

LA-UR-12-21764

Approved for public release; distribution is unlimited.

Title: Fuel Cycle Research & Development Technical Monthly - April 2012

Author(s): Miller, Michael C.

Intended for: Report



Disclaimer:

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under contract DE-AC52-06NA25396. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes.

Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

## Technical Monthly – April 2012

### MPACT Campaign

#### **Management and Integration**

- [LANL] Attended the April 5 NTD meeting in Salt Lake City. In addition, a series of meetings are being scheduled to integrate planning with NA-22 and NA-24. Work on proliferation metrics continues and the new Proliferation and Terrorism Risk assessment task funding arrived and work plan developed.

#### Accounting and Control Technologies

#### **Microcalorimetry**

- [LANL] A peer-review session of quantitative analysis results was completed using newly developed spectral analysis code. Methods and results were reviewed by experts from within LANL and one university professor. Also completed was analysis of data collected from several samples over the past couple of years using the newly developed spectral and isotopic analysis code. Results are being prepared for presentation at the SORMA West conference in May as well as a journal paper.

#### **Electrochemical Sensor**

[INL] Post-test analyses of the salt and sensor material for the first sensor test are complete. Sensor materials for the next couple of tests have been fabricated. The second sensor test was started. The experimenter was able to obtain a clean signal and it looked promising. After a couple of days of open circuit potential (OCP) measurements, the Materials and Fuels Complex (MFC) at INL where the experiments are performed started a work stand-down. This stand-down caused the test to be stopped short. Once the work stand-down is lifted, tests with different arrangements will continue and will be oriented based on post-test analysis of the first and second sensor tests. Materials with different

annealing temperatures will also be prepared for analysis.

#### **Lead Slowing Down Spectrometer**

- [LANL] Continued work on perturbation method for LSDS analysis. We are running simulations to delineate issues and are checking additional data libraries to see whether there are differences in simulation results.

#### **Fast Neutron Multiplicity Analysis**

- [INL] A parallel set of modeling to support the conceptual design of the liquid-scintillator assay counter was worked on. The updated copy of the MCNP-PoliMi code from RSICC was received. This will be used along with MCNPX. We are also in the process of working with ORNL to determine if the STRUCK-based digitizer system they use with the liquid-scintillator detectors will be applicable for this program.

### MPACT Analysis Tools

#### **Multi-isotope Process Monitor**

- [PNNL] Additional methods of multivariate analysis of fuel characteristics based on simulated gamma spectra were investigated, including locally weighted methods. Generalization of a computational framework to quantify the impact of gamma-ray counting statistical precision on principal component regression (PCR) analysis of a multi-component (i.e. multi-isotope) gamma-ray spectrum is in progress. A proposal to instrument H-Canyon is being prepared in conjunction with SRNL and the NNSA's NGSI program. The goal is to collect large amounts of nuclear process data to be used in the development of the MIP monitor analysis methods. Limited experimental work to support uncertainty analysis is planned. List mode data logging techniques using available detectors and systems will be investigated to

support development of the proposal to instrument H-Canyon.

*For more information on MPACT contact Mike Miller (505) 667-3335*

## **Modeling and Simulation for Analysis of Safeguards Performance (Electrochemical)**

- (SNL) Discussions with staff at ANL have been used to refine the preliminary safeguards design for an electrochemical facility. These results are being written up into an INMM paper for presentation in July.

## **Material Control including Process Monitoring (Pattern Recognition, Sensors)**

- (ANL) Design of the nanoliter scale molten salt sampling system using the chosen interconnection strategy was completed. Handoff to an external foundry for fabrication based on ANL specified micro-fabrication processing protocols was also completed. Fabrication of the quartz chips is underway. Design of the heat exchange manifold and chip holder was initiated.

## **Sensor for measuring density and depth of molten electrolyte**

- [INL] All of the components ordered to assemble the double bubbler have arrived.

## **MPACT System Integration and Technical Support**

- [LANL] Pratap Sadasivan, and his team have been working on the new metrics for proliferation and security. They have defined the basic structure and method, implementation strategy, needed data, and approach to application. Initial drafting of several sections of the milestone document was started.

## **Safeguards and Security by Design**

### **Used fuels storage security analysis, guidance and best practices**

- [SNL] A UFD/MPACT transition meeting with LLNL and LANL for new NTD Mike Miller was held in early April. Work continued on a coordinated best practices milestone report with Scott Demuth at LANL. We will complete initial recommendations on best practices to meet the 5/31/2012 milestone.