UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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RECEIVED

6/24/09
74FR 30175
(7)

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
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A. Y... (CJG2)
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6/24/09
74 FR 30175

(7)

PUBLIC SUBMISSION

As of: October 19, 2009
Received: October 16, 2009
Status: Pending_Post
Tracking No. 80a42ca6
Comments Due: October 30, 2009
Submission Type: Web

Docket: NRC-2009-0257
Notice of Public Workshop on a Potential Rulemaking for Safe Disposal of Unique Waste Streams Including Significant Quantities of Depleted Uranium

Comment On: NRC-2009-0257-0001
Public Workshop: Potential Rulemaking for Safe Disposal of Unique Waste Streams Including Significant Quantities of Depleted Uranium

Document: NRC-2009-0257-DRAFT-0003
Comment on FR Doc # E9-14820

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General Comment

The NRC erred when it decided to formulate guidelines for depleted uranium disposal in a low-level waste disposal facility. That decision did not take into account the hundreds of thousands of years over which DU grows more radioactive.

NRC should focus on reevaluating its decision that shallow land burial is adequate for depleted uranium disposal.
Out of sight out of mind but not out of the environment. Who will be testing during the 4.5 BILLION years of DU's half life to measure the effects of this highly toxic form of particle radiation?

The fact that DU grows more radioactive over the many millennia prohibits DU disposal at any of the current or pending low-level waste disposal facilities.

The NRC must, as part of this rulemaking, prepare an environmental impact statement that fully evaluates DU disposal in a deep geologic repository.

It is inappropriate to license any new uranium enrichment facility until regulations are in place governing disposal of depleted uranium and disposal facilities have implemented those regulations.

Please read the attached document.

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Attachments

E-RIDS = ADM-03
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NRC-2009-0257-DRAFT-0003.1: Comment on FR Doc # E9-14820
NRC-2009-0257-DRAFT-0003.2: Comment on FR Doc # E9-14820

The NRC erred when it decided to formulate guidelines for depleted uranium disposal in a low-level waste disposal facility. That decision did not take into account the hundreds of thousands of years over which DU grows more radioactive.

NRC should focus on reevaluating its decision that shallow land burial is adequate for depleted uranium disposal.

The fact that DU grows more radioactive over the course of one million years prohibits DU disposal at any of the current or pending low-level waste disposal facilities.

The NRC must, as part of this rulemaking, prepare an environmental impact statement that fully evaluates DU disposal in a deep geologic repository.

It is inappropriate to license any new uranium enrichment facility until regulations are in place governing disposal of depleted uranium and disposal facilities have implemented those regulations.

HERE'S WHY

Epidemiological studies and toxicological tests on laboratory animals point to DU as being immunotoxic [65] teratogenic[66] [67] neurotoxic [68] with carcinogenic and leukemogenic potential. [69]. A 2005 report by epidemiologists concluded: "the...epidemiological evidence is consistent with increased risk of birth defects in offspring...exposed to DU." [11]

Uranium is a ... radioactive heavy metal... According to Hanson (1974), uranium is soluble in oxygen-rich water, such as those found in the surface of the ocean.... Where DU lodges in bottom sediments, the electro-chemical conditions common in such layers tends to change uranium to a form that has a **high affinity for organic material.** "

According to the International Atomic Energy Agency:

"Plants will ...uptake DU present in soil and in water... The DU in water and vegetation will be transferred to livestock through ingestion of grass, soil, and water.

Depleted uranium in the soil will be in an oxidized, soluble chemical form and migrate...and be incorporated into the food chain. It is difficult to predict how long it would take for this to occur. As a result of chemical weathering, DU buried under the surface will corrode with time, slowly converting the metallic uranium of the DU into uranium oxides... The specific soil characteristics will determine the rate and chemical form of the oxidation and the rate of migration and solubility of the depleted uranium. This environmental pathway may result in the long term (in the order of several years) in enhanced levels of depleted uranium being dissolved in ground water and drinking water.

Consumption of water and food is a potential long term route of intake of DU." (from http://www.iaea.org/NewsCenter/Features/DU/du_qaa.shtml)

Out of sight out of mind but not out of the environment. Who will be testing during the 4.5 ***billion*** years of the DU's half life to measure the effects of this highly toxic form of particle radiation?

Although 60% "less radioactive" than naturally occurring U-238, DU, an alpha radiation particle emitter, compared to photo or beta radiation, is more effective at causing certain biological effects, notably either cancer or cell-death for equivalent radiation exposure. It follows the same radioactive decay chain of uranium-238. The daughter nuclide of a radioactive decay event may also be unstable (radioactive). In this case, it will also decay, producing radiation. The resulting second daughter nuclide may also be radioactive. This can lead to a sequence of several decay events. Eventually a stable nuclide is produced. This is called a decay chain, which for uranium 238 and DU is as follows:

DU decays, through alpha-emission, with a half life of 4.5 billion years to thorium-234

which decays, through beta-emission, with a half-life of 24 days to protactinium-234

which decays, through beta-emission, with a half-life of 1.2 minutes to uranium-234 which decays, through alpha-emission, with a half-life of 240 thousand years to thorium-230

which decays, through alpha-emission, with a half-life of 77 thousand years to radium-226

which decays, through alpha-emission, with a half-life of 1.6 thousand years to radon-222

which decays, through alpha-emission, with a half-life of 3.8 days to polonium-218

which decays, through alpha-emission, with a half-life of 3.1 minutes to lead-214

which decays, through beta-emission, with a half-life of 27 minutes to bismuth-214

which decays, through alpha-emission, with a half-life of 20 minutes to polonium-210

which decays, through beta-emission, with a half-life of 160 microseconds to lead-210

which decays, through beta-emission, with a half-life of 22 years to bismuth-210

which decays, through beta-emission, with a half-life of 5 days to polonium-210

which decays, through alpha-emission, with a half-life of 140 days to lead-206, which is a stable nuclide.

The alpha-particles emitted by DU consists of two protons and two neutrons bound together (the equivalent of a Helium nucleus with atomic mass of 4 amu) with a total energy of about 5 Million electron Volts (MeV). They are a highly ionizing form of particle radiation. They are relatively harmless until/unless ingested (moving through many organisms up the food chain) or inhaled. In contact with living tissue, the massive (compared to a beta particle or gamma ray) alpha particle smashes through cellular DNA like a wrecking ball through a building, inducing aberrant cell growth and cancers.

Being relatively heavy and positively charged, alpha particles quickly lose kinetic energy within a short distance of their source. This results in several MeV of destructive energy being deposited in a relatively small volume of material. This increases the chance of cellular damage in cases of internal contamination. In general, external alpha radiation is not harmful since alpha particles are effectively shielded by a few centimeters of air, a piece of paper, or the thin layer of dead skin cells. Even touching an alpha source is usually not harmful, though many alpha sources also are accompanied by beta-emitting radio daughters, and alpha emission is also accompanied by gamma photon emission which are harmful. If substances emitting alpha particles are ingested, inhaled, injected or introduced through the skin, then it could result in a measurable damaging dose.

The Relative Biological Effectiveness (RBE) is a measure of the fact that alpha radiation is more effective at causing certain biological effects, notably either cancer or cell-death, compared to photo or beta radiation, for equivalent radiation exposure. This is generally attributable to the high Linear Energy Transfer (LET), which is about one ionization of a chemical bond for every Angstrom of travel by the alpha particle. The RBE has been set at the value of 20 for alpha radiation (DU) by various government regulations. The RBE is set at 10 for neutron irradiation, and at 1 for beta and ionizing photon radiation.

However, another component of DU's alpha radiation is the recoil of the parent nucleus, due to the conservation of momentum requiring the parent nucleus to recoil, much like the 'kick' of a rifle butt when a bullet goes in the opposite direction. This gives a significant amount of energy to the recoil nucleus, which also causes ionization damage. The total energy of the recoil nucleus is readily calculable, and is roughly the weight of the alpha (4 amu) divided by the weight of the parent (typically about 200 amu) times the total energy of the alpha. By some estimates, this might account for most of the internal radiation damage, as the recoil nuclei are typically heavy metals which preferentially collect on the chromosomes. In some studies[2] this has resulted in a RBE approaching 1,000 instead of the value used in governmental regulations.

Normal functioning of mammalian kidney, brain, liver, heart, and numerous other systems can be affected by uranium exposure, because in addition to being radioactive, uranium is a toxic metal.[5]

The Institute of Nuclear Technology-Radiation Protection of Attiki Greece has noted that "depleted uranium munitions can potentially contaminate wide areas around the impact sites or can be inhaled..."[6]

Studies using cultured cells and laboratory rodents continue to suggest the possibility of leukeomgenic, genetic, reproductive, and neurological effects from chronic exposure.[53] In addition, the UK Pensions Appeal Tribunal Service in early 2004 attributed birth defect claims from a February 1991 Gulf War combat veteran to depleted uranium poisoning.[54] [55]

DU is considered both a toxic and radioactive hazard. Its use in incendiary ammunition is controversial because of potential adverse health effects and its release into the environment .[56] [57] [58] [59] [60 [61]

Besides it's residual radioactivity, DU is a heavy metal whose compounds are know from laboratory studies to be toxic to mammals.

THAT'S WHY

References:

(1) www.ehjournal.net/content/4/1/17

(2) Winters-TH, Franza-JR, Radioactivity in Cigarette Smoke, New England Journal of Medicine, 1982; 306(6): 364-365

(5) E. S. Craft, A. W. Abu-Qare, M. M. Flaherty, M. C. Garofolo, H. L. Rincavage, M. B. Abou-Donia (2004). "Depleted and natural uranium: chemistry and toxicological effects". *Journal of Toxicology and Environmental Health Part B: Critical Reviews* 7 (4): 297-317.

(6) Mitsakou C, Eleftheriadis K, Housiadas C, Lazaridis M Modeling of the dispersion of depleted uranium aerosol. <http://www.ncbi.nlm.nih.gov/pubmed/12705453> 2003 Apr, Retrieved January 15, 2009

(11) Hindin, R. *et al.* (2005) "Teratogenicity of depleted uranium aerosols: A review from an epidemiological perspective," <http://www.ehjournal.net/content/4/1/17> *Environmental Health,* vol. 4, pp. 17. at PubMed <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1242351>

(24) US Dept. of Energy Handbook, "Primer on Spontaneous Heating and Pyrophoricity" <http://hss.energy.gov/NuclearSafety/techstds/standard/hdbk1081/hbk1081.html>, Chapter "Uranium" <http://hss.energy.gov/NuclearSafety/techstds/standard/hdbk1081/hbk1081e.html>

(53) Miller AC, McClain D. (2007 Jan-Mar). "A review of depleted uranium biological effects: in vitro and in vivo studies". *Rev Environ Health* **22** (1): 75-89. PMID 17508699 <http://www.ncbi.nlm.nih.gov/pubmed/17508699>.

(54) Williams, M. (February 9, 2004) "First Award for Depleted Uranium Poisoning Claim," <http://vitw.org/archives/405> *The Herald Online,* (Edinburgh: Herald Newspapers, Ltd.)

(55) Campaign Against Depleted Uranium (Spring, 2004) "MoD Forced to Pay Pension for DU Contamination," <http://www.cadu.org.uk/news/17.htm> *CADU News 17*)

(65) Wan B, Fleming J, Schultz T, Sayler G (2006). "In vitro immune toxicity of depleted uranium: effects on murine macrophages, CD4+ T cells, and gene expression profiles". *Environ Health Perspect* **114** (1): 85-91. PMID 16393663 <http://www.ncbi.nlm.nih.gov/pubmed/16393663>.

(66) Arfsten D. P., Still K. R., Ritchie G. D. (2001). "A review of the effects of uranium and depleted uranium exposure on reproduction and fetal development.". *Toxicol Ind Health* **17** (5-10): 180-91. doi 10.1191/0748233701th111oa <http://dx.doi.org/10.1191%2F0748233701th111oa>. PMID 12539863 <http://www.ncbi.nlm.nih.gov/pubmed/12539863>.

(67) Domingo J. L. (2001). "Reproductive and developmental toxicity of natural and depleted uranium: a review". *Reprod Toxicol* **15** (6): 603-9 <http://www.ncbi.nlm.nih.gov/pubmed/11738513>.

(68) Briner W., Murray J. (2005). "Effects of short-term and long-term depleted uranium exposure on open-field behavior and brain lipid oxidation in rats.". *Neurotoxicolgy and Teratology* **27** (1): 135-44. <http://www.ncbi.nlm.nih.gov/pubmed/15681127>.

(69) A.C.Miller, D.Beltran, R.Rivas, M.Stewart, R.J.Merlot and P.B. Lison (June 2005) (PDF), *Radiation- and Depleted Uranium-Induced Carcinogenesis Studies: Characterization of the Carcinogenic Process and Development of*

Medical Countermeasures
<http://www.afrri.usuhs.mil/www/outreach/pdf/miller_NATO_2005.pdf>, **CD 05-2**, Armed Forces Radiobiology Research Institute, NATO RTG-099 2005