

Summary of Closed Meeting on Aqueous Reprocessing Conceptual Model  
December 10-11, 2012

The U.S. Nuclear Regulatory Commission (NRC) is assessing hazards and risks associated with aqueous reprocessing to (1) provide the Department of Energy (DOE) regulatory input to its Advanced Fuel Cycle Research and Development Program, which includes spent nuclear fuel separations and waste forms, and (2) further develop the draft regulatory basis for reprocessing safety and risk assessments regulatory gap contained in Chapter 2 of the NRC's Draft Regulatory Basis for Licensing and Regulating Reprocessing Facilities dated November 2011 (Accession No. ML112081702). The NRC tasked the Center for Nuclear Waste Regulatory Analyses (CNWRA) to develop (1) conceptual process flow diagrams with mass balances and (2) conceptual facility design descriptions for a reprocessing facility that co-extracts uranium and plutonium from spent nuclear fuel, immobilizes and stores high-level waste, and fabricates mixed oxide fuel.

The purpose of the meeting was to fill the information gaps for the activities described above since a significant amount of such information is unavailable in open literature. This meeting discussed data gaps and assumptions used to develop the draft conceptual model for estimating hazards and risk. The enclosed draft slides which identify the conceptual model were used to conduct the meeting discussions. AREVA and DOE's Idaho National Laboratory representatives were asked to comment on the draft conceptual model. They indicated that the basic assumptions that the CNWRA made in coming up with the conceptual facility design descriptions for an aqueous reprocessing facility were reasonable with a few exceptions, some of which are noted below:

- The iodine desorption process was assumed to be over efficient
- The spent fuel accountability tank was assumed to render the highest hydrogen explosion hazard instead of the concentrated high-level waste buffer storage tank
- Hydrazine was excluded from the uranium and plutonium co-extraction process and the nitric acid concentration assumed was high for partitioning uranium
- Wrong types of calciner and denitrator were assumed in the uranium and plutonium mixed-oxide powder production process
- The ratio of the mixing volume to the settler volume in the mixer-settlers was overestimated
- The process flow rates in the pulsed separations columns were underestimated
- Certain large pieces of equipment in the plutonium-uranium decontamination process were out of sequence
- Buffer tanks for storing concentrated high-level waste were missing in the high-level waste treatment process

As a result of information gained in this meeting, CNWRA will revise its conceptual facility design descriptions and proceed with developing the conceptual model that can be applied for quantitative hazard and risk estimations.

During the meeting, no agreements or regulatory decisions were discussed or made.

Enclosures: (1) Attendees  
(2) Slides, Closed Meeting to Discuss Aqueous Reprocessing Conceptual Model