Environmental Technology Development, Deployment and Commercialization: Two DOE Examples

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Goal and Scope. Two instruments developed at Los Alamos National Laboratory (LANL) are now being deployed at Department of Energy (DOE) sites. Each illustrates complexities of environmental technology development, deployment, and licensing in DOE.

Methods. The SuperHENC is a high-efficiency passive neutron-coincidence counting system for the rapid assay of plutonium contents of large containers (1.9 m^3 Standard Waste Boxes -SWBs) of waste contaminated with transuranic elements from the Rocky Flats Environmental Technology Site (RFETS), destined for deep geologic disposal at the Waste Isolation Pilot Plant. The system is trailer-mounted, and is integrated with a BNFL Instruments, Inc. Gamma Energy Analysis system for isotopic measurement. The SuperHENC incorporates state-of-the-art hardware and software developed at LANL to enable assay of large containers at accuracy and precision expected of drum counting systems. The project was funded by RFETS with support from the Accelerated Site Technology Deployment program. Commercial licensing of the technology was part of the initial plan, and two vendors have agreed to license the technology. Development and deployment have taken longer than anticipated due to unforeseen changes in 1) funding and schedule priorities at the site, 2) authorization basis issues and DOE standards, 3) technical issues with background correction.

The Supercritical Fluid Extraction/Fourier Transform Infrared (SFE/FTIR) system developed at Los Alamos analyzes stabilized plutonium-bearing nuclear materials for moisture content, to ensure compliance with DOE Standard 3013-2000 for stabilization and long-term storage of surplus plutonium. The standard addresses a Secretarial commitment to the Defense Nuclear Facilities Safety Board (DNFSB) in response to their Recommendation 94-1, which addresses the risk of unstabilized nuclear materials at DOE weapons complex sites. The system is intended to replace the Loss-On-Ignition (LOI) method, which tends to vaporize non-hydrogenous constituents, thereby giving a falsely high estimate of moisture content. The SFE/FTIR system has been deployed at both LANL and at Hanford, and gives a valid measurement for all materials currently represented in the Integrated Surveillance Program of the 94-1 Research and Development program.

Results and Conclusions. The SuperHENC system is undergoing WIPP Certification audit in mid-May. By avoiding the need to reduce large objects to fit in drums, the SuperHENC is expected to save $100 million, reduce worker dose and injury during deactivation and decommissioning of weapons complex facilities, and accelerate closure of the Rocky Flats plant, reducing risk to the environment and the public.

The SFE/FTIR system is available as off-the-shelf components, with straightforward analytical procedures, and is expected to save $15 million through reduced need to recalcine material. However, a new process at Hanford produces calcined materials that may give a false negative analysis by SFE/FTIR. A technical review of this already deployed technology will determine whether it can satisfactorily meet the requirements of the standard for this material type.

Recommendations and Outlook. State-of-the-art technology can be reasonably rapidly deployed and commercialized, given careful planning, attention to site authorization basis and quality assurance requirements, and a recognition that extended technical support to sites may be needed, as the system cannot be expected to solve all problems at once.