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Enhanced Chemical Cleaning Project Y-492 (ECC)

Mission Need Statement

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The Mission Need of the Enhanced Chemical Cleaning (ECC) Project is to provide an additional cleaning option to render a waste tank as clean as practical to satisfy criteria necessary to operationally close the tank and remove it from the Industrial Wastewater permit. During bulk waste removal, most of the radioactive sludge and salt waste is removed from a tank. The waste residue on the tank walls and interior components and the waste heel at the bottom of the tank must be further removed prior to tank closure to minimize the impact of the closure action on future human health and the environment. How clean a tank must be prior to taking irreversible closure actions is driven by several regulatory standards. The primary applicable closure standards are:

- DOE Order 435.1;
- Section 3116 of the 2005 National Defense Authorization Act (NDAA); and
- South Carolina Pollution Control Act General Closure Plan (tank farm-specific).

In the standards above, certain maximum future peak year dose levels are established for both radioactive and chemical constituents resulting from the closure activities. These peak year dose requirements, typically referred to as "performance objectives," define the threshold that must be achieved before consideration of closure actions. For F-Tank Farm and H-Tank Farm, the cumulative contributions from all tanks, components and structures within the specific tank farm are compared to the applicable performance objectives. A second, and equally important, criterion found in each of these regulatory standards is the requirement to demonstrate to that all practical efforts have been made to reduce the final inventory of radioactive and chemical constituents in the residual waste that could contribute to dose to future members of the public. Although the terms used to describe this criterion differ slightly among the standards (e.g., "remove key radionuclides to the maximum extent that is technically and economically practical," "removal of highly radioactive radionuclides to the maximum extent practical," or "removal to the extent practicable from an engineering perspective"), a cogent argument must be documented that clearly demonstrates that all reasonable activities to remove waste prior to closure were considered and implemented as practical.

Oxalic acid cleaning of tanks was successfully demonstrated through the cleaning of Tank 16 in the early 1980's. Tanks 5 and 6 were cleaned using three large batches of concentrated oxalic acid similar to the Tank 16 cleaning campaign. This method is also planned for Tank 7. This process is referred to as Bulk Oxalic Acid Cleaning. Although the application of this process has been determined to be acceptable for Tanks 5, 6 and 7 as documented in Liquid Waste System Plan revision 15, it results in hundreds of thousands of gallons of spent acid that must be handled in the compliant waste tanks. The spent acid forms oxalates that are anticipated to create evaporator foaming and scaling problems, increase the volume of water required to wash the sludge, and increase the volume of saltstone that is disposed of in the Saltstone Disposal Facility. For these reasons, the bulk process cannot be accommodated in the liquid waste system flowsheet over the long term and is therefore not planned for any additional tanks.

Enhanced Chemical Cleaning is based on adapting proven techniques from the commercial reactor and steam-generating industries to the cleaning of the SRS carbon steel waste tanks. A dilute acid stream dissolves residual waste and etches steel surfaces to clean tank internals. The oxalates in the acid stream are then destroyed using a proprietary process developed by AREVA. The dissolved metals and associated radionuclides precipitate out and are transferred to a compliant sludge tank. Concentrated oxalic acid or oxalic acid crystals regenerate the acid cleaning stream for reuse. Since this process can be utilized with minimal impacts on tank space and downstream processes, the tank cleaning can continue until the process is no longer effective in removing the residuals.

Successful completion of this chemical cleaning step is expected to render the tank as clean as practical and thus strongly support meeting the tank closure requirements. Enhanced Chemical Cleaning allows virtually unlimited use of oxalic acid to clean the tanks and is therefore planned to be a key element of the practicality arguments required to satisfy the regulatory standards discussed above.