the need to dispose of LLRW waste. The proposed requirements for the licensee to submit a safety case analysis of the LLRW disposal facility that includes a defense-in-depth analysis will clarify and make more transparent to the public the decision-making and analysis necessary in determining that the waste acceptance criteria and the facility design and location will result in the safe disposal of the LLRW.

The proposed changes will allow the use of a performance assessment to determine waste acceptance criteria for waste that was not considered in the original analysis that lead to the current LLRW classification. This will give the states and licensees additional flexibility while maintaining public health and safety. Texas has already employed the use of a performance assessment to determine what concentrations, total activity, and additional restraints are required for the disposal of depleted uranium since the original

waste classification analysis did not include large amounts of depleted uranium and agrees that this methodology should be standard throughout the country.

The proposed three-tiered approach, with staggered dose limits over three time periods of a disposal site, provides a reasonable balance between the need to assess site performance and the inherent uncertainty in predicting dose to the public and intruders very far into the future. The three-tier approach will still allow Texas to analyze the performance of the LLRW disposal facility up to peak dose as is currently required in Texas rules. However, those rules require the compliance period to be 1,000 years or peak dose, whichever is longer. Adopting the proposed compliance period with a compatibility category B may be perceived as a lowering of the standards for radioactive waste disposal. The TCEQ requests that NRC assign those requirements as compatibility category C, as further detailed below.

Specific Comments

1.) Amended Section 61.13(e), Technical Analyses.

61.13(e) states "Analyses that assess how the disposal site limits the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses shall be required for disposal sites with waste that contains radionuclides with average concentrations exceeding the values listed in table A of this paragraph, or if necessitated by site-specific conditions. For wastes containing mixtures of radionuclides found in table A, the total concentration shall be determined by the sum of fractions rule described in paragraph 61.55(a)(7). The analyses must identify and describe the features of the design and site characteristics that will demonstrate that the performance objectives set forth in §§ 61.41(c) and 61.42(c) will be met."

Comment: The TCEQ suggests that the NRC consider removing Table A and references from the proposed rule and move the table to the draft guidance document, NUREG-2175. The TCEQ supports the remaining proposed revisions in 61.13 for conducting technical analyses and the compatibility categories.

2.) Amended Section § 61.41(a), Protection of the General Population From Releases of Radioactivity.

61.41(a) states "Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 0.25 milliSievert (25 millirems) to any member of the public within the compliance period. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable during the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a)."

Comment: The compatibility category for this amended section is proposed to remain unchanged as category A. The TCEQ suggests the NRC consider a compatibility category of C so that Texas can keep the requirement of peak dose or it may be perceived as a lowering of the standards for radioactive waste disposal. This will allow Texas to retain the flexibility in regulations more stringent than the NRC.

3.) **New Section § 61.41(b), Protection of the General Population From Releases of Radioactivity.**

61.41(b) states "Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals shall be minimized during the protective assurance period. The annual dose, established on the license, shall be below 5 milliSieverts (500 millirems) or a level that is supported as reasonably achievable based on technological and economic considerations in the information submitted for review and approval by the Commission. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a)."

Comment: The TCEQ suggests removing "established on the license." Since this will already be stated in the rule there is no need to state it in the site's license as well. Also, this new section is being proposed with a compatibility category B. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.41(b) and will be consistent with the compatibility category in 61.13.

4.) **Amended Section § 61.42(a), Protection of Inadvertent Intruders.**

61.42(a) states "Design, operation, and closure of the land disposal facility must ensure protection of any inadvertent intruder into the disposal site who occupies the site or contacts the waste at any time after active institutional controls over the disposal site are removed. The annual dose must not exceed 5 milliSieverts (500 millirems) to any inadvertent intruder within the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b)."

Comment: The compatibility category for this amended section is proposed to be changed from compatibility H&S to compatibility category A. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.42(a) and will be consistent with the compatibility category in 61.13.

5.) **New Section § 61.42(b), Protection of Inadvertent Intruders.**

61.42(b) states "Design, operation, and closure of the land disposal facility shall minimize exposures to any inadvertent intruder into the disposal site at any time during the protective assurance period. The annual dose, established on the license, shall be below 5 milliSieverts (500 millirems) or a level that is supported as reasonably achievable based on technological and economic considerations in the information submitted for review and approval by the Commission. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b)."

Comment: The compatibility category for this new section is proposed to be compatibility category B. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.42(b) and will be consistent with the compatibility category in 61.13.

6.) **Revised Section § 61.58 Waste acceptance.**

61.58 states *"Waste acceptance criteria.* Each applicant shall provide, for approval by the Commission, criteria for the acceptance of waste for disposal that provide reasonable assurance of compliance with the performance objectives of subpart C of this part. Waste acceptance criteria shall specify, at a minimum, the following:...."

Comment: The compatibility category for this amended section is proposed to be changed from compatibility D to compatibility category B. The TCEQ suggests that the NRC consider changing the compatibility to category C. This will allow the sited states greater flexibility in meeting the requirements proposed in 61.58.

RulemakingComments Resource

From: Gabriel Bohnee <gabeb@nezperce.org>
Sent: Thursday, July 30, 2015 12:25 PM
To: RulemakingComments Resource
Cc: Amanda Rogerson; David Bernhard
Subject: [External_Sender] Nez Perce Tribe ERWM comments
Attachments: Docket ID NRC-2015-0003 LLW Disposal Comments from NPT ERWM.pdf

Attached are the Nez Perce Tribe's Environmental Restoration and Waste Management Division's comments on the Proposed Rule for Low-Level Radioactive Waste Disposal.

Nez Perce
ENVIRONMENTAL RESTORATION & WASTE MANAGEMENT
P.O. BOX 365 • LAPWAI, IDAHO 83540-0365 • (208) 843-7375 / FAX: 843-7378

July 29, 2015

Cindy Bladey, Chief Rules, Announcements, and Directives Branch (RADB)
Office of Administration Mail Stop: 3WFN-06-A44M
U.S. Nuclear Regulatory Commission
Washington DC 20555-0001

Re: *Comments on Docket ID NRC-2015-0003, proposed changes to Low Level Waste Disposal*

Dear Ms. Bladey:

The Nez Perce Tribe appreciates the opportunity to comment on Proposed 10 CFR Part 61 Technical Requirements and Guidance. The Nez Perce Tribe is committed to protecting, preserving, and perpetuating the natural resources on which our people have depended since time immemorial. These resources are critical to our cultural and economic survival. When these resources are contaminated or lost, part of our connection to the land, and hence part of our culture, is lost. The Tribe relies on NRC, as our federal fiduciary trustee, to protect the Nez Perce Tribe's treaty resources.

The Tribe largely agrees with the changes NRC has made. Many of the changes will ensure the safe disposal of low-level radioactive waste. The Tribe does have two core concerns regarding the proposed changes, however. The Tribe is concerned that the proposed changes constitute a relaxation of exposure standards for tribal members and the general public for commercial, near-surface Low Level Radioactive Waste (LLRW) disposal facilities for the timeframe that begins 1,000 years after closure and extends for the subsequent 9,000 years. This relaxation increases "acceptable" exposure limits approximately twenty fold from the previous standard, and potentially prohibits the full, safe utilization of natural resources by tribal members and the general public during that time period. In addition, the changes, in some instances, allow the near-surface disposal of large quantities of depleted uranium, which has been proven unsafe, by NRC's own analysis. The previous standards would require large quantities of depleted uranium to be disposed at a deeper site like the Waste Isolation Pilot Plant (WIPP) and not in near-surface LLRW disposal facilities, especially when a time frame greater than 10,000 years is considered.

The Tribe appreciates your consideration of our comments and a timely response. Please contact Gabriel Bohnee, ERWM Director, at (208) 621-3746 or gabeb@nezperce.org,

with any questions on these comments. We look forward to an inclusive, open decision-making process with the goal of protecting the Nez Perce Tribe's retained treaty rights and the Columbia River.

Sincerely,

Gabriel Bohnee
ERWM Director

Cc: Rod Skeen, CTUIR
Russell Jim, YIN
Ken Niles, Oregon
Dennis Faulk, EPA
Jane Hedges, Ecology

RulemakingComments Resource

From: Marv Lewis <marvlewis@juno.com>
Sent: Sunday, August 02, 2015 5:02 PM
To: Comfort, Gary; maryo@nirs.org; dianed@nirs.org; RulemakingComments Resource; janetmike@comcast.net
Subject: One comment on 10cfr61 rulemaking.

Dear Mr. Comfort,
Thank you for allowing me to get one ,last comment in on this rulemaking .
My point is that the proposed rule will mesh in an unfortunate timing with the TPP, Transpacific Partnership treaty, to force the USA to become the National Sacrifice area for the dumping of low level radioactive waste from the entire World!
Respectfully submitted,
Marvin Lewis
marvlewis@juno.com
3133 Fairfield Street
Philadelphia, PA 19136
2152789963

D H E C
PROMOTE PROTECT PROSPER
Catherine E. Heigel, Director
Promoting and protecting the health of the public and the environment

July 28, 2015

The Honorable Stephen G. Burns, Chairman
U.S. Nuclear Regulatory Commission
c/o Annette Vietti-Cook, Secretary
Washington, DC 20555-0001
ATTN: Rulemakings and Adjudications Staff

RE: Comments on Proposed Rule 10 CFR Parts 20 and 61, Low-Level Radioactive Waste Disposal, Docket ID NRC-2011-0012 (80 FR 16082)

Dear Commissioner Burns:

Thank you for the opportunity to comment on the proposed amendments to the regulations that govern low-level radioactive waste ("LLRW") disposal. The proposed rule amends the regulations to ensure the safe disposal of previously unanticipated waste streams, including large quantities of depleted uranium, that are significantly different from the waste streams considered in the current regulations.

South Carolina is one of four states in the country that have a commercial LLRW disposal facility. This facility is located in Barnwell, South Carolina ("Barnwell Site" or "Site") and is operated by Chem-Nuclear Systems, LLC ("CNS"), a wholly owned subsidiary of Energy*Solutions*. The Barnwell Site occupies approximately 235 acres of land owned by the state and leased to CNS under a 99-year lease agreement. The Barnwell Site has operated since 1971 under a license to allow for near surface disposal of LLRW, and currently accepts Class A, Class B, and Class C wastes from generators in the Atlantic Compact whose members include South Carolina, New Jersey, and Connecticut. CNS accepts waste from nuclear power plants, universities, and other industries.

Eighty-six percent of the acreage at the Barnwell Site has been closed in accordance with existing regulations. Disposal operations for the remaining portion of the Site are projected to end in 2038. The Site has disposed of depleted uranium in the past but does not intend to accept large quantities of depleted uranium in the future. Those portions of the Site where depleted uranium was disposed of have been closed at considerable cost to the Decommissioning Trust Fund.

The South Carolina Department of Health and Environmental Control ("Department") is concerned that the proposed regulations will adversely impact our State. South Carolina would be subject to unnecessary economic burden from implementing the proposed regulations, which are intended for operating facilities that manage unique waste streams, not sites that have largely been closed such as the Barnwell Site.

If the proposed rule is implemented as currently written, it will essentially undermine the spirit of the rulemaking process, since it will in effect be changing the rules in the middle of the game. The Department believes that the current regulations ensure the adequate protection of health and the environment for traditional LLRW, as long as the waste classification system is followed.

What appears to have been a proposed rule that was limited in scope to address the acceptance of large quantities of depleted uranium and other unique waste streams has expanded into a much more complicated rule that could lead to unnecessary burdens and potentially severe consequences for the State. We ask that you reconsider this proposed rule and provide a specific exclusion for existing facilities that are not pursuing the disposal of the unique waste streams for which the proposed rule was originally intended.

Thank you for your assistance with this important matter. The Department commends the Commission and its staff for all its hard work and your commitment to protect the environment and the health of our citizens. My staff has submitted comments under a separate cover. We look forward to your response.

Sincerely,

Catherine E. Heigel

Catherine E. Heigel

RulemakingComments Resource

From: ed trever <trev.ed@gmail.com>
Sent: Saturday, July 25, 2015 12:55 AM
To: RulemakingComments Resource
Subject: [External_Sender]

It is critical for the NRC to maintain tough standards for radioactive waste. Any safety assessments should be made by an entity that does not have a clear conflict-of-interest of a close relationship with waste dump operators. States should not be prevented from setting their own, stricter safety standards, especially in denser population areas.

Please keep the general public's interest at heart.

To The Commissioners of the NRC
From MARVLEWIS@JUNO.COM
RE NRC-2011-0012 & NRC-2015-0003
LLRW DISPOSAL

Dear Chairman & Commissioners,
Please accept the following comments on the Proposed Rule.

1 – The FRN & other documents do not give a good estimate of how much LLRW will issue. The accidents @ Fukushima show that melt thru "China Syndrome" will and has occurred. The LLRW amounts have not been determined. The new treaty "Trans Pacific Partnership" may well require states to take vast amounts of LLRW & Where is this scenario address in FRN?

2 – "costs" What will happen to land values when massive amounts of LLRW must be

disposed of? Will National Sacrifice areas cause ~~livable~~ Liveable land areas to become excessively expensive beyond economic use for agriculture?

My reading of "blending" suggests that manipulation of numbers and geological testing can result in "errors" in land disposal. We can hope that the danger is no greater than that of using wheat for Kitty litter at Carlsbad!

Respectfully submitted,

Marvin I. Lewis
R.P.E. (Retired)
3133 Fairfield St.
Phila. PA 19134

RulemakingComments Resource

From: Barbara <warrenba@msn.com>
Sent: Monday, September 21, 2015 2:58 PM
To: RulemakingComments Resource; Gallagher, Carol
Subject: [External_Sender] Final Comments LLRW Disposal Docket ID NRC-2011-0012
Attachments: Final Comments NRC proposed rule 10 CFR 61 Sept. 21. 15.pdf

We are submitting Final Comments on this Proposed Rule 10 CFR Parts 20 and 61.

On behalf of multiple organizations,

Barbara Warren, RN,MS

**Alaska Community Action on Toxics * Beyond Nuclear *
Alliance for A Green Economy * Citizens' Environmental Coalition *
Dr. Whyte Pediatrics * Citizens to End Nuclear Dumping in Tennessee*
Nukewatch * Coalition on West Valley Nuclear Wastes *
Empire State Consumer Project * Nuclear Age Peace Foundation *
Long Branch Environmental Education Center * Uranium Watch*
New York Public Interest Research Group *
Sierra Club Atlantic Chapter * Sierra Club Niagara Group ***

September 21, 2015

Nuclear Regulatory Commission
Washington, DC 20555-0001

Submitted via website and Email
Rulemaking.Comments@nrc.gov

Re: Docket ID NRC-2011-0012; NRC-2015-0003;
RIN 3150A- 192
Low-Level Radioactive Waste Disposal
NRC proposed rule 10 CFR Parts 20 & 61

Summary

We appreciate the granting of our extension request on this important proposed rule. Unfortunately, the NRC proposal misrepresents the nature and significance of the proposal in order to evade what should be the normal process of review. NRC offers the fact that it is promulgating requirements for more technical analysis from applicants and licensees to ensure safety. The safety conclusion was arrived at without analyzing the increased radioactive hazard, involving potentially one million metric tons of long lived radionuclides being handled by careless disposal. This conclusion does not protect the public for the long term.

While we have supported earlier comments by the Nuclear Information and Resource Service, these comments are focused on why a Full Environmental Impact Statement is necessary under the National Environmental Policy Act, NEPA. The nature of the hazard for thousands or millions of years into the future, its size, potential magnitude of severe impacts and the limited recommended protections for just a fraction of the hazard time period, require far more careful analysis than an Environmental

Assessment can provide. The finding of no significant impact is not supported by the actual proposal and its clear potential of harm.

Furthermore, NRC's proposal undertakes risk management in the absence of the required risk assessment, which is standard in federal policy development and NRC itself identified as necessary for its LLRW program in 2012. We also identify other required considerations that were not undertaken by NRC—children's health, environmental justice and climate change.

Detailed Comments

A full Environmental Impact Statement is necessary to address the many concerns raised by this proposal. Below we discuss some of the rationale that support the necessity of an EIS (see bullets below) , however we acknowledge that we are not planning to highlight every issue, only the major areas that required a more thorough analysis.

- This is a major federal action involving potentially over a million metric tons of radioactive waste and depleted uranium including long- lived radionuclides that are still present thousands, even millions of years after the 10,000 year protective assurance period ends. The Agency has provided no analysis of health and environmental impacts in this proposal and there clearly was no analysis for the long time frame post 10,000 years in which hazardous long lived radionuclides will largely be ignored. This stands in stark contrast to the fact that the proposal is talking about requiring analyses from applicants and licensees to license or expand a disposal site and operate it.

- This federal action largely requires states to accept this regulatory plan by agreeing to adopt the entire plan in order to be compatible with what NRC proposes. This certainly restricts states' rights to utilize more health protective standards or to factor in local or regional issues of concern. It also underestimates overall state costs by calculating only the implementation costs of the rule --- not the long term management of a hazardous site and preventing public health and environmental impacts. The implementation costs appear to be focused on the costs for the private entity obtaining a license. As a result the estimated costs of $2.1 million for all states in no way reflects the true long term costs for states. Why would any state agree to this plan unless they are completely duped by orchestrated misinformation?

- The implications of the Public- Private nexus was not explored and evaluated in the proposal. The NRC tells us that states or the federal government would have to be the owners of the disposal site, but the proposal assumes that a private entity would operate the disposal site. The transfer of the site to the owner would occur approximately 5 years after site closure, although the Commission could even shorten this period. Thus the site owner would likely bear 95% of costs of the more than 11,000 years of site management that will be necessary. The alternative, of no public health protections is ethically unacceptable. Amazingly no detailed financial assurance requirements were discussed related to the private disposal operator. This suggests that the operator will be able to earn profits for perhaps a few decades and then transfer all responsibilities and all potential future environmental and health impacts with no funds to do the job. Of course this also means that taxpayers will be paying the true costs that are the result of the inadequate analysis associated with this proposal.

- In fact the entire Part 61 proposal relies on the private sector to conduct a variety of technical analyses that establish the stability of a surface disposal site and its ability to contain radioactive waste without releasing it to the environment. A private entity with interest in short term profits has a built in conflict of interest in relation to society's goals for long term protection of the environment, drinking water, and public health. Strict compatibility with this new Part 61 requires states to assume liability, but they are not provided with any opportunity in this proposal to have stronger financial assurance requirements or to adopt stricter standards that go above and beyond what NRC is recommending. State authority to be more protective must be retained for the viability and credibility of the facilities. The pros and cons of this approach should have been evaluated in a thorough EIS. In addition there should have been some discussion in an EIS of what happens if states don't agree to this deal.

- An enormous loophole in the NRC proposal exists concerning the federal Department of Energy—a loophole that has had no environmental review. IF DOE is the site owner, the entire proposal falls apart—with absolutely no substitute or alternative management post site closure. This loophole alone should have necessitated a full EIS. Yet the entire subject is dealt with in a small paragraph in the proposed rule §61.7 g) (4). If DOE is the site owner, the license is terminated after site closure because NRC has no authority over DOE. No further explanation is provided. Given the enormity of the DOE complex of

radioactive facilities, DOE is likely to be the site owner of many of the disposal sites contemplated in this rule. The absence of a joint promulgation of this rule or announcement of DOE's intention to agree to NRC's compatibility requirements means that we potentially have a proposal to officially deregulate vast quantities of long-lived radioactive waste with no entity responsible to protect the public. DOE has major responsibilities over many radioactive waste generator activities, nuclear production facilities, weapons work and cleanup and remediation of a vast complex of contaminated sites. DOE will certainly be contributing waste to the disposal sites contemplated in this proposal, but if DOE is the owner, there will be no 1000 year compliance period, no performance assessment period and no protective assurance period of 10,000 years. For this reason alone, the NRC proposal must be abandoned as unacceptable.

- Climate change was not considered when the original 10 CFR Part 61 was adopted December 27, 1982. Thirty-three years have passed since that time. Climate change is now a significant issue internationally, nationally and at the state and local levels. President Obama has signed a number of Climate Change Executive Orders, some with specific requirements for Federal Agencies to take account of climate change (both mitigation and adaptation) in the specific areas of their work and in relation to facilities they manage. Not only do we know that urgent action is needed on climate change to reduce greenhouse gas emissions before a runaway and uncontrollable situation occurs; it has also been made clear that climate change impacts are occurring NOW. Notably the NRC has a particularly brief and weak Climate Change Adaptation Policy Statement, issued in June, 2011. This proposal fails to address Climate Change factors that should be considered associated with this proposal.

  The LLRW proposal identifies that "Many features, events and processes can influence the ability of a LLRW disposal facility to limit releases of radioactivity to the environment." Unfortunately, the proposed rule fails to define "features, events and processes" so that climate change is included and its multiple potential impacts appropriately evaluated in order to ensure that protective measures are instituted. We know for example that the occurrence of extreme rainfall events has increased by 74% in the Northeast of the US. Extreme rainfall events accelerate erosion, cause landslides, and flood surface disposal sites – with the potential to release radioactive materials. Other areas of the US are more vulnerable to drought and wildfires and fires have been raging in the West and

Southwest destroying millions of acres. Radioactive waste stored at Los Alamos was actually threatened by wildfire recently.

The magnitude and frequency of severe events associated with climate change have increased dramatically. There is no indication in this proposal that applicants and licensees will be required to factor in climate change in any of their technical analyses, since climate change is not discussed at all and no EIS has evaluated the implications of climate change on surface disposal of radioactive materials.

- There are few specific requirements in the proposal, other than the idea that an applicant or licensee must conduct technical analyses. NRC is proposing disposing of dangerous, long term hazardous materials in clearly inadequate surface disposal facilities that cannot be expected to last over the periods necessary. NRC leaves the type of analysis open to the applicant, although suggesting qualitative and quantitative analyses. Primarily site factors are listed, but this proposal is unlike even EPA's municipal landfill rule for non-hazardous solid waste, which clearly identifies prohibitions to siting a landfill. There are no prohibitions here such as for protection of an aquifer. There are no explicit requirements for barriers to prevent radioactive releases. Shallow land burial of nuclear waste has been a failure across this country—all 6 of the original "low-level" nuclear waste sites have leaked or are leaking. States are paying to maintain them in perpetuity. The "new" proposed 10 CFR 61 still allows unlined soil trench burial for wastes that are dangerous much longer than the ground in which they are buried will continue to be solid and stable. NRC really needs to be strengthening the regulations—requiring greater integrity and isolation of the waste. Instead the proposed rule allows even more dangerous and longer lasting waste into inadequate waste sites. NRC should be providing requirements and incentives for greater isolation. This proposal is talking about surface disposal but provides no requirements or specifications for robust barriers and structures to limit rainfall infiltration and in fire prone areas, possibly concrete covers.

  We do not believe that adequate review of all of these technical analyses will occur for a variety of reasons. Each applicant or licensee will choose their own model and their own inputs, making it difficult for states and federal agencies to thoroughly review the accuracy and validity of the results. Standardization could help but not eliminate this problem. The NRC, in the absence of any plan to

verify or conduct vigorous enforcement, is placing complete reliance on these technical analyses to claim that Radioactive Releases and Public Health Impacts will not occur. However, thorough review is absolutely essential with full knowledge of the input parameters on the part of the reviewer, and the opportunity for independent review by the public. We strongly oppose this proposed rule. Based on the weakness of this proposal, we have no confidence that the NRC's version of reasonable assurance that performance objectives will be met from these technical analyses would match that of any "reasonable and prudent" person.

- The so-called inadvertent intruder is also the subject of a licensee analysis. However, an inadvertent intruder is not defined. This proposal assumes there will be no barriers and signage that might cause an intruder to hesitate. Even though requirements for such may not be enforceable, and should certainly not counted as credit in performance assessments, NRC should require barriers, signage and institutional controls for the entire time period necessary for full decay of the radionuclides. It is bizarre to talk about an inadvertent intruder as being someone who might undertake home construction or engage in agricultural activities. This person is someone taking up long term residence or farming activities and much more likely to have higher exposure levels than an inadvertent or unintentional intruder. Building a house requires a property title search which should indicate that a long term hazard exists at the site. Is NRC suggesting that you will require no records to be kept of what was put in these sites and how long it will be dangerous?

  Clearly institutional controls are needed for much longer than 100 years if the disposal facility contains long lived radioactivity. If an EIS had been prepared maybe we would not be guessing about what NRC intends.

- Public health impacts are actually certain to occur under this proposal given that there is no articulated plan to restrict site access and no plan for any management after site closure if DOE is involved. Using an exposure limit of 500 millirems/year is also guaranteed to result in public health impacts. The rule allows greater than 500 mr/year in some cases. However, the NRC failed to conduct any health and environmental analyses themselves associated with the likely radioactive releases and public health impacts that will occur. We strongly object to the granting of exemptions or relaxation of standards related to

technical or economic considerations, when there has been no assessment of the public health and environmental impacts. NRC also makes specious claims that the proposed technical analyses by licensees will fully protect the public and there was no factual basis developed to support this idea in the absence of an EIS.

- **Children's Health** Risk assessments address not only the hazard but also the populations impacted and whether there exist particular vulnerabilities. NRC did not do a risk assessment and did not evaluate for example the unique vulnerability of children, which is required under the Executive Order on the Protection of Children from Environmental Health Risks and Safety Risks, signed on April 21, 1977. This Executive Order requires all federal agencies to assign a high priority to addressing health and safety risks to children, coordinate research priorities on children's health, and ensure that their standards take into account special risks to children. The Order also created a President's Task Force on Environmental Health Risks and Safety Risks to Children to implement the Executive Order.

  The nature of the hazard is critical to this discussion. We are talking about radioactivity which damages genes, causing mutations and affecting reproduction, in addition to a long list of other organ and system impacts. Some of the radionuclides are long-lived and therefore can affect many generations into the future. The health of our children and of the whole reproductive part of the human life cycle is critical to the survival of humans as a species. The required consideration of children did not occur.

  Environmental Justice is addressed in Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The Order states that federal agencies must identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. These communities often experience high pollution levels as well as inadequate oversight and enforcement from environmental agencies. We challenge NRC to identify a radioactive waste disposal site in a wealthy community. In fact we know that any new radioactive disposal facility will be located in some sort of disadvantaged community.

Multiple pollution burdens contribute to public health disparities based on race, ethnicity and income level. The consideration of vulnerable populations was not included. An environmental impact statement is necessary to accomplish this objective.

- **Intergenerational Injustice**
  This proposal involves massive quantities of radioactive waste that must be isolated from humans for thousands to millions of years and thus many generations. Yet the proposal contemplates short term operation of a disposal facility with the subsequent transfer to the government. No funding or details about the thousands of years of government management are provided. What is provided is very troubling—in the case of DOE the license is merely terminated. In the case of states, how are we to ensure the management over thousands of years? Few governments have existed continuously for a 1000 years yet we are talking about greater than 10,000 and possibly a million years of management. Very recently states experienced extraordinary economic problems as a direct result of financial deregulation. What amount of funds should be put aside for long term future management of these disposal sites and protection of future generations?

  In the absence of analysis we are merely transferring enormous hazards and cost consequences to our children and grandchildren along with no funds for them to manage the risks.

Risk Assessment & Environmental Review are necessary to develop an adequate Risk Management program. In this proposal NRC is starting with what should be the end result: the risk management program.

Risk Assessment is an essential foundational element for developing and undertaking to manage risks, such as through a performance assessment program. The current proposal was not risk-informed. In fact, the NRC ignored earlier Agency recommendations regarding the development of a stronger risk basis for LLRW. The current NRC proposal primarily advances risk management in the absence of the needed first step, which is Risk Assessment.
The Agency did make a finding regarding the need for a "stronger risk basis to the program" for LLW disposal in its report in 2012 from the Risk Management Task Force

(RMTF). [1] Several products were supposed to be produced as a result. However, we find no discussion of the development and finalization of a stronger risk basis in this current proposal.

The Agency also proposed to "help ensure that current and future regulatory initiatives had a stronger, more well-defined risk basis" mentioning at the same time planned revisions to 10 CFR 61. The current proposal is a regulatory initiative. A stronger risk basis would mean producing a risk assessment. Yet despite the apparent adoption of the 2012 recommendations, the Agency did not develop a risk assessment to inform its proposed risk management plan, which is primarily reliant upon a performance assessment.

Defense In Depth

According to the NRC, defense- in-depth is only implicitly contained in the revised Part 61 proposal. We believe that a factual basis is needed to support the conclusion that this proposal constitutes defense in depth. Merely saying that defense in depth is present implicitly, without a detailed discussion of the key elements and how they interact to provide layers of defense in depth over the various time periods involved, is simply insufficient. Also fundamental to developing defense methods is adequate assessment of the risks; this is an integrated process involving extensive feedback.

The RMTF did find that "NRC has not developed an explicit characterization of defense-in-depth considerations for the LLW program." The Task Force also recommended that NRC develop an explicit characterization of how defense-in-depth within the proposed risk management framework applies to the LLW program and build this into current and future staff guidance documents and into training and development activities for the staff."[2]

The RMTF also found that "Consideration of environmental risks as well as safety risks is a central part of the LLW regulatory program." It recommended that the NRC " include environmental reviews within the scope of its risk management framework."

A thorough environmental review in a full environmental impact statement would appear to be indicated for the many reasons provided above. We do not believe this

[1] A proposed Risk Management Regulatory Framework, from the Risk Management Task Force, NUREG-2150, April 2012.

[2] Ibid, Section 4.4

proposal should be finalized. It is not acceptable and we have only covered a few of the reasons.

Conclusion

Our nation has failed to grapple effectively with the problems connected to the nuclear era and the development of the nuclear bomb. Massive quantities of nuclear waste are generated in the entire nuclear chain from the mining of fuel to the use and disposal of nuclear waste. All things "nuclear" create radioactive waste. A few decades of fuel in a nuclear reactor requires millions of years of isolation. We have NO solutions for this waste. The nation has no long term repository and by 2050, we will need 2 repositories.

Careless handling of nuclear waste has created many environmental releases and catastrophes. In 6 years, a private entity, Nuclear Fuel Services, so contaminated the West Valley Nuclear Reprocessing site in NY that more than 40 years later there is no end in sight for the cleanup, while burial areas threaten to dump their contents to waterways leading to the Great Lakes and the drinking water for millions. Annually there is a battle over adequate funds to continue the cleanup, which will not be completed in the lifetime of any of those participating. One of the nation's disposal sites – WIPP- is now out of service after it suffered a catastrophic explosion, closing it to transuranic waste. This particular catastrophe occurred because multiple layers of protective barriers, and operational requirements were systematically discontinued, as a result of budget cuts, weakening the protections previously deemed necessary.

At the same time, we are generating more nuclear waste by refurbishing weapons, building new nuclear facilities and importing nuclear waste originally provided to other countries. In the name of repatriation we are also re- acquiring this waste to be managed for millions of years.

The current nuclear system and its waste are not sustainable. Over the years our agencies have weakened public health and safety requirements in multiple ways. As the waste quantities grow, the costs also grow, and it is impossible to find a nuclear facility, dump or other operation that is not leaking, or posing serious safety and health threats. Declassifying hazards, weakening standards, relabeling, and disposing of massive volumes of highly hazardous radioactive materials will increasingly contaminate our world and impact habitability. This NRC proposal reflects more of the same irresponsible approach to our nuclear waste problem. This approach must be ended in favor of one that values the earth and future generations.

Respectfully submitted,

Barbara Warren, RN, MS, Executive Director
Citizens' Environmental Coalition
Albany, NY

Judy Braiman
Empire State Consumer Project
Rochester, NY

Pamela Miller, Executive Director
Alaska Community Action on Toxics
Anchorage, Alaska

Kathleen Ferris
Citizens to End Nuclear Dumping in Tennessee
Tennessee

Paul Gallimore, Director
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Albany, New York

Kevin Kamps
Radioactive Waste Watchdog
Beyond Nuclear
Takoma Park, Maryland

Jessica Azulay
Director
Alliance for a Green Economy
Syracuse, New York

urenco

SEP 15 2015

LES-15-00159-NRC

Attn: Document Control Desk
Director, Division of Security Operations
Office of Nuclear Security and Incident Response
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Supplemental Comments of URENCO USA on NRC "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012), 80 *Fed. Reg.* 16081 (March 26, 2015)

References: 80 Federal Register 51964, Dated August 27, 2015

In accordance with the guidance set forth in the Reference, Louisiana Energy Services (LES), dba URENCO USA (UUSA), submitted comments to the 10 CFR 61, Low-Level Radioactive Waste, proposed rulemaking on September 15, 2015. As allowed in the Reference, UUSA's comments were submitted via the website *http://www.regulations.gov*.

The supplemental comments submitted by UUSA are enclosed.

Should there be any questions, please contact, Amy Johnson, Licensing and Performance Assessment Manager at 575.394.6203.

Respectfully,

Jay Laughlin
Chief Nuclear Officer and Head of Operations

Enclosure: UUSA Supplemental Comments on 10 CFR 61 Proposed Rulemaking

cc:

Annette L. Vietti-Cook
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001
ATTN: Rulemakings and Adjudications Staff

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Enclosure

UUSA Supplemental Comments on 10 CFR 61 Proposed Rulemaking

Annette L. Vietti-Cook
Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001
ATTN: Rulemakings and Adjudications Staff

Subject: Supplemental Comments of URENCO USA on NRC "Low-Level Radioactive Waste Disposal; Proposed Rule" (RIN 3150–AI92; Docket ID NRC–2011–0012), 80 *Fed. Reg.* 16081 (March 26, 2015)

On March 26, 2015, the Nuclear Regulatory Commission published a proposed rule to amend its regulations in 10 C.F.R. Part 61 governing low level radioactive waste (LLRW) disposal facilities. URENCO USA (UUSA) submitted comments on the proposed rule on July 23, 2015 (Comments) and also participated in the Commission briefing on the rulemaking on June 25, 2015. The initial comment period closed on July 24, 2015, but on August 27, 2015, the NRC reopened the comment period for the proposed rule until September 21, 2015. 80 *Fed. Reg.* 51964. UUSA submits these supplemental comments in accordance with the NRC's notice reopening the comment period in order to address some recent developments.

Subsequent to submitting our Comments, UUSA became aware of separate NRC Part 61-related activities involving Greater-Than-Class C (GTCC) waste disposal. *See* SECY-15-0094, "Historical and Current Issues Related to Disposal of Greater-Than-Class C Low-Level Radioactive Waste," dated July 17, 2015. SECY-15-0094 addresses the disposal of GTCC in a LLRW disposal facility and a potential new rulemaking to amend Part 61.

In light of this new development, UUSA would like to supplement its Comments based on the release of SECY-15-0094. The new activities on GTCC waste disposal, like the two separate ongoing Part 61-related activities discussed in our Comments, could significantly affect UUSA and underscores the point that the NRC should not approach these Part 61-related activities in a piecemeal manner. UUSA recommends that the NRC pursue all three Part 61-related activities in a coordinated manner as discussed below.

Need for Integrated Approach to Part 61 Rulemaking Activities

In its Comments, UUSA recommended that the NRC should take an integrated approach to the Part 61-related rulemaking activities. The NRC's present Part 61 rulemaking came about as a result of the licensing of the UUSA facility, during which a number of issues were raised about the appropriate disposal of large quantities of depleted uranium (DU) from uranium enrichment facility operations, including whether DU should be treated as GTCC waste. In the contested hearing during UUSA facility licensing, the intervenors proposed one contention that challenged whether DU was low-level waste and could be disposed of in a LLRW disposal facility, and another contention that challenged the NRC's evaluation of the impacts of DU disposal in the Environmental Impact Statement for the UUSA facility. For both contentions, the intervenors argued that DU should not be disposed of as Class A waste, but instead should be disposed of as GTCC waste.[1]

[1] *Louisiana Energy Services* (National Enrichment Facility), CLI-05-20, "Commission Memorandum and Order" at 5-6 (Oct. 19, 2005) (summarizing intervenors' arguments).

In *Louisiana Energy Services* (National Enrichment Facility), CLI-05-05, the Commission determined that the GTCC waste argument was irrelevant to the issue of whether DU was low-level waste, but further stated that "[a] more difficult question—and one we need not answer today—concerns whether the LES material, in the volumes and concentration proposed, will meet the Part 61 requirements for near-surface disposal."[2] In a subsequent decision, *Louisiana Energy Services* (National Enrichment Facility), CLI-05-20, the Commission ruled that the intervenors' GTCC waste argument was an impermissible challenge to the NRC's regulations.[3] Nonetheless, the Commission also directed the NRC staff to evaluate outside of the adjudicatory proceeding whether the disposal of DU from enrichment facilities warrants amending the Part 61 waste classification tables.[4]

The NRC staff's original Part 61 rulemaking efforts in response to the Commission's directive were subsequently expanded and bifurcated into the present rulemaking addressing technical analyses and disposal criteria and a separate waste classification rulemaking. Now with SECY-15-0094, it appears that the NRC staff is introducing a *third* but related rulemaking action involving GTCC and TRU waste disposal.

All three Part 61-related activities could have a significant impact on the disposal of DU from the UUSA facility, with significant adverse financial impacts on UUSA. However, UUSA is at a disadvantage in evaluating SECY-15-0094 and any activities that may come from it because the NRC has yet to resolve the waste classification issue to determine how DU from enrichment facilities should be categorized. If, contrary to our expectations, the end result of the NRC's activities is that the DU should be treated as GTCC waste, then UUSA would have a significant interest in the NRC's activities proposed in SECY-15-0094. Because the potential new rulemaking activities are being addressed on a separate track, UUSA has difficulty evaluating whether the NRC's GTCC waste disposal activities will affect us. This result underscores the problem with the NRC not evaluating all its Part 61-related rulemaking activities in a coordinated manner.

In September 2014, the Commission directed the staff in SRM-M140918 to provide a paper on the NRC's regulatory history on GTCC waste disposal. The NRC staff submitted SECY-15-0094 to respond to the Commission request, as well as to seek Commission approval of the staff's recommendation to allow the State of Texas to license the disposal of GTCC waste.[5] Resolution of this issue, the staff explained, would support a response to the Texas Commission on Environmental Quality's January 2015 inquiry regarding whether it possesses the authority to license GTCC waste disposal. SECY-15-0094 at 1. In response to Texas' inquiry, the staff conducted a jurisdictional analysis into the regulation of GTCC waste disposal and presented three options for the Commission to consider in SECY-15-0094. Two of the three options, including the staff's recommended option, would dedicate NRC staff resources to approval of a disposal path for GTCC waste at a Texas facility.

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[2] *Louisiana Energy Services* (National Enrichment Facility), CLI-05-05, "Commission Memorandum and Order" at 16-17 (Jan. 18, 2005).
[3] *Louisiana Energy Services* (National Enrichment Facility), CLI-05-20, "Commission Memorandum and Order" at 18.
[4] *Id.* at 17.
[5] This matter was not part of the Commission's SRM and was first raised by the State of Texas in January 2015. There was no notice that this issue would be combined with the staff's response to the SRM.

Two noteworthy issues arise as a result of SECY-15-0094. First, the NRC may be over simplifying the GTCC waste disposal matter by characterizing it as merely a jurisdictional issue between the NRC and Agreement States. Among other things, such a narrow view could curtail the opportunity for informed stakeholder participation on this issue. In this regard, like the Nuclear Energy Institute, who commented at a recent Commission briefing on GTCC, we agree that further public meetings would be valuable before a final decision on how to proceed is made.

Second, the NRC staff indicates in SECY-15-0094 that the new activities could create a need to readjust the staff's current priorities and workload. As the NRC staff notes, two of the three options identified in SECY-15-0094 would require re-evaluating guidance, undertaking rulemakings (e.g. to incorporate TRU waste into the definition of LLRW), and licensing a new facility (either directly by the NRC or by the NRC assisting Texas in developing its technical, safety and security criteria to license and regulate the GTCC waste facility). In order to undertake these two options, the NRC staff notes that current priorities and workload may need to be reevaluated and adjusted, and some current activities may "need to be shed." SECY-15-0094 at 8, 9. Only the third option—no action—would not require a reallocation of priorities and workload. The NRC staff does not recommend the third option and acknowledges that its recommended option could be viewed "as inconsistent with the current and projected environment of constrained resources." SECY-15-0094 at 10.

Thus, the GTCC waste disposal matter could take resources away from the resolution of the two other key and related Part 61 rulemaking activities. If the NRC were pursuing the three Part 61-related activities in a coordinated manner, the agency would be in a better position to determine the most appropriate prioritization of the rulemaking activities as it moves forward.[6] UUSA therefore recommends that the NRC pursue all three Part 61-related activities in a coordinated manner.

Concern with NRC's Reliance on Qualitative Factors in Regulatory Analysis

As UUSA noted in our Comments on the NRC's use of "qualitative" factors in its Regulatory Analysis for the proposed rule, the NRC should understand the full costs and benefits of its proposed activities in order to determine whether contemplated regulatory changes yield safety benefits commensurate with the costs. In its Comments, UUSA referenced a letter to then NRC Chairman Macfarlane from Representative Upton and a number of other members of the House Committee on Energy and Commerce, dated September 19, 2014, discussing the importance of the NRC understanding the costs and benefits of its decisions.

Subsequent to filing our Comments, we note that on August 17, 2015, Representative Upton and a number of other members of the House Committee on Energy and Commerce sent another letter to NRC Chairman Burns, again stressing the importance of the NRC "conducting rigorous, quantitative, cost-benefit analysis to justify its regulatory decision-making." As Rep. Upton's letter points out,

[6] For example, the NRC should be in a better position to utilize its Common Prioritization of Rulemaking (CPR) process, which the NRC relies upon to prioritize rulemaking activities as part of its effort to manage the Cumulative Effects of Regulation. See SECY-11-0032, "Consideration of the Cumulative Effects of Regulation in the Rulemaking Process," dated March 2, 2011, at 8.

"analyses untethered to objective data increases the risks that subjective judgments will be substituted to support preferred regulatory outcomes, no matter how marginal the safety benefit." Thus, UUSA believes it prudent for the Commission to heed this advice and apply it when making any decisions about how to proceed regarding the GTCC matter.

* * * * *

UUSA appreciates the efforts of the NRC and the opportunity to comment on this important rulemaking. If you have any questions on the original or supplemental comments, please contact Amy Johnson at 575-394-6203 or Amy.Johnson@URENCO.com.

Respectfully,

Jay Laughlin
URENCO USA Chief Nuclear Officer and Head of Operations

RulemakingComments Resource

From: Lois Chalmers/IEER <lois@ieer.org>
Sent: Monday, September 21, 2015 5:56 PM
To: RulemakingComments Resource
Subject: [External_Sender] IEER Comments re: Docket ID NRC-2011-0012 (proposed rule) LLRW disposal
Attachments: IEER Comments on revision of 10 CFR 61 on NRC LLRW disposal Dkt NRC-2011-0012 filed 2015-09-21.pdf

Attached please find: IEER Comments on revision of 10 CFR 61 on NRC LLRW disposal Dkt NRC-2011-0012 filed 2015-09-21.pdf

IEER Comments on the Nuclear Regulatory Commission's Proposed Rule on Low-Level Radioactive Waste Disposal (10 CFR Part 61; Docket NRC-2011-0012)[1]
Arjun Makhijani
September 21, 2015

Sincerely yours, Lois Chalmers for IEER

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IEER Comments on the Nuclear Regulatory Commission's Proposed Rule on Low-Level Radioactive Waste Disposal (10 CFR Part 61; Docket NRC-2011-0012)[1]

Arjun Makhijani
September 21, 2015

The following are the Comments of the Institute for Energy and Environmental Research concerning the Nuclear Regulatory Commission's Proposed Rule on Low-Level Radioactive Waste Disposal as it appeared in the *Federal Register* on March 26, 2015.

1. I have made a number of comments formally and informally on elements of NRC 2011[2] on many occasions, including at the invitation of the NRC staff. By-and-large, the proposed revisions ignore essentials of my comments at best. The NRC has ignored sound science and common sense in many aspects of the proposed rule.

2. The proposed rule revisions constitute a major federal action. For instance, the revisions would potentially allow large amounts of extremely long-lived radionuclides, including hundreds of thousands of tons of depleted uranium from enrichment plants and possibly even wastes currently defined as Greater-than-Class-C waste, to be disposed of in shallow land facilities. It is therefore incumbent on the NRC to prepare an Environmental Impact Statement on the proposed revisions, setting forth and analyzing reasonable alternatives as well as a no-action alternative.

3. A definition of the term "member of the public" should be provided in the rule. It should explicitly include people of all ages, including infants and children, and including males

[1] U.S. Nuclear Regulatory Commission, "10 CFR Parts 20 and 61 [NRC–2011–0012; NRC–2015–0003] RIN 3150–AI92. Low-Level Radioactive Waste Disposal; Proposed Rule," *Federal Register* v.80, no.58 (March 26, 2015), pages 16081-16125, on the Web at www.gpo.gov/fdsys/pkg/FR-2015-03-26/pdf/2015-06429.pdf, hereafter 80 FR 16081-16125 (2015-03-26).
[2] NRC 2011

as well as females. Annual dose compliance should be explicitly assessed to the member of the public who is estimated to get the largest dose according to this definition. Specifically, for the purposes of 10 CFR 61, the term "member of the public" should be defined as

> A member of the public is (i) a male or female of any age affected by the operations of a facility covered by this rule except during a period when he or she is carrying out any operation which is part of management or disposal of low-level radioactive waste, nuclear fuel cycle or (ii) a male or female of any age affected by the facility covered by this rule and/or the waste disposed of in it after the closure of the facility into the indefinite future.

4. The definition of "inadvertent intruder" in the proposed rule is absurd. How can a person be an "intruder" if they engage in normal activities, such as agriculture, after all institutional controls have expired and after all passive barriers are assumed to no longer be effective? An "intruder" by definition is someone who is not authorized to be on the site but enters anyway. After 500 years, people who enter the site will be members of the public who may gain access by purchasing land, by using in a manner that may then be authorized, or may simply be using land that has been opened up to the public by design or lapse of institutional memory. At that time, anyone on the former disposal site is simply a member of the public as defined in paragraph #3 above. We therefore suggest that the term "intruder" be confined to those entering the site without authorization or by crossing barriers for the first 500 years, as follows:

   > *Intruder*: Any person who enters the site inadvertently or deliberately without authorization or in violation of barriers during the 100-year period of institutional control after closure or during the 400 years after that when manmade barriers are expected to be effective.

   Dose limits for intruders should be applied only to persons fitting this description.

5. The proposed revised language of 10 CFR 61.41 (the proposed 10 CFR 61.41(a)) drops organ doses altogether from the rule on the grounds that equivalent dose, calculated using organ weighting factors is a "modern" approach because such weighting factors did not exist at the time of the publication of ICRP 2 (in the late 1950s) on which the current rule is based. This is disingenuous and misleading. It would also cause a massive relaxation of allowable pollution and organ doses from many radionuclides, including all actinides, strontium-90, and various radioiodines.

   While the ICRP has created a methodology for calculating effective dose using organ weighting factors, it has not done away with organ doses. *Indeed, organ dose calculations are the foundation of committed effective dose.* In other words, organ doses must first be calculated before effective dose can be calculated; *they remain the most fundamental quantity in estimating internal dose.*

   The calculation of effective dose from organ doses requires the interposition of "weighting factors" whose crude nature and even arbitrariness is evidenced, among other

things, by the fact that they have changed greatly in several ways since ICRP 60 was published in 1991. Table 1 shows the weighting factors in ICRP 60 published in 1991 and in ICRP 103 published in 2007.

Table 1: Organ or Tissue weighting factors in ICRP 60 (1991) and ICRP 103 (2007)

Organ or Tissue	**ICRP 60**	**ICRP 103**
Gonads	0.20	0.08
Bone marrow (red)	0.12	0.12
Colon	0.12	0.12
Lung	0.12	0.12
Stomach	0.12	0.12
Bladder	0.05	0.04
Breast	0.05	0.12
Liver	0.05	0.04
Oesophagus	0.05	0.04
Thyroid	0.05	0.04
Skin	0.01	0.01
Bone surface	0.01	0.01
Brain	N/A	0.01
Salivary glands	N/A	0.01
Remainder (Notes 1 and 2)	0.05	0.12

Source: ICRP 60 (1991) p. 8 and ICRP 103 (2007) p. 65. “N/A” means" not applicable.”
Notes: 1. Remainder in ICRP 60: adrenals, brain, upper large intestine, small intestine, kidney, muscle, pancreas, spleen, thymus, and uterus.
2. Remainder in ICRP 103: adrenals, extrathoracic (ET) region, gall bladder, heart, kidneys, lymphatic nodes, muscle, oral mucosa, pancreas, prostate (males), small intestine, spleen, thymus, uterus/cervix (females).

Note the large differences in the weighting factors for gonads (down by 60 percent in ICRP 103), breast (up by 140 percent in ICRP 103) and the “remainder” (up by 140 percent in ICRP 103).
The list of radiosensitive organs that had individual weighting factors is longer in ICPR 103; the list of organs in the “remainder” also increased in ICRP 103. For instance the lymphatic nodes were not included in weighting factors at all in ICRP 60. *Indeed, seven new organs appeared in ICRP 103 that were not mentioned at all in ICRP 60*: salivary glands, the ET region, gall bladder, heart, lymphatic nodes, oral mucosa, and prostate (males). *One organ was eliminated*: upper large intestine, which, in ICRP 60 was part of the “remainder”; this was in addition to the colon being listed as a separate organ.

The averaging of male and female gonads (testes and ovaries, respectively) also does not make sense in the context of the rule of protecting the most exposed member of the public. It is also highly prejudicial to women and to future generations. Specifically, primary oocytes are formed in utero; females are typically born with a million or more of them. Sperm, in contrast, are continuously created. Moreover, the contribution of the

ovum to a person is far greater than that of the sperm; for one thing, all mitochondria, which are the foundation of the human energy system, come from the ova. In contrast, radiation damage to an embryo arising from damaged sperm would typically occur due to exposure in the weeks just before conception; moreover sperm contribute no mitochondria.

Similarly, averaging the male and female breast makes no sense from the point of view of a rule seeking to protect all members of the public to a standard that is equal to or better than that of the most exposed member of the public. Female breast cancer is 100 times more common than the male breast cancer.[3] The risk factors for breast cancer incidence in BEIR VII show the female breast to be a highly radiosensitive organ; the male breast cancer risk was low enough that it was lumped together with the remainder of the cancers not explicitly listed. Female infants have a risk of 0.117 cancers per sievert for breast cancer alone. This risk is about the same as the lifetime average for all cancers (male and female average risk). In contrast, the prostate cancer risk for male infants is more than ten times lower – 0.0093 cancers per sievert. A weighting factor that averages male and female breasts therefore is highly stacked against females, especially female children who are highly vulnerable to breast cancer risk compared to almost all other cancers except non-fatal skin cancers, for which male infants have the greatest radiosensitivity, according to the EPA.[4]

It is clear that sex averaging of weighting factors is unjustified for a dose-based rule that seeks to protect "any member of the public."

Averaging organ weighting factors by age also makes no sense in a regulatory context in which the aim is to limit dose to the most exposed member of the public, who will often be a child. Children's organs are still developing; for some organs that process extends through puberty. Averaging them with adult organ weighting factors is scientifically unacceptable in a dose-based standard.

The NRC's argument that organ dose should be eliminated because the ICRP 2 approach was based on an obsolete "critical organ" approach is specious. Organ dose is still fundamental to internal dosimetry. There is nothing obsolete about this approach. Moreover, current science continues to show that many radionuclides target specific organs like the thyroid or bone surface. This means that limiting organ doses is the most protective way to limit harm to public health.

The organ dose approach is entirely modern; as noted, organ doses are the basis for effective dose estimates. The method of calculating organ doses has been updated, and the updated dose conversion factors have been published by the EPA in Federal Guidance Report 13. This new method of calculation should be adopted. That is the proper way

[3] American Cancer Society 2014

[4] NAS/NRC 2006 Table 12-D1 (p. 311); units converted to risk per sievert. The EPA estimates female breast cancer incidence risk as 0.126 cancers per Sv (EPA 2011 Table 3-12b (p. 54)). It is the most radiosensitive cancer of all excluding non-fatal skin cancers, for which male infants have the greatest radiosensitivity at 0.172 cancers per Sv (EPA 2011 Table 3-12a and Table 3-12b (p. 54)).

to update the rule to reflect recent scientific understanding. For internal dose this will mean limiting the committed equivalent organ dose due to intake in one year to any member of the public plus the external dose to that organ to a specified limit.

As further evidence of the current validity of organ dose, we note that U.S. government is implementing a large compensation program for current and former nuclear weapons complex workers stricken with cancer likely caused by radiation exposure at work based entirely on organ dose calculations. Internal doses to a specific target organ (relevant for a particular cancer) from a multiple radionuclides are calculated; external organ doses are added to them. Effective doses are not involved in determining probability of causation or in compensation decisions.

Further, the ICRP itself has explained that effective dose, while convenient for regulatory purposes and for estimating risk to the public on some aggregated basis, is not intended for individual protection:

> Effective dose is an *indicator for stochastic risk* but it is *not intended for the assessment of risks of individuals*.[5]

The reason is that there are "uncertainties in the low-dose range, underlying approximations, simplifications, sex and age - averaging)."[6] While the uncertainties and the degree of arbitrariness in weighting factors and the variable grouping of organs under the rubric of "remainder" of the body is not explicitly mentioned in this quote, any reasonable understanding of current dose estimation methods and of cancer induction points to organ doses as the most fundamental quantity in radiation dosimetry and the protection of public health if a dose-based standard is used.

ICRP 103 explains that the weighting factors are averages over populations do not apply to particular individuals:

> They represent mean values for humans *averaged over both sexes and all ages* and thus do not relate to the characteristics of particular individuals.[7]

10 CFR 61 and other basic radiation protection rules, like 40 CFR 190, are fundamentally about the limitation of *individual* dose. By limiting the dose to "any member of the public" to a specified value, the rule ensures that all members of the public are protected to the same or higher levels than the most exposed member of the public (that is, to a level of dose or risk that is lower than the most exposed member of the public). *This goal is substantially compromised when average weighting factors are used. It is utterly compromised when male and female weighting factors for all age groups are averaged, as is the case with present weighting factors in both ICRP 60 and ICRP 103.* This is because current understanding of radiation risk shows that females and children face substantially higher risk for most cancers than adult males for the same radiation dose.

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[5] Menzel 2011 Slide 20, italics added
[6] Menzel 2011 Slide 20
[7] ICRP 103 (2007) p. 68, italics added

Children also generally get higher committed equivalent organ doses than adults per unit of radioactivity inhaled or ingested.[8] *These understandings of the higher risk faced by females and children and the higher doses experienced by children represent the most fundamental updating of the science that needs to be reflected in the revised rule. Effective dose, which uses average weighting factors, does not and cannot do that job.*

It would be unacceptable and unscientific to drop organ doses; it is all the more egregious that the NRC is proposing to do so on the grounds of modernizing and updating the science. As I have pointed out more than once, both to the NRC and to the EPA, we still have organs. Organ doses are still calculated in the most up-to-date science, though somewhat differently than before. The present science still shows that many radionuclides preferentially target certain organs, as a simple fact of human biology. *Organ doses are the most fundamental quantities in modern internal radiation dose estimation.* It is the weighting factors that are used to calculate effective dose that add a large element of uncertainty and even arbitrariness to the process. As they currently stand, they also obliterate essential differences between males and females and between children and adults. Effective dose may be convenient for regulators and licensees because it enables them to roll everything into a single number. *But regulation is not for the convenience of licensees and regulators. It is for the protection of the public.*

Modernizing and updating the science points in the direction of dropping effective dose and limiting the rule to organ doses, including internal doses from combinations of radionuclides added to the external dose. It is also relevant in this context to note that whole bodies do not get cancer (though, once contracted, it can spread throughout the body). Cancer initially affects a particular organ or system. Even circulatory and lymphatic system cancers have target organs, like the bone marrow and lymph nodes.

In sum, the most reliable current science points in the direction of focusing 10 CFR 61 on organ dose alone and rejecting committed effective dose.

Finally, it is important to note that dropping organ doses from the rule in favor of effective dose alone would substantially relax the implicit permissible concentrations of all radionuclides that preferentially target certain organs. Examples include all actinides and strontium-90, which target the bone surface, and radioactive isotopes of iodine which target the thyroid. This was pointed out in a study commissioned by the EPA as long ago as 1997.[9] It would be completely unacceptable to relax radiation protection under the guise of modernizing and updating the science, especially when recent science, including the risks published by the EPA in 2011,[10] has concluded that the cancer risks of radiation are far greater than those estimated when 40 CFR 190 was first promulgated.

In light of the above, we recommend that 10 CFR 61.41 be revised to read:

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[8] FGR 13 CD Suppl. (2002)
[9] SC&A 1997
[10] EPA 2011

> Concentrations of radioactive material which may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 25 millirems to the whole body or to any organ of any member of the public, with annual internal dose being defined as committed equivalent dose to any organ due to intakes of radionuclides in one year; all pathways are included in the estimation of dose, including the drinking water pathway from all sources of drinking water affected by the facility. Drinking water concentrations specified in or implicit in 40 CFR 141.66 must not be exceeded in surface water or groundwater at any point on or beyond the site boundary due to operations of the facility or disposal of radionuclides at the facility. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.

We have reduced the allowable dose to the thyroid from 75 millirem per year in the existing rule to 25 millirem per year. The BEIR VII risk assessment for thyroid cancer shows that 75 millirem per year to the thyroid of female children from infancy to five years of age would by itself produce a thyroid cancer risk of about 2 in 10,000.[11] Exposures after that would further increase the risk. The new assessment of this disease and of sex differences in risk requires a lowering of the allowable thyroid organ dose to 25 millirem per year at most.

Note that the doses from all sources of drinking water should be included in the revised 10 CFR 61.41. One way to ensure protection of offsite water resources to the drinking water standard would be for the NRC to require groundwater and surface water at or beyond the site boundary to comply with EPA's drinking water limits. Even Milton Friedman, an eminent apostle of the free market and limited government, noted that the freedom of individuals should be limited in a variety of ways. Among other things he noted that "one man's freedom to murder his neighbor must be sacrificed to preserve the freedom of the other man to live." He noted this in the context of determining the "appropriate activities of government." In the same general context, he also opined that they should not be free to pollute the water flowing through their property because that action "in effect forc[es] others to exchange good water for bad" involuntarily: that is, an exchange when people are in situations where "it is not feasible for them, acting individually, to avoid the exchange or to enforce appropriate compensation."[12] This precisely describes the situation in which neighbors of NRC licensees find themselves. It is therefore the responsibility of the NRC, even in a minimalist interpretation of the appropriate role of government, to prevent that enforced exchange of good water for bad.

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[11] Calculated from NAS-NRC 2006 Table 12D-1 (p. 311). EPA 2011 estimates thyroid cancer risks to be somewhat lower at 1.4 in 10,000 (calculated from EPA 2011, Table 3-12b). In any case, even with the lower thyroid cancer risks in EPA 2011, the life risks from thyroid cancer alone at 75 millirem per year would exceed 3 in 10,000 were exposure at 75 millirem per year permitted. This clearly points to a lowering of the annual thyroid exposure limit by at least a factor of three, which is the recommendation in these comments.

[12] Friedman 1962 Chapter 2, on web at http://books.cat-v.org/economics/capitalism-and-freedom/chapter_02 the rule.

As noted above, the structure of the drinking water rule was originally meant to protect individuals and small water systems from possible large expenditures of a federal mandate. This was reasonable enough; but the same structure has, all too often, allowed corporate polluters to force their neighbors to involuntarily exchange good water for bad. It is time to plug this hole in the drinking water rule. The free pass that the EPA and the NRC have given to licensees to pollute their neighbors' water supplies must be revoked.

6. External dose calculations should take into account that children are smaller and hence their various organs are closer to the ground (and hence to contamination that is present on the ground). These organs include their reproductive organs. This is especially important for female children.

7. The proposed language of 10 CFR 61.41(a) does not specify what guidance document will be used for dose calculations. It should specify that the EPA's current guidance – Federal Guidance Report 13 – will be used. At present FGR 13 does not contain separate dose conversion factors[13] for males and females. Therefore, the rule should also specify that when the EPA publishes separate dose conversion factors for males and females that they will be automatically incorporated into compliance assessment.

8. One thousand years as a compliance period is both too short and too long. It is too long because the proposed rule makes no provisions for any barriers to be effective in ensuring that compliance can be achieved for beyond 500 years. It is too short because some radioactive materials have half-lives that are far longer. For instance, the half-life of uranium-238, the main constituent of depleted uranium, is over 4.4 billion years. Its specific activity grows over hundreds of thousands of years due to the growth of progeny (uranium-234, thorium-230, and radium-226). The proposed rule recognizes this problem but it unacceptably increases doses to the public to 500 millirem for a "protective assurance" period defined as the period from 1,000 years to 10,000 years.

   There is no basis on which to relax the protection of people far into the future compared to those alive today or those in the next 500 or 1,000 years. As noted above, doses to any organ of any member of the public should be limited to 25 millirem per year.

   While the rule proposes that analysis of shallow land burial performance can be done for 10,000 years, this is unrealistic. From what we know about the past, 10,000 years is a very long-time for analysis of performance of shallow land systems. Ice ages can occur and have occurred on time scales that are similar. Severe climate disruption due to warming is already occurring, according to the best available scientific evidence and analysis. The NRC's own invited experts to the 2009 depleted uranium workshop considered 10,000 years far too long for reasonable modeling of shallow land facilities. Specifically, Peter Burns, a geochemist, stated "I was **particularly amused** by the climatic divisions, none of which can be relied on, even perhaps at 1,000 but certainly not in 10,000 or 100,000 [years]. As an example, I am a geoscientist. **So I have this rare**

[13] Dose conversion factors for internal dose convert an intake (inhalation or ingestion) of a unit of radioactivity of a particular radionuclide into an organ dose.

ability to see into the far distant past. (Laughter.) And I know, for example, that Death Valley was filled with about 1,000 feet of water 10,000 years ago. And that tells you how much the climate can change in the arid regions."[14] The NRC has ignored this advice and the underlying science. No scientifically sound calculation for shallow land disposal can be done over such a long period; the uncertainties would be huge even for parameters that one might foresee, not to speak of those that one cannot. The uncertainty in the dose calculations could easily be several orders of magnitude. The proposed 10 CFR 61.13 would require that "uncertainties" be taken into account (at (a)(8)) in providing the "reasonable assurance" of compliance. But it provides no clue as to how climate disruption would be taken into account. Indeed, the word "climate" does not even appear in the proposed text, let alone a definition of climate change or climate disruption. The language regarding uncertainties in the proposed 10 CFR 61 is clearly *pro forma*; as it currently stands it would have little scientific connection to the real world over thousands of years.

At the same time, a 10,000 year time frame for reasonable assurance of limiting doses is not enough for certain radionuclides. IEER has shown that disposal of depleted uranium even in the very dry climate of southwestern Texas (Andrews County) can result in doses that would be thousands of times the 25 millirem limit, dependent on assumptions about erosion rate. At an erosion rate of 0.01 cm per year, the dose from grouted depleted uranium disposal at 100,000 years would be essentially zero; however, at an erosion rate of 0.032 cm per year, the peak external dose, (occurring at about 78,000 years) would be about 121 rem, or almost 5,000 times the 25 millirem annual limit.[15]

These are heuristic calculations (done with the DOE-created computer program RESRAD). They do not estimate dose in the future in any realistic sense, since erosion is only one parameter to be taken into account. But they do show that the doses from very long-lived radionuclides can be huge and that the uncertainties are also enormous. Both are irremediable problems of shallow land burial of large amounts of depleted uranium and other very long-lived wastes.

9. The rule should acknowledge that the risks from disposal of long-lived radionuclides, like plutonium-239 or the constituents of depleted uranium over time in shallow land facilities, are too uncertain to be accurately modeled. It is unacceptable to dispose of large total amounts of long-lived radionuclides even in low concentrations or long-lived radionuclides in high-concentrations in shallow land facilities. This means that long-lived radionuclides must have both total radioactivity and concentration limits. Examples include depleted uranium from enrichment plants, recycled uranium, and other such waste streams that resemble Greater-than-Class-C waste or transuranic waste. They should be banned from shallow land facilities and be explicitly designated for deep disposal without exception and without any loopholes.

10. It is acknowledged here that wastes containing mainly short-lived radionuclides cannot exclude every iota of long-lived material. This is the reason for having concentration

[14] NRC 2009, pp. 94-95. Emphasis added.
[15] Makhijani and Smith 2005, table on p. 16

limits. The current GTCC limits should be maintained. Table 1 in the present rule at 10 CFR 61.55(a) should be amended by dropping the word "transuranic." This simple change would limit the concentrations of a number of long-lived alpha-emitting radionuclides that are not covered by the present rule, including uranium-238, thorium-232, thorium-230, and radium-226.

11. Long-lived radionuclides should be defined as those having half-lives of more than 10 years, which is compatible with an institutional control period of 100 years (ten half-lives). The definition of long-lived waste in the proposed rule at 61.2 is far too expansive in the context of shallow land burial.

12. Total curie limits are needed, in addition to concentration limits in 10 CFR 61.55 and those recommended just above. For instance, Class C waste containing less than a hundred curies of carbon-14 (half-life 5,730 years), even under the current Class C concentration limits, can pollute groundwater (at least at Hanford) to levels exceeding safe drinking water standards as well as the 10 CFR 61 dose limits. This was the result as estimated by the Department of Energy's calculations for the reactor graphite disposal at the Hanford site.[16] Hundreds of curies disposed of in similar conditions would violate the present 10 CFR 61.41 without violating Class C concentration limits. The depleted uranium example discussed above provides another example.

13. The above considerations indicate that a method must be found to protect the public without crossing the boundaries of scientific reasonableness and common sense. The current rule does not do that; the proposed rule would make the problem a lot worse. This requires a multi-pronged approach that *must be adopted as a whole* given the complexity and variety of waste streams that are included under the unfortunate rubric of "low-level waste."

14. First, the compliance period should be limited to 500 years.

15. Second, for long-lived radionuclides that do not have decay products that build up beyond 500 years, curie limits could be set by examining a hypothetical pulse release of the entire inventory of long-lived radionuclides into the environment in various ways immediately after the end of the compliance period. The limits for long-lived radionuclides could be set so that the dose criteria would not be exceeded with any combination of long-lived radionuclides or release modes. This could allow upper curie limits to be derived in a scientifically reasonable way that would also ensure compliance with dose criteria. This is a reasonable approach for radionuclides such as carbon-14.

16. Third, a modified approach is needed for radionuclides that have build-up of decay progeny, such as uranium-238. In such cases, the peak inventory should be assumed to

[16] The DOE calculated that disposing of 37,000 curies of carbon-14 on the Central Plateau would cause a contamination of 1.3 million picocuries per liter, or 650 times the drinking water limit of 2,000 picocuries per liter. See Yakama Nation ERWM 2010, Attachment 3, pages 13 and 14. Assuming the same concentration and environmental conditions, a total source term of 57 curies would produce contamination to the drinking water limit. Adding pathways other than drinking water would of course add to the dose.

be released instantly at the end of the compliance period. For instance, in case of depleted uranium disposal, the peak future inventory of radium-226 would be assumed to be exposed to the surface at 500 years; external doses would be calculated based on that. In the case of internal dose. The equilibrium mixture of uranium-238 and its progeny would be assumed to be deposited in groundwater instantly and doses to a resident farmer family estimated on that basis. This would not be modeling in the conventional sense of choosing parameters such as erosion for the long-term. It would be a heuristic calculation that would indicate maximum conceivable dose without involving methods of estimating shallow land burial performance that are technically indefensible for periods of thousands of years. The goal would be to assure protection of the public according to the same standards we expect for ourselves today. Wastes exceeding the concentrations ***or*** quantities as discussed above should be slated for deep geologic disposal, as is the case for DOE transuranic waste.

17. The proposed "intruder" dose limit of 500 millirem per year is unacceptably high. There is no moral rationale for allowing doses to future generations beyond 500 years, the proposed period of barrier life after which "intruders" could come into the site unrestricted, to be greater than those for those of the present public or the public in the coming decades. The proposed limit is five times bigger than the 10 CFR 20 limit for members of the public from *all sources* of man-made radioactivity (except medical and sewer). Intruder doses should be limited to the same doses as for the present and immediate future. Only the method of calculating them after the formal modeling performance period would change.

18. With the above provisos, *and only with the above provisos*, the compliance calculations done by formal modeling such as by the use of RESRAD or similar approaches, can be limited to 500 years. This is a reasonable period, especially in view of the NRC proposed requirement for the durability of intruder barriers of 500 years. While the proposed rule states the requirement as "at least 500 years" (at 61.7(f)(3)), there is no regulatory mandate for durability beyond that time. If the NRC does not adopt total radionuclide and concentration limits as above and the calculation methods for long-term public health protection along the lines suggested above, then the present language of 10 CFR 61, Subpart C, which does not have a time limit of compliance, should be maintained. This would not be a very good result but greatly preferable to the proposed changes to 10 CFR 61 regarding compliance period.
19. The revised rule should address how the NRC is going to assure the scientific soundness of the modeling. It should also create a process for making corrections of errors if and when they occur in licensing-related technical documents along with license amendments as needed in such cases. I have pointed out the problem of some specific egregious errors and their persistence over many years in a number of forums. It is important for the NRC to have a formal external, independent review procedure in done through blind contracts awarded from an escrow fund not controlled by the industry or by the NRC. The NRC should also have a procedure for promptly addressing technical errors pointed out by the public as part of the rule and for making the needed corrections should they be verified. Verification calculations should be published promptly.

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RulemakingComments Resource

From: Ellen Thomas <et@prop1.org>
Sent: Monday, September 21, 2015 9:03 PM
To: RulemakingComments Resource
Cc: greenpalmetto@yahoo.com; et@prop1.org
Subject: [External_Sender] Ruth Thomas Re Docket ID NRC-2011-0012 - 10 CFR Part 61 - Proposed Rule and Guidance

To: Rulemaking.Comments@nrc.gov

Re: Docket ID NRC-2011-0012 - 10 CFR Part 61 - Proposed Rule and Guidance re shallow burial of low-level radioactive waste

Here are our observations and recommendations regarding low-level radioactive waste and the Nuclear Regulatory Commission (NRC)'s proposal to amend 10 CFR Part 61 by including the unanalyzed nuclear waste streams which were left out of the original ruling.

Our principal reference source is the official transcript of proceedings of the NRC which took place on Tuesday, November 19, 2013. The purpose of this meeting was for the Department of Energy (DOE) to advise the members of the NRC's Advisory Committee on Reactor Safeguards' Subcommittee on Radiation Protection and Nuclear Materials about the shallow burial of low-level radioactive waste.

After introductions, those representing the Savannah River National Laboratory, the DOE's Office of Health, Safety, and Security, the DOE's Savannah River Site, and a member of the Nevada site office of the Nevada National Security Site, gave presentations on their approach to land burial of low-level radioactive waste. They talked about various processes they used to reach decisions, defense-in-depth, and how all of these various processes fit into their way of thinking. Their use of a thousand-year time frame for quantitative compliance was discussed at length. **However, their choice of that particular time frame was not based on scientific data, but was picked at random.**

Those from the NRC had difficulty understanding this approach of the DOE.

On page 10 of the transcript, a member of the NRC's Subcommittee on Radiation Protection and Nuclear Materials raised questions, e.g: "In the case of uranium where there is no peak, you know, how do you terminate that? I mean, what's the end point for let's say depleted uranium? That's an issue that's churning around here, you know, it's always building up, it's riskier in the future than it is today.... What does the DOE do?" (Page 10 of the transcript)

The DOE put off answering these questions. Instead they continued on with their presentation.

The chairman of the Subcommittee, on page 20 of the transcript, returned to the subject of uranium. He says, "The hard thing to get some folks to think about is a thousand years is a long time. Well, forever is even longer, because uranium will be here when the planet is cleaved in half. It's ten to the ninth year half-life? It's not going anywhere soon. So it's a forever waste.... I'll be curious when you get to that stuff. We'd like to hear about your strategies for dealing with these longer-lived radionuclides and their persistence in the environment beyond almost any kind of engineering you can think of. So with that little tidbit laid out there for the future discussion, go ahead."

Instead of directly addressing this, a DOE spokesman started talking about hazardous waste rather than radioactive waste.

The majority of the discussion is from the viewpoint of what the DOE has experienced, and how they think there is no need to do the calculations to know what this would mean for the exposure of future generations.

We in Environmentalists, Inc., disagree with the DOE and call attention to the changes that have been going on since nuclear weapons were manufactured and nuclear power has been used to generate electricity. Before both of these, avoiding exposure to radiation was a matter of limiting the time you spent in the sun, only having X-Rays when absolutely necessary. People knew where the sources of radiation were, and how to keep from having skin cancer. There were no sources of radiation taken internally, only external radiation.

Throughout the meeting, no one mentioned stopping the production of this waste material for which there is no solution on how to isolate it from people and the environment.

Our recommendation to the NRC is to focus on isolation projects and phasing out nuclear power projects, both the reactors and the fuel cycle facilities. There is a crucial need to stop making radioactive waste.

We request a dialog on the subject of low-level radioactive waste, a dialog which includes our group and other public interest and civic organizations, as well as independent researchers. By independent we mean those who do not benefit from taking a pro-nuclear position.

We ask that you accept our being a party to these decisions. Serious mistakes have been avoided because of input from the public and public interest organizations. Expensive mistakes have been made because public input was not considered.

Ruth Thomas
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RulemakingComments Resource

From: Marv Lewis <marvlewis@juno.com>
Sent: Tuesday, September 22, 2015 2:36 AM
To: RulemakingComments Resource; CHAIRMAN Resource; Blake, Kathleen; kevin@beyondnuclear.org; support@khouse.org; dianed@nirs.org
Subject: [External_Sender] Comments NRC Rulemaking on 10CFR Part 61 , LLW Land Disposal

Dear Chairman and Commissioners,
Please accept this email as my comments on the present rulemaking on Part 61.
I point out that the Staff has not coordinated fully with the TransPacific Partnership ,TPP, disclosure officer,Tom Reif. This was not due a deficiency on the part of the Staff, but because the Office of TPP Disclosure Officer was filled yesterday.
Depending on the words of the TPP treaty, our beloved United States can be turned into a sacrifice zone for the dumping of nuclear waste from the entire world.
I respectfully request that the comment period for this present rulemaking be extended to make sure that the TPP does not conflict with this rulemaking , and our great country does not wind up as a dumping ground for the radioactive wastes from the entire world!
Respectfully submitted
Marvin Lewis

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80FR16081 88

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Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0165
Low-Level Radioactive Waste Disposal; Reopening of Comment Period

Document: NRC-2011-0012-DRAFT-0178
Comment on FR Doc # 2015-21169

Submitter Information

Name: Pia Jensen

General Comment

Docket ID: NRC-2011-0012

There are many reasons why this proposal regarding low level nuclear waste disposal facilities ought be stopped in it's tracks. I am quickly reminded of the radiation protection model proposal (LNT v Hormesis) in reading the proposal and other's comments. There is no justification for increasing exposure potential nor for changing rules in favor of industry interests.

Comments by Helene Cuomo (#68), Jim Lieberman and J. T. Greeves (#11), and Matt Pacenza on Behalf of Heal Utah on Site-Specific Analyses for Demonstrating Compliance (#3) highlight issues of industry influence, logistics, time management, capacity, policy/rule alignment, historic record, and health, which require further attention before any new rules are proposed.

It appears that the NRC is taking on more than it can actually handle. I believe that some rule proposals should be tabled while the NRC and industry re-direct their attention to more pressing concerns such as fixing failing infrastructures at Hanford, WIPP, LANL, South Carolina MOX, and the many aging nuclear power plants around the country as well as international agreements for receiving more waste form other countries.

I do not believe the NRC can handle it's current work load and lacks capacity to appropriately prioritize their work in order to fulfill it's mandates to protect health and the environment. The liability issues are stacking up.

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80FR16081 89

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Low-Level Radioactive Waste Disposal; Reopening of Comment Period

Document: NRC-2011-0012-DRAFT-0179
Comment on FR Doc # 2015-21169

Submitter Information

Name: Judith Zitko
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General Comment

Since exposure to radiation is cumulative, no amount of radiation should ever be considered "safe", not even so called "low level" radiation. I am old enough to recall when the peaceful use of nuclear energy was first proposed for use as an energy source in the US and that they had no safe way to dispose of the radioactive waste but it was felt that by the time they would have to deal with it, they (the scientists) would know how to dispose of it....safely. Fast forward to today and no surprise we don't know how to safely dispose of it. Common sense would dictate that we cease to build and operate nuclear power plants. They are the most expensive form of energy, but also the most dangerous. Three Mile Island, Cheronobyl and now Fukushima in Japan where tons of radioactive water is being dumped into the Pacific Ocean on a daily basis. Our government seems to be silent and is not even monitoring the radiation off the West Coast of the US, or anywhere in this country, which begs the question as to why not? We tried nuclear energy and in my opinion it's been a huge failure with no one private insurance company willing to insure any of these plants, so my tax dollars are at risk as well as my life and well being. So, when you consider all this why would you even consider changing the safe level of radiation from zero to small doses?

PR-20, 61
80FR16081 90

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Low-Level Radioactive Waste Disposal

Comment On: NRC-2011-0012-0165
Low-Level Radioactive Waste Disposal; Reopening of Comment Period

Document: NRC-2011-0012-DRAFT-0182
Comment on FR Doc # 2015-21169

Submitter Information

Name: Anonymous Anonymous

General Comment

Docket ID: NRC-2011-0012 LL Radioactive Waste Disposal

No burial of radioactive waste should be allowed. Public radiation exposure of 5 mSv per yr is unacceptable for radioactive waste dumps (closed or open) & anything else where the individual has no choice. By conservative gov (BEIR, EPA) estimates 5 mSv per year leads to 1 excess cancer per 25 people (lifetime exposure). Some experts put this rate as double.

This is planned leakage. It is 33 times more than that for Yucca Mountain (0.15 mSv); 20 times more than that allowed by EPA for operating nuclear reactors (0.25 mSv), & 50 times the ICRP "constraint" standard for public exposure to prolonged component of long-lived radionuclides (0.1 mSv) (ICRP 103. p. 116).

Radioactive waste with short-lived radionuclides can be held in containment, until no longer radioactive, more cheaply than the overpriced burial. Rad waste must be monitored in proper, retrievable, containment & not buried. Burial speeds up the degradation process of any containment & keeps leaks from being stopped before they reach the environment. Accessible monitoring allows replacement of waste containers before they fail. Along with leaking into the environment, the buried waste can catch fire & explode. Monitoring the radiation leak rates after leakage is unacceptable. The storage containment must be replaced before leaks reach the environment. This can only happen in a proper storage facility.

There should be no radioactive leaks at all! Only zero millisieverts is acceptable.

Dilution & tricks used for calculating mSv exposure are unacceptable. Assumptions regarding food intake, dispersal into air & water must be clear. But, dispersal is unacceptable risk, anyway.

This 5 mSv results in 20 excess cancer deaths per 1000 compared to less than one, 0.38 per 1000 for hysterectomy surgery. The risk to women of 5 mSv per year is even higher than this average of 20 deaths. It would be 50 cancers per 100 women. Approximately 25 will die. A hysterectomy is supposed to have some benefit. Nuclear waste has none, and there is no choice. Where is the informed consent notice and approval by each American? There is none. These are cancers above and beyond other risks or medical exposures.

So-called "exempt" radioactive waste is unacceptable. It is unacceptable to declare radioactive waste, non-radioactive and to cease tracking it! This is so-called "exempt" waste and it is still dangerous radioactive waste!

It is important to recall that radioactive half-lives are half of half of half, etc. so that even radioactive cesium 137, half-life 30 years, stays radioactive for over 300 years. Iodine 131, half of 8 days will be radioactive for months.
1 half life = 50% left
10 half life = 0.097% left
20 half life = 0.0001% left

Concrete linings will crack sooner or later from both age and dry-wet shrinkage; cracking and swelling of the underlying clay, and most soil types. If it is constantly saturated this speeds the spread of radiation throughout the environment. Cracking due to wet-dry shrinkage could happen quickly. Irradiation speeds up concrete degradation; concrete is permeable. Even proper underground structures always leak, and require some pumping to keep dry (e.g. parking garages, tunnels, etc). Your proposal of "increasing the amount and longevity of radioactivity that goes into shallow land burial." and allowing "even longer-lasting waste into unlined soil trenches" (See Arrigo-NIRS comment) is patently unacceptable murder.

The 5 mSv radioactive leaching into the environment is intentional, known, and planned leaking. In the event of an accident it becomes more.

Diane Arrigo, on behalf of over 100 organizations says that the NRC "must not forget that the American public and our elected officials have repeatedly rejected the deregulation of nuclear waste. It should not be inserted into this rule which is about licensed radioactive disposal. The proposed rule re-asserts the publicly rejected concept of deregulation and we demand the deletion of this and any provisions that allow for manmade radioactive waste, materials, emissions and practices to be released from radioactive regulatory control. Deregulation, release, exemption, clearance and deminimus are completely unacceptable."

I also agree that the NRC must "adopt stricter disposal site requirements, keeping long-lasting waste out of shallow burial sites". I concur that there should be no blending or averaging of radioactive waste.

I support the entire comment of Diane Arrigo and the 100 organizations. However, there should be absolutely no burial of radioactive waste whether in lined or unlined trenches. It will leach into groundwater & probably explode like WIPP did. It's a major disaster waiting to happen and, in the event of explosion, the dumps in the arid western states will empty their contents upon much of America when it rains.

Confederated Tribes and Bands
of the Yakama Nation

Established by the
Treaty of June 9, 1855

September 21, 2015

Secretary, U.S. Nuclear Regulatory Commission
ATTN: Rulemaking and Adjudications Staff
Washington, DC 20555001

Subject: **Yakama Nation Comments to the Nuclear Regulatory Commission Regarding the Proposed Rule Changes for Low-Level Waste Disposal (10 CFR Part 61; Docket NRC-2011-0012)**

Dear NRC Secretary,

The Yakama Nation appreciate the opportunity to review and provide comments on the Nuclear Regulatory Commission (NRC) Proposed Rule, "Low-Level Radioactive Waste (LLW) Disposal" This letter transmits our main issue and comments on areas of concern for the Yakama Nation.

The Confederated Tribes and Bands of the Yakama Nation is a federally recognized sovereign pursuant of the Treaty of June 9, 1855 made with the United States of America (12 Stat. 951). New NRC regulations are only applicable to the US Ecology LLW Disposal Facility, located on the Hanford Site. The Hanford Site is Yakama Nation ceded lands and they retain reserved rights to the Site lands under the Treaty.

The existing and new LLW Disposal rules have a far reaching impact to the Yakama Nation, because the US Ecology LLW Disposal Site is located on the Hanford Central Plateau and surrounded by numerous DOE managed LLW Disposal Sites. In fact the US Ecology site sets in a sea of radiological and chemical contamination on the Central Plateau from DOE managed facilities. A concern is how DOE will adopt these new LLW Disposal rules since DOE is self-regulating and the NRC lack regulatory authority over DOE management of LLW disposal. This DOE concern includes the US Ecology Site that will be turned over to DOE upon closure.

Because of the location of the US Ecology Site and DOE's LLW disposal sites located throughout the Central Plateau, the review we conducted addressed future land-uses of the Central Plateau after the 1,000 year Compliance Period, when all institutional controls, intruder barriers, and other precautions have failed. The future land-use was based on the Yakama Nation's vision of fully exercising their treaty rights that include hunting, gathering, cattle grazing, sweat lodge use, tribal ceremonies, and maybe someday the development of a small community.

The community development excavates into the waste sites (where covers have eroded away and the site resembles natural landscape), for housing construction, water/electrical/sewer installations, a local landfill (for construction debris), and drilling through the waste sites for drinking water – that is radiological contaminated. During the community development no one knows they are being exposed to radiation. For radiation is an invisible threat to human health that cannot be seen, felt, or smelled. Detection requires specialized radiation meters. Future developers will not have radiation meters in hand – since

they have no idea the long-lived radionuclides are present. The first cancer victim occurs within 10 years. Twenty years later 40% of the community population has cancer and "cluster" is declared that requires investigation. The investigation identifies radiological contamination in the soils, groundwater, drinking and irrigation water systems, and subsequently almost everything within the community that contacted the contaminated water. The contaminated water was used for drinking, bathing, cooking, swimming, watering lawns and gardens, and washing anything and everything including carpets, interior/exterior of houses, cars, etc. Spreading contamination throughout the community.

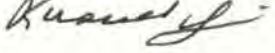
The outcome. The community has to be abandoned and fenced off to keep people and animals out. The people of the community have to find a new home and live with the health consequences of being exposed to long-lived radionuclides. How the community would be cleaned and the contamination disposed of in the future is another unknown.

Long-lived radionuclides have extremely long half-lives in the thousands years, such as plutonium-239 and -240, and technetium-99, if not millions of years as with uranium and iodine-129. These radionuclides are an invisible threat to human health and the environment. These are the reasons why the Yakama Nation does not support the disposal of long-lived radionuclides in LLW Disposal Sites – no matter what waste form, depth of burial or concentration. There are no assurances that these LLW Disposal Site that contain long-lived radionuclides will remain protective over the life of the nuclide, especially when this document points out that institutional control will fail in 100 years and intrusion protection in 500 years.

The best action for long-lived radionuclides is disposal in a deep geologic repository like the DOE Waste Isolate Pilot Project in New Mexico. Deep geological disposal is the only method that can ensure protectiveness of human health and the environment over the long-term.

The Yakama Nation looks forward to dialog on these concerns and comments. If you have any questions please contact Russell Jim at (509) 945-6741.

Sincerely,



Russell Jim
Yakama Nation
ERWM Program Director

Yakama Nation ERWM Program Comments:

The Yakama Nation has no comments on the new NRC regulations for the disposal of Class A and B waste, and Class C waste with no concentrations of long-lived radionuclides. LLW Disposal Facilities were originally designed for short-lived radioactive waste where the radiological threat to human health and the environment decays away in 100 to 500 years.

The Yakama Nation does not find the current and new LLW Disposal rules protective of human health and the environment when LLW disposal sites contains long-lived radionuclides. The following comments pertain to disposal of Class C waste that contains long-lived radionucides, and how these nuclides are unsuitable for disposal in LLW Disposal Facilities – as shown repeatedly throughout this document.

Waste Forms, Classifications, Stabilization

§Section 61.7 (f) Waste classification and near-surface disposal. Waste that must be stable for proper disposal are classified as Class B and C waste. To the extent that is practicable, Class B and C waste forms or containers should be designed to be stable (i.e., maintain gross physical properties and identity), over 300 years. For long-lived waste and certain radionuclides prone to migration, a maximum disposal site inventory based on the characteristics of the disposal site may be established to limit potential exposure and to mitigate the uncertainties associated with long-term stability of the disposal site. Some waste, depending on its radiological characteristics, may not be suitable for disposal if uncertainties cannot be adequately addressed with technical analyses.

Comments:

Class C containers designed to be stable for over 300 years are not adequate when it comes to long-lived radionuclides that will outlive the containers. Some long-lived radionuclides first half-life are thousands of years and pose the same radiological threat to human health and the environment in a 1,000 years as they do today. In order to be protective Class C waste forms and containers, that contain long-lived radionuclides, need to be designed to ensure no mitigation of the nuclides for the life of the radiological threat. Since there is currently no technology to allow for a waste form or container to last the life of long-lived radionuclides shows that long-lived radionuclides are not suitable for disposal in LLW Disposal Facilities.

Establishing maximum inventory limits for LLW Disposal Site should be done for all radiological waste sites – no matter what the classification, but especially where long-lived radionuclides are going to buried. Current LLW regulations provide long-lived radionuclide concentration limits based on cubic meters. The concentration limits per cubic meter may appear to be small, but when you add up all of the cubic meters in a waste site, that could hold millions of cubic yards, these small concentrations become large radiological sources and a threat human health and the environment

Long-lived radionuclides are not suitable for disposal in LLW Disposal Site as stated repeatedly throughout this document due to their extremely long half-lives that will outlast institutional controls, waste stability, and waste container integrity. The future of the long-lived radionuclides is not uncertain. They will remain radioactive and a threat to human health and the environment for a very long time.

§Section 61.44 Stability of the disposal site after closure. The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site for the compliance (1,000 years) and protective assurance (10,000 years) periods . . . .

Comments:

The compliance and protective assurance periods end at 11,000 years, which doesn't mean much when it comes to the radiological threat posed by long-lived radionuclides, especially those with extremely long half-lives. Because the long-lived radionuclides will outlive the protective assurance period shows they are unsuitable for disposal as LLW.

§61.52(a)(2) Waste designated as Class C pursuant to §61.55 must be disposed of so that the top of the waste is a minimum of 5 meters below the top surface of the cover or must be disposed of with intruder barriers that are designed to protect against an inadvertent intrusion for a least 500 years.

Comments:

Placing 5 meters of soil over the top of Class C waste that contains long-lived radionuclides is not protective of human health and the environment. This actions is considered protective by the NRC due to shielding affect of the cover, but 5 meters of soil will not stop future intrusions.

An intrusion barrier that will last 500 years means nothing when it comes to long-lived radionuclides with half-lives in the thousands of years. When an intrusion is done (after the 500 year period), and the barrier is encountered it will simply be seen as construction debris or an old landfill. Without radiation detection equipment, people who drill or dig into these waste sites will not know they are being exposed. A protective intrusion barrier needs to last the life of the long-lived radionuclides – which is impossible, and thus the nuclides are not suitable for disposal in LLW Disposal Site.

§61.55 Waste Classification. (a) Classification of waste for near surface disposal. (1) Considerations. Determination of the classification of radioactive waste involves two considerations. First, consideration must be given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional controls, waste form and disposal methods are effective.

Comments:

Long-lived radionuclides hazard will persist long after precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. This statement clearly shows the radiological threat of long-lived radionucides and that they are not suitable for disposal in LLW Disposal Site.

Institutional Controls/Intrusion

§61.7 Concept (f)(3) Waste that will not decay to levels which present an acceptable hazard to an intruder within 100 years is typically designated as Class C waste. Class C waste must be stable and be disposed of at a greater depth than the other classes of waste so that subsequent surface activities by an intruder will not disturb the waste. Where site conditions prevent deeper disposal, intruder barriers such as concrete cover may be used. The effective live of these intruder barriers should be at least 500 years. A maximum concentration of radionclides is specified in table 1 and 2 of §61.55 so that the end of the 500 year period, the remaining radioactivity will be at a level that does not pose an unacceptable hazard to an inadvertent intruder or to public health and safety. Waste with concentrations above these limits is generally unacceptable for near-surface disposal. There may be some instances where waste with concentrations greater than permitted for Class C would be acceptable for near-surface disposal with special processing or design. Disposal of this waste will be evaluated on a case-by-case basis with the technical analyses required in §61.13.

Comments:

The document states "Class C waste must be stable and be disposed of at a greater depth than the other classes of waste for that subsequent surface activities by an intruder will not disturb the waste." No matter how deep you bury Class C waste that contains long-lived radionuclides will not prevent human and subsequent environmental exposures if the intruder drills through the waste site to obtain water underneath (that may be contaminated and result in spreading contamination throughout the water systems).

Table 1 and 2 of § 61.55 identify a few long-lived radionuclides, but not all. These table need to identify all long-lived radionuclides. The table should also include the radiological half-lives and the total time it will take for these long-lived radionuclides to decay to a safe level.

The document states "Waste with concentrations above (table 1 and 2) limits is generally unacceptable for near-surface disposal. Disposal of long-lived radionuclides in unacceptable for near-surface or deep burial due to the long-term radiological threat to human health and the environment.

The document states "There may be some instances where waste with concentrations greater than permitted for Class C would be acceptable for near-surface disposal with special processing or design. Disposal of this waste will be evaluated on a case-by-case basis . . ." Disposal of any long-lived radionuclides in LLW Disposal Site is unacceptable in low concentrations and this regulations states an exception to increase the concentration. This goes against the NRC "limit concentrations" statements throughout this document. The NRC needs to develop very strict regulations on Class C waste that do not require a case-by-case decision.

§61.7 Concept (f)(4) Regardless of the classification, some waste may require enhanced controls or limitations at a particulate land disposal facility. A performance assessment and an intruder assessment are used to identify these enhanced controls and limitations, which are site- and waste-specific. Enhanced controls or limitations could include additional limits on waste concentration or total activity, more robust intruder barriers, deeper burial depth, and waste-specific stability requirements. These

enhanced controls or limitations could mitigate the uncertainty associated with the evolutionary effects of the natural environment and the disposal facility performance over the compliance period.

Comments:

Enhanced controls or limitations including additional limits on waste concentration or total activity, more robust intruder barriers, deeper burial depth, and waste-specific stability requirements will not increase the protectiveness when it comes to long-lived radionuclides. As stated earlier there is not waste form, container, intruder barrier, etc., that can be implement that will last the life of the radiological threat long-lived radionuclides pose to human health and the environment.

§61.59 Institutional Requirements. (b) Insitutional control. The land owner or custodial agency shall carry out an institutional control program to physically control access to the disposal site following transfer of control of the disposal site from the site operator. The institutional control program must also include, but not limited to, carrying out an environmental monitoring program at the disposal site, periodic surveillance, minor custodial care, and other requirements as determined by the Commission; and administration of funds to cover the cost for these activities. The period of institutional will be determined by the Commission, but institutional controls may not be relied upon for more than 100 years following transfer of control of the disposal site to the owner.

Comments:

Institutional Controls (ICs) to the Yakama Nation mean:

- *Access controls – fences, signs, camera, guards, etc.*
- *Intruder controls – waste site cover*
- *Land and Groundwater restrictions (deed restrictions, drilling restrictions, land-use/excavation restrictions).*
- *Environmental monitoring (surface areas, vadoze zone and groundwater).*
- *Surface/Barrier monitoring and repairs.*

ICs to prevent exposure to the radiological hazards by humans – through isolation. Keeping people away from the waste site – prevents exposure. But ICs are only good as long as they are maintained until the radiological hazard is no longer a threat. For LLW Disposal Sites, without long-lived radionuclides ICs may provide this protection if maintained. But for long-lived radionuclides there is no assurance ICs will remain in place (per the NRC IC fail at 100 years). Thus ICs are not protective of human health and the environment when it comes to long-lived radionuclides – making them unsuitable for disposal in LLW Disposal Sites.

To ensure protectiveness the NRC needs to establish regulations that ICs for LLW must last at least 500 to 1,000 years depending on the waste site radiological characteristics.

Compliance and Protective Assurance Periods

§61.2 Definitions.

Compliance period is the time out to 1,000 years after closure of the disposal facility.

Protective assurance period is the period from the end of the compliance period through 10,000 years following closure of the site.

Comments:

The definitions above say nothing but provide a timeframe. What is to be complied with after closure and up to 1,000 years. This document only states that certain aspect of disposal must last through the compliance period. The compliance period does not include the ICs (which cannot be relied upon after 100 years). The compliance period does not include the intruder barrier (which only needs to last for 500 years). The NRC needs to establish strict regulations on what compliance really means to ensure protectiveness for 1,000 years. The 1,000 compliance period may keep people out of the area, but it does not reduce the radiological threat of long-lived radionuclides with the first half-life of 20,000 years or more.

What does protective assurance mean? This time period is used in the document to show that certain aspect of the disposal must last through the protective assurance period. How is the protective assurance actions assured when protective precautions (ICs, intruder barriers, etc.) have failed – as stated in this document. The NRC needs to establish strict regulations to ensure protective assurance is properly conducted for 10,000 years. The 10,000 year period may sound good, but when it comes to long-lived radionuclides, with the first half-live in the 100,000 year range, 10,000 years does not reduce the radiological threat.

Summary Comment:

The Low-Level Radioactive Waste Disposal document clearly showed that long-lived radionuclides are not suitable for disposal in LLW Disposal Site. These radionuclides will outlive any precautions, (ICs, waste form stability, container structural stability, environmental monitoring, etc.) taken to prevent exposure to humans or the environment. The invisible radiological threat from these radionuclides will last for thousands, if not millions of years with no way to assure no exposure. The only safe disposal method for long-lived radionuclides is in a deep geological repository – like DOE's Waste Isolation Pilot Project (WIPP) in New Mexico.