NE-19-18711, Nuclear Material Holdup Modeling and Measurement Campaign for the Columbia Fuel Fabrication Facility

In 2016, the Westinghouse Electric Company Columbia Fuel Fabrication Facility (CFFF) discovered an inadvertent, large accumulation of uranium-bearing materials in a rooftop ventilation scrubber system. The Nuclear Regulatory Commission was notified, and a major extent-of-condition and a root cause analysis were conducted. The main CFFF operations were halted for months while these activities were ongoing. Large quantities of uranium were found in in-service and out-of-service ventilation systems across the plant. Fuel delivery schedules were challenged nearly to the point of failure. Based on this event, regulators all over the world ordered processing facilities to inspect ventilation systems and other equipment and issued notices, reports, orders, and violations based on subsequent discoveries.

An attempt to perform in-situ non-destructive assay on other relatively low SNM content ventilation systems has met with some success. This was accomplished through careful statistical analysis of extensive cleanout data used for a one-time calibration. This has not been done for the Torit® process ventilation systems due to the difficulty in equipment availability as well as other technical factors that make these systems more challenging to model.

Westinghouse Electric Company and Oak Ridge National Laboratory will design and perform an experiment that incorporates improved measurements to produce a calibrated, National Institute of Standard and Technology traceable, non-destructive assay measurement method that will address these volumetric type deposits. This method, involving modeling and measurements, will allow the holdup accumulations to be better monitored and estimated, precluding the need for filter disassembly, and will assist in addressing the issues raised by Nuclear Regulatory Commission.