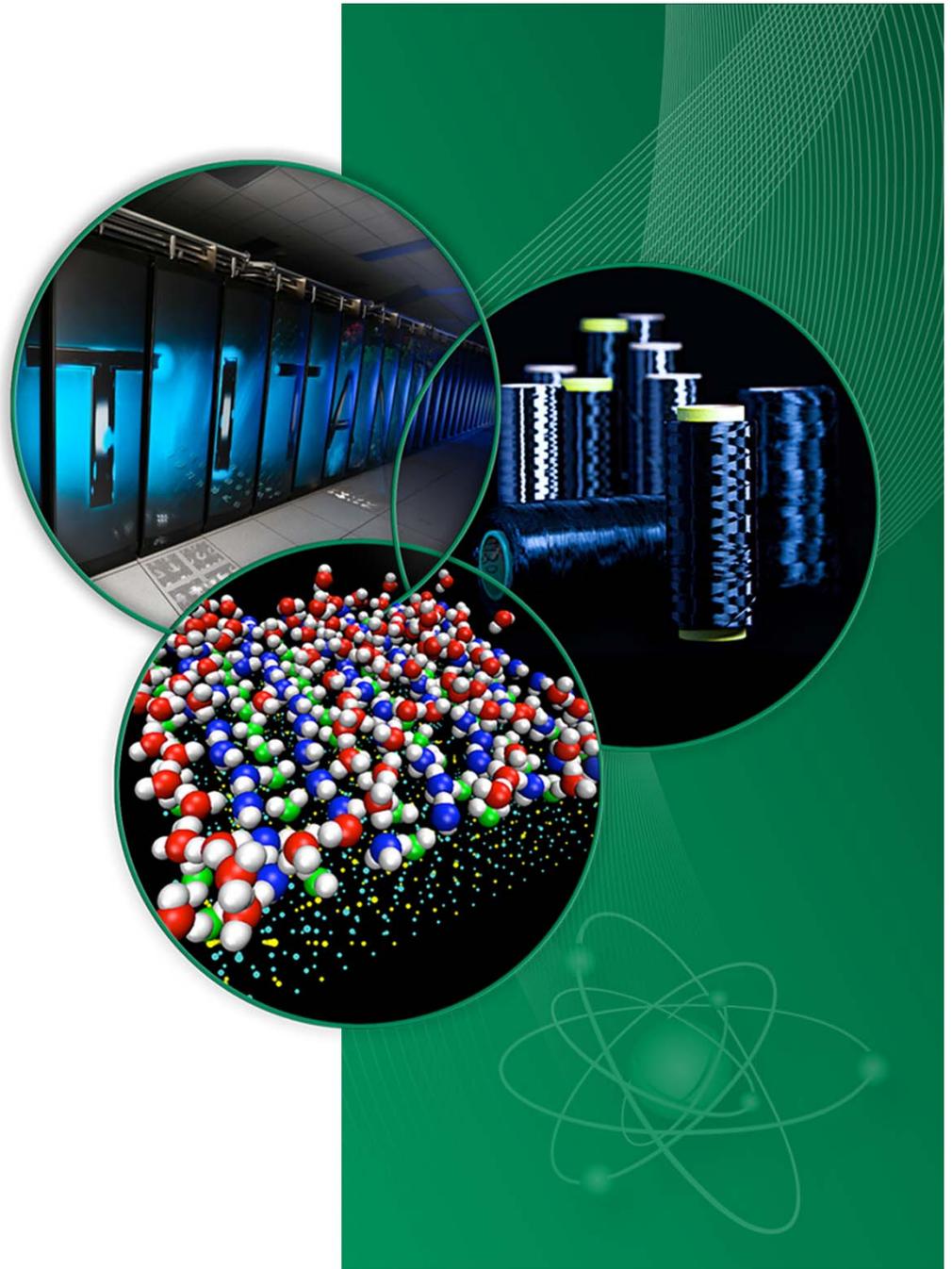


NSED Monthly Report

April 2013

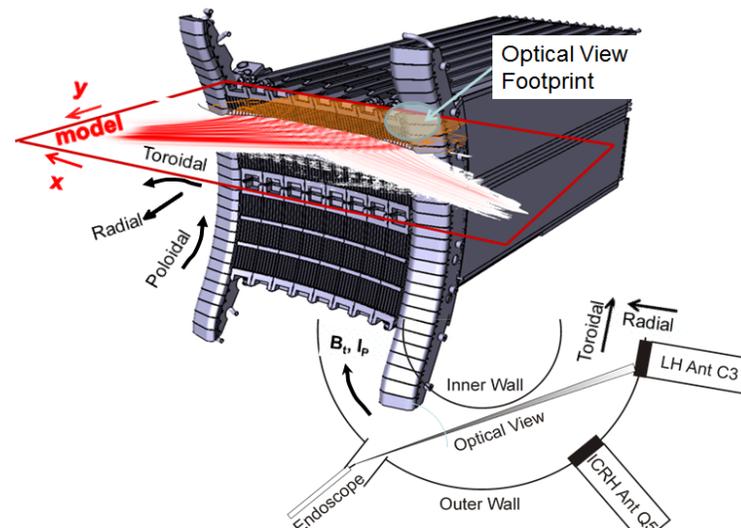
Nuclear Science & Engineering
Directorate



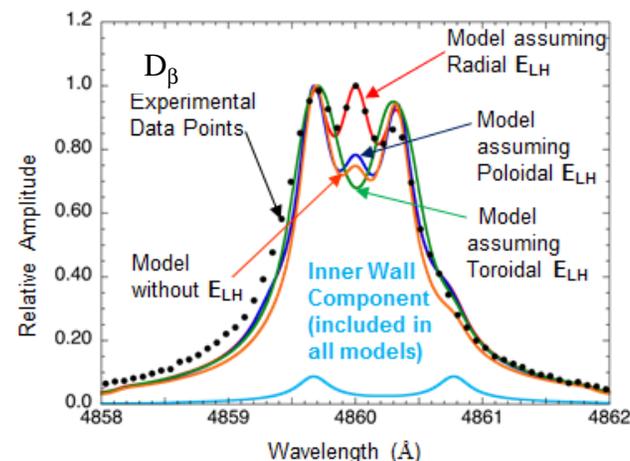
"Dynamic Stark Spectroscopic Measurements of Microwave Electric Fields Inside the Plasma Near a High-Power Antenna" published in Phys. Rev. Letters 2013

by C. C. Klepper, R. C. Isler, J. Hillairet, E. H. Martin, J. H. Harris, D. L. Hillis, et al. –

- Successful matching of measurement to modeling provided a first demonstration of a non-intrusive measurement, compatible with a fusion reactor environment, directly measuring the local interaction of injected waves with the plasma near the antenna.
- Measurement at 1- to 4-MW, 3.7-GHz lower hybrid wave launcher in the superconducting tokamak, Tore Supra at Cadarache, France.
- This project greatly benefited from nearly 25 years of collaborative ORNL activities on Tore Supra.
- The ORNL effort (led by C. C. Klepper) included participation and synergy with the PhD work of E. H. Martin (NCSU).



Above: Geometry of the measurement. Below: Spectral models fitted to D_β spectral measurement data; best spectral model was consistent with Full-Wave model prediction.

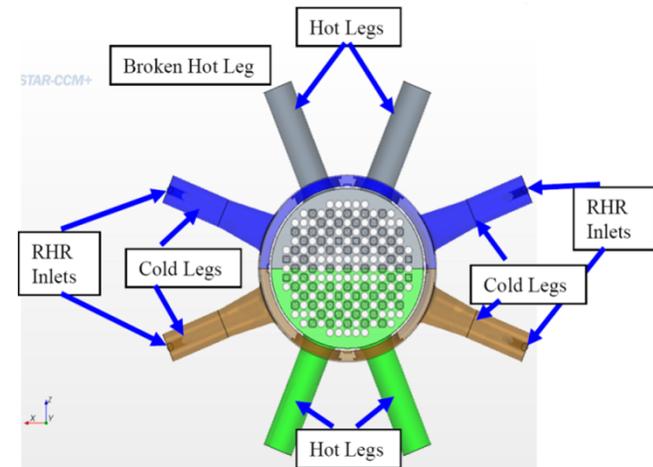


First-of-a-kind HPC computational fluid dynamics model predictions provide valuable insights

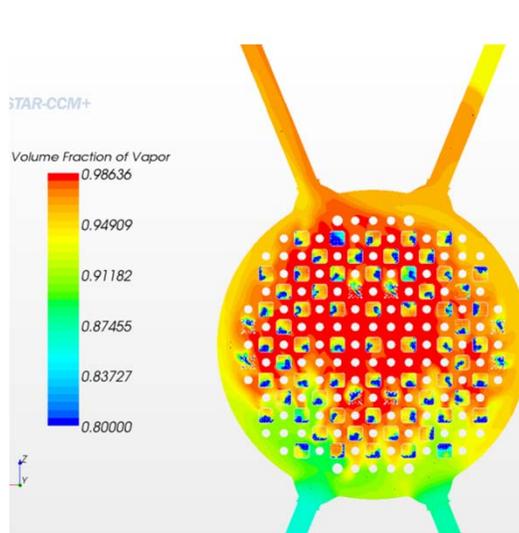
Model of a Westinghouse Four-Loop PWR used to study post-LOCA scenarios involving in-vessel flow blockages due to fibrous materials

Background and Objectives

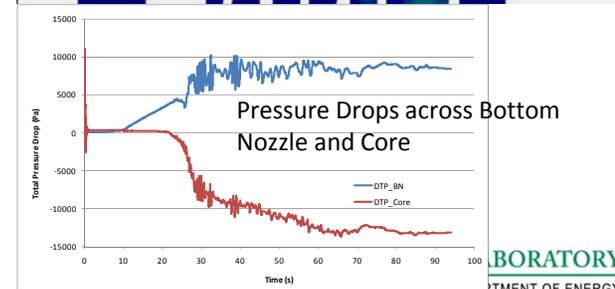
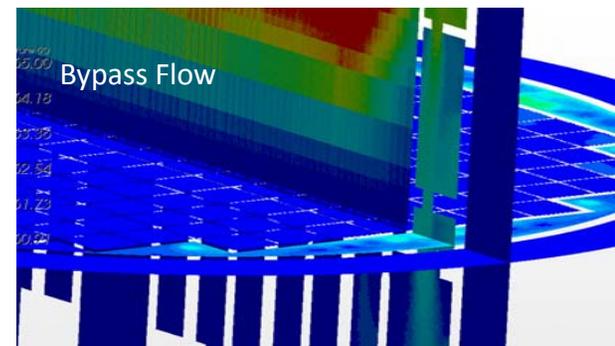
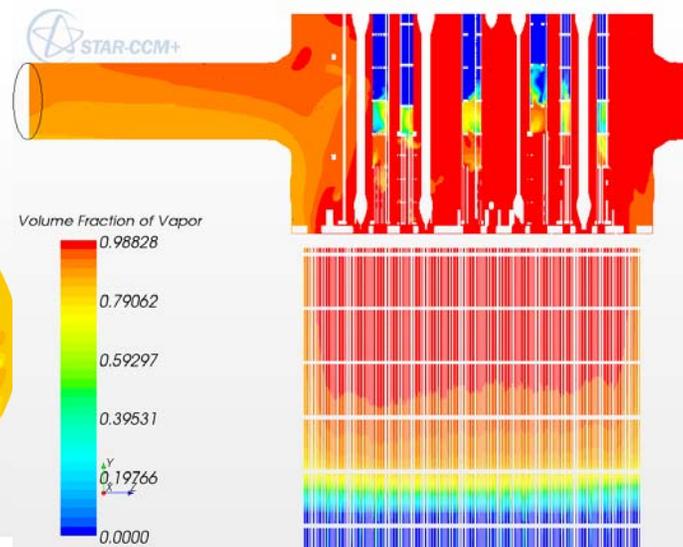
- Fibrous debris may exist in containment sump system after LOCA and may be trapped by bottom nozzles at the core inlet
- As pressure drop increases in bottom nozzle region, coolant into the core may decrease while alternate flow paths may increase
- Long term core cooling may be challenged due to lack of flow into the core and poor mixing may result in boric acid precipitation
- Exercise a first-of-kind multi-physics, boiling and two-phase flow simulation with Star-CCM+ (commercial code) to help drive development and benchmarking of CASL's new thermal hydraulics tool (Hydra)



Void Fraction at Hot Log Level



Void Fraction on Vertical Plane



Congressman Charles Fleischmann

R-TN 3rd District
VOCC Tour, May 1, 2013



Congressman Fleischmann visited CASL and the VOCC laboratory. He was accompanied by:

- Jane Jolley – Field Director, Office of U.S. Senator Bob Corker
- Ron Townsend Executive VP Battelle Memorial Institute
- John Welch Chairman, Battelle Board of Directors
- Paul Howarth, Director CEO, Battelle Energy United Kingdom

Brigadier General Fred Stoss visits ORNL



Brigadier General Ferdinand "Fred" Stoss, III is the current Deputy Director for Nuclear Operations (J3N), United States Strategic Command. During his visit on April 11th hosted by George Fisher and Dick Davis of the Global Security Directorate, Jeff Binder presented an overview of Nuclear Science and Engineering at ORNL.

University Meetings



April 25th, Dr. Jeff Binder traveled to North Carolina State University to meet with the Dean of Engineering, Dr. Louis Martin-Vega along with various other NCSU administrative and faculty staff. He also was NCSU's guest speaker for their weekly seminar to graduate students and faculty.



April 26th, Dr. Binder participated in the Nuclear Engineering Department Advisory Committee (NEDAC) meeting at NC State, of which Dr. Steve Zinkle is a committee member.



April 29th, Dr. Binder participated in the University of Tennessee Nuclear Engineering Board of Advisors meeting.

ORNL's Richard Haire receives American Chemical Society's Seaborg Award

Richard Haire is a retired ORNL researcher and UT-Battelle Corporate Fellow. He was recognized for his valuable contributions to our knowledge of actinide chemistry. Haire, while at ORNL, concentrated on the transplutonium elements produced in the Department of Energy research reactor, the High Flux Isotope Reactor (HFIR).



NNSA Recognizes Career Contributions of Dr. Ron Miskell



Dr. Ron Miskell received a certificate of recognition from the National Nuclear Security Administration (NNSA) Office of Nonproliferation and International Security for his machine tool technology expertise and critical contributions to nonproliferation programs. Dr. Miskell's efforts, spanning a 55-year career, were commended for helping to ensure a long and continued period of peace and security for our nation.



*The National Nuclear Security Administration
Certificate of Recognition
is Awarded to*

Dr. Ronald V. Miskell

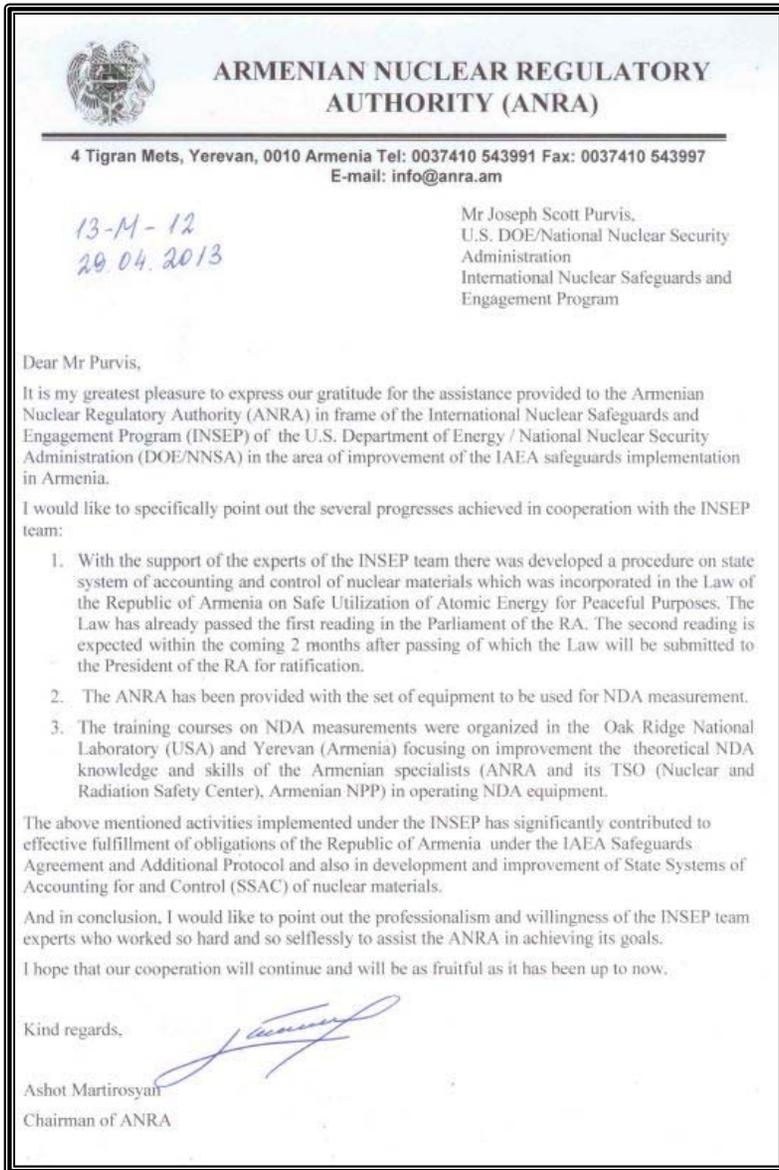
In recognition of dedicated service to the Department of Energy/National Nuclear Security Administration's (DOE/NNSA) Office of Nonproliferation and International Security (NIS).

Your contributions to the DOE have been invaluable throughout your 55 year career. Our Oak Ridge facilities have been privileged to benefit from your knowledge of machine tool technology, including your many advancements in directed numerical control. Your efforts to incorporate technologically advanced machine tools into various production facilities at the DOE Y-12 Plant, and your management of the DOE National Machine Tool Partnership Program have ensured the development of machine tool technology that has been vital to the maintenance of the nation's nuclear weapon stockpile. Through these efforts, you have helped ensure a long and continued period of peace and security for our nation.

In addition, you have made many great contributions in international efforts to prevent the proliferation of nuclear weapons. Your support to the IAEA Action Team inspections in Iraq, the development of export control criteria for equipment critical to the nuclear fuel cycle and nuclear weapons, and your support of export control technical assessments relating to industrial equipment for the Nuclear Suppliers Group have all proven to be critical aspects of a successful nonproliferation program. We are indebted to you for your service and eternally grateful for your significant contributions.

*Anne Harrington
Deputy Administrator For Defense Nuclear
Nonproliferation*

Recognition for Improved IAEA Safeguards Implementation in Armenia



Jeff Chapman



Tyler Guzzardo



Steve Cleveland



Jeff Chapman working with ANRA officials in Armenia

ORNL's support of the International Nuclear Safeguards and Engagement Program (INSEP) efforts to improve International Atomic Energy Agency safeguards implementation in Armenia was recognized in a letter from the Armenian Nuclear Regulatory Authority (ANRA) to the DOE/NNSA sponsor, Mr. Joseph Purvis.

The ORNL INSEP team was comprised of Jeff Chapman, Steve Cleveland, and Tyler Guzzardo.

John Canik's paper makes 'highly cited' list for 2012

John Canik was notified in April that a paper he authored is one of "**The Most Cited** Articles in 2012 Published in *Physics of Plasmas*"

Paper presents results on confinement improvement and turbulence reduction due to introduction of lithium to a fusion plasma experiment.



Edge Transport and Turbulence Reduction with Lithium Coated Plasma Facing Components in the National Spherical Torus Experiment.

Canik, JM; Maingi, R; Kubota, S; Ren, Y; Bell, RE; Callen, JD; Guttenfelder, W; Kugel, HW; LeBlanc, BP; Osborne, TH; Soukhanovskii, VA
[Phys. Plasmas 18, 056118 \(2011\)](#)



2013 ANS student conference at MIT

NSED staff members, Jess Gehin and Barbara Snow, participated in the 2013 ANS Student Conference at MIT

Students were very interested in ORNL research and internship opportunities



NESLS program

35 Students have been selected by NSED staff as participants in the NESLS program

- 13 from the University of Tennessee
- Others from UW, Penn State, UNC, NCSU, Texas A&M, GIT, UII, RPI, ETSU, TTU, MIT, UF, and UMo

University events

- University of Utah Nuclear Engineering Program Visit – April 3rd
 - Kim Gilligan visited the University of Utah Nuclear Engineering Program (UNEP). In addition to meeting with the UNEP director (Tatjana Jevremovic) and the other faculty member (Haori Yang), Gilligan spoke to two classes, had a brown bag Q&A, met individually with the post-docs, and toured the facilities
- Nonproliferation Workshop for University of Tennessee Class
 - Dr. Steve Sputnik's nuclear engineering class had hands-on learning opportunities in the safeguards lab to expand their knowledge in three sessions this month
 - Basic NDA
 - SNM Hold-up Monitoring
 - Portal Monitoring



CIRE nuclear science summer projects



Justin Knowles



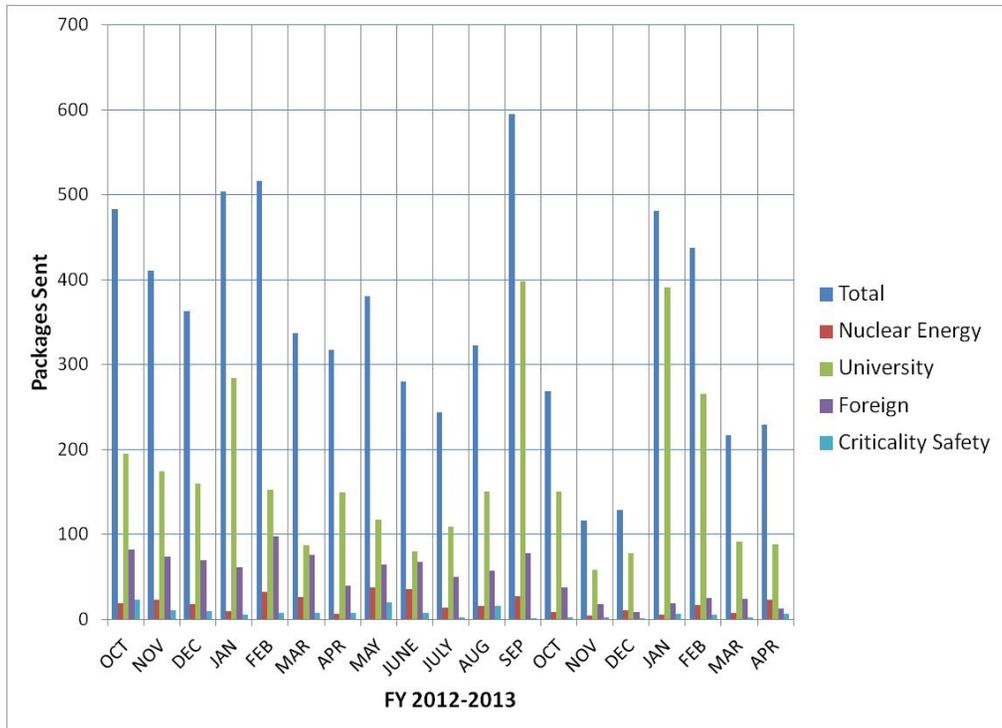
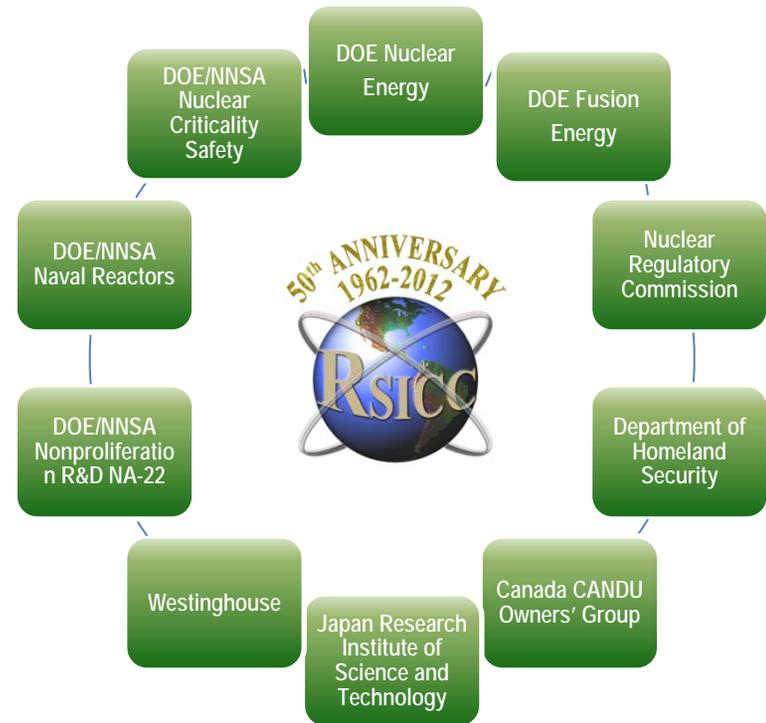
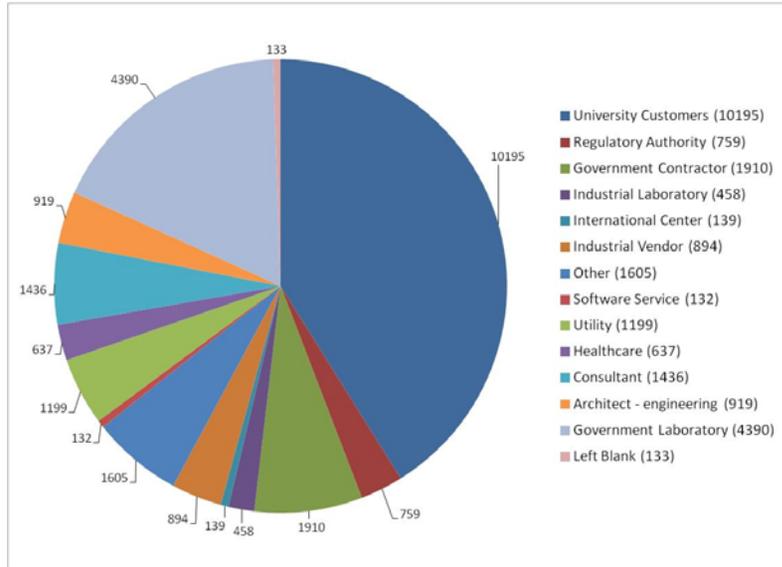
Kristian Myhre

Summer projects were secured for two Center for Interdisciplinary Research and Graduate Education (CIRE) students: Justin Knowles and Kristian Myhre. The students will be working with David Glasgow in the HFIR Neutron Activation Analysis (NAA) facility



Radiation Safety Information Computational Center (RSICC): Serving the scientific community for 50 years

RSICC



- Software and data packages distributed FY2013: 1879
- 8 package updates and revision April 2013

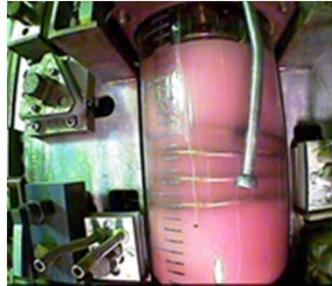
Radioisotope production

- Continued cold testing of the Catalyzed Electronic Plutonium Oxide Dissolver (CEPOD) for acid consumption evaluation.



Curium Feedstock Processing

- Consolidation of rework solutions continues.



Americium-Curium Processing

- Campaign 74 Rework: Ongoing for upcoming Cf-252 orders.
- Completed wire segmenting for upcoming orders.



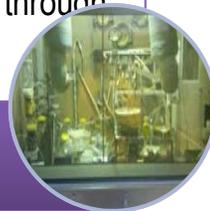
Cf-252 Production

- Two new NpO_2 powder preparation glove boxes were placed into service.
- Successfully completed the 1st run in the new glove boxes to produce $>140\text{g}$ NpO_2 .
- 14 partially loaded NpO_2 targets were successfully prepared and installed in HFIR for Cycle 447 irradiation.



Pu238 Operations

- Shipments: Six Ac-225 Shipments with a total of 80.9 mCi shipped
- 44 Abstracts have been received for 8th International Symposium on Targeted Alpha Therapy (TAT).
- Website for the TAT symposium is accepting registration through May 10, 2013.



Actinium Production

- Cubicle 1 transfer arm fabrication drawings & procurement of various components are in progress.
- Cubicle 2 procurement for new welding lathe system has been submitted.
- Alternative methods for swaging, fusion welding, and target plug configuration continue.



Target Fabrication Equipment Upgrade

Radioisotope production

- Additional tracer-level separation using Am-241 and Cf-249 was complete using EiChrom's LN Resin to determine if the resin could be reused for subsequent runs.
- Installation of the new glove box to support this activity is in progress.

Cm-248 recovery from Cf-252 Decay



- Received the 3rd cask of PuBe sources, which contained 2 source capsules.
- Capsules were cut opened, source material recovered, and calorimeter measurements taken on the material.
- Source material in the 1st capsule was dissolved.

PuBe Operations



- The cross-section for ^{227}Ra (n, γ) ^{228}Ra was estimated to be $\sigma_0=600\text{b}$ and $I_0=1000\text{b}$
- A summary of the current project results were presented at the 245th American Chemical Society Meeting.

Th-229 Project



- Set-up continues of the new Cf glove box
- Results from the experiments to date were presented at the 245th American Chemical Society Meeting.

LDRD Cf-251 Separations



Enriched stable isotope technical services and shipping

Isotopes

Fifteen shipments of 42 enriched stable isotopes were made in April

- 82 shipments of 242 enriched stable isotopes have been made in FY13 to date

Six custom technical services were completed in April

- These were dispensing of metals from past metal conversions
- 92 technical services have been completed in FY13 to date

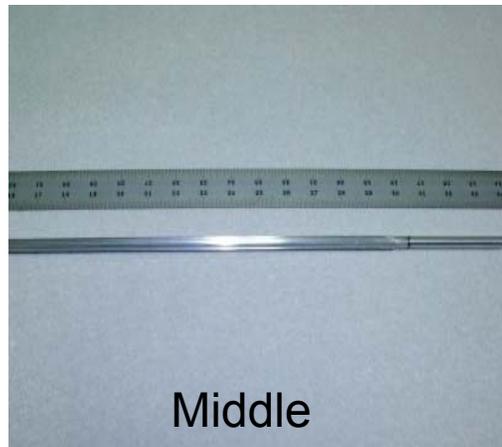
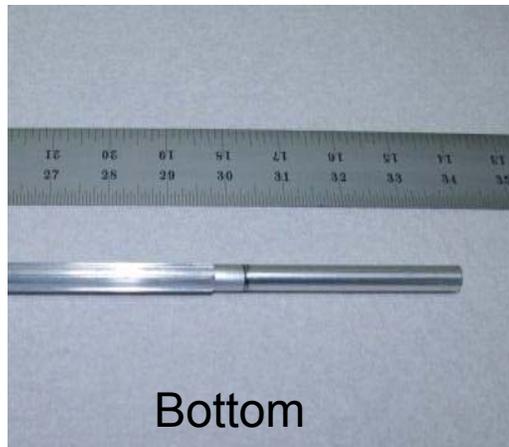
Improved process for chromium oxide reduction to metal developed

- Previously, perchloric acid or molten sodium had to be used to prepare Cr metal, but those methods were discontinued years ago because of hazards
- Improved process uses Ca metal in a vacuum system which is much safer and yields an improved metal product powder

Pu-238 supply project milestone completed

NSITD

During April, eighteen partially loaded targets containing approximately three inches of neptunium oxide/aluminum cermet pellets were successfully fabricated and qualified for irradiation. The targets will be irradiated in HFIR Cycles 447 and 449. Single pellet targets which had been irradiated in HFIR Cycle 446 were qualified and re-inserted for irradiation in Cycle 447. This represents completion of the third (out of five) major milestones for FY 2013 for this project.



Photographs of Partially Loaded Targets

Press coverage for unmanned aerial systems at ORNL

Work on using unmanned aerial systems (UAS) for environmental sampling has recently been highlighted in an April 12 article on Frank Munger's blog titled "Drones at ORNL." Current and future work with UAS includes building customized payloads for air sampling, surveillance and assessment for border and perimeter security, and performance testing of UAS platforms. The Principal Investigators recently were recertified by passing the written portion of the private pilot's exam and are working with Department of State sponsors to performance test UAS platforms. The most recent Certificate of Authorization was approved by the Federal Aviation Administration and includes expanded flight zones around remote portions of the Oak Ridge Reservation.



Drones at ORNL



ORNL's Nathan Rowe is shown with a remote controlled device or "test drone"

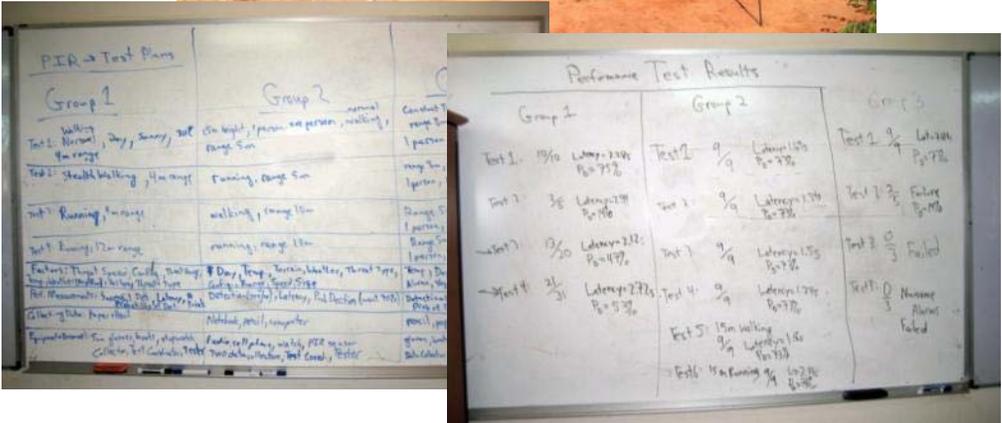
Border security training in Kenya



ORNL staff members conducted a new training course on Design, Testing and Evaluation for Border Security Systems from April 22-25, 2013 at the Kenya Wildlife Service (KWS) Training School at Manyani. Fourteen KWS and Administration Police officers learned how to select appropriate equipment and conduct performance testing for border security applications. The training included many practical exercises, including an actual sensor performance test designed by the participants. Several of the course participants are KWS instructors, and thus the lessons of the training may be incorporated into other KWS training programs.



Sensor performance test exercise at Border Security training course in Kenya



Performance test plans and test results prepared by training participants

Contact: Terry Donaldson, 865-576-4853
donaldsontl@ornl.gov

Work in Russia



Ministry of Defense of the Russian Federation

ORNL representatives participated in an assurance exercise to provide Russian Federation (RF) Ministry of Defense (MOD) officers and military recruits the theoretical and practical training to operate, maintain, and manage modern physical protection systems and equipment at RF MOD sites. The exercise was held at the Moscow Engineering and Physics Institute.



NSITD publications - April

Abstracts – 3

Journal Article – 1

Letter Report – 2

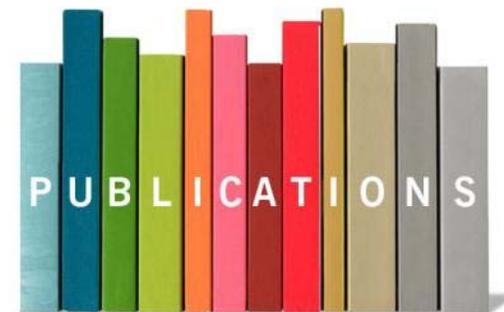
ORNL/TM – 4

Other – 1

Paper in Conference Proceedings (Books, CD, etc.) – 1

Presentations – 42

Thesis – 3



DOE Innovation Hub meeting

Oak Ridge National Lab, April 5, 2013

CASL

Meeting Objectives

- Original Hubs discussed status and challenges
 - CASL, EEBHub, JCAP
- New Hubs overviewed their objectives & approach
 - JCESR, CMI
- 3 specific challenges were focus of discussions
 - Program Management: Technical Planning, Execution/Tracking, Review
 - Promoting Integrated Science: Hub/DEO Integration, One-Roof
 - Achieving Impact: Metrics, Partnerships, IP Management, Technology Deployment



Participating Hubs:

- Consortium for Advanced Simulation of LWRs, CASL
- Energy Efficient Building Hub, EEB
- Joint Center for Artificial Photosynthesis, JCAP
- Joint Center for Energy Storage Research, JCESR
- Critical Materials Institute, CMI



Results:

- Numerous specific actions identified from this meeting
- Ex: establish 4-5 hub working groups on topics of common interest & challenges and exchange lessons learned/best practices
- A good exchange well worth the time



Hub Day on the Hill

Washington, DC, April 23, 2013

CASL

Agenda:

- Meeting with Secretary of Energy nominee, Ernest Moniz, and Deputy Secretary of Energy, Dan Ponemann
- Directors joined policymakers on Capital Hill to discuss the critical research and to answer questions from attendees
- Individual meetings with congressional staffers



Participating Hubs:

- Dr. Doug Kothe - Consortium for Advanced Simulation of LWRs, CASL
- Dr. Henry Foley - Energy Efficient Building Hub, EEB
- Dr. Nate Lewis - Joint Center for Artificial Photosynthesis, JCAP
- Dr. George Crabtree - Joint Center for Energy Storage Research, JCESR
- Dr. Alex King - Critical Materials Institute, CMI



Critical Materials Institute

Results:

- Good opportunity to convey higher-level Hub and CASL objectives, approach, and value to the public
- More info at <http://energy.gov/articles/energy-innovation-hub-directors-visit-hill>



CASL Collocation

- FY14/15 Milestones
 - V&V Planning
 - Product Integration Charter Presentation
- Hydra-TH F5/Waldo Testing
 - CASL 1-Pager Communications Tool
 - Discussion of THM Workshop
- Seabrook Assembly and Rod Selection for L1/L2 CRUD Milestones (POR7)
 - VERA Release Plan Discussion
- Sierra/VERA Integration and Update on Fretting activities
 - Product Plan Update Kickoff
- VERA Update
 - Hydra-TH Development Meeting
 - EPRI Cost Meeting
- Validation Data Needs Survey
 - L3:PM.Metrics.P6.01 Review
 - Industry Council Meeting Follow-up
- Proposed Approach for Sierra-related Milestones for GTRF
 - CASL COBRA-TF Users Group
- Product Applications Meeting, Product Definition Document Review
 - WEC Test Stand Status
- Verification Survey Review
 - MPO Update
 - IPMP Meeting

VOCC Tours



Tours for April 2013

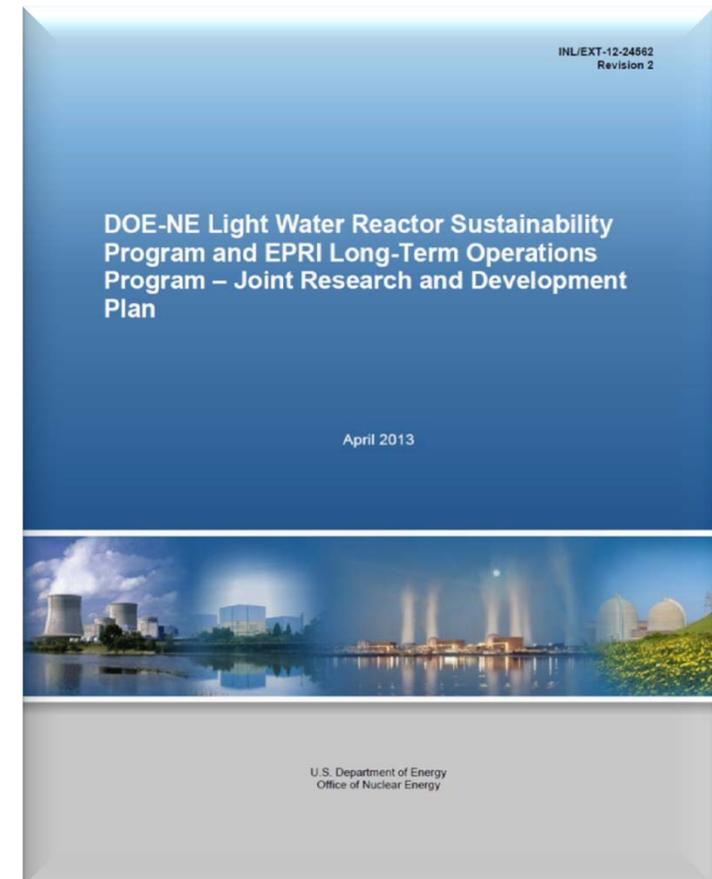
- Congressman Charles Fleischmann
- Jane Jolly, Office of US Senator Bob Corker
- Ron Townsend, Battelle Memorial Institute
- John Welch, Battelle Board, Paul Howarth, Battelle Energy, UK

Meetings

- All Hub Meeting, April 5
- Hub Day on the Hill, April 23

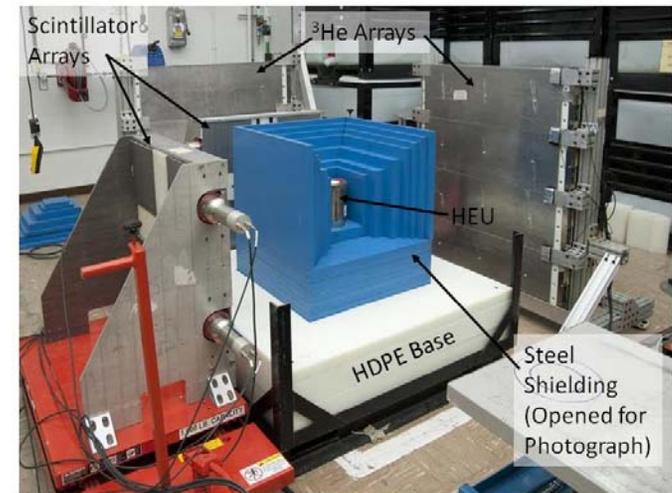
ORNL continues its prominent role in leadership of the DOE-NE Light Water Reactor Sustainability (LWRS) program

- Quarterly Program Review at ORNL
 - Held April 30–May 1, 2013 (co-hosts: Don Williams (RNSD) and Jeremy Busby (FNMSD))
 - DOE-NE, Idaho National Laboratory, Electric Power Research Institute (EPRI), and Nuclear Energy Institute (NEI) in attendance
 - Showcased ORNL research facilities with LWRS-related materials R&D in progress
- LWRS Joint R&D Plan with EPRI
 - LWRS milestone report issued April 16, 2013
 - 2nd annual update reflects maturing and productive DOE/EPRI R&D collaborations on issues relevant to extended nuclear power plant service lifetimes
- Industry Meeting on NPP Long-Term Operations (LTO)
 - Held April 10–11, 2013 (NEI; Washington, D.C.)
 - ORNL participation in discussions with nuclear utilities to ensure LWRS R&D role is consistent with industry/regulatory needs for LTO

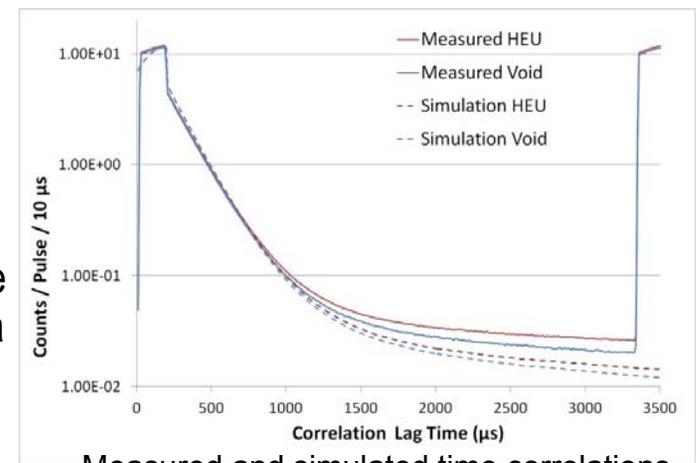


Detection methods developed for SNM in maritime environments

- RNSD and NSITD staff completed \$2M NA-22 nuclear weapons and material security project to determine the usefulness of active neutron interrogation for detecting special nuclear material (SNM) aboard cargo ships at sea
- Measurements with an 18-kg highly enriched uranium casting at Y-12 demonstrated that active interrogation could detect SNM inside of a 48" polyethylene or 25" steel cube of shielding material
- Measurement results were used to validate ORNL's unique hybrid Monte Carlo/deterministic simulation methodology and define detector response functions
 - Nuclear Instruments and Methods B (NIM-B) journal article detailing validation results is in review
- Challenging detection scenarios (source > 10^{20} neutrons) were evaluated using ADVANTG/MCNP for hybrid analysis
 - NIM-B journal article detailing this technique is in review
- This simulation technique will allow mission planners to assess the viability of a large number of potential equipment deployments at a very low cost



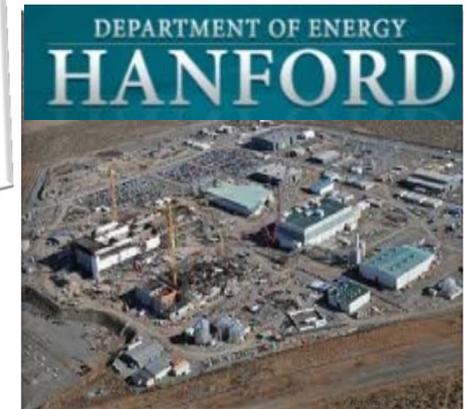
Steel Shielding Measurement Configuration



Measured and simulated time correlations

Criticality safety experts support DOE facility reviews

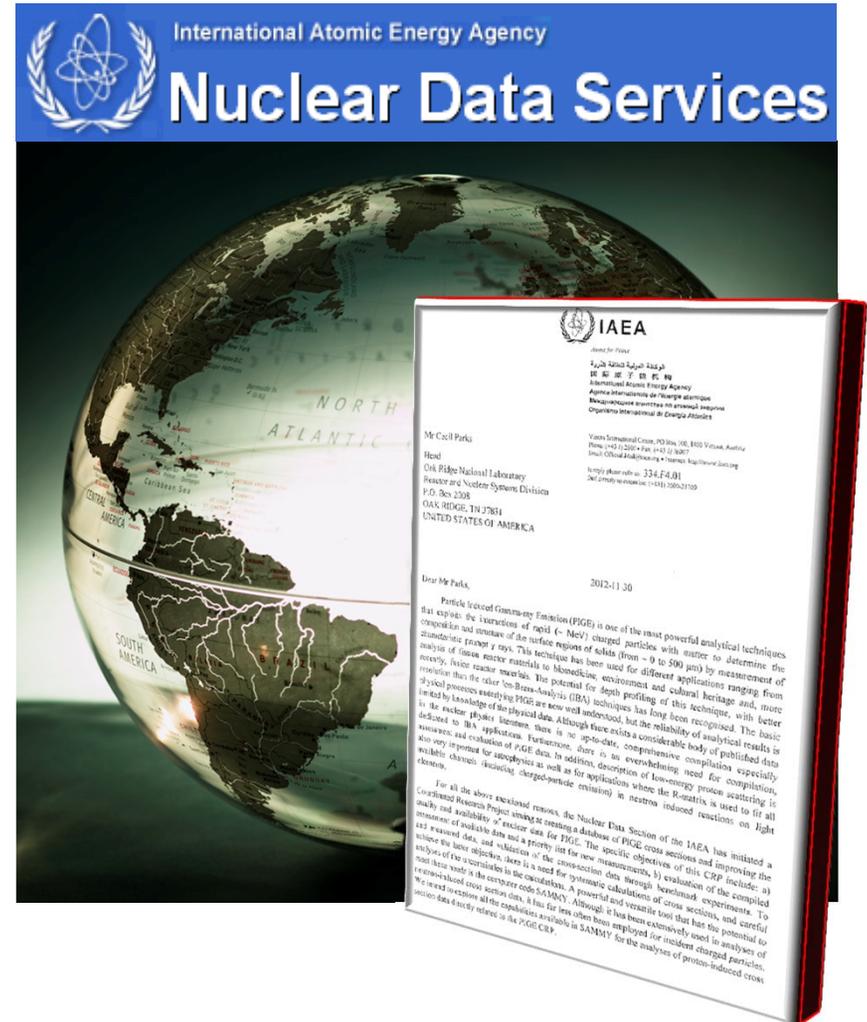
- Ernie Elliott is a member of the DOE-appointed Independent Review Team for the Waste Treatment Plant (WTP) at Hanford
 - RNSD staff developed comprehensive parametric study of plutonium and neutron absorber (iron) masses that will be subcritical for fissile material accumulations within WTP tanks



- Ernie Elliott participated as member of DOE-appointed assessment team of nondestructive assay and nuclear safety experts to examine an event at the Advanced Mixed Waste Treatment Project at Idaho National Laboratory
 - Event: fissionable mass content of a repackaged drum exceeded the criticality safety limit

Nuclear data expert support for IAEA

- Luiz Leal was invited by International Atomic Energy Agency (IAEA) to participate in Coordinated Research Project (CRP) to develop nuclear data analysis capabilities for particle induced gamma-ray emission (PIGE) cross-section data using the ORNL-developed SAMMY software
 - Initial PIGE CRP meeting held April 8-13, 2013 at IAEA Headquarters in Vienna, Austria
 - Leal also represented ORNL nuclear data R&D activities at the Joint European Fission and Fusion meetings in Paris



SCALE spring training courses

- Four hands-on training courses offered:
 - Criticality and Shielding
 - Sensitivity and Uncertainty
 - Lattice Physics and Depletion
 - ORIGEN Activation, and Decay
- 35 attendees representing nine countries: USA, Canada, Czech Republic, Germany, Italy, South Africa, South Korea, Spain, Turkey, United Kingdom

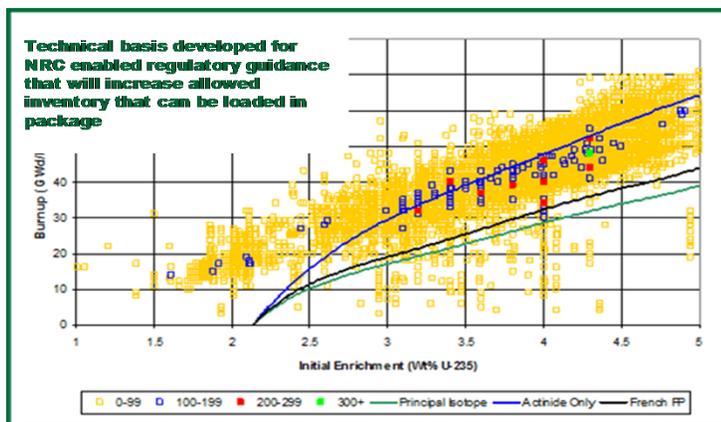
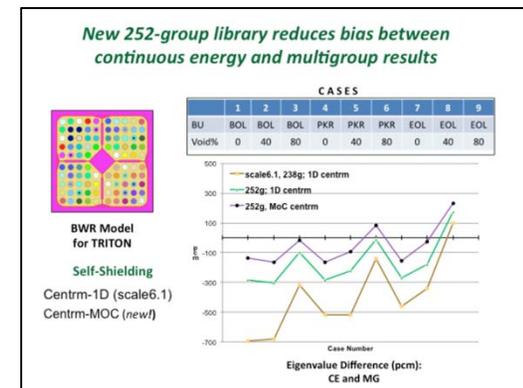


Significant Event Awards announced for three RNSD activities



- ORNL-Led, Multi-Laboratory Technical Assessment of the US Used Nuclear Fuel Inventory – Josh Peterson, Andy Worrall, Don Mueller, Debbie Weaver, Jess Gehin, and John Wagner

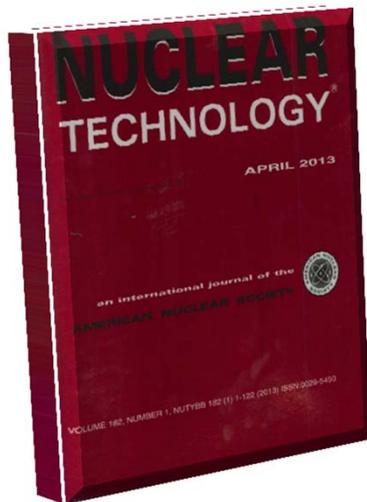
- Technical Advancements in Nuclear Data Processing – Mark Williams, Kang Seog Kim, Doro Wiarda, and Andrew Godfrey



- Development of Technical Basis for NRC Regulatory Guidance to Enable Expanded Utilization of High-Capacity Spent Nuclear Fuel Storage & Transportation Systems – John Scaglione, Georgeta Radulescu, Ian Gaud, Don Mueller, Germina Ilas, B.J. Marshall, and John Wagner

Publications

- ORNL/TM Report - 1
- Letter Reports – 5
- Journal Article - 1



Douglas E. Peplow, Thomas M. Miller, Bruce W. Patton, and John C. Wagner, "Hybrid Monte Carlo/Deterministic Methods for Accelerating Active Interrogation Modeling," *Nucl. Technol.*, Vol. 182, No. 1, April 2013, pp. 63-74.

T. J. Harrison, R. E. Hale, and R. J. Moses, *Status Report on Modeling and Analysis of Small Modular Reactor Economics*, ORNL/TM-2013/138, UT-Battelle, LLC, Oak Ridge National Laboratory, March 2013.

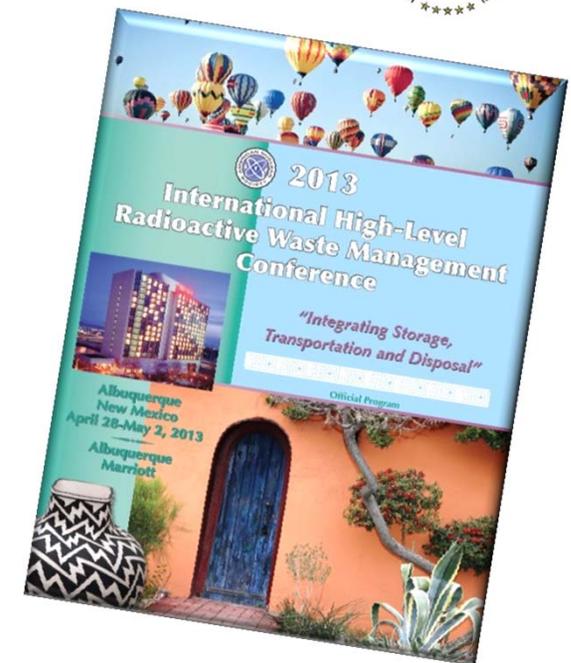


RNSD contributions to the 2013 International High-Level Radioactive Waste Management (IHLRWM) conference

The following 12 technical papers were presented at the 2013 IHLRWM, representing work performed for the DOE-Office of Nuclear Energy and the Nuclear Regulatory Commission.



- "A Modular Design Concept for a Used Nuclear Fuel Repackaging Facility," by R. L. Howard, D. R. Giuliano, T. L. Lessard, J. T. Carter, and P. Rodwell
- "ADVANTG Shielding Analysis for Closure Operations in an Open-Mode Repository," by A. M. Beville, G. Radulescu, J. M. Scaglione, and R. L. Howard
- "Assessment of Used Nuclear Fuel Inventory Relative to Disposition Options," by J. C. Wagner, J. L. Peterson, D. E. Mueller, J. C. Gehin, A. Worrall, T. Taiwo, M. Nutt, M. A. Williamson, M. Todosow, R. Wigeland, W. G. Halsey, R. P. Omberg, P. N. Swift, and J. T. Carter
- "Consequences of Used Nuclear Fuel Failure on Criticality Safety," by B. J. Marshall and J. C. Wagner
- "Considerations for an Integrated Storage, Transportation, and Disposal Canister," by J. M. Scaglione, A. Caswell, and G. Radulescu
- "Data Mining to Determine Inventory Characteristics of UNF for Potential Future Recycling Campaigns," by J. L. Peterson
- "Integrating Data and Analysis Capabilities for Cask-Specific Safety Evaluations," by J. M. Scaglione, R. A. Lefebvre, G. Radulescu, H. J. Smith, D. Ilas, K. R. Robb, and J. C. Wagner
- "Production of Simulated High-Burnup Used Fuel Cladding in the HFIR," by R. H. Howard, Y. Yan, R. L. Howard, J. L. McDuffee, and L. J. Ott
- "SNF Disposal Concepts for Small and Large Waste Packages," by E. Hardin, T. Hadgu, D. Clayton, R. Howard, H. Greenberg, J. Blink, M. Sharma, M. Sutton, J. Carter, M. Dupont, and P. Rodwell
- "Test System for Evaluating Spent Nuclear Fuel Bending Stiffness and Vibration Integrity," by J.-A. Wang, H. Wang, B. B. Bevard, R. L. Howard, and M. E. Flanagan
- "Used Fuel Management System Architecture and Interface Analyses," by M. Nutt, R. L. Howard, I. Busch, J. T. Carter, P. Rodwell, A. Delley, E. Kalinina, E. Hardin, and T. Cotton
- "Utilization of Used Nuclear Fuel in a Potential Future U.S. Fuel Cycle Scenario," by A. Worrall



Authors noted in **bold** are affiliated with Oak Ridge National Laboratory

Materials irradiation – April

Project	Format	Sponsor	Stage					Notes
			Newly proposed	In Design	In Fabrication	In Reactor	Removed	
Titan Metal	Rabbit	DOE, FE US-Japan				9	26	Tungsten and steel
Composite Flexure	Rabbit	DOE, FE				8		SiC
Mini-Composite	Rabbit	DOE, FE			4	3Q 2013		SiC
Round-bar Tensile	Rabbit	DOE, FE		4+		2013		Steel
Hydrided Clad	Target	DOE, NE				2	2	Zircaloy
Ibiden	Rabbit	WFO, Ibiden				28 (10 waiting)	2	Graphite
Nippon	Rabbit	WFO, Nippon		31		4Q 2013		Graphite
UO2 TEM disks	Rabbit	Texas A&M				1		UO2
Titan Tensile	Rabbit	DOE				9	9	V-4Cr4Ti, SiC, Graphite, steel
EPRI	Large VXF	EPRI			3	4Q 2013		Steel, Inconel
Toyo Creep	Target	Toyo Tanso			3	3Q 2013		Graphite
Inconel springs	Rabbit	AECL		~40		2013		Inconel
Graphite Creep	Rabbit	EDF			5	3Q 2013		Irr. Graphite
SHINE	Rabbit	DOE		TBD				Mo-99
Exotic Ceramic	Rabbit	DOE, FE		9		2013		TiSiC Ceramic
SiC Joining tests	Rabbit	DOE, FE		21		3Q 2013		SiC
HTV Capsule	Target	DOE NE		1		4Q 2013		Graphite
FCR&D Rabbits	Rabbit	DOE NE		1		1Q 2014		DU fuel samples
General Atomics Rabbits	Rabbit	General Atomics		5		3Q 2013		SiC
FeCrAlY	Rabbit	Fusion		8+		4Q 2013		FeCrAlY
Metallic glass, High entropy alloys	Rabbit	Fusion		2	3	3Q 2013		Metallic glass, high entropy alloy



Experiment Fabrication



Fluoride Salt Cooled High Temperature Reactor (FHRs) R&D collaborations

- **Czech Republic Nuclear Research Institute Řež plc**
- **University of Wisconsin – Madison**
- ORNL shipped two 75 kg packages of Molten Salt Reactor Experiment (MSRE) intermediate coolant loop salt
 - FLiBe: 66% lithium fluoride – 34% beryllium fluoride
- Czech Nuclear Research Institute Řež plc collaboration
 - Research using LR-0 zero power reactor
 - Integration with State Department, White House
 - Research to develop reactivity benchmarks for fluoride salts
- University of Wisconsin (UW) – Madison collaboration
 - Process salt and fill irradiation capsule at UW
 - Transfer to Massachusetts Institute of Technology for irradiation studies at the MIT Nuclear Reactor Laboratory



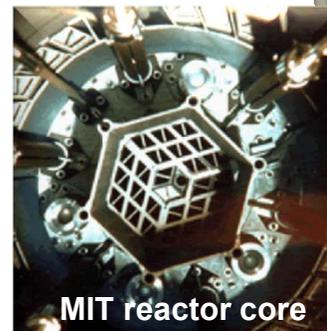
Czech LR-0 Critical Facility



Solid FLiBe within storage container



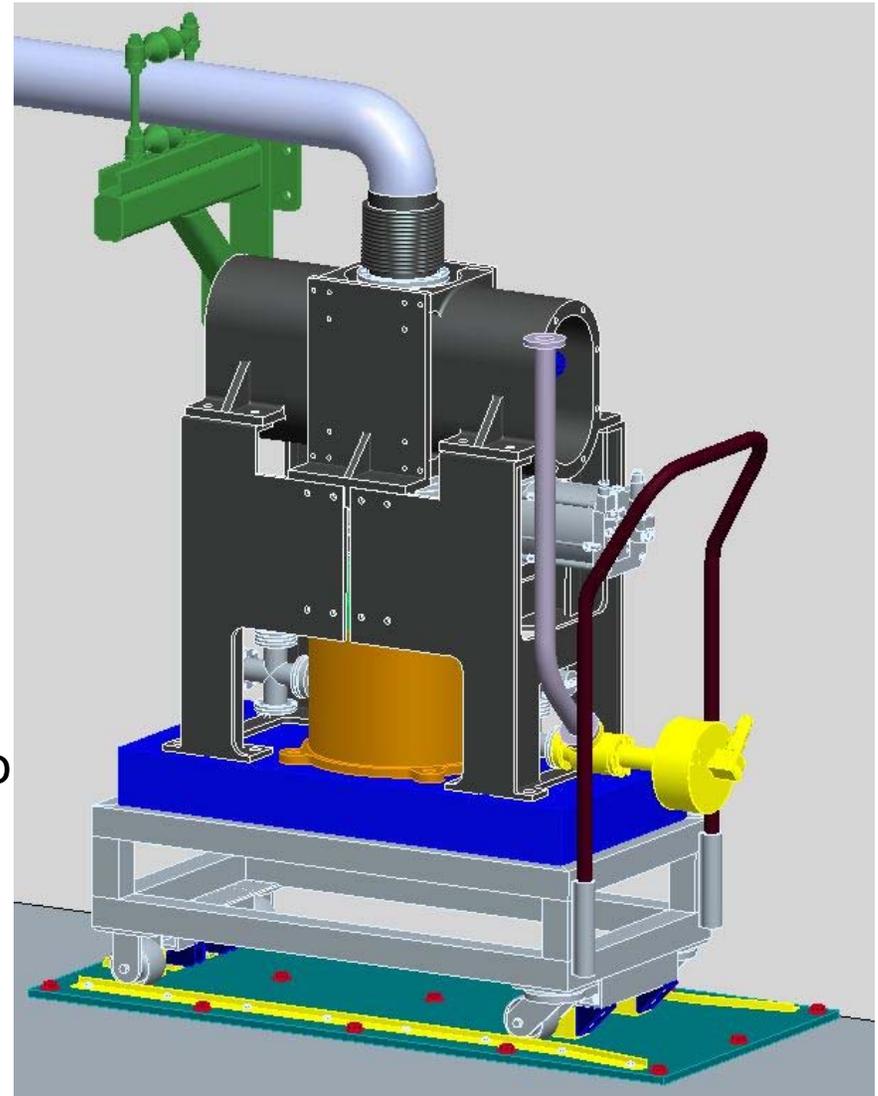
FLiBe package at Řež



MIT reactor core

ORNL-led diagnostic for ITER is the first to reach Preliminary Design Review milestone

- T. M. Biewer and C. C. Klepper of the FMNSD Division successfully defended the Diagnostic Residual Gas Analyzer system at a Preliminary Design Review at ITER in April 2013.
 - ORNL team members include:
C. Marcus (MSSE Division),
T. Younkin (HERE intern).
 - Engineering services provided by Knoxville based, small business, PECOS Inc.
- This is the first US-credited diagnostic to reach the PDR stage for ITER.

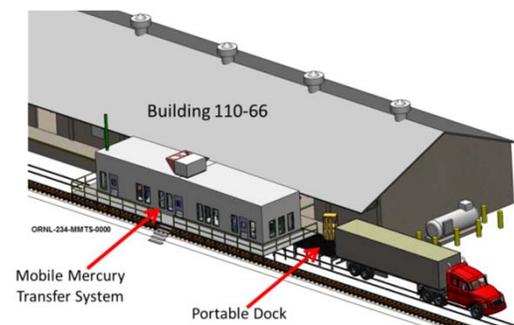


Mercury Stockpile Stewardship Program (MSSP) Team completed issuance of Mobile Mercury Transfer System (MMTS) Permit to Construct Application (PTCA)

- The Defense Logistics Agency (DLA) is the program sponsor and was issued four (4) sets of notebooks and CDs of two volumes comprising an important technical deliverable. The image below reflects Vol. 1 of 2, with Vol. 2 about half the size of Vol. 1.



Mobile Mercury Transfer System (MMTS)
Permit to Construct Application (PTCA)

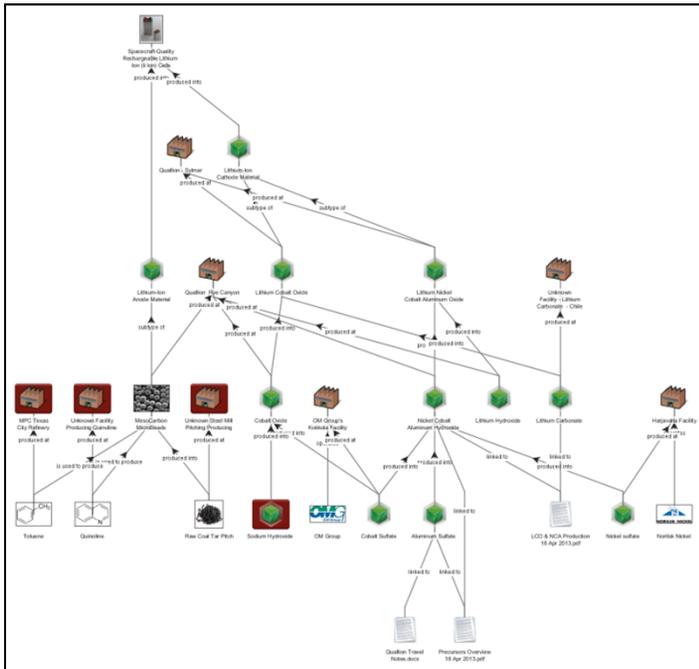


- These submittals were directly provided by the sponsor to the Nevada Department of Environmental Protection (NDEP) for consideration in approving the next project phase, which is actual fabrication of, building, and testing the MMTS.
- The package consists of a wide variety of deliverables including lay-outs, flow diagrams, material handling bases, operations description, detailed design and fabrication drawings, P&IDs, specifications, calculations, permits, safety basis, hazards assessment, and more.
 - The package complies with the Nevada Chemical Accident Prevention Program (CAPP), also being prepared and instituted by the ORNL team.

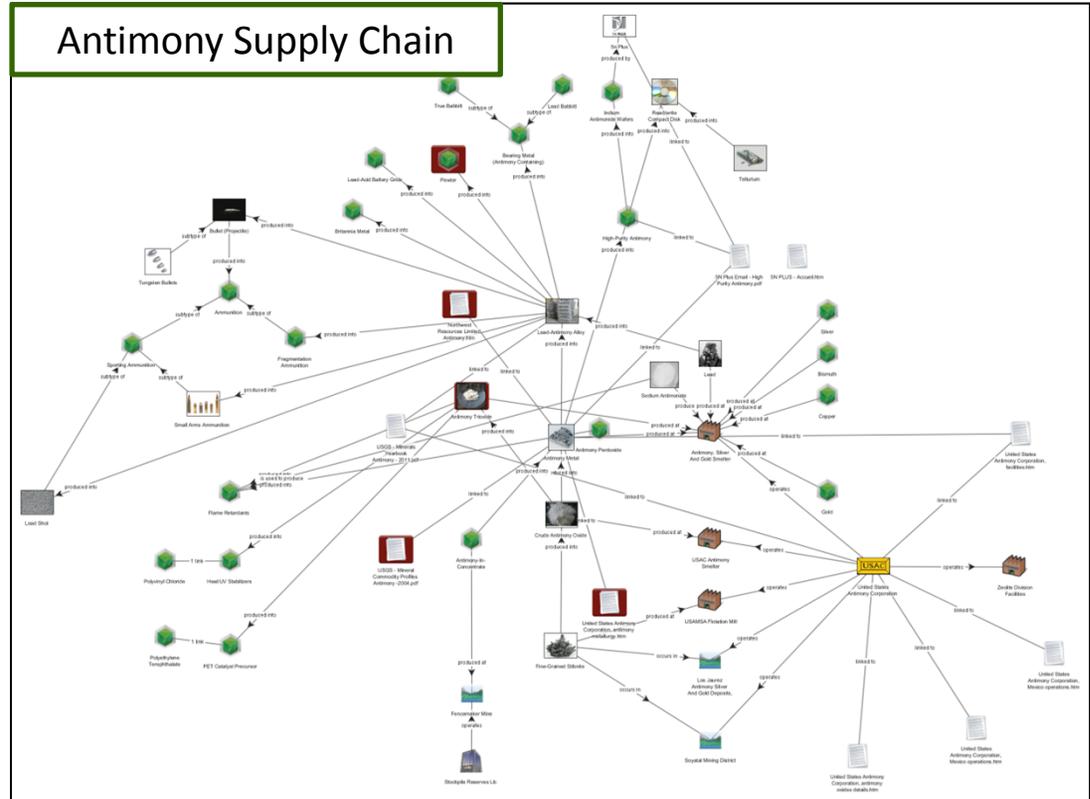
Defense Logistics Agency – Strategic Materials

- DLA and ORNL subcontractors received training on the Production and Research Informatics for Strategic Materials System (PRISM).
 - PRISM provides a visual database to model supply chains
 - Allows for collaboration between DLA, ORNL, Universities, and subcontractors
- ORNL has modeled several material supply chains to date and plans to complete 40 to 50 by end of FY13

Lithium-Ion Battery Supply Chain
(Space Applications Only)

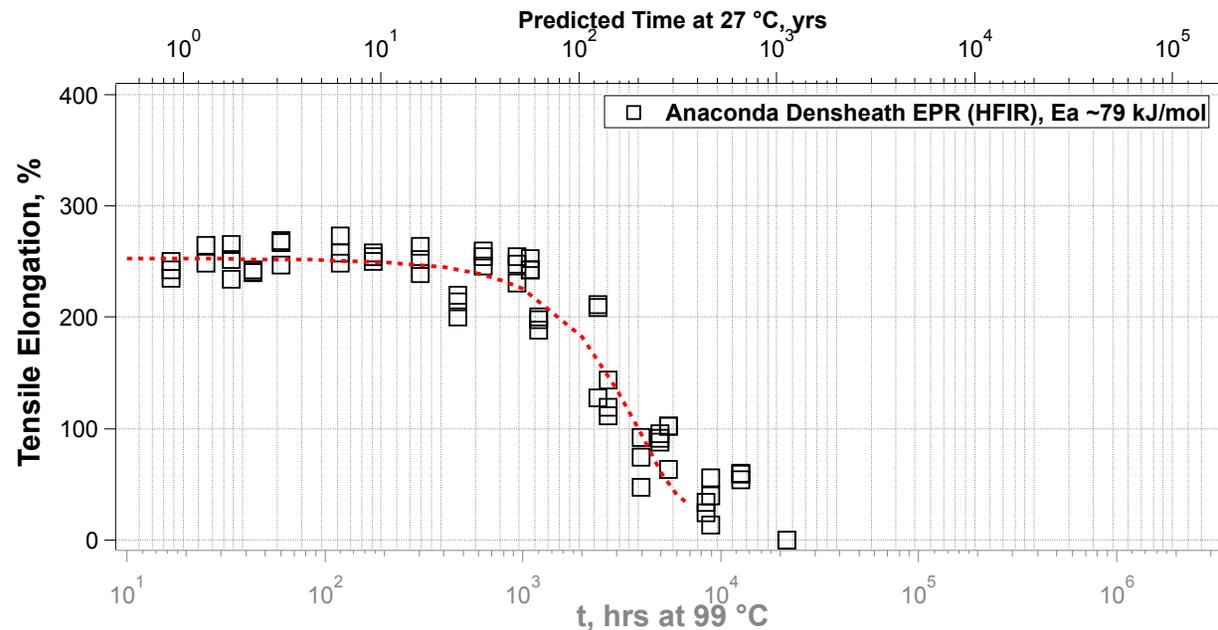


Antimony Supply Chain



A joint analysis of original HFIR electrical cables has been performed as part of the Light Water Reactor Sustainability Program

- Using electrical cables from HFIR that were originally installed during construction prior to its 1965 startup, the LWRS program has analyzed remaining useful life of the cable insulation.



- Sandia National Laboratory, using ORNL materials and input have determined the electrical cables will maintain performance for an additional ~250 years!

NNFD FY2013 cumulative facility metrics



Hot Cell Availability

99.86% Bldg. 7920

98.5% Bldg. 7930

100% Bldg. 3525

100% Bldg. 3025E

Facility Upgrades and Maintenance Activities

7920

- Programmed maintenance operations.
- Glove box Installations.
- TSR Calibrations and Functional Testing: Cubicle J Plug Gamma Monitor Testing.
- Target Fabrication Equipment Refurbishment – Transfer of Cubicle 3 In-Cell Hoist to the Decon Box for repair.

7930

- Programmed maintenance operations.
 - Tests Semi-Annual SR 4.1.1.3 HEPA Filter Efficiency.
 - Shield Plug Frame assembly fabrication for PaR has been sent to PaR for testing.
- 
- PaR test stand drawings complete and signed out.
 - E-7 DID Exhaust Fan HEPA filter change out completed and tested.

3525

- Programmed maintenance operations.
 - Completed cell inlet filter replacement.
- 
- Completed Chillwater Expansion Tank replacement.
- 

3025E

- Programmed maintenance operations.
- Trouble-shooting CAA crane radio control function failure.
- Returned SPL AH to service and set up evaporator.
- Completed minor repairs MSM units.
- Completed electrical inspection of modified slow speed saw.
- Fabricated and installed guard for slow speed saw .

4500 area gaseous waste reconfiguration and stabilization project

- Sent samples from six roughing filters for analysis and received off-site and RMAL lab results for determination of waste disposal path
- Prepared and approved Work Plan and Radiation Work Permit to inspect vent duct interior and caulk shield plugs
- Successfully completed the isolation of the 4500 Area Hot Off Gas Header
- Approved Work Plan, Radiation Work Permit, Penetration Permit to create access openings in vent duct for potential application of foam
- Reviewing alternative foam delivery subcontractors



Removing Sliding Valve from Hot Off Gas Header



Size-reducing 3106 Roughing Filter Sample

Central campus legacy material removal project

2026 Activities

- Commenced Phase II cleanup work planning and scheduling activities
- Started packaging of general waste from Rooms 101, 102, 103, 136 and 140



Segregation of general waste on Phase II work

4501 D Cell Activities

- Lead items were loaded into waste container for disposal
- Removed two liquid nitrogen tanks



Final vessel removal from D cell

Soil and slab characterization and removal in the southeast quadrant

- Awarded contracts for site characterization subcontractor (BOA task release); data evaluation (SAIC PO); and DOE-EM Sample Management Office support (UCOR MPO)
- Reviewed and approved site characterization contractor's project submittals
- Completed supporting documents and preparations for sampling slab and underlying soil at the 3550 slab
- Sampling of 3550 slab and underlying soil scheduled for May 6-10, 2013



Wide-angle view of 3550 from southeast



View of 3550 from northwest

EM project integration support

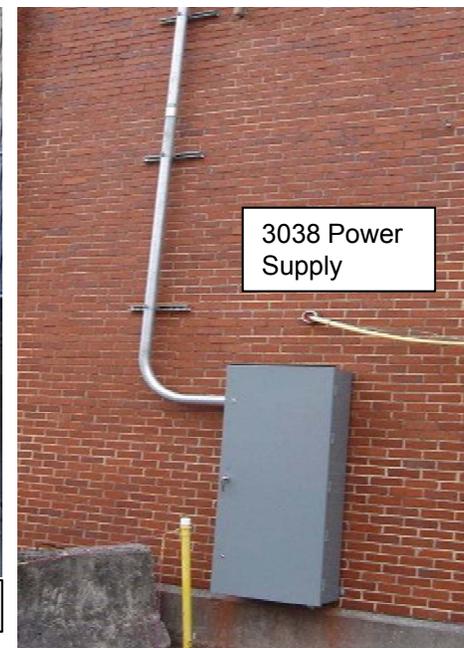
- EM Contractor SEC continued to work with NNSC for possible shipment of the one remaining RTG at 3517 (BUP-500). UT-B coordinated a review of structural soundness of the RTG cage, loading and transportation tie-down approach
- At UCOR request UT-B submitted an estimate to install 2 manipulators into Cell A and B of Building 3026D. Manipulators may be relocated at cell face and will be retrieved by UT-B post project. UT-B prepared a ROM estimate to provide long term ventilation for these hot cells
- UCOR and UT-B consummated an MOU to remove the 6 manipulators from the cells in the Alpha Handling Area of Building 3038. A work plan is in the review cycle
- UCOR and UT-B commenced development of an MOU to reconnect Building 3038 to a permanent power supply



Manipulators to be removed in AHA of Building 3038



BUP 500 -Awaiting Disposition Path Decision



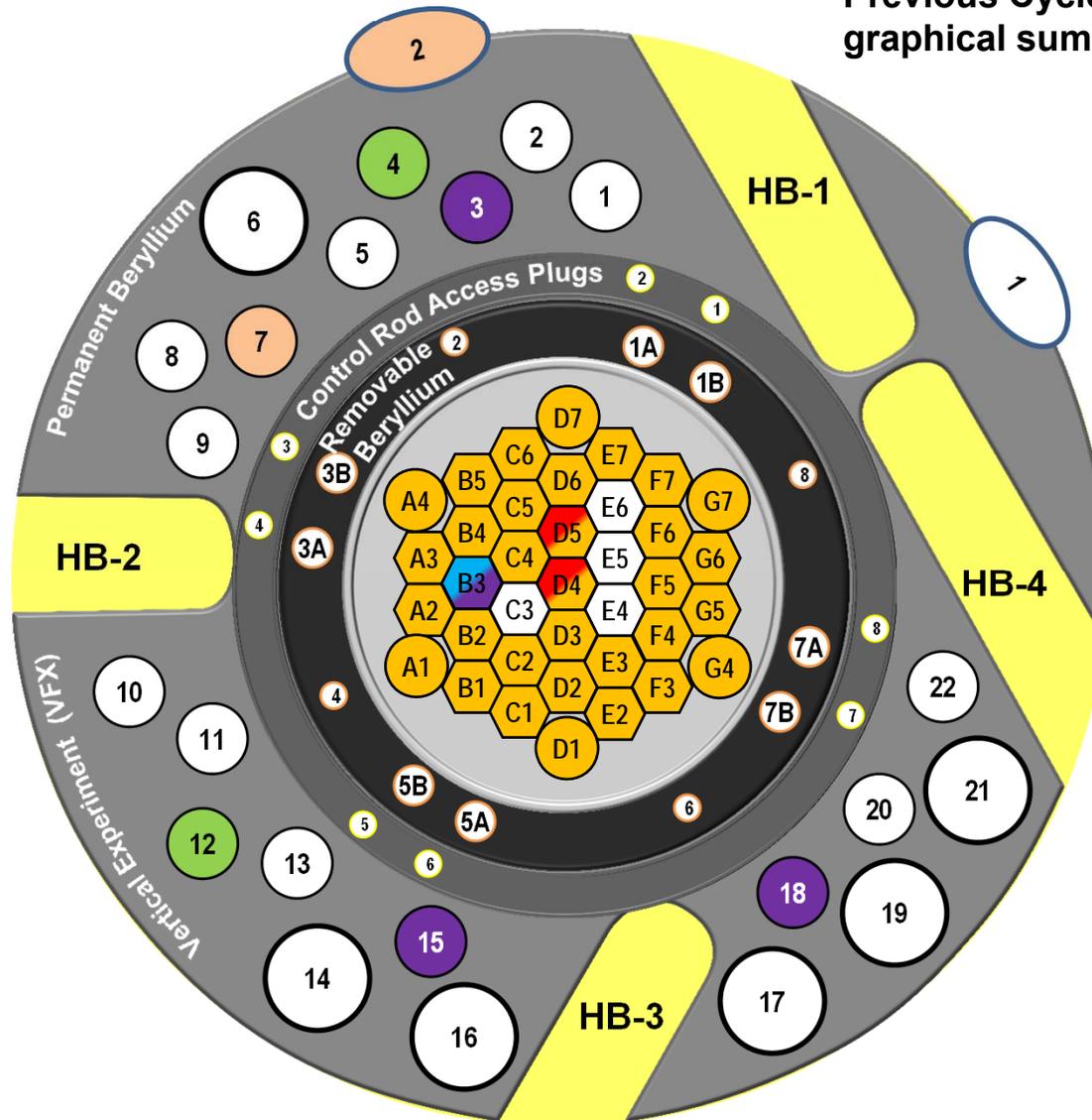
3038 Power Supply

Preparation for HFIR cycle 447 in-vessel experiments continues

Previous Cycle 446
graphical summary

April 2013						
SU	M	T	W	TH	F	SA
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Reactor OFF



- Isotope Production
- Isotopes for Research
- Materials Experiment
- Fuels Experiment
- Pneumatic Facility NAA
- Hydraulic Facility
- Neutron Scattering
- Available Positions