Utah Department of Environmental Quality
Division of Radiation Control

Frequently Asked Questions

November 2013

Depleted Uranium Performance Assessment

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DU Performance Assessment

www.radiationcontrol.utah.gov/EnSolutions/depleteduranium/performassess/duperfass.htm

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What is Depleted Uranium (DU)?

Depleted uranium is a byproduct of the uranium enrichment process. Natural uranium is composed of three primary isotopes: U^{235}, U^{238}, and U^{234}. Nuclear reactors need a higher concentration of fissionable uranium-235 (U^{235}) than occurs naturally. The enrichment process increases the proportion of U^{235} available to create a nuclear reaction.

The material left from the enrichment process is "depleted," meaning it has proportionately less U^{235} and proportionately more U^{238}. Depleted uranium is initially less radioactive than natural uranium.

The enrichment process produces small quantities of enriched uranium and large quantities of depleted uranium hexafluoride (DUF_6), an unstable compound. To stabilize this depleted uranium, deconversion facilities chemically extract fluoride and replace it with oxygen. This produces uranium oxide, a chemically stable compound. Deconversion facilities place this uranium oxide into steel canisters for long-term disposal.

How Does Depleted Uranium Waste Change Over Time?

Depleted uranium retains its radioactivity for a very long time. Uranium decays very slowly, with a half-life ranging from millions to billions of years.

The decay products of uranium become more radioactive over time due to ingrowth. This ingrowth occurs when "parent" uranium isotopes decay to produce "daughter" isotopes. If these daughter isotopes are unstable, they decay as well, producing even more daughters. As these daughter products grow, the total radioactivity from uranium and these daughters increases. Radioactivity peaks after about one or two million years, at which point the daughter products decay as fast as they are generated, resulting in secular equilibrium. After billions of years, U^{238} and its daughter products decay to a stable form of lead.

Radioactivity for depleted uranium that has reached secular equilibrium can be almost 14 times greater than the initial radioactivity levels. While depleted uranium may meet Class A waste classification requirements prior to shipment and disposal, over a lengthy period of time its radioactivity levels may increase beyond Class A and Class C values.

What is a Performance Assessment?

A performance assessment (PA) is a quantitative evaluation to determine whether a disposal facility can meet federal and State performance standards to protect public health and safety. It considers:

- potential radiation exposures from the disposal site to the general public or inadvertent intruders by evaluating different scenarios for exposure;
- potential radiological dose, using appropriate modeling and methodologies, to determine if there is reasonable assurance that the potential dose will be below the regulatory standard;
- the stability of the site during operation, closure, and post-closure, including site conditions, potential pathways for transport of materials, the potential for environmental releases, and disposal depth;
- performance and institutional control periods sufficient to protect public health and safety.

Energy*Solutions* requested a license amendment to allow it to accept large quantities of depleted uranium for disposal at its facility. Federal and state rulemaking require Energy*Solutions* to conduct a site-specific PA to determine if the Clive facility is suitable for the disposal of DU. State rules require a compliance period for DU of a minimum of 10,000 years, with additional qualitative simulations for the period of peak radiation dose.

On June 1, 2011, Energy*Solutions* submitted a 960-page, site-specific Performance Assessment to the State that identified critical data, facility design, and modeling procedures for DU disposal at its facility. The Division of Radiation Control (DRC) will use the information from the PA, along with contractor and state agency review of the Performance Assessment, to determine whether the company can provide reasonable assurance of compliance with regulatory performance objectives for the safe management and storage of depleted uranium.

What is the Tentative Timeline for DRC Review of the Performance Assessment?

Division review of the Performance Assessment is currently underway. The 2013 timeline is as follows:

August 27, 2013
DEQ enters into a contract with Virginia-based contractor, S. Cohen & Associates (SC&A), to assist with the evaluation of the Energy*Solutions* Performance Assessment.

October 28, 2013
DEQ sends its Completeness Review (CR) of the DU Performance Assessment to Energy*Solutions*. The agency gives Energy*Solutions* a November 2013 deadline to respond to comments from the CR and submit any missing or additional information for the Performance Assessment.

November 13, 2013
DEQ hosts an Open House to allow interested members of the public an opportunity to ask questions about the review process.

Tentative 2014 Timeline

July 2014
Final Safety Evaluation Report (SER) complete.

July 2014
Public comment period begins.

August 2014
Public Meetings (dates and times TBD).

August 2014
Public comment period ends.

September 2014
Final determination by the Director of Division of Radiation Control on whether or not to issue Energy*Solutions* a license amendment or a new license application for the disposal of depleted uranium.