



Department of Energy
Washington, DC 20585

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DNF SAFETY BOARD

June 7, 2010

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

This letter is to inform you of the completion of Commitments 5.3.1.4, 5.3.1.5, and 5.3.1.6 in the Department of Energy (DOE) *Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2007-01*, dated October 24, 2007. With this transmittal, all deliverables associated with Commitment 5.3.1 have been completed.

Commitments 5.3.1.4 through 5.3.1.6 identify *in situ* nondestructive assay (NDA) research and development, quality assurance, and oversight needs. No interim actions are necessary. A report documenting the NDA needs is attached.

If you have any questions or need further information, please contact me at (301) 903-4218.

Sincerely,

A handwritten signature in black ink, appearing to read "Richard H. Lagdon, Jr.", with a long horizontal line extending to the right.

Richard H. Lagdon, Jr.
Chief of Nuclear Safety
Office of the Under Secretary
U.S. Department of Energy

Attachment

cc:

K. Johnson, S-3
J. Poppiti, EM-21
M. Whitaker, HS-1.1
S. Petras, HS-1.1



Nondestructive Assay (NDA) Holdup Measurement Program Needs

The purpose of this report is to identify attributes of an NDA holdup program that are necessary for the safe and cost-efficient elimination or mitigation of criticality safety hazards. The summary statement of the needs identification deliverable is:

5.3.1 Identify DOE NDA holdup measurement needs and technical bases for personnel training and qualification; equipment capabilities; directives; research and development; quality assurance; oversight; and any interim actions.

The needs identification deliverable is further broken down into six subparts. This report completes deliverable 5.3.1 by addressing subparts 5.3.1.4, 5.3.1.5, and 5.3.1.6. Deliverable subparts 5.3.1.1, 5.3.1.2, and 5.3.1.3 were previously submitted to the Board on March 31, 2010. Deliverable subpart 5.3.1.4 is a report identifying the R&D projects for which funding is requested. Subpart 5.3.1.4 identifies R&D needs, and incorporates the needs through the Planning, Programming, Budgeting, and Execution process of nuclear safety R&D. The identification of research and development needs is addressed in this report. The incorporation of these needs into nuclear safety R&D will be addressed in a separate report associated with Deliverable 5.4.1 (conduct of a gap analysis).

The Department will conduct a gap analysis using the outcomes of the extent of condition, state of the practice, and DOE NDA holdup measurement needs reviews as the basis for developing a plan that is prioritized to address identified gaps in personnel training and qualification; equipment capabilities; policy, directives, and standards; research and development; quality assurance; and oversight. Actions will then be taken (Deliverable 5.4.2) to address the identified needs and to close gaps between current NDA holdup measurement practices and the state of the practice. This may require introducing commercial practices or equipment into the DOE complex or research and development for new equipment or practices. Potential gap-filling actions will be risk- and cost-prioritized.

Deliverable 5.4.2 will identify those prioritized R&D projects that will be submitted for consideration under the Nuclear Safety R&D project, as well as the schedule, responsible parties, funding source for developing the proposals, and mechanisms that will be used to draft the R&D requests and submit them for consideration.

Specific deliverables are broken out of the summary statement and are discussed separately.

5.3.1.4 Identify and incorporate the needs for in-situ NDA Research and Development (R&D) through the Planning, Programming, Budgeting, and Execution process of nuclear safety R&D.

The Technical Support Group (TSG) evaluated research and development (R&D) activities during the site visits with extensive inquiries into current R&D activities associated with NDA measurements in general and NDA holdup measurements in particular. These inquiries included, but were not limited to, instrumentation, data analysis, procedures, automation, measurement

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uncertainty, and the measurement uncertainty process, measurement techniques, nuclear material standards, and calculations.

One consistent issue that emerged was the lack of R&D funding for NDA and holdup measurements across the DOE complex. Currently, there is no known source of domestic R&D funding for NDA and no mechanism for making NDA R&D needs known to funding agencies. In the past, R&D needs were made known through the user needs call coordinated by the Office of Safeguards and Security. Reorganizations and changes in mission focus have all but eliminated DOE support for domestic NDA and NDA holdup R&D. The result has been an erosion of technical capabilities and corporate knowledge as experienced practitioners approach retirement. The current lack of R&D support is a disincentive for new personnel to enter the NDA field.

The *in-situ* NDA R&D needs are to:

- Reestablish consistent, long-term, and effective DOE funding support for domestic NDA R&D supporting operating facilities and facilities undergoing deactivation and decommissioning (D&D).
- Establish an independent verification technique or a well-characterized test bed to verify holdup measurements performed.
- Implement a modified version of the holdup measurement software (HMS4) that simultaneously analyzes multiple energy lines, thereby reducing data analysis time and the potential for human error.
- Develop and document a correction factor for area measurements performed at an angle relative to the nuclear material deposit.
- Develop attenuation correction parameters for non-regular geometries such as a half-filled pipe, round geometry shielding, and thick shielding with variable attenuation path lengths.
- Develop, test, and apply medium-resolution detectors for *in situ* holdup measurements (this is an area that would benefit D&D operations significantly).
- Require R&D funding support to thoroughly evaluate and integrate new commercial developments into operational holdup measurement equipment.
- Promote enhancements to detectors and techniques in the areas of reliability and human factors engineering as found in sections 5.3.1.2-A and 5.3.1.2-B of NDA Holdup Needs (Part 10).
- Develop and standardize an uncertainty model with complex-wide application to replace the multiple, varied approaches currently used.

5.3.1.5 Identify quality assurance needs to ensure effective implementation of NDA activities.

The quality assurance (QA) needs are to:

- Ensure QA is incorporated into new consensus standards by including guidance in the areas of procedural development, definition of terms, definition and documentation of data quality objectives, consistent application of techniques, and performance of calculations, including uncertainty determinations, with clear communications with stakeholders;
- Ensure that NDA staff are supplied training in the areas of QA related to DOE requirements;
- Ensure QA staff are adequately trained in the areas of NDA and *in-situ* measurements to effectively evaluate QA related to these areas;
- Selection of opportunities for validation of NDA measurement results against cleanout quantities or other confirmation data; and
- Consistent application of the data quality objectives process with NDA customers.

5.3.1.6 Identify oversight needs consistent with DOE O 226.1 to ensure effective implementation of NDA activities.

5.3.1.6-A Oversight Performance

Assessments related to NDA are performed by NDA customers or end users of holdup results (i.e., material control and accountability (MC&A), criticality safety, safeguards and security, waste characterization, and radiological protection personnel). While it is expected that external oversight in the form of DOE-initiated MC&A reviews or expert assistance requested by the holdup NDA program management is performed infrequently, self-assessments are expected to be performed several times per year by NDA personnel as well as the NDA customers.

The oversight performance need is to:

- Enhance the rigor of the self-assessment program in the following areas:
 - Annual schedule of self-assessments to be performed by holdup NDA personnel;
 - Selected topic areas based on observed and noted needs of the NDA program;
 - The quality of field measurements, NDA data, analysis methods, technical reports, and proper use of results;
 - Recognition of NDA measurement uncertainty and the use of results as applied to criticality safety requirements;

- Management observations; and
- A summary of results, including metrics, that reflects an evaluation of the self-assessment program.

5.3.1.6-B Corrective Actions

The corrective action need is to:

- Increase rigor in the following areas:
 - Application of a formal or informal causal analysis to identified deficiencies, as warranted;
 - Corrective actions determined on a graded approach, including a dedicated review board with input from organizations impacted by the deficiency; and
 - Corrective actions tracked to completion with documented verification.

5.3.1.6-C Holdup NDA Program

The Holdup NDA Program needs are to:

- Retain experienced NDA personnel to plan NDA measurements, perform technical reviews of NDA analyses, and provide guidance to less experienced NDA personnel;
- Use other NDA experts as available onsite for assistance with the many facets of holdup NDA; and
- Regularly communicate issues between NDA and criticality safety personnel to support the proper understanding and application of *in situ* NDA capabilities.

Conclusion

The generic *in situ* NDA holdup measurement program needs identified in this report are based on the results of state-of-the-practice reviews at three sites within the scope of the Implementation Plan, and do not encompass site-specific needs. Given the programmatic differences between the sites, including relative criticality risk associated with fissionable material holdup, a graded approach will be applied to tailor the generic needs for specific sites. Given the recently conducted *Nondestructive Assay Holdup Measurements of Uranium and Plutonium Materials Training* conducted at Los Alamos National Laboratory and ongoing support for standards development, no interim actions have been identified in the areas covered in this report.