Tech Fact Sheet

Portsmouth-Paducah Program Office ***Ohio Kentucky***

Non-Destructive Analysis Calibration Standards for Gaseous Diffusion Plant (GDP) Decommissioning

Challenge

The decommissioning of GDP facilities requires accurate, non-destructive assay (NDA) of residual enriched uranium in facility components for safeguards and nuclear criticality safety purposes. Current practices used to perform NDA measurements frequently have poorly defined uncertainties due to several factors, including; lack of available Working Reference Material (WRM) standards and surrogate container matrices to test performance and less than adequate programmatic requirements defined by end users. As a result, measurement uncertainties (typically ± 50 to 100 percent of measured values) are estimated without supporting data. Conservative uncertainty estimates may lead to safeguards and criticality safety measures that are costly, unnecessary and overly conservative. Alternatively, underestimating uncertainty could lead to inadequate controls. WRM standards and methods for adequately defining NDA measurement uncertainties are needed for better quantification of residual uranium deposits (typically referred to as "holdup").

Technical Solution

The acceptance and use of NDA characterization data to support D&D projects requires verification and validation of the methods used to collect and interpret the NDA data. Working reference material (WRM) standards and container-specific surrogates are required to verify and validate NDA methods used to support characterization of gaseous diffusion equipment within the D&D project. Because working reference material standards are not commercially available, EM Headquarters collaborated with the Paducah Site Office to prepare such required standards to simulate the chemical and physical conditions present in the systems, structures and components being characterized. The development and implementation of working reference material standards, coupled with use of container-specific surrogates, provides the necessary and sufficient means of evaluating the performance of NDA methods. The evaluation of performance is essential for identifying the capabilities and limitations of NDA methods.

NDA radiation detector put in place to measure the contents of the blue box.

Various NDA measurement devices, which can be positioned near plant equipment for measurement.

Site Project & Identifier	Tech Stage: Deployed
Portsmouth-Paducah Program Office – NDA Calibration Standards	NDA Standards have been developed and deployed at Portsmouth.

Tech Accomplishment

Working reference materials have been developed using configurations (uranium content, chemical form, etc.) similar to those in the GDP facility for testing in surrogate materials that simulate geometry and other cascade measurement conditions. Additional working reference materials in different enrichments and configurations are under construction and testing is planned in the near future.

Impact

By developing working reference materials, a scientifically defensible method for accurately estimating uncertainty in NDA measurements of enriched uranium in cascade process equipment can be provided.

Impact and Features

- Provide a scientifically defensible method for accurately estimating uncertainty in NDA measurements of enriched uranium in cascade process equipment.
- Enhances safeguards and nuclear criticality safety during decommissioning of cascade facilities.
- Potentially reduce costs in decommissioning of cascade facilities by avoiding unnecessary safeguards and nuclear criticality safety measures.

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Technology Name	• NDA calibration standards • Criticality safety • GDP decommissioning
Federal End User Information	Mr. Tom Hines DOE Paducah Site Office 270-441-6829
Tech User Information	TBD
Web Links	TBD
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Challenge Category	Tech Solution Category
• Criticality Safety • Material Safeguards • Measurement uncertainty	• Instrument Calibration • NDA measurements • Criticality Safety