

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

January 3, 2020

TO: Christopher J. Roscetti, Technical Director
FROM: Matthew Duncan and Brandon Weathers, Resident Inspectors
SUBJECT: Oak Ridge Activity Report for Week Ending January 3, 2020

Modular Facility Operation: NPO issued a safety evaluation report approving the CNS proposed final hazard categorization for the modular facility as Below Hazard Category 3 (see 7/5/19, 9/20/19, and 11/8/19 reports). This is the first time that Y-12 will perform a fissile operation in a facility considered to be non-nuclear where criticality is precluded by the nature of process and segmentation such that a criticality accident alarm system is not required. While there were no explicit conditions of approval, NPO noted that there are conditions, parameters, and assumptions that must be maintained to ensure the basis for the hazard categorization remains valid. For example, there are nine assumptions in the nuclear criticality safety determination. This approval is limited to the first set of components that will be processed in the modular facility. Additional components that are planned for future work will require a subsequent review by NPO.

Safety Basis: The resident inspector reviewed documentation from a receipt of a significant amount of enriched uranium from a foreign country via the Central Scrap Management Office. The scrap declaration includes various information, such as a general description of the material received, including processing history, enrichment, and chemical and radiological impurities. Notably, it stated that the possible plutonium content from reprocessing would be less than 10 ppm with respect to uranium, and that the worst case plutonium isotopic concentration by mass for plutonium-238 was estimated to be 17%. Review of the supporting safety basis documentation and calculations indicated this was bounded by what was analyzed (20 ppm plutonium of which 17% is plutonium-238), but further evaluation indicated there was an error in the calculation that significantly underestimated the plutonium-238 contribution to the calculated inhalation dose conversion factor. The assumed plutonium solubility class was also not conservative. Finally, the scrap declaration also stated the uranium-236 concentration could be much higher than assumed in the calculation, though the impact would be significantly less. The resident inspector shared this information with NPO and CNS. CNS processed it through its new information process and after further research determined there was a typographical error in the calculation. This makes the question regarding the solubility class moot. CNS determined a potential inadequacy of the safety analysis does not exist.

Building 9212: CNS nuclear criticality safety engineers completed an evaluation of the potential nuclear criticality safety issues identified with the Building 9212 skull burner (see 11/15/19 report). The evaluation involved verifying the dimensions of skull burner crucibles and performing additional calculations for a range of oxide densities and crucible inner diameters. Based on the field measurements and calculation results, nuclear criticality safety personnel recommend that skull burner operations may resume with crucibles that have been verified by field measurements to match the dimensions indicated on the design drawing.

Uranium Processing Facility: Two weeks ago, NNSA approved the critical decision 4 milestone (project completion) for the Uranium Processing Facility Substation Subproject.