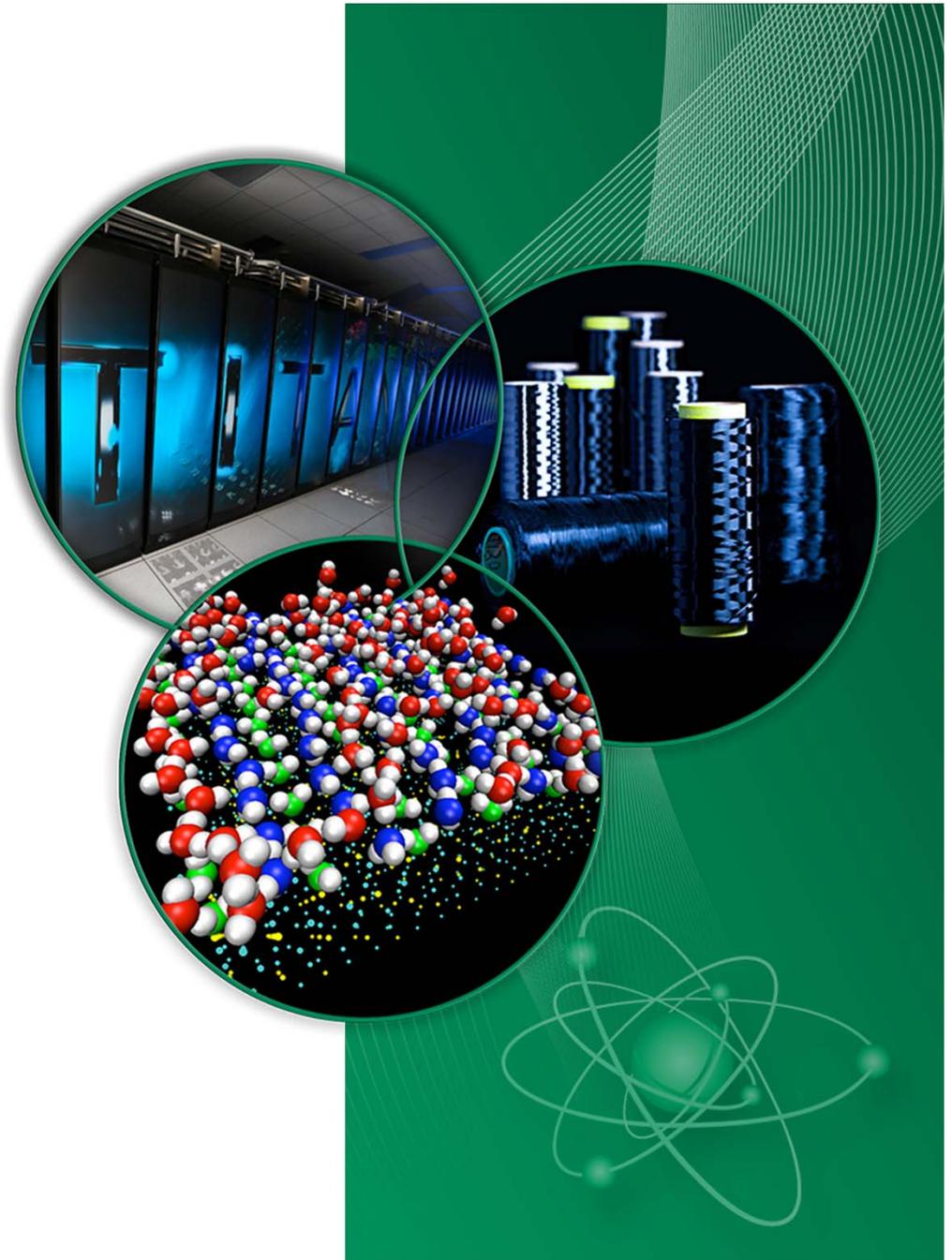


NSED Monthly Report

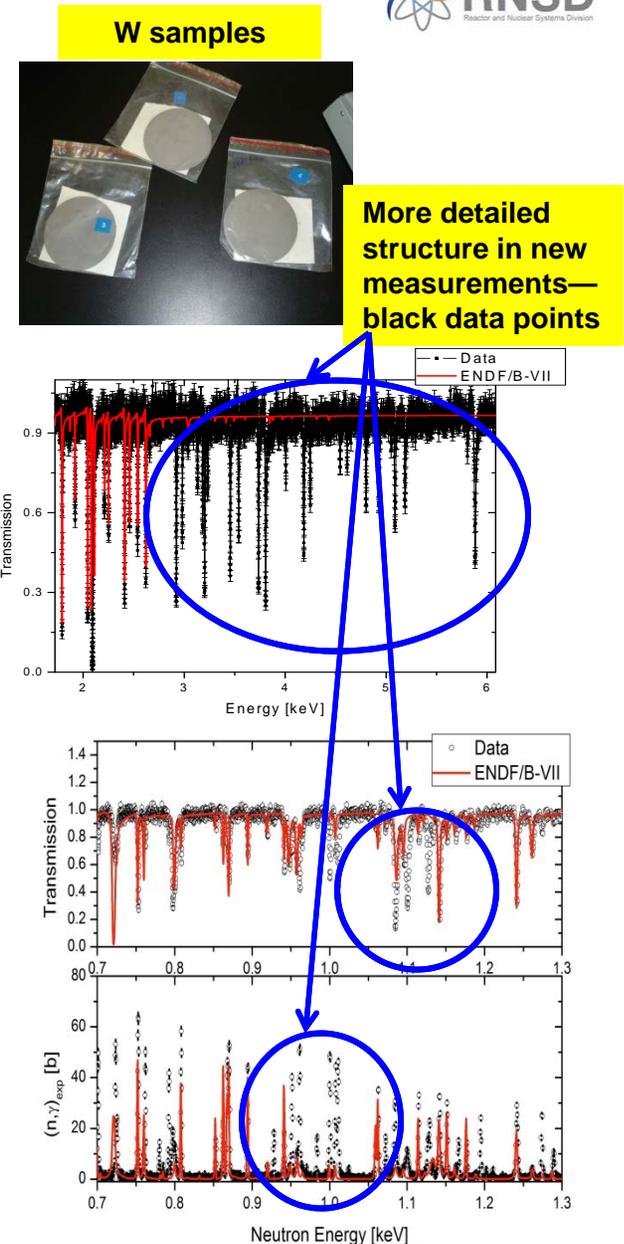
February 2014

Nuclear Science & Engineering
Directorate



Completion of Tungsten Neutron Cross-Section Measurements

- Klaus Guber completed a multi-year measurement campaign for stable tungsten isotopes ($^{182,183,184,186}\text{W}$) needed to support completion of new ORNL resonance evaluations for the US Nuclear Criticality Safety (NCS) Program
- Issues to address: poor performance of existing tungsten data in critical benchmarks and NCS applications sensitive to tungsten—also evaluated resonance region (RR) covariance data not available for sensitivity/uncertainty analyses
- Guber led effort to complete measurements at Institute for Reference Materials and Measurements (IRMM) in Belgium and at Rensselaer Polytechnic Institute
 - Measurements performed on 4 enriched tungsten isotope samples that resulted in more than 12 individual experiments
 - IRMM measurements provide highest energy-resolution cross-section data (total and capture)—enables extension of RR to 2x higher energies relative to existing tungsten data evaluations
 - New data provide more resonance structure detail—important for self-shielding calculations in nuclear applications



NSITD staff members receive Secretary of Energy's Achievement Award for 2013

Awards & Recognition



JOE BIRDWELL received a Secretary of Energy's Achievement Award as a member of the Salt Waste Disposal Technologies Team (along with several PSD staff members) that was selected as one of only nine winners of the Secretary of Energy's Achievement Award for 2013

- This award is recognition of contributions to the development and implementation of an advanced high-level salt waste processing technology that is being used to clean up the Savannah River Site

STAN MOSES received a Secretary of Energy's Achievement Award as a member of the National Nuclear Security Administration's Global Threat Reduction Initiative (GTRI) Team, which successfully removed or confirmed the disposition of highly enriched uranium (HEU) and separated plutonium around the world

- The GTRI team removed or dispositioned over 5,000 kilograms of HEU and plutonium – enough for over 200 nuclear weapons
- This effort was in response to a 2009 Presidential initiative to secure vulnerable nuclear materials around the world

The awards will be presented at the 2013 Secretarial Honor Awards Ceremony at Department Headquarters on March 3, 2014

NNSA, formally recognizes the contributions of the G2 project team



Michael Lempke, Associate Principal Deputy Administrator to NNSA, formally recognized the contribution of the G2 project, issuing certificates of appreciation for the entire team, distributed at an ORNL-sponsored recognition breakfast in February

- The NNSA Enterprise Management Information System Generation II (“G2”) has been one of the success highlights of NNSA and ORNL - designated as the lead lab for software development and hosting
- From 2007 until now, the project has grown exponentially in scope and staff
 - A total of 45 people from ORNL, HQ, PNNL, ANL, and from subcontractors Cadre5 and Acato now contribute to this work



- During the short time G2 has been under the purview of the NNSA Office of Infrastructure and Operations (NA00), the significant impact to the office has already been acknowledged at the highest levels of management

Julie Ezold – Keynote speaker, Chattanooga 2014 Engineers Week Awards Banquet



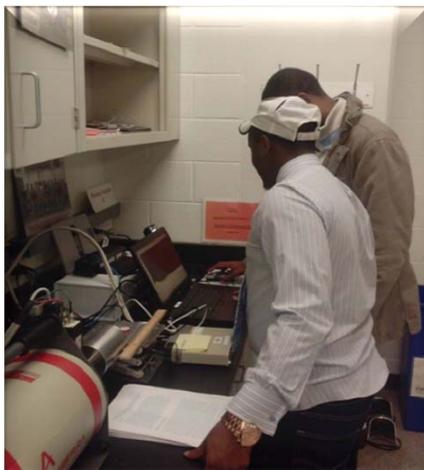
**Topic: "Engineering and Contributing
to the STEM Conversation"**



Next Generation Safeguards Program

- University of Tennessee – supported “Arms Control, Non-Proliferation, and Nuclear Safeguards & Security” course with speakers
- North Carolina State University – supported video conference Q&A session for their "Nuclear Nonproliferation and Safeguards Technology and Policy" course with subject matter experts
- Morehouse College – A group of 10 students and two professors to ORNL for a two day NGSF Nonproliferation Workshop
 - The workshop included hands-on exercises and tours

Morehouse students taking an NDA measurement



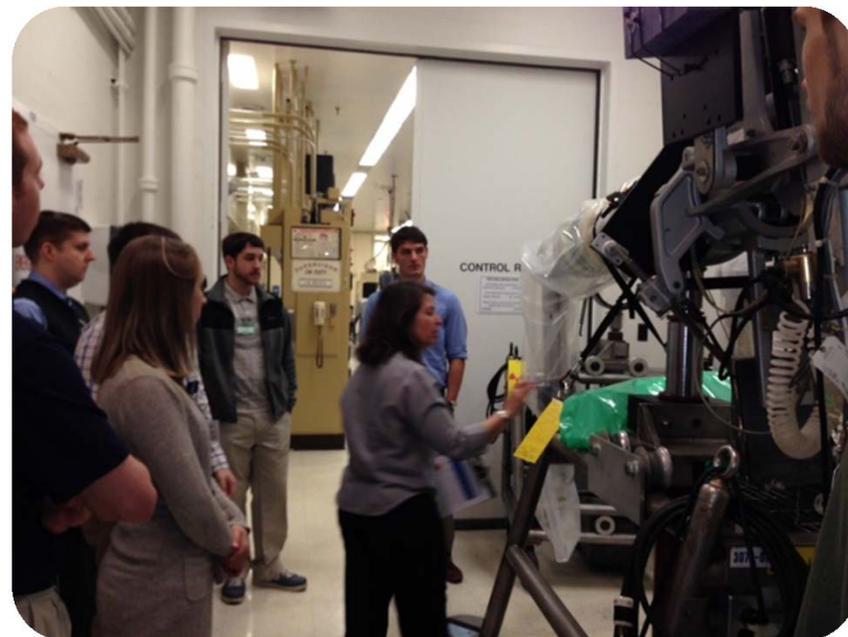
ORNL staff member, Dr. Louise Evans instructs students on enrichment measurements



University of Tennessee Nuclear Engineering graduate students

ORNL hosted a visit of University of Tennessee nuclear engineering graduate students and graduate student recruits on February 24, 2014

- The group was welcomed to ORNL by Cecil Parks
- The students were escorted on tours to provide an overview of ORNL's nuclear capabilities and allowed them to directly interact with our staff members
 - Consortium for Advanced Simulation of Light Water Reactors (CASL)
 - Spallation Neutron Source (SNS)
 - High Flux Isotope Reactor (HFIR)
 - Radiochemical Engineering Development Center (REDC)

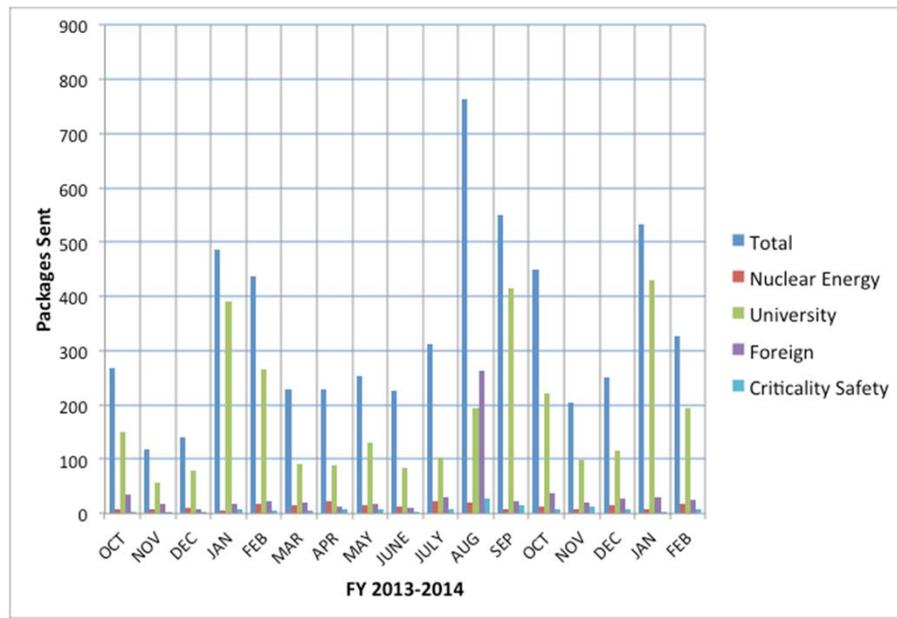
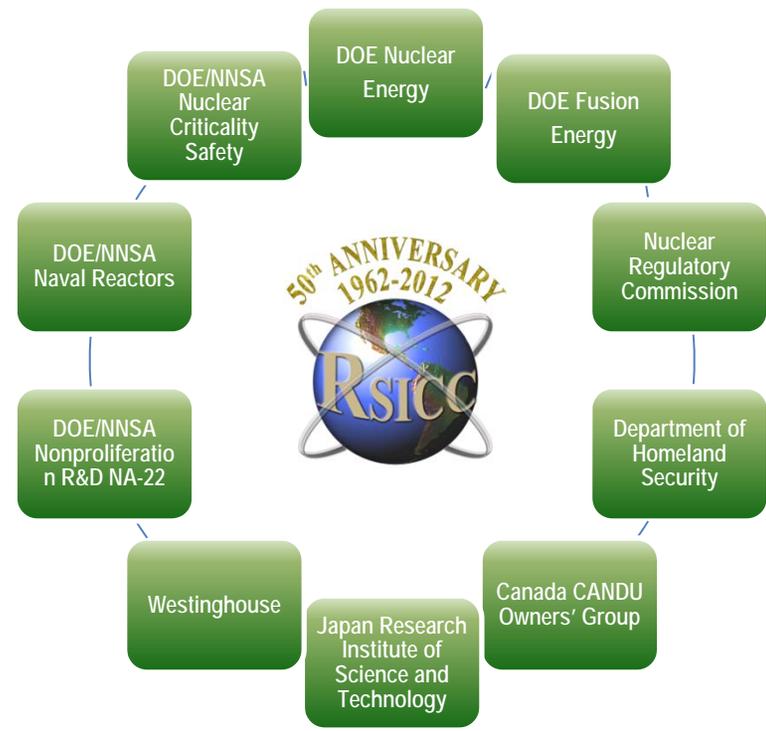
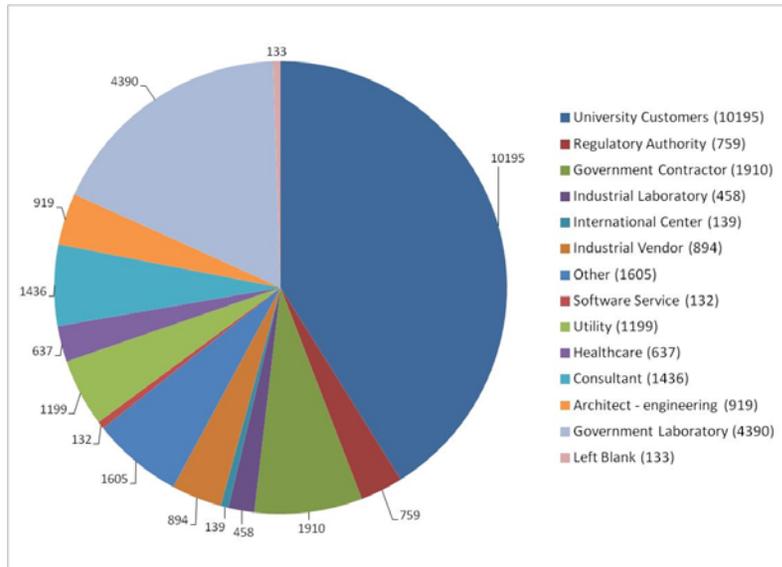


NSITD's, Julie Ezold, describes how the REDC manipulators operate

STEM outreach activities

- ORNL is helping to develop learning modules for new devices purchased by the L&N STEM Academy, further test them at the Hardin Valley STEM Academy, and help develop similar, age-appropriate learning modules for younger students
 - The L&N STEM Academy has acquired 10 LEAP motion controllers, intends to purchase several Raspberry Pi kits, and will be able to purchase one or two robotic arms over the summer
- ORNL is beginning an outreach project with Appalachian Bear Rescue
 - Identified a student from L&N STEM Academy to work on this project over the summer
 - An ORNL team will perform design reviews with him

Radiation Safety Information Computational Center (RSICC): Serving the Scientific Community for 50 years



- Software and data packages distributed FY2014: 1766
- 3 package updates and revisions February 2014

Radioisotope Production

Cm Target Refurbishment

Ac-225 Program



Ac-225 purification glove box line at the Radiochemical Engineering Development Center

- Completed five shipments to three customers with a total activity of 73.3 mCi



Transfer Arm Installed in Cubicle 1



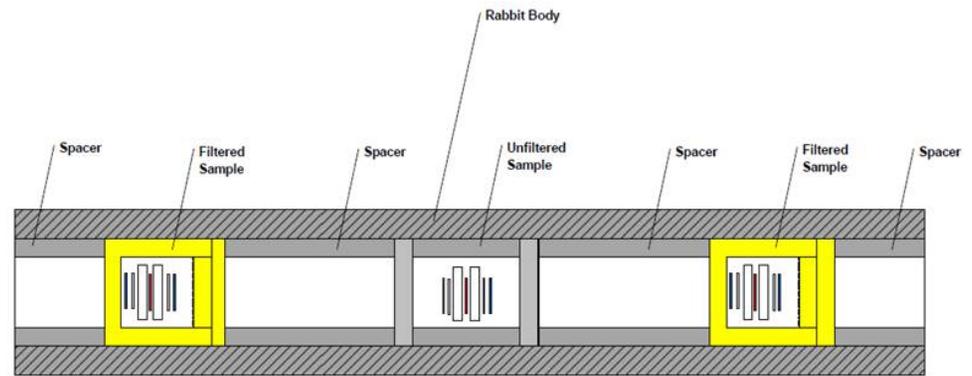
Thermal Cleaning Furnace for Installation in Cubicle 3

- Target handling/transfer arm installed in Cubicle 1
- Completed fabrication of the vacuum retort and in-cell stand for the new pellet thermal cleaning furnace
- Completed fabrication of the remote elastomeric swaging system for the target assembly system – Bench-top trials were initiated
- Continued dummy pellet fabrication trials to evaluate the performance of the hydraulic press and finger assembly for top-punch loading

Radioisotope Research & Development

Validation of Transcurium production optimization

- Identified actinide samples for irradiation
- Developed target design
- Identified Rh-103 as a filter material for optimizing the production of heavy actinides such as ^{249}Bk and ^{252}Cf



Percutaneous Access Device Project



New vacuum chamber



Mouse size percutaneous access devices

- Work authorization received for first two phases of project
- Preparations for cold testing of equipment is underway



Cm-248 Recovery from Cf-252 Decay

- Designed and fabricated prototypical hot cell equipment (photo on left) for using a preloaded Eichrom LN Resin cartridges to remove residual Cf-252 from acid adjusted Cm-248 fractions

Enriched stable isotope technical services and shipping

Sixteen shipments of 55 enriched stable isotopes were made in February

- 49 shipments of 188 enriched stable isotopes have been made in FY14 to date

Twenty-five custom technical services were completed in February

- Technical services included those shown below
- 52 technical services have been completed in FY14 to date



Sr-88 oxide sintered pellets for Sr-89 production in HFIR

Purchased Ti-48 and leased Ti-50, Cr-50 and Cr-54 oxides pressed and encapsulated in experiment holders for the investigation of nuclear resonance fluorescence



Mg-24 metal disc to be used in laser vaporization studies of transient species in water clusters



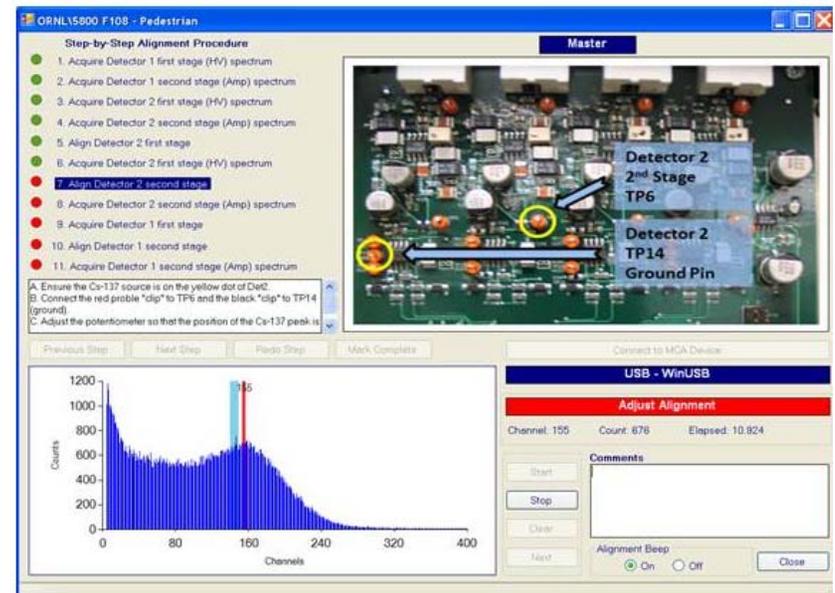
Custom software for field alignment of Second Line of Defense deployed Radiation Portal Monitors

ORNL completed the application, called Multi-Channel Analyzer Alignment Wizard (MCAAW), provides a tool that greatly reduces the time required to perform alignments and eliminates many potential errors

- The application is currently ready for pilot deployment

MCAAW provides the following benefits over the existing procedure

- A step-by-step alignment procedure reduces training requirements
- Software is pre-configured which eliminates significant software setup time
- Device parameters are automatically set eliminating the possibility of parameters being misconfigured
- Required spectrum are automatically saved using a standardized naming scheme
- Automated calculation of alignment channel provides more consistent alignments
- Integrated generation of a zip file for completed alignments simplifies transfer of files to ORNL
- Allows for tracking and review of the latest alignment for each monitor at a site



Screenshot of a MCAAW alignment showing the step-by-step procedure (upper left), detailed step guidance (upper right), automatic data collection (lower left) with target range highlighted in light blue and current channel at the red line, and data acquisition details and controls (lower right)



New capabilities for Radiation Signature Training Device (RSTD)

- The first three of five new RSTD production glove boxes were installed this month
- The new glove box line will establish the capability to produce a variety of actinide-based RSTDs at ORNL
- Process equipment installation and set-up in the new glove boxes is underway



Photos of glove boxes installed in Building 7920, Lab 209

Safeguards measurements of Pu and U adapted to pyro-processing using the ORNL HKED



- The goal of this effort is to produce an aqueous representation of a product stream in a pyroprocessing scenario for verification purposes utilizing a Hybrid K-edge Densitometer (HKED)
- In February, depleted uranium oxide was dispensed and prepared for dissolution
 - A nitrate solution containing Pu-239 was converted to a chloride solution, concentrated, and sampled for concentration confirmation
- February also marked the first time the HKED was used to measure a sample, which was prepared from known MOX fuel research material
 - The measurement was also a first with a higher than 100:1 U/Pu ratio



Photo of the HKED



Mobile Uranium Facility (MUF) trial cold weather deployment in Alaska

The MUF was transported from ORNL to Alaska and brought operational to test deployment in cold weather conditions





Training/Workshops



Department of Homeland Security Nuclear Forensics Training

ORNL hosted the Overview of Nuclear Forensics for the Federal Workforce training on February 11-12, 2014

- The course was attended by 33 students from 17 organizations
- Course instructors from 7 different agencies presented a variety of perspectives on the forensics process, and gave students insight into the roles and responsibilities of each organization
- This is the fourth time ORNL has hosted the DHS National Technical Nuclear Forensics-sponsored course and we have been asked to present it again in 2015

Jordanian National Nuclear Security Workshop

NSITD subject matter experts worked together with other ORNL, Sandia National Laboratory, and University of Tennessee representatives to conduct a five day, "Jordanian National Nuclear Security Workshop," for fifteen participants from the Jordanian nuclear community

- The aim of this event was to bring together technical experts, managers, and regulators to discuss best practices focused on promoting nuclear security strategies
- The workshop was cohosted by the Department of State Partnership for Nuclear Security and Department of Energy NNSA International Nuclear Security Program
- Topics included nuclear security culture, nuclear security education and training; developing and sustaining a nuclear security infrastructure; protective force operations and transportation security



Bill Toth (Threat Reduction Initiative Group Leader) giving a presentation at the workshop

NSITD publications



- **Journal Article – 1**

1. Jake Livesay, Christopher Blessinger, Tyler Guzzardo, and Paul Hausladen, "*Rain-Induced Increase in Background Radiation Detected by Radiation Portal Monitors,*" *Journal of Environmental Radioactivity.*

- **Letter Report – 2**

1. Nathan C. Rowe, *Selection of Test and Calibration Sources for Use with Radiation Portal Monitors,* ORNL/LTR-2013/585.
2. Robert T. Jubin and Stephanie H. Bruffey, Milestone Report – M4FT-14OR0312023 – *Planning Complete to Accept Kr-85 Legacy Samples,* ORNL/LTR-2013/579.

- **ORNL/TM – 3**

1. James E. Radle, Daniel E. Archer, John T. Mihalczko, Seth M. McConchie, James A. Mullens, Eric D. Sword, and Matthew A. Blackston, Oak Ridge National Laboratory NA-243 Office of Nuclear Verification Quarterly Progress Report, 1st Quarter FY 2014, ORNL/TM-2014/34.
2. Alexander L. Enders and John E. Gunning, Annual Report of Data Analysis for FY 2013, ORNL/TM-2014/31.
3. Gerhard (Jerry) R. Eisele and Cameron W. Coates, Guide to Urine Specimen Collection for Random Drug Testing for the MVD-IT, ORNL/TM-2014/4.



Productive CASL/NRC meeting results in topics for potential future engagement



- **Well attended by NRC staff from key offices**
 - 12 NRC attendees representing staff, branch chiefs, and division directors
 - Office of Regulatory Research
 - Office of Nuclear Reactor Regulation
- **Supports objective to keep NRC informed on CASL activities**
 - Inform NRC on research to support eventual use of CASL tools in licensing activities by industry
 - Seek area for potential collaboration
 - Discuss potential Phase 2 scope of interest to NRC
- **Topics identified for potential engagement**
 - Advances/improvements in sub-channel T/H modeling
 - Creating an industry “push” for CFD in license applications
 - Interoperability of VERA with NRC TRACE reactor systems code
 - CASL core simulator to assess impact of approximations in current approaches
 - Computing resource requirements and availability

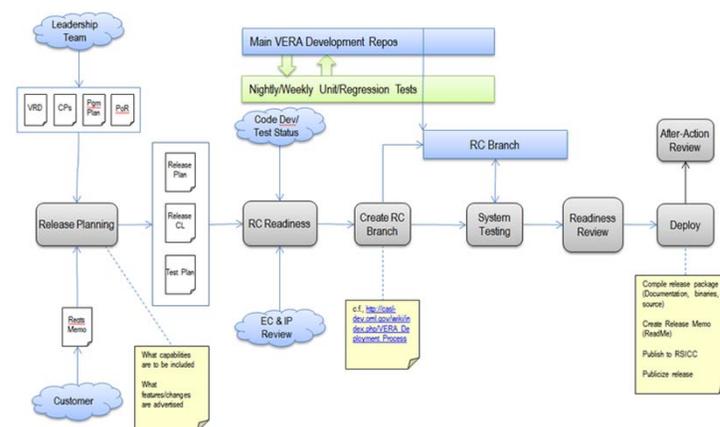
CASL/NRC Meeting February 25, 2014 Rockville, MD

Time	Agenda Item	Presenter
1:00 pm	CASL Update	Doug Kothe
1:30 pm	Challenge Problems Status	Zeses Karoutas
1:50 pm	VERA Status/Development	Jess Gehin
2:10 pm	TH Status/Development	Emilio Baglietto
2:30 pm	Validation and Uncertainty Quantification	Vince Mousseau
3:00 pm	Break	
3:15 pm	Validation Data Availability and Needs	Nam Dinh
3:45 pm	CASL Phase 2 proposal planning	Paul Turinsky
4:00 pm	Discussion	
5:00 pm	Adjourn	



First RSICC release of VERA delivered

- Release candidates for selected VERA components finalized in Dec 2013
 - VERA-CS coupled neutronics + thermal hydraulics
 - Standalone neutronics & thermal hydraulics
 - Dakota uncertainty quantification capability
 - VERAIn common input processor
- Licensing terms
 - Test & Evaluation license completed
 - Completed review of component code licenses
- Final documentation delivered as part of release
 - Revised installation guide
 - README files for components
 - Theory & User Manuals
- Export control determination completed
- Process for approving distribution under test & evaluation terms drafted
- Final software tested & delivered to RSICC



SOFTWARE TEST AND EVALUATION LICENSE AGREEMENT

[SOFTWARE NAME & VERSION]

UT-BATTELLE, LLC, hereinafter referred to as, a _____ company having its principal place of business at _____, hereinafter referred to as the "LICENSOR," and [COMPANY], a [STATE] company, having its principle place of business at [ADDRESS], hereinafter referred to as "EVALUATOR" agree as follows, with both hereinafter referred to collectively as the Parties:

CASL activities

CASL

- Education Program
- Phase 2 Technical Scope Down Selection Process
- Phase 2 Challenge Problem Mini Charter
- Industry Test Stand Experience
- MPACT Validation Uncertainty Quantification (VUQ)
- CASL Value Proposition Meeting Subcommittee
- VUQ Milestone Review
- Phase 2 Renewal Proposal
- CASL Metrics
- VUQ Strategy
- VERA Acceptance Testing
- AMA Hydra-TH Applications Overview and Status
- Phase 2 - Industry Program / Deployment Discussion
- Phase 2 Scope Discussions
- Planning for March Industry Council Meeting
- TCP Problems, Issues, and Improvements
- COBRA-TF Working Group Meeting
- License & IPMP Update
- ANC-VIPRE-BOA status/BOA 3.1 availability



VOCC Tours

7 Tours for
February 2014

- David Rose, UK Daily Mail
- Steven Doehler, University of Cincinnati
- DOE NE and Nuclear Fuel Development
- University of Tennessee Nuclear Graduate Recruitment Students
- Ben Thomas (GSD)
- CSE Division

Meetings

NRC Meeting, February 25
NEI Meeting, February 26

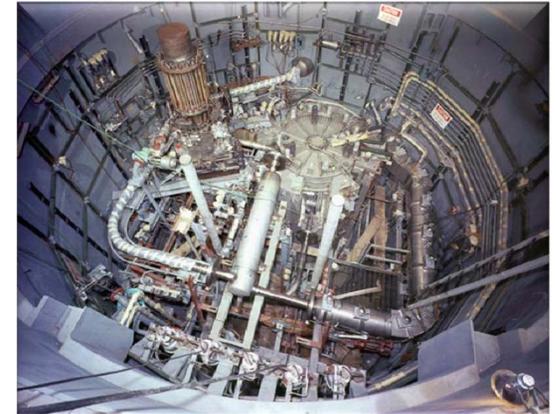
Leadership in OECD-NEA Working Party on Scientific Issues for Reactor Systems (WPRS)

- WPRS Meeting and associated Expert Group Meetings were held February 18–21 at Organization for Economic Co-operation and Development (OECD) Nuclear Energy Agency (NEA) Headquarters in Paris, France
- Robert Grove represented the US and ORNL and served as Chair in the Expert Group on Radiation Transport and Shielding
- Matthew Jessee represented the US and ORNL in the Expert Group on Reactor Physics and Advanced Nuclear Systems (EGRPANS) and the Expert Group on Uncertainty Analysis in Modeling
- Jeff Powers participated as an invited expert and has been confirmed as a new US representative in the Expert Group on Reactor Fuel Performance (EGRFP) and EGRPANS
- Larry Ott (ORNL, retired) was recognized in absentia in the EGRFP and WPRS meetings for his dedicated service as the EGRFP chair
- Timothy Valentine and Philip Fink (INL) led US participation in proposing a new expert group on Experimental Data, Benchmarks and Validation

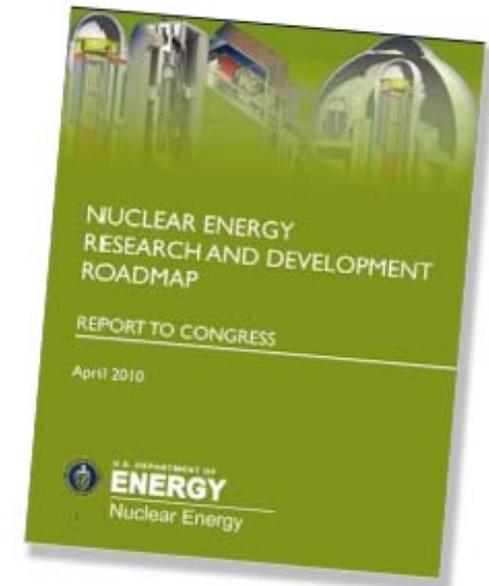


EPRI/Southern Company meeting on MSR feasibility assessment

- Meeting held at ORNL February 12–13, 2014.
- Supports EPRI/Southern Company study to assess advanced nuclear energy systems for potential demonstration.
 - This meeting focused on information to support an assessment of molten salt reactors (MSRs)
 - Assessment Areas: .Baseline design, ops and maintenance, and risk assessment (technical, regulatory, industry)
- Significant interest by Southern on hosting advanced reactor demonstrations.
 - Interested in several advanced reactor types (MSR, Gas Cooled, Liquid Metal)
 - Open to cost-share model with support from DOE
- Unique opportunity for gaining commercial/industry support for developing and deploying advanced nuclear reactors.
- Organizations involved:
 - EPRI supported by Vanderbilt, ABS Consulting
 - Southern Company supported by FLiBE Energy



ORNL's Molten Salt Reactor Experiment operated in the 1960s

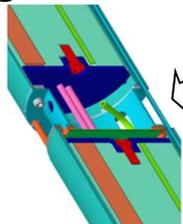


Materials irradiation – February 2014

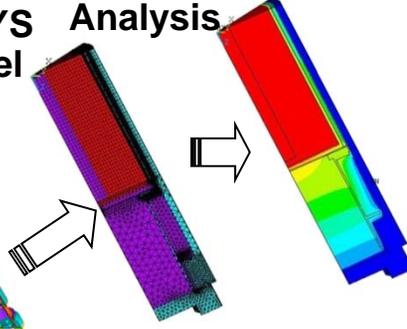
Project	Format	Sponsor	Stage				Notes	
			Newly proposed	In Design	In Fabrication	In Reactor		Removed
Steel Screening	Rabbit					5		Cycle 451
Titan Metal	Rabbit	DOE, FE US-Japan				1	29	Tungsten and steel
Composite Flexure	Rabbit	DOE, FE				8		SiC
Mini-Composite	Rabbit	DOE, FE				3	1	SiC
Round-bar Tensile	Rabbit	DOE, FE		4+		TBD 2013		Steel
Hydrided Clad	Target	DOE, NE					4	Zircaloy
Ibiden	Rabbit	WFO, Ibiden				23	15	Graphite
Nippon	Rabbit	WFO, Nippon			6	30, Cycle 452		Graphite
Toyo Creep	Target	Toyo Tanso			1	2, Cycle 449		Graphite
Inconel springs	Rabbit	AECL		11		8, Cycle 452	2	
Graphite Creep	Rabbit	EDF		3			3	Irr. Graphite
SHINE	Rabbit	DOE		5	4	Cycle 452		Mo-99
Exotic Ceramic	Rabbit	DOE, FE				4	5	
SiC Joining tests	Rabbit	DOE, FE		21	5	Cycle 453		SiC
HTV Capsule	Target	DOE NE		1		2014		Graphite
FCR&D Rabbits	Rabbit	DOE NE		1		2014		DU fuel samples
FeCrAlY	Rabbit	Fusion				2, Cycle 450	3	FeCrAlY
EPRI Rabbits	Rabbit	EPRI			7	Cycle 453		
TOYO Rabbits	Rabbit	TOYO TANSO				17	17	Graphite
EPRI VXF	VXF Target	EPRI				3		Steel Weld Coupons
Superconducting Tapes	Rabbit	Fusion		2		Cycle 453		
Bulk Metallic Glass	Rabbit	Fusion		4				

Experiment Design

Design Detail



ANSYS Model



Thermal Analysis

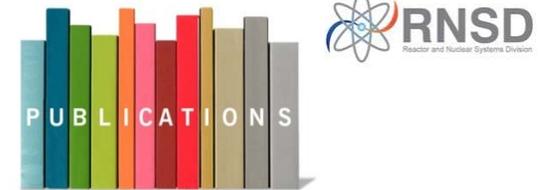
Experiment Fabrication



Irradiation



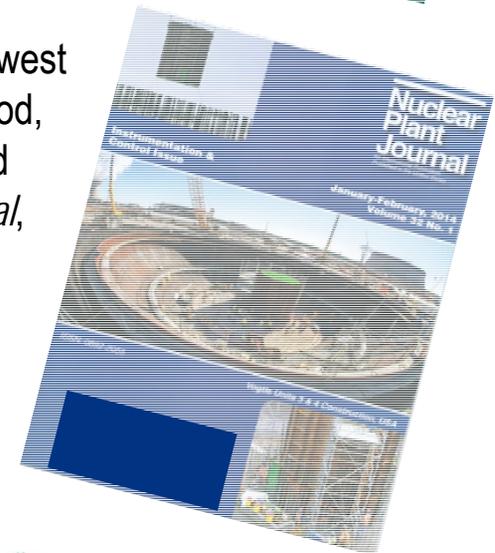
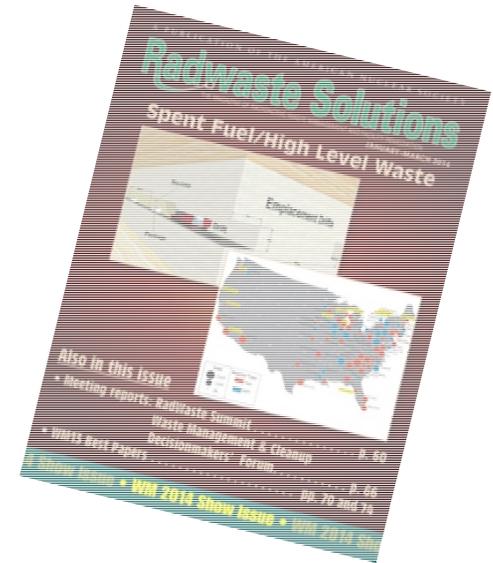
RNSD publications



- Letter Report - 1
- Journal Articles - 3

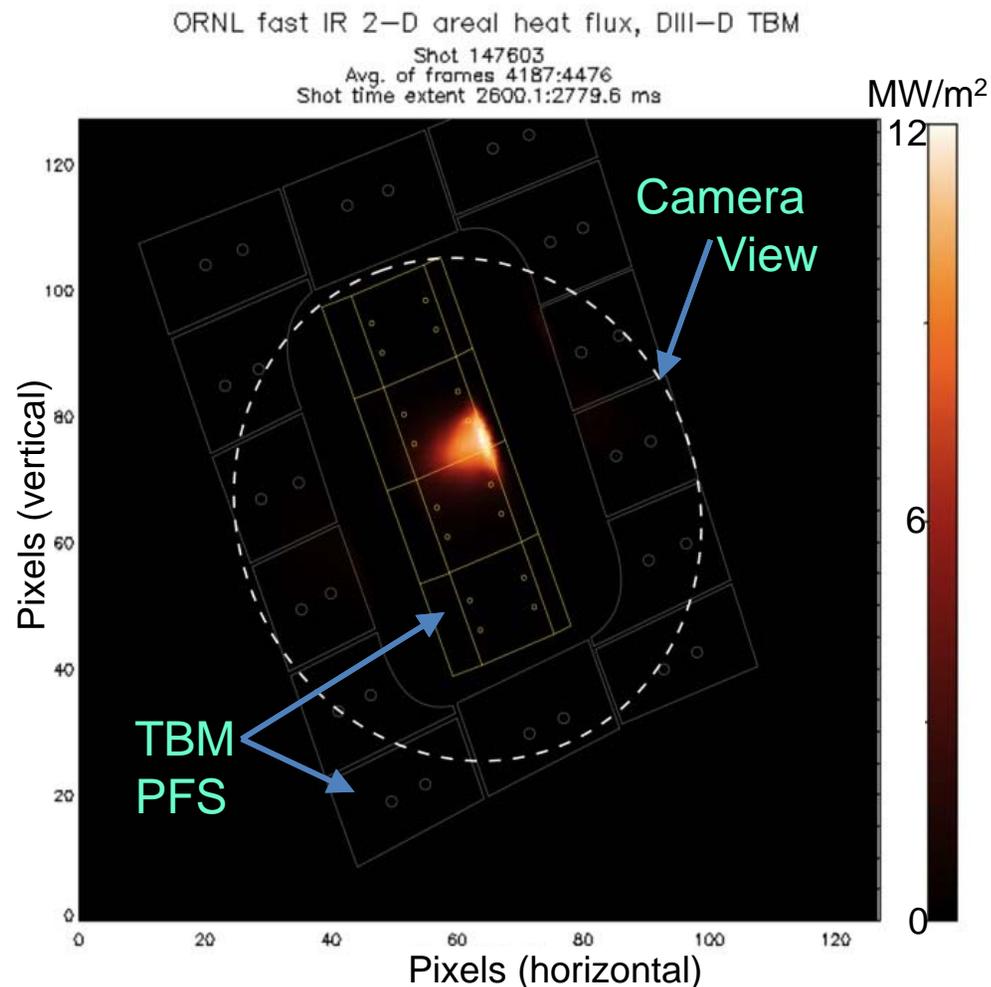
RNSD staff members contributed two articles published in the January–March 2014 edition of *Radwaste Solutions*. These papers were supported by DOE-NE.

1. E. L. Hardin, D. J. Clayton, R. L. Howard, J. Clarity, J. M. Scaglione, J.T. Carter, W.M. Nutt, and R.W. Clark, “*Evaluation of Direct Disposal of Spent Fuel in Existing Dual-Purpose Canisters*,” *Radwaste Solutions*, Vol. 21, No. 1, 26–39, January–March 2014.
2. Joshua Peterson and John Wagner, “*Characteristics of Commercial Spent Nuclear Fuel: Distributed, Diverse, and Changing Time*,” *Radwaste Solutions*, Vol. 21, No. 1, p. 50–59, January–March 2014.
3. Pradeep Ramuhalli, Evelyn Hirt, Garill Coles, and Ryan Meyer, Pacific Northwest National Laboratory; Jamie Coble, University of Tennessee; and Richard Wood, Oak Ridge National Laboratory (RNSD) “*Controlling O&M Costs of Advanced SMRs using Prognostics & Enhanced Risk Monitoring*,” *Nuclear Plant Journal*, Vol. 32, No. 1, p. 42–44, January–March 2014.



DIII-D continuing studies of heat flux to plasma facing surfaces with mock ITER Test Blanket Module (TBM)

- ORNL fast infrared camera is a key to experimental interpretation
- Mock TBM mimics perturbations anticipated in ITER's TBM
 - 3-D field perturbations can cause anomalous plasma facing surface (PFS) heating
- Past TBM experiments on DIII-D showed 3-D plasma facing surfaces $\Delta T > 1500^\circ\text{C}$
- Corresponds to sustained heat flux of $> 10 \text{ MW/m}^2$
 - Typical DIII-D outer wall heat flux $< 0.5 \text{ MW/m}^2$
 - Agrees with 3D fast ion modeling
 - In ITER, Be wall $T_{\text{melt}} = 1280^\circ\text{C}$



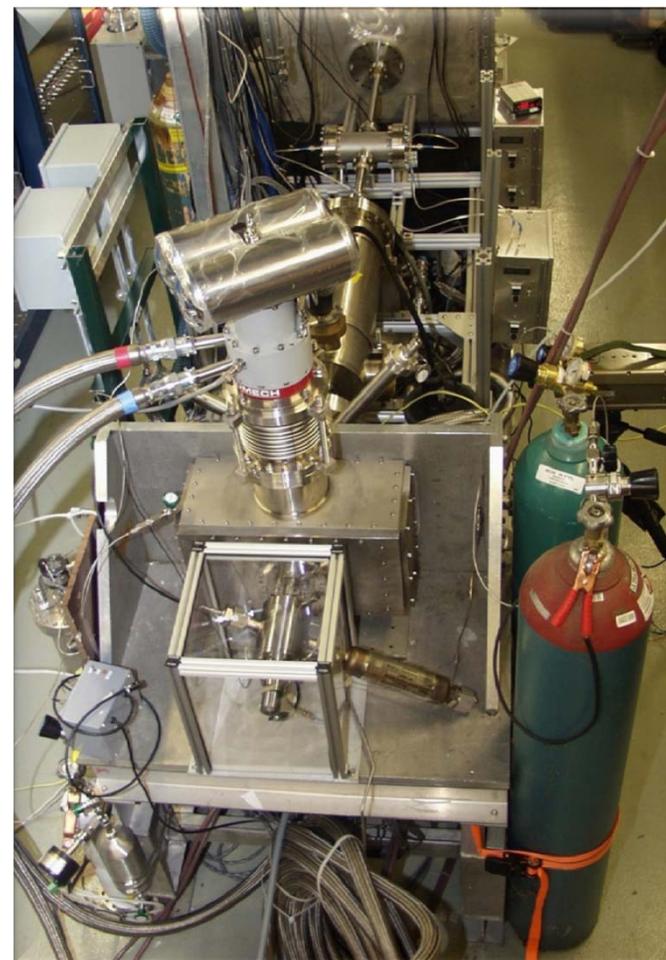
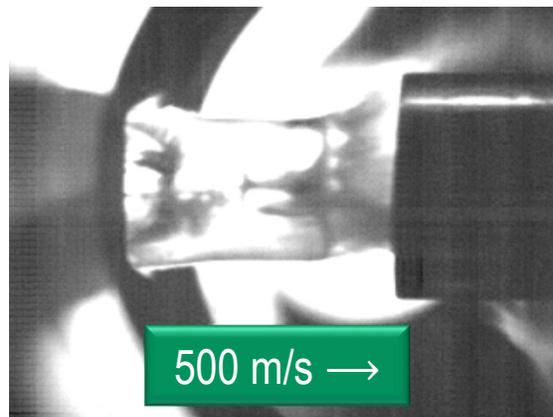
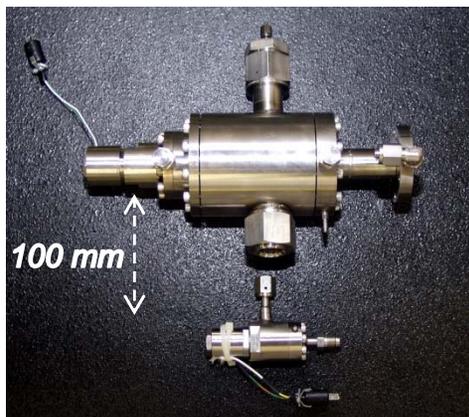
Laying the groundwork for participation in the 2017 D-T fusion experiments at JET in the United Kingdom

- FMNSD Scientists (Ted Biewer & Chris Klepper) assisted JET staff (Uron Kreuzi) in the calibration of fibers used on the JET “Optical Penning Gauge (OPG)” diagnostic
 - The OPG was installed by ORNL staff (Don Hillis) prior to the 1997 JET Deuterium Tritium (D-T) fusion experiments, and continues to operate
 - The OPG measures tritium and helium concentration in the divertor
- ORNL instrumentation will play key roles in the planned 2017 JET D-T fusion experiments by measuring the “He ash” in the fusion plasma core and the constituents of the divertor exhaust gas
- Recently, Ted Biewer became Deputy Leader of the US BPO Diagnostics Group and has proposed a Task Group to organize US participation in the JET D-T fusion experiments



Single-Pellet Test Facility upgraded to facilitate experiments with large shattered neon pellets

- Method for plasma disruption mitigation using shattered pellets was developed in this facility (system on DIII-D/planned for ITER)
- New cryogenic refrigerator with more capacity allows testing at lower temperatures (~ 8 K); large (16.5 mm) neon pellets can now be frozen faster (~ 20 min. as compared to >1 hr. with previous cry-cooler)
 - Also, the solid vapor pressure is now low enough for pellets to be held for long periods (1 day or greater – TBD in tests?)
- Limited testing with a large propellant valve (orifice=22 mm) resulted in \sim doubling of the pellet speed from that achieved with a standard ORNL fast solenoid valve (orifice=5 mm)
 - This would significantly decrease response time to deliver material to plasma



Highlight courtesy of S.K. Combs in FMNSD

ORNL support for Weapons-Grade Plutonium Disposition Program

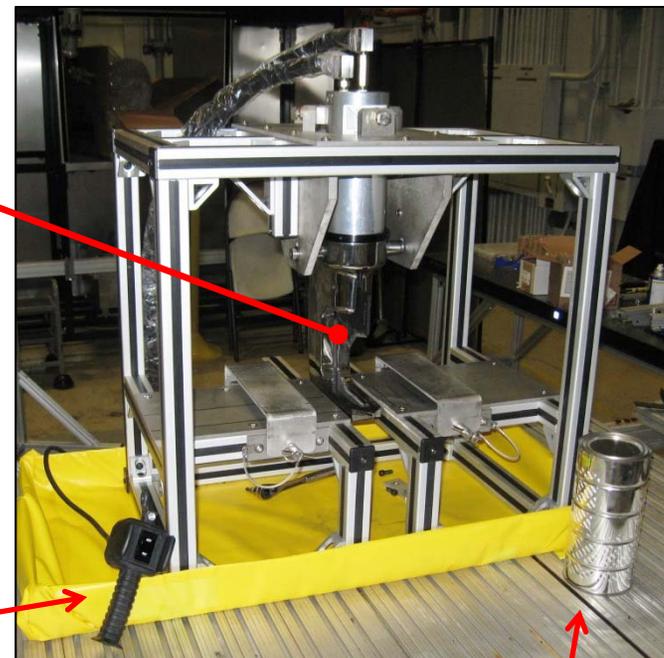
- Program Status
 - ORNL technically involved since 1994, and after 2015, well positioned to participate in whatever plan is approved
 - December 2013 - plant was 60% complete
 - New options - disposal of weapons-grade Pu under review
- Managed Production
 - Fuel elements and irradiation of first weapons-grade MOX fuel in the ATR reactor to ~40 GWd/MT burnup (~ 5 years)
 - Significant capabilities derived from this program for ORNL
 - PIE showed successful predicted behavior of the MOX fuel

Remote hydraulic shear developed and ready for deployment

- Remotely operated tooling is needed to size-reduce nuclear material for future processing
- Remote Systems procured a commercial shear designed for portable, hands-on use and modified it for remote operation within an enclosure
- System was successfully tested and demonstrated to sponsor and end-user in Building 7603
- Delivered to Nonreactor Nuclear Facility Division for final installation and deployment

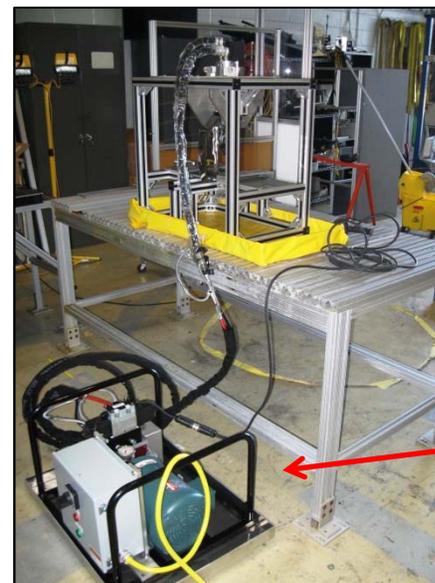
Hydraulic
Piston with
Cutting Blade

Pendant
Controller



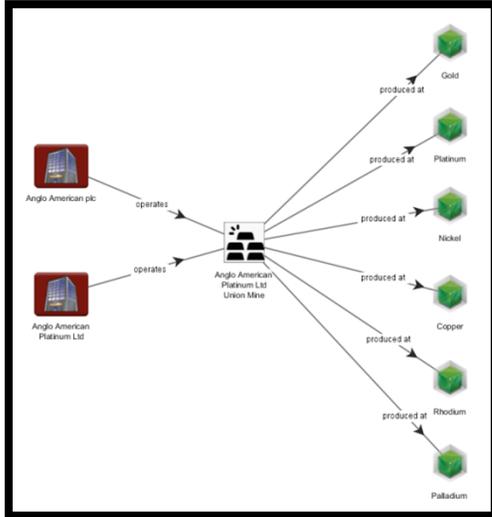
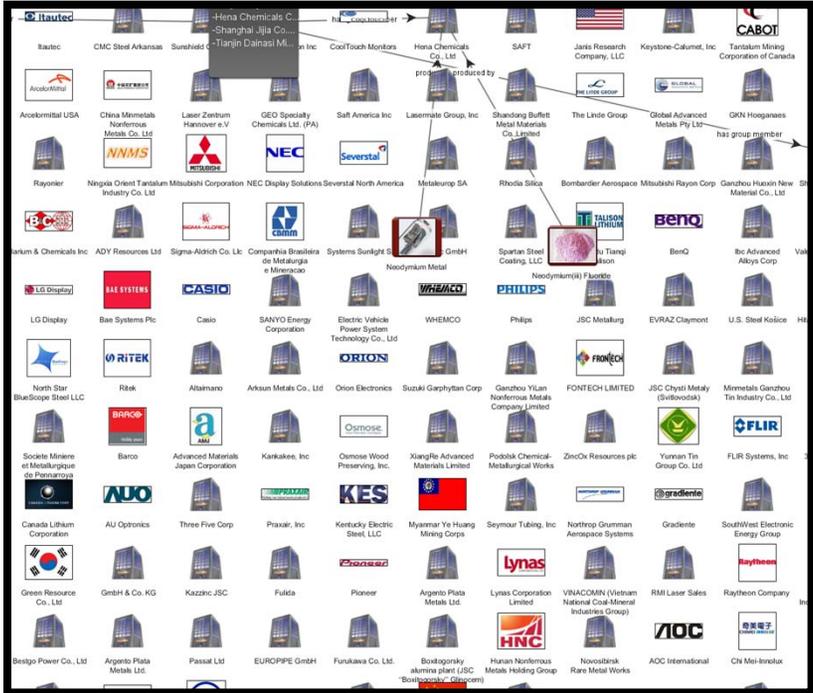
Material
Storage
Container

Hydraulic
Power Unit



Multiple dataset integration into SMART successfully completed

- For the Strategic Materials Analysis & Reporting Topography (SMART) System to gain greater operational efficiencies, multiple datasets have been investigated for procurement and integration
- Metal Bulletins was selected as the first procured dataset for integration due to price (\$60K annually) and value of information
 - Tracks production and capacity data on over 3,000 companies
- The integration of this dataset with the existing USGS dataset has allowed ORNL analysts to more easily and accurately construct supply chains for strategic materials
- Example of companies added (top image) and supply chain from Anglo American's Union Mine (lower image)

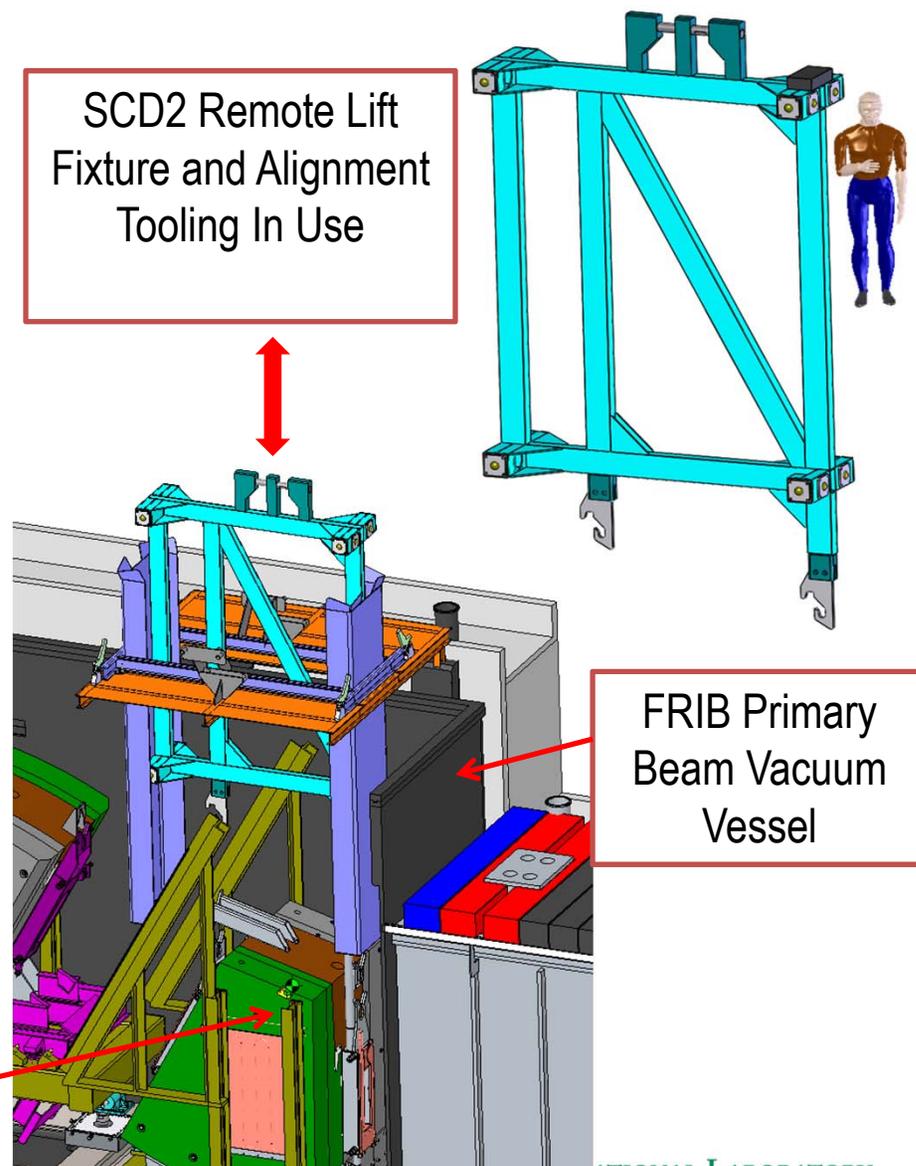


FRIB Super Conducting Dipoles (SCD) remote handling intermediate review completed

- Remote Systems (RS) successfully completed the FRIB SCD Remote Handling Intermediate Review on February 28, meeting a Project Milestone.
- RS is the primary lead of this task and:
 - Worked with MSU SCD designers to facilitate remote handling (RH) compatibly,
 - Developed RH procedures,
 - Defined and designed required remote handling equipment,
 - Limited selection of RH equipment illustrated.
- Current design level ~ 50%
- Path forward to future detailed design reviews (60% & 90%) defined with ORNL lead

SCD2

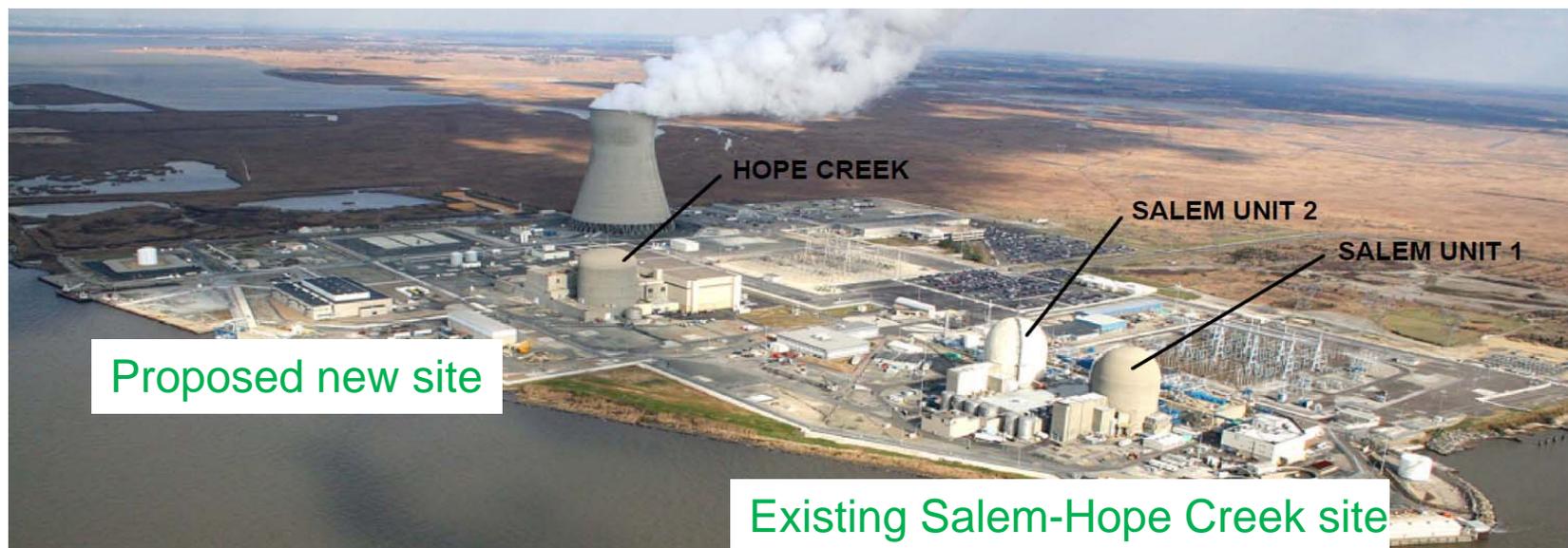
SCD2 Remote Lift
Fixture and Alignment
Tooling In Use



FRIB Primary
Beam Vacuum
Vessel

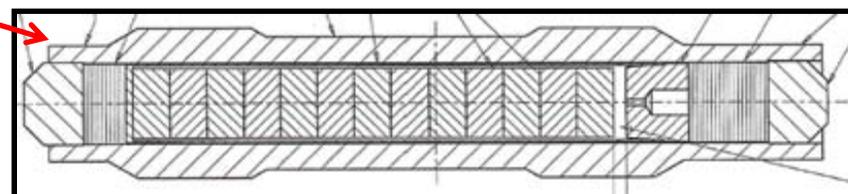
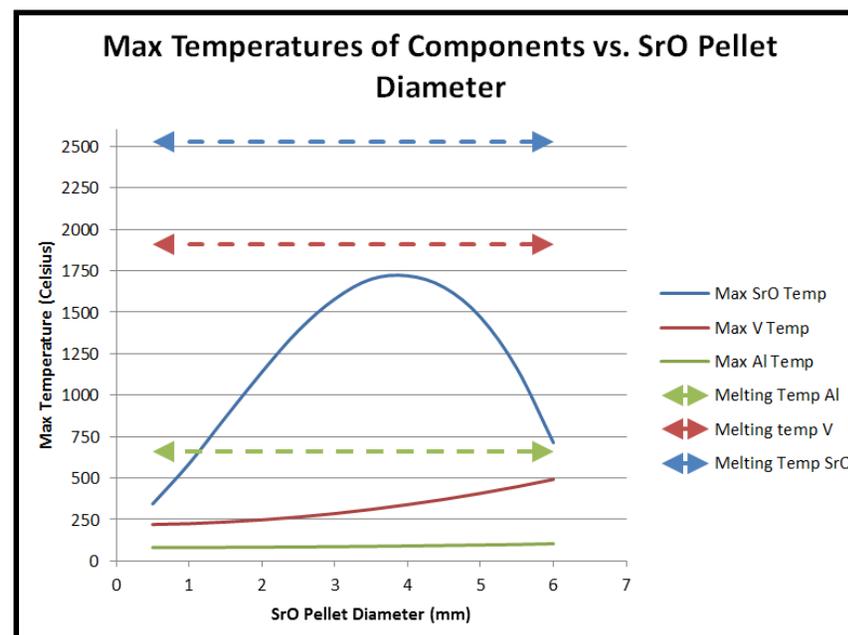
Fuel cycle and decommissioning input to NRC's PSEG LLC Early Site Permit Draft Environmental Impact Statement

- Public Service Electric & Gas early site permit application for additional units at Salem-Hope Creek site in New Jersey
 - NRC writing meeting held at ORNL week of February 3
 - Responsibility for chapters on nuclear fuel cycle and waste management, and on decommissioning
 - General counsel review of Waste Confidence continues
 - Draft Environmental Impact Statement to be issued for comments this summer.



HFIR safety calculation of Strontium Oxide target heat transfer completed

- With final approval of this calculation, strontium oxide pellets will be authorized to be irradiated in HFIR
- Strontium oxide will be activated with the high neutron flux to produce radio-isotopes used for cancer treatment
- Calculation C-HFIR-2013-035 has determined that a “rabbit” filled with strontium oxide pellets can be irradiated in HFIR without a concern of target failure or any adverse effects on the HFIR core



Multi-Program High Bay Facility (7625/7627)

- Completed removing ductwork and siding from high bay west wall, and re-routed facility instrument air system piping in preparation for installation of new ITER Ion Cyclotron Heating radiofrequency transmission line supports
- Installed cooling water piping and made electrical modifications in Room 108 for Proto-MPEX Thomson Scattering laser system
- Adjusted circuit breaker settings to reduce arc flash hazards and improve electrical coordination



Preparing to Remove West Wall Siding



Electrical Mods for Proto-MPEX Laser

Multi-Program High Bay Facility (7625/7627) (continued)

- Completed annual inspection of facility cranes and other hoisting and rigging equipment
- Obtained and began installing replacement compressor for facility instrument air supply system
- Initiated weekly facility access tours, required for unescorted access into Building 7625 (in addition to required reading)
- Continued connections of new 13.8-kV vacuum switchgear in 7627 required for high magnetic field operation of Proto-MPEX



Inspecting 20 Ton Crane



Circuit Breakers

NNFD FY 2014 cumulative facility metrics

Hot Cell Availability

Bldg. 7920 February	99.1%
Cumulative	95.1%
Bldg. 7930 February	99.0%
Cumulative	98.8%
Bldg. 3525 February	100%
Cumulative	99.6%
Bldg. 3025E February	100%
Cumulative	96.0%

Facility Upgrades and Maintenance Activities

7920

- Programmed maintenance operations
- Manipulator changes for Hot Cell operations
- Glove box installations and removals




- Target fabrication refurbishment support

7930

- Programmed maintenance operations
- Continued Par Phase I facility electrical modifications

3525

- Programmed maintenance operations
- Installed permanent D/P gage for building exhaust HEPA filters



- Repaired several manipulators
- Began glove box service panel upgrades

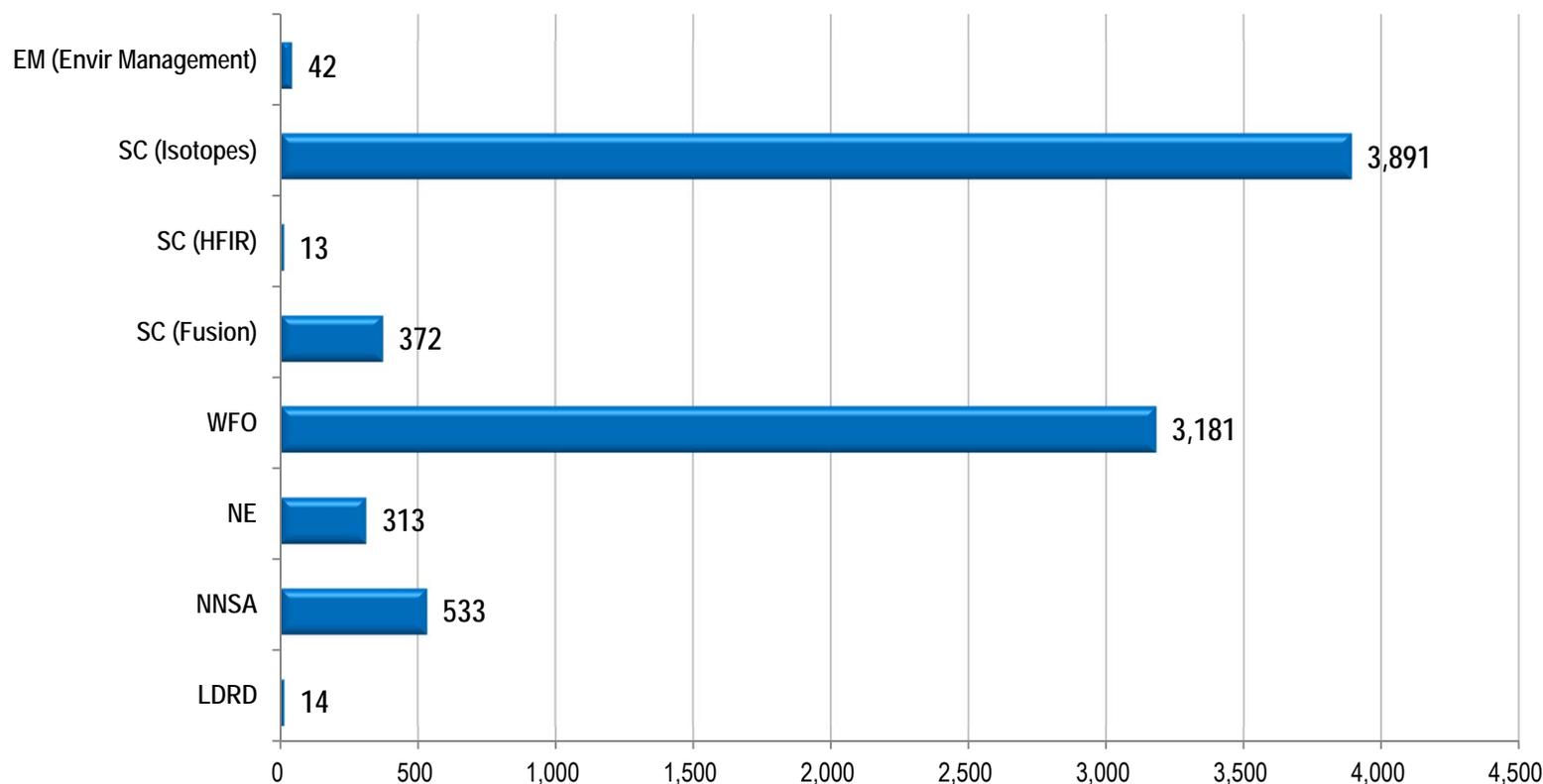



3025E

- Programmed maintenance operations
- Performed maintenance on facility PCM-1B units
- Performed maintenance on two Canberra Argos-5AB units and one PCM unit
- Completed FRM checks
- Removal of numerous salvage item from facility

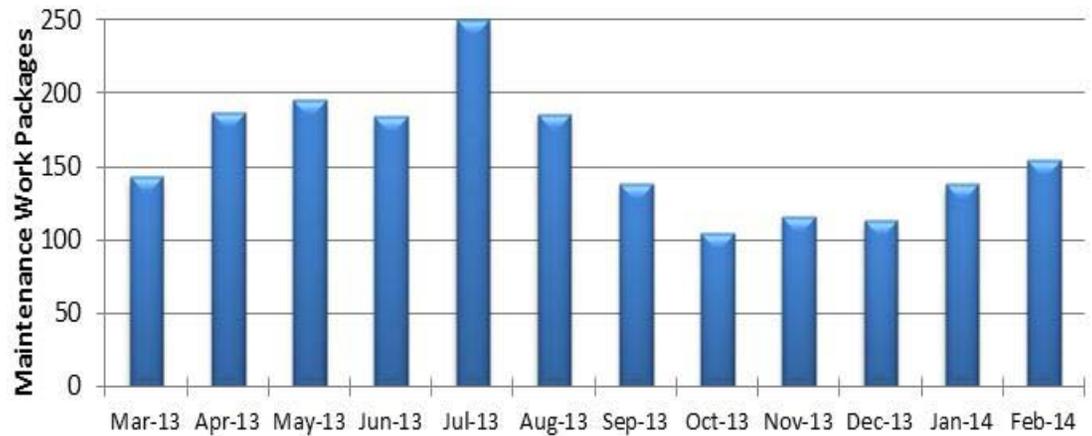
NNFD FY 2014 business volume by customer metrics

ORNL Hot Cell Usage by Sponsor *(1st Quarter 2014 – last 12-months, \$K)*



FY 2014 NNFD Maintenance Program* performance – last 12 months

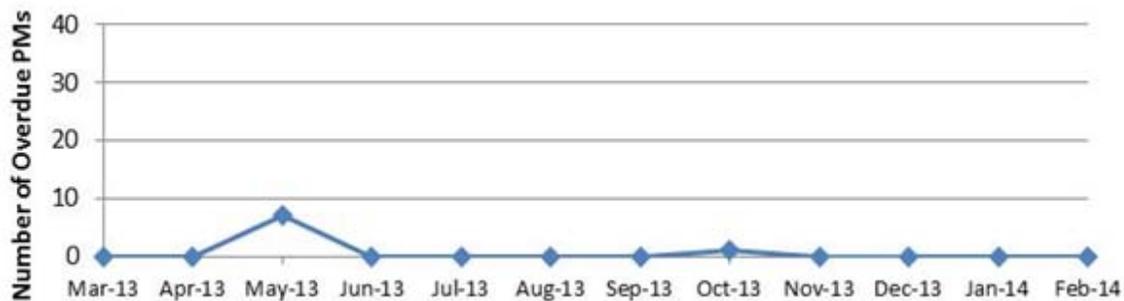
138 work orders open >90 days
Nuclear maintenance backlog meeting goal



Goal: < 175

* Work scope that could affect the operation of a CAT 1, 2, or 3 Nuclear Facility (safety and non-safety; corrective, preventive, experiment, and modification)

No safety-related overdue NNFD repetitive maintenance actions



Goal: Zero overdue

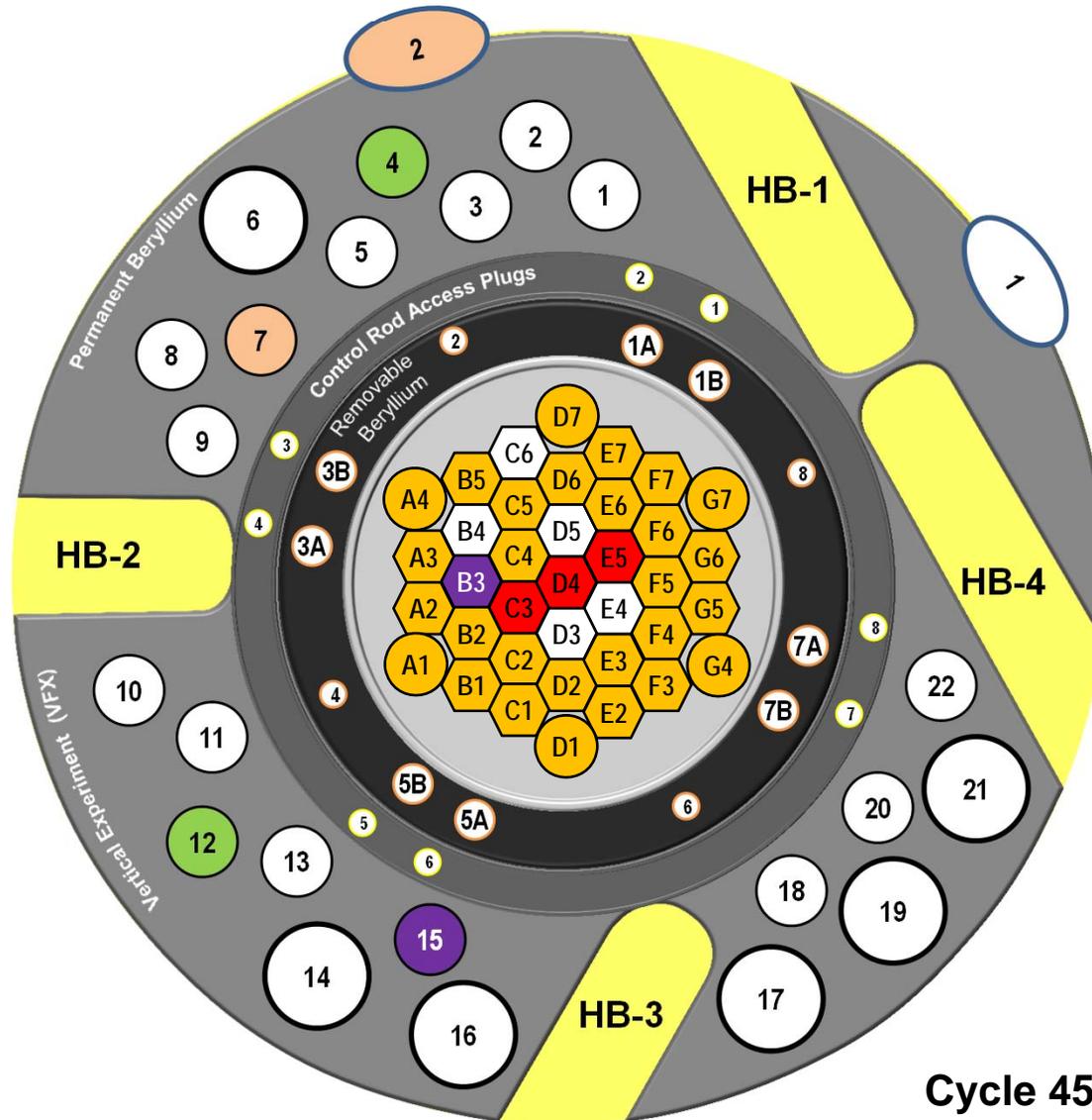
High Flux Isotope Reactor (HFIR) Cycle 451



February 2014

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	

Reactor OFF
Reactor ON



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

Cycle 451 graphical summary

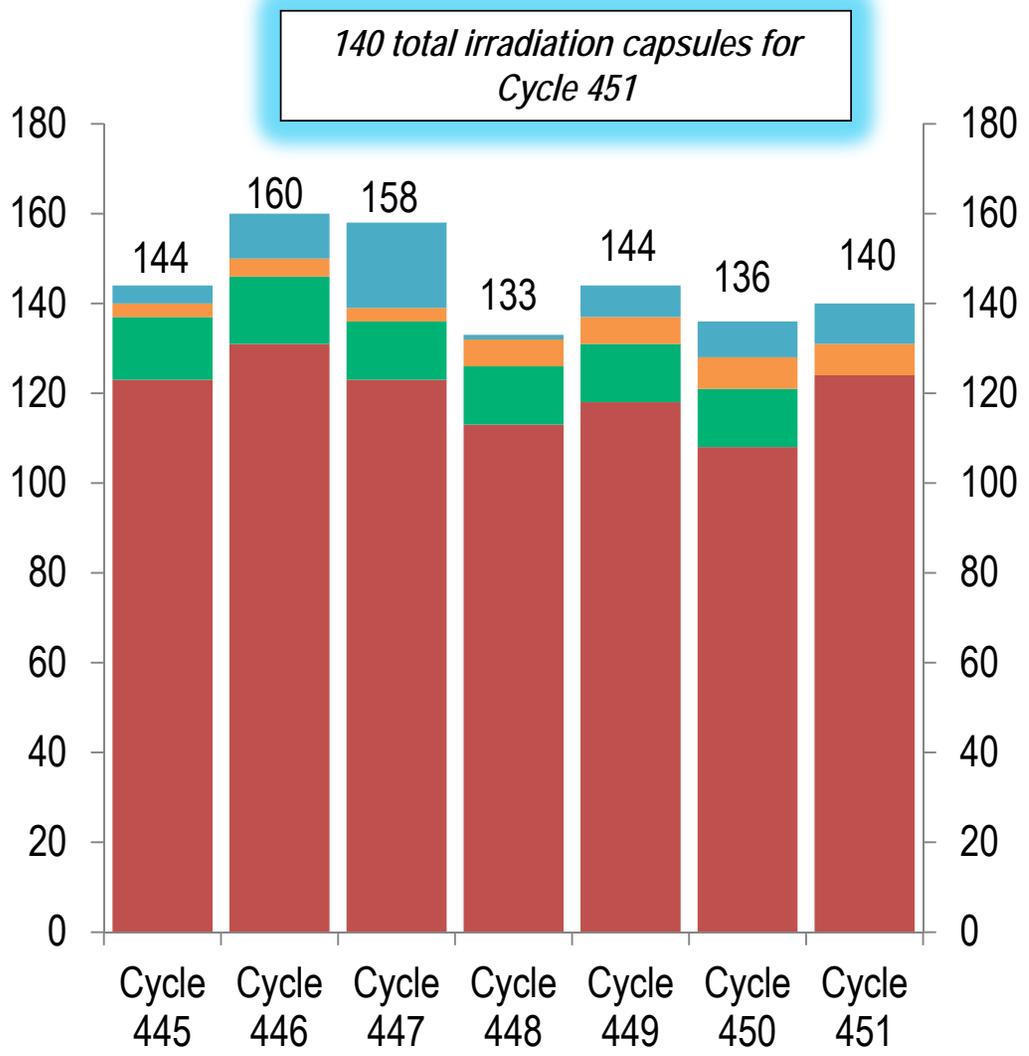


Number of irradiations in Cycle 451 remain high, driven by materials irradiations supporting fusion materials programs and Pu-238 irradiations

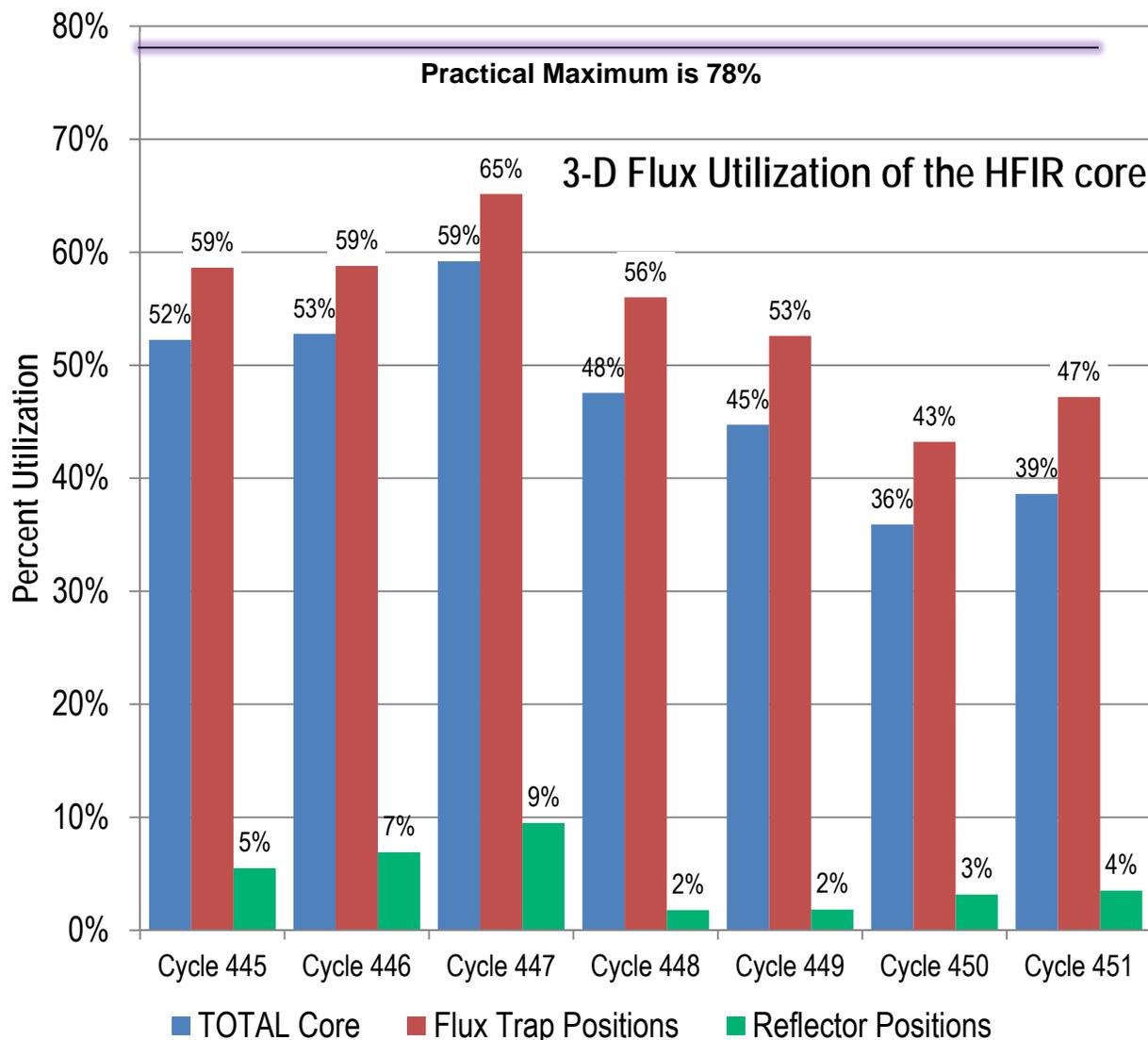
Materials Experiments
• Silicon Carbide
• V, Mo, & Cu alloys
• Zircaloy
• Graphite
• Steels

Commercial Isotope Production
• Selenium (Se-75) – production
• Ni-63 production

Research Isotopes
• Pu-238 for NASA
• Yttrium-89 for research



HFIR 3-D Flux utilization down slightly despite the high number of individual capsules – Fewer full-length targets installed



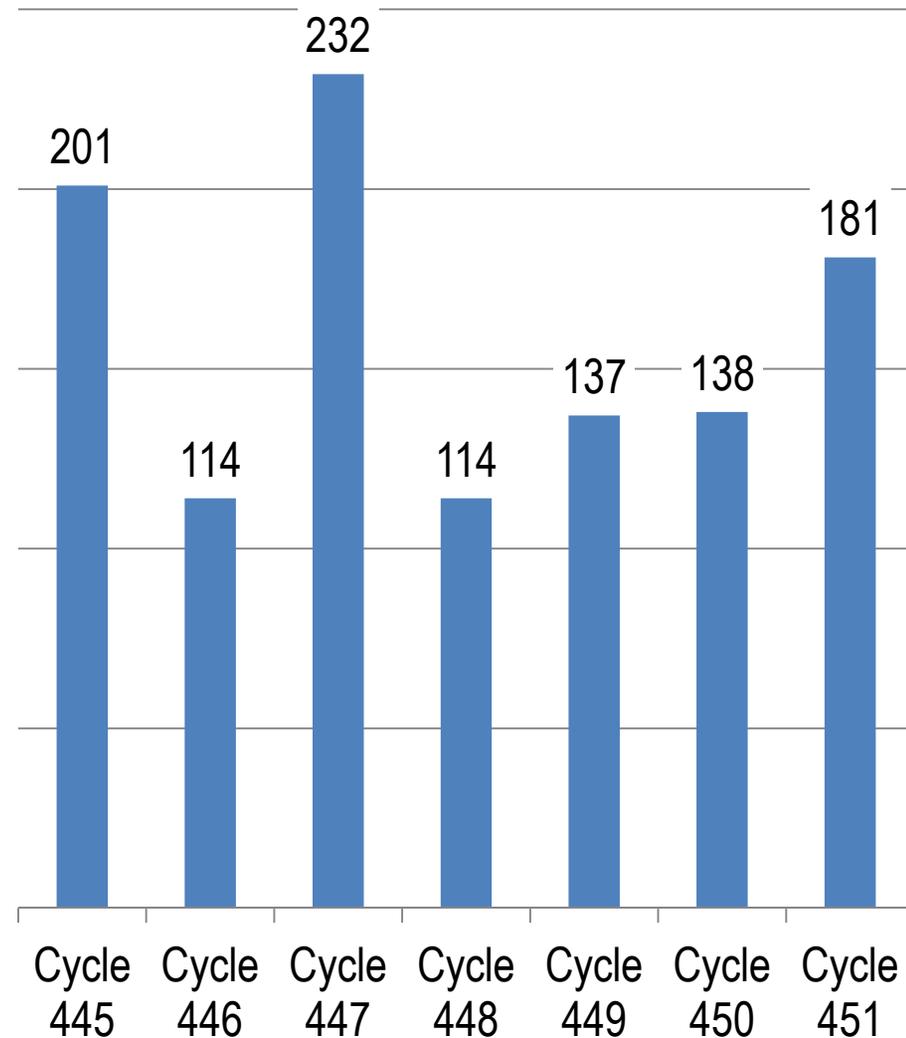
- Flux Utilization remains down slightly as we make room for upcoming Cf-252 production targets
- Flux Trap Utilization will remain around these levels until it rises further due to Cf-252 irradiations starting in May 2014
- The **practical maximum 3D** utilization is less than 100% due to heat-load and flow limitations in the flux trap. The practical maximum is approximately 78%.

Significant pneumatic tube irradiations and neutron activation analysis work during Cycle 451



Pneumatic Tube Summary

- 119 Rabbits for IAEA
- 21 Silver zeolites for iodine sequestration research
- 19 Cf Separations process chemistry investigation
- 1 Sm-153 metal for isotope production
- 5 Uranium and plutonium for ultra short-lived gamma spectroscopy of fission products
- 9 Carbon fiber and formed solids for impurity investigation
- 7 Flux monitors
- 181 TOTAL**

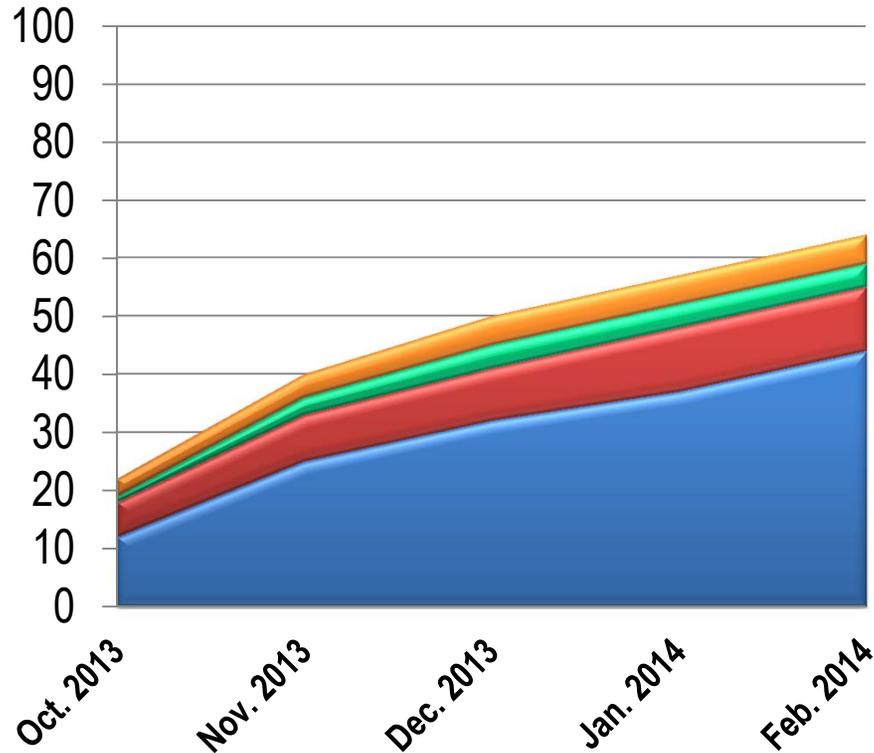
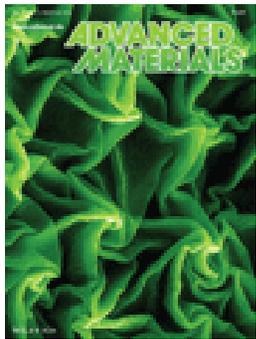


8 new publications in February that cite HFIR in neutron scattering

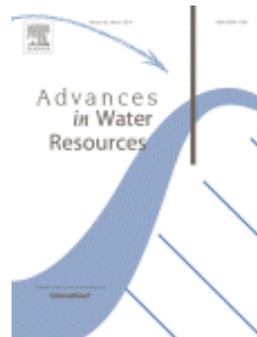
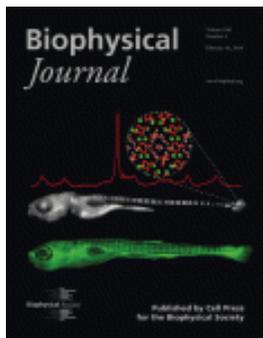


HFIR Cited Publications

8 Neutron Scattering



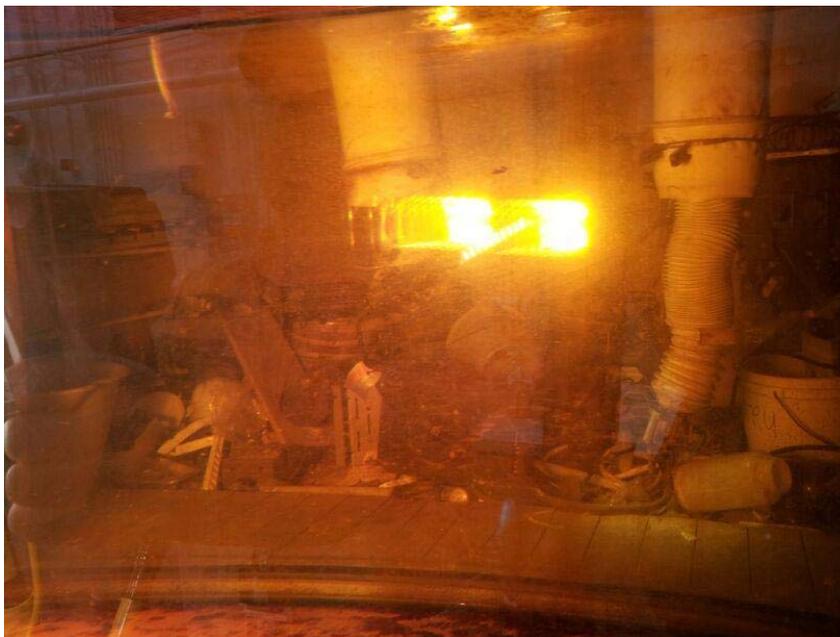
- Modeling, Simulation and Reactor Operations (Cumulative)
- Isotope Production and Research (Cumulative)
- Materials Science (Cumulative)
- Neutron Scattering (Cumulative)



Central Campus Legacy Material Removal Project

2026 Activities

- **Completed window cleaning on Hot Cell 6**
- Replaced lighting in Hot Cell 3
- Completed clean-out of Hot Cell 3
- Completed packaging and load-out of CH-TRU waste
- Developed estimate for packaging and load-out of RH-TRU waste



Hot Cell 3 Prior to Clean-out



Hot Cell 3 Post Clean-out