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Title: Fuel Cycle Technologies FCT Research and Technology Development Campaigns Monthly Campaign Performance Review

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Fuel Cycle Technologies

FCT Research and Technology Development Campaigns

Monthly Campaign Performance Review

Mike Miller
National Technical Director – MPACT (1.02.04)
FY 2012 June Data
Held: July 26, 2012

Dial In: TBD

NE-5
Office of Nuclear Energy
U.S. Department of Energy



MPACT

Milestone Status – M2's

Milestone Number	Title	Level	Estimated Finish Date	Revised Finish Date	Actual Finish Date	\$ Impact	QRL
1.02.04.02 - Accounting and Control Technologies							
M2FT-12IN0402021	Test different reference/sense electrode designs for impedance and compatibility with electrolyte	M2	7/31/2012				QRL3
M2FT-12OR0402041	Complete proof-of-concept imaging measurements to quantify SNM in holdup configurations	M2	8/31/2012				N/A
M2FT-12LA0402011	Demonstrate simultaneous multiplexed readout of high-yield 256 pixel array with total counting rate in the kHz range	M2	8/31/2012				QRL3
M2FT-12IN0402031	Model the performance of active neutron interrogation/liquid scintillator for assaying fuel cycle materials	M2	10/31/2012				QRL3
1.02.04.03 - MPACT Analysis Tools							
M2FT-12LA0403112	Document proliferation and security evaluation criteria for use in next fuel cycle options screening	M2	6/30/2012		6/29/2012		QRL3
M2FT-12PN0403016	Complete and Document Automatic Algorithm for MIP	M2	7/31/2012				QRL3
M2FT-12SN0403042	Complete and document baseline electrochemical model and MPACT sensitivity analysis	M2	10/31/2012				QRL3

MPACT

Cost Performance (\$Ks)

WBS	Title	Total Available	MONTHLY				CUMULATIVE				Change (%)	CARRYOVER		
			PC	VE	AC	Var (VE-AC)	Var (%)	PC	VE	AC	Var (VE-AC)	Var (%)		
1.02.04	MPACT	\$5,024	\$454	\$443	\$293	\$149	33.75%	\$3,501	\$3,458	\$2,619	\$839	24.26%	↓ -1.39%	\$502

➤ Cost Variation

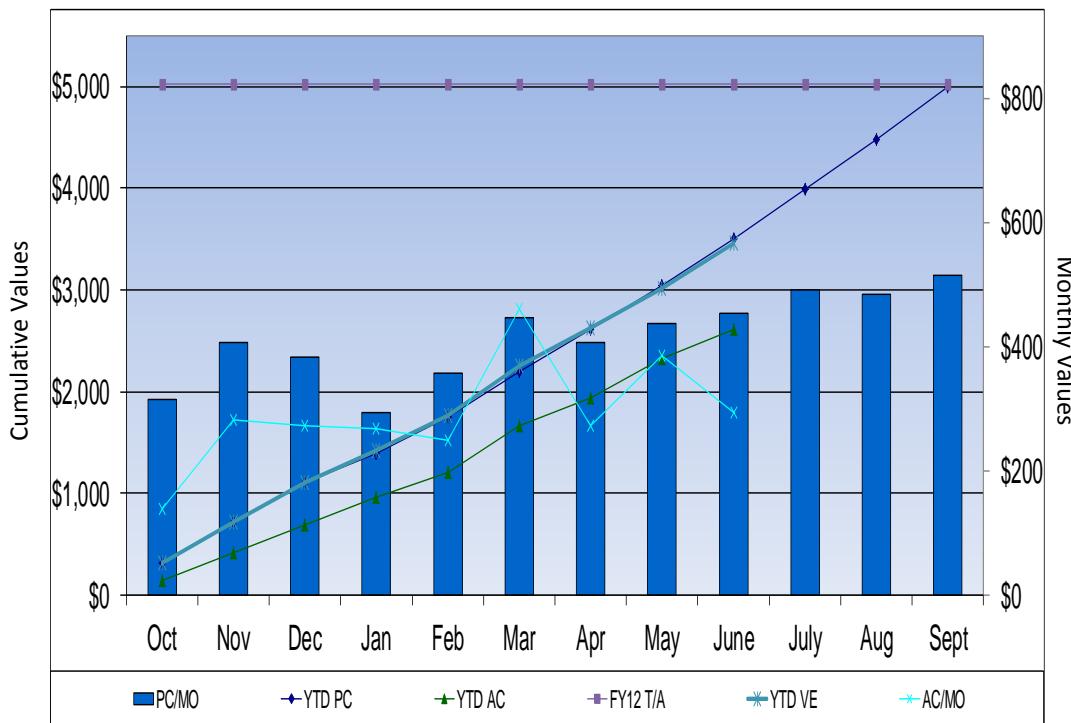
Increased fourth quarter spending, meetings and travel will bring MPACT Management and Integration costs closer to spending projections.

➤ Identified Carryover - \$502K

Some amount of funding is being held back for initial FY13 funding and for finishing reports.

➤ Open Commitments - \$198K

Unpaid university and collaboration contracts and long lead procurement items make up the bulk of the open commitments.



PC = Planned Cost; AC = Actual Cost; VE – Value Earned; TA = Total Available (FY12 Allotments plus FY11 Carryover)

MPACT Major Accomplishments

Management and Integration:

- **(LANL) MPACT Management and Integration:** Coordination meetings between NE and NA-22, NA-24, and NA-82 were conducted the week of June 11th. Preparations are being made for the next MPACT working group meeting, scheduled for Aug 28-30 at Idaho Falls. In addition to covering accomplishments and discussing future plans, a site tour of INL facilities (MFC, EBR, ATR, INTEC) is being organized.

Accounting and Control Technologies:

- **(LANL) Microcalorimetry:** Now operating 256-pixel array at LANL. We are in the process of tuning detector parameters to improve and optimize performance. Preliminary measurements show approximate number of live pixels is similar to that observed previously at NIST. Continuing to study contribution to systematic error from uncertainties in tabulated gamma-ray energies.
- **(INL) Electrochemical Sensor:** Testing of sensors fashioned from different precursor materials continued. SEM analysis of all used sensors has been or will be performed.
- **(INL) Fast Neutron Multiplicity Analysis:** The team has submitted two papers to the upcoming INMM meeting that are related to our fast neutron multiplicity R&D effort. Both of these papers will be given as oral presentations by our students working on the project at the University of Michigan. Title of the papers are: 1) INL-CON-12-24625 Validation of the MCNPX-PoliMi Code to Design a Fast-Neutron Multiplicity Counter and 2) INL-CON-12-24645 Active-Interrogation Measurements of Induced-Fission Neutrons from Low-Enriched Uranium. We are making progress on our project's main goal of designing a concept for a prototype fast-neutron multiplicity counter and have started laying out the outline for our final report. We have been working with our ORNL collaborators to develop a new digitizer system to support our experimental campaign planned for next year.
- **(ORNL) Fast Neutron Imaging to Quantify Nuclear Materials:** The imaging detector design was modified for each pixel to have an 8 x 8 pixel array. Quotations and purchasing process for components, including the new PSD scintillator are in progress.
- **(LANL) Lead Slowing Down Spectrometer:** Ongoing perturbation calculations are providing information on the fundamental systematic error limits of LSDS. In order to achieve separating the contribution of Pu and 235U to the signal, there will need to be tight controls on systematic errors. Continuing to look into He4 detector. Research into local construction of a He4 detector continued.
- **(PNNL) Lead Slowing Down Spectrometer:** PNNL has begun to apply its algorithm to test it using experimental data from previous RPI measurements. PNNL also developed a plan to address the lack of statistics in the MCNP modeling of the NGSI 64 assemblies. The ISU graduate student built and tested a fission chamber to gain experience with them.

MPACT Major Accomplishments

MPACT Analysis Tools:

- **(PNNL) Multi-isotope Process Monitor:** Fuel characterization framework development continued during June. A report describing the methodologies is being completed. Kenneth Dayman, from University of Texas, spent a week at PNNL wrapping up his master's research and working on a journal submission covering that work. The target journal is the IEEE transactions on Nuclear Science; submission is planned for the end of July. A proposal to instrument H-Canyon is being prepared in conjunction with SRNL and the NNSA's NGSI program. The impact of gamma-ray spectrum counting statistics on the precision of relative radioisotope component intensities as reconstructed via Principal Component Regression (PCR) continued in June with Monte Carlo simulations of a two-component (i.e., two radioisotope) system. This work generalizes earlier studies in FY12 in which Poisson counting variations of only a single spectrum component were simulated.
- **(SNL) Modeling and Simulation for Analysis of Safeguards Performance (Electrochemical):** Preliminary insights into safeguards challenges and the initial design for an electrochemical plant have been written up into an INMM paper and will be presented at the INMM Summer Meeting. Work is currently adding a new visualization capability for integrating materials accountancy with physical protection.
- **(ANL) Material Control including Process Monitoring (Pattern Recognition, Sensors):** Fabrication of quartz chips continued at an external foundry. Awaiting delivery of the heat exchange manifold and chip holder.
- **(INL) Sensor for measuring density and depth of molten electrolyte:** All of the components ordered to assemble the double bubbler have arrived at the INL.
- **(LANL) MPACT System Integration and Technical Support:** The initial report on cost-basis metrics for nuclear material security risk and proliferation risk was completed as scheduled.

Safeguards and Security by Design :

- **(SNL) Used fuels storage security analysis, guidance and best practices:** Coordinated with Scott Demuth on joint report - LANL milestone on best practices. Attended Nuclear Energy Institute National Nuclear Security Conference. Developed plan for soliciting input on prioritized issues for used fuel storage security. Worked on setting up a meeting with the Nuclear Regulatory Commission. Worked on FY2013 work package planning.
- **(LANL) Used fuels storage security analysis, guidance and best practices:** RFP finalized and sent out and awaiting response from World Institute for Nuclear Security.



MPACT

Issues and Concerns

(Include any anticipated baseline changes)

- None

MPACT

Look Ahead (60-90 Days)

(General items and meetings)

- INMM meeting to be held July 16-19 in Orlando, FL.
- The MPACT working group meeting is scheduled for Aug 28-30 at Idaho Falls, ID.
- Used fuel storage security discussions with NRC (NE, NA) scheduled for Aug 14 in DC.
- IAEA workshop on Safeguards by Design to be held Sept 11-15 in Vienna.
- ANS/INMM Facility Operations-Safeguards Interface meeting to be held Sept 24-28 in Savannah, GA.