Abridged Discussion on HLW Definition Revision

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The present source-based definition of HLW is part of a feel-good solution for disposing of spent commercial reactor fuel. The second part of this feel-good solution is that all HLW has to be permanently isolated from the world in a deep geologic formation, so we can forget about it. Nothing in the current approach allows consideration of other possible solutions that could equally protect human health and the environment. The current approach was subsequently applied to the wastes that arose from reprocessing activities at our defense production sites, and the projected costs and schedules for placing that massive volume of material into deep geologic formations are prohibitive. As a result, ways have been devised to avoid having to treat and dispose as HLW much of the wastes stored in the tanks. The agreement with USNRC to allow reclassification of a large fraction of those wastes as "Incidental to Reprocessing" requires removal of most of the high specific-activity materials from a large volume-fraction of the tank wastes and has led to the development of very complex and expensive treatment systems and equipment to accomplish that removal, as evidenced by the current problems with the Waste Treatment Plant. Another volume-reduction effort (reclassification of some of the tank wastes as TRU, for disposal at WIPP) has been proposed by DOE, but may be illegal, as was discussed earlier this afternoon by Al Boldt.

A science-based approach to resolving how to treat and where to dispose of the tank wastes could be similar to the performance assessment protocols developed during the efforts to qualify the Yucca Mountain site to receive spent commercial reactor fuel. Well-characterized data used in the site-specific baseline calculations could be adjusted in sensitivity calculations to establish the required performance parameters of the immobilization treatment, and guide the development of the system processes needed to assure protection of human health and the environment.

DOE should commission the National Academies to consider the question of treatment of tank wastes and disposal of those wastes at locations other than deep geologic formations. The Academy should develop alternatives to the current rule that "if it came from reprocessing, it is HLW and goes into deep geologic disposal". Those alternatives should have strong scientific bases and should protect human health and the environment at a cost to the nation that is not exorbitant.

Why the Source-Based Definition of HLW Needs Revision

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The current source-based definition of High Level Waste (10CFR50 Appendix F) has long-outlived its usefulness. That definition says: ["high-level liquid radioactive wastes" means those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels.] By statute, high level waste requires immobilization and geologic isolation from surface environmental systems, regardless of the actual concentrations of radioactivity contained in the waste stream.

Very large volumes of "high-level wastes" were generated at the Defense Nuclear Production Facilities at Hanford and Savannah River during the roughly 40 years of production activities. Because the projected costs to immobilize and isolate these waste volumes in deep geologic repositories were so large, efforts were made to minimize the "high-level waste" volumes, basically by creating ways to reclassify a large fraction of that volume to the equivalent of "low level waste". Agreements were reached with the US Nuclear Regulatory Commission that if the concentrations of radioactive components in large volumes of the waste could be reduced to sufficiently low specific-activity levels (Low Activity Waste, LAW), that waste material could be redefined as "wastes incidental to reprocessing"(i.e. equivalent to "low level waste"), and would not require deep geologic isolation.

As a result, the original source-based "high-level waste" is subdivided into a much smaller volume fraction of "high-level waste" that would require deep geologic isolation, and a much larger volume fraction of "low activity waste" (LAW) that could be immobilized and dispositioned to a near-surface disposal facility, thus greatly reducing overall waste immobilization and disposition costs. This approach is the basis for the current DOE immobilization and disposition path forward for reprocessing wastes at defense nuclear production sites, and has led to the design and development of some very complex systems and processes for treating the wastes.

This approach has also given rise to some interesting and potentially dangerous anomalies when considering the ultimate goal of protecting human health and the environment against the consequences of disposal of the defense reprocessing wastes. The high specific-activity fission product components (e.g., Cs-137) which have relatively short half-lives, end up in the HLW fraction of the waste stream destined for geologic isolation, and the very long-lived but low specific-activity components (e.g., I-129 and Tc-99) end up in the LAW fraction of the waste stream destined for near-surface disposal. This arrangement is problematic because the I-129 and the Tc-99 components have been shown in performance assessment analyses for Hanford near-surface disposition as the dominant sources for long-term radioactive exposure to the public and the environment, and clearly should be better isolated from the near-surface environment.

The mission of protecting human health and the environment would be much better served if the current machinations designed to reduce volumes requiring geologic isolation were replaced by a science-based protocol that evaluated the short and long-term risks of dispositioning specific waste materials into site-specific locations (i.e., performance assessment analyses). The results of these analyses could then serve as guidance for selecting waste treatment processes that could provide sufficient immobilization of the waste components to allow disposal into non-deep geologic locations. It should be noted that most of the radioactive components of DOE's defense reprocessing wastes have specific-activity levels that fall within the NRC's categories of Class A, B, or C for Low Level Waste which, under current regulations, do not require geologic isolation.

DOE should commission the National Academies to examine these questions and provide recommendations, as the first step toward developing rational science-based protocols for treatment and disposal of DOE's defense reprocessing wastes.