PANEL SESSION 60 - Disposal of Large Quantities of Depleted Uranium – Role of Site Specific Performance Assessment

Co-Chairs: Larry Camper, *US NRC;*
Christine Gelles, *US DOE (USA)*
Reporter: Boby Abu-Eid, *US NRC*

Panelists Included:

- David Esh, *US NRC*
- Marty Letourneau, *US DOE*
- Tom Magette, *EnergySolutions*
- Jean-Francois Gervais, *AREVA (France)*
- Rusty Lundberg, *State of Utah*
- Christopher Thomas, *HEAL Utah (USA)*

Approximately 130 attendees were present at Session 60 on "*Disposal of Large Quantities of Depleted Uranium – Role of Site Specific Performance Assessment.*"

Following introductions and opening remarks by the two Co-Chairs **Larry Camper and Christine Gelles,** they opened the proceedings by providing rationale and purpose of the Session. Mr. Camper added that Session 60 was organized in the context of US NRC activities pursuing rulemaking to require a site-specific performance assessment for disposal of unique waste streams including large quantities of DU. Ms. Gelles emphasized the importance of DU disposal issue to DOE and the need to expedite resolving this issue giving high priority to protection of health and safety of the public and the environment. The panel was charged by the Co-Chairs to discuss aspects of site-specific performance assessment for disposal of large quantities of DU from regulator, public interest, and industry perspectives.

David Esh's presentation focused on the NRC's Low-Level Waste (LLW) Disposal Rulemaking particularly on site-specific technical analysis in the context of NRC's SECY 08—147 for amendment of 10 CFR Part 61 to specify requirements for site-specific analysis to identify any restrictions or limits on disposal of DU, if necessary. He gave background information by comparing mill tailings with DU and cautioned of generation of DU progenies particularly Ra-226 to become comparable in concentration to mill tailings in approximately 1400 years and Th-232 in 500 years, with Ra-226 & Th-232 concentrations reaching approximately 3×10^5 pCi/g in a million year after disposal.

He discussed post-closure PA analysis in reference to 10 CFR Part 61.41, as well as intruder analysis requirement under 10 CFR Part 61.42 and stability evaluation requirements under Part 61.44. He emphasized that disposal of long-lived radioactive waste is challenging due to consideration of complex aspects of climate change and geomorphology. He indicated that DU is not included in NRC's waste classification tables and suggested that DU should be subjected to the scrutiny of intruder assessment.

He outlined key technical issues such as uncertainties, performance period, near surface stability, exposure scenarios to receptors, and waste & site specific issues such as geochemistry and geo-

hydrology. He stated that outside of Yucca Mountain High-level waste disposal, a period of performance longer than 10,000 year has not been applied in the US. Mr. Esh did not propose a specific PA period to consider for disposal of DU admitting that this is under current discussion and deliberation by NRC staff.

Marty Letourneau gave a historical background of 10 CFR Part 61 developments, indicating that the DOE did not ask the NRC to include DU waste in Part 61 Tables and therefore it was not included in the waste classification scheme. He believed that DU can be disposed safely with site-specific PA analysis and consideration of all safety aspects and related factors influencing decision-making similar to IAEA approach corresponding to the Safety Case. He emphasized that PA should help in addressing facility siting and design to meet safety requirements; however, PA alone should not be the only factor in the "Go or No-Go" decision-making process.

Tom Magette indicated that Energy*Solutions* believes that emphasis should be placed on ensuring safety of the public and protection of the environment. Therefore, Energy*Solutions* hired Neptune & Company to conduct PA analysis based on site-specific analysis of the Clive/Utah disposal facility. He added that safety of the public in waste disposal management is the core issue and their focus is to demonstrate in a transparent manner how the public is protected from the disposal of DU. He emphasized the need for long-term stability of the disposal facility and control of intruder and radon emanation in the long-term. He emphasized that no disposal site can indefinitely contain waste materials and some releases should be expected. In this context, Mr. Magett pointed out that only realistic exposure scenarios should be considered when addressing the issue of public safety and environmental protection.

Rusty Lundberg indicated that the State of Utah adopted the NRC recommended interim action that facilities disposing DU should develop a site-specific PA which should evaluate site performance against criteria in SECY-08-0147 prior to disposal of large quantities of DU. He then referred to Utah Radiation Control Board Action (December 2009) of changes requiring DU Performance Assessment and approval by the Executive Secretary before disposal. He then addressed Utah PA rulemaking and the revised proposed conditions for requiring a PA. Mr. Lundberg presented a summary of Utah PA Education & Discussion Stakeholder Workshop. He emphasized the importance of providing opportunity to involve interested stakeholders in matters, such as PA, related to the disposal of low-level radioactive waste in Utah. Mr. Lundberg finally summarized Workshop "Parking Lot Items" including: (a) long-term modeling and performance period; (b) performance objectives (protection) components; (c) other considerations of public interest / public protection and (d) quality assurance and transparency.

Jean-Francois Gervais of AREVA, presented a different perspective regarding DU. In a presentation titled "*Depleted uranium: Hearing a different drummer",* he started his presentation by questioning the validity of designating DU as *"waste"* as it should be considered as a valuable strategic resource (e.g., as in Europe and Japan). He presented DU inventories in Russia, France, Germany, UK, and the Netherlands and showed that these countries have either adopted conversion of DU (e.g.; UF_6 into U_3O_8) for interim storage of their depleted UF_6 for reprocessing or future usages. He explained how AREVA U_3O_8 is conditioned in containers of 10 MT capacity and stored on two sites in France. He showed that DU containers are stacked, either in dedicated depleted uranium storage facilities, or as radiation shielding in reprocessed

uranium storage facilities. Mr. Gervais presented the French « Environmental Code » in the article L542-1-1 which states : « *A radioactive material is a radioactive substance for which further use is forecast or contemplated, after treatment if need be» and Radioactive waste is a radioactive substance for which no further use is forecast or contemplated*. He then discussed current DU utilization in radiological shielding in reprocessing and uranium storage facilities and in MOX fuel fabrication for LWR. He also discussed present and mid-term utilization and re-enrichment of tails referring to recent programs based on gaseous diffusion enrichment technology. For the long-term utilization, he emphasized the importance of DU usage as fast neutrons reactor fuel.

In conclusion, Mr. Gervais indicated that in the past decades, most countries considered depleted uranium as a valuable resource for the next generation of reactors, at a distant horizon requiring several decades of intermediate storage. Therefore, status of depleted uranium and storage policies in Europe have been defined accordingly. Mr. Gervais emphasized that present intermediate storage options for DU should be acceptable for its usage as fuel for fast neutrons reactors; therefore, storage policies should be revisited accordingly.

Christopher Thomas, HEAL Utah, presented to the audience an illustration chart to show that DU is a unique waste stream, mainly because it becomes significantly more radioactively hazardous over time, due to ingrowth of decay products. He added that recognizing the unique properties of depleted uranium, the draft NRC EIS for the classification system of low-level waste in Part 61 classified depleted uranium along with a host of other radionuclides. He presented a table from draft EIS to show that waste classification concentrations for uranium was .05 micro curies per cubic centimeter. He added that concentrated DU is ten times as concentrated, so it would have been categorized as GTCC. He emphasized that DU was eventually removed for administrative reasons, because no NRC licensees possessed large amounts of concentrated depleted uranium at that time. Because of the way the tables are written, that designates large amounts of concentrated DU as Class A waste. This is important for Utah because Utah only accepts Class A waste.

Mr. Thomas drew analogy of a movie rating system to DU classification. He said “this would be like a movie studio submitting a movie to the ratings board and the board indicating the movie would get an NC-17 rating. So the studio pulls the movie and later goes direct to video as an unrated movie, and suddenly that has the effect of making it like a G rated movie”.

For depleted uranium in Utah, he highlighted two things about the existing performance assessment. It looked mostly at whether radionuclide thresh holds would be exceeded at a compliance point at the edge of the facility, and it looked at a compliance period of a minimum of 500 years. He indicated that he worked with “Utah Radiation Control Board” to implement a new rule that requires a new performance assessment. In this context, he presented his views regarding the onsite intruder scenario emphasizing that the scenario assumptions for a recreationalist or rancher were inadequate because exposure was only assumed through uptake by plant roots that slowly bring radionuclides to the surface which then mix with the soil.

He expressed his disagreement with selection of 10,000 years for period of performance as the “Company (e.g.; Energy*Solutions*) seems to be treating this as a maximum period selected for

demonstration of compliance". Regarding site stability requirement, he believes that a site that gets washed away during the compliance period should not pass the test. Further, he added that site isolation from population and the ecosystems should be a priority in evaluating site suitability.

Public Comment and/or Questions:

Question: Is NRC institutional control period 100 years?
Answer: Yes

Question: Is there a NEPA requirement for DU disposal?
Answer: NEPA does apply, however not all States have a NEPA requirement like NRC does for its actions.

Question: How robust governments are at maintaining a site after 100 years?
Answer: Waste classification system as well as site natural characteristics should require minimal government oversight after 100 years.

Question: Mr. Larry Camper (Session Co-Chair) presented the following question to panel members: "What is your recommended period of performance for DU disposal?"

- Christopher Thomas: He said he understands that 10,000 years is used by some but that peak dose is needed, and in this case that means 2 million years.
- Dave Esh: Did not recommend a value, but said for long-lived waste need to consider all sources of uncertainty and take into account consideration of increasing uncertainties with time.
- Rusty Lundberg: 10,000 years for quantitative compliance analysis and peak dose for qualitative analysis to support decision-making.
- Tom Magette: 10,000 years, with qualitative assessment of potential long-term impacts.
- Jean-Francois Gervais: Does not support permanent disposal. Only interim storage should be considered.
- Marty Letourneau: 10,000 years and using the safety case concept for decision-making, however the DOE uses 1,000 years in DOE Order 435.1.

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