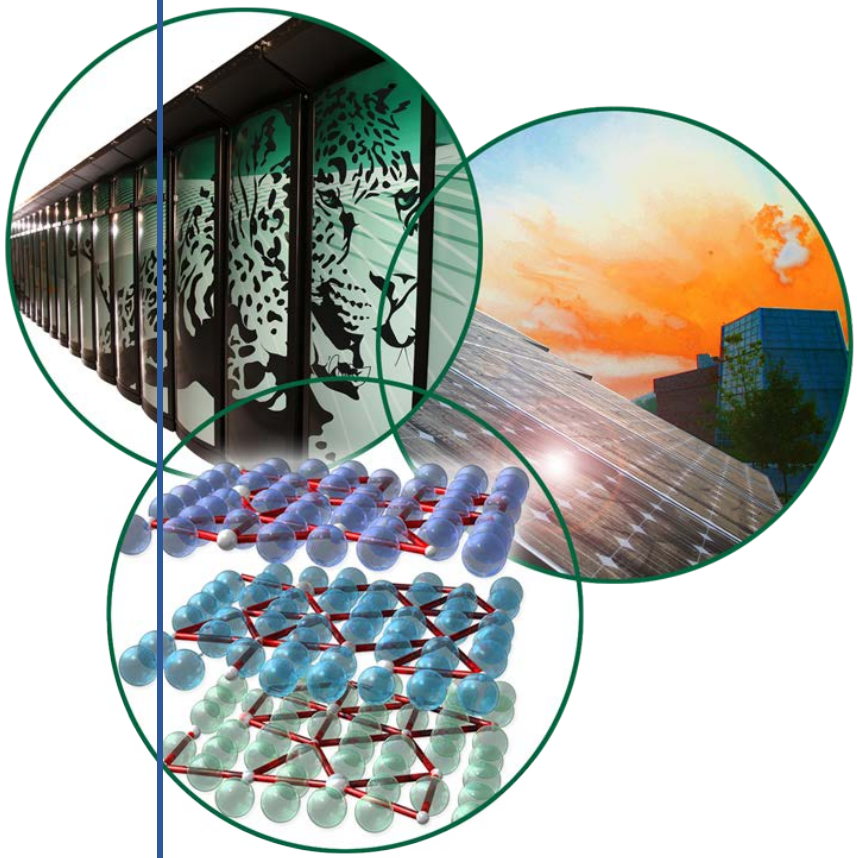
NSED Monthly Report

October 2012



Nuclear Science & Engineering Directorate

U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY

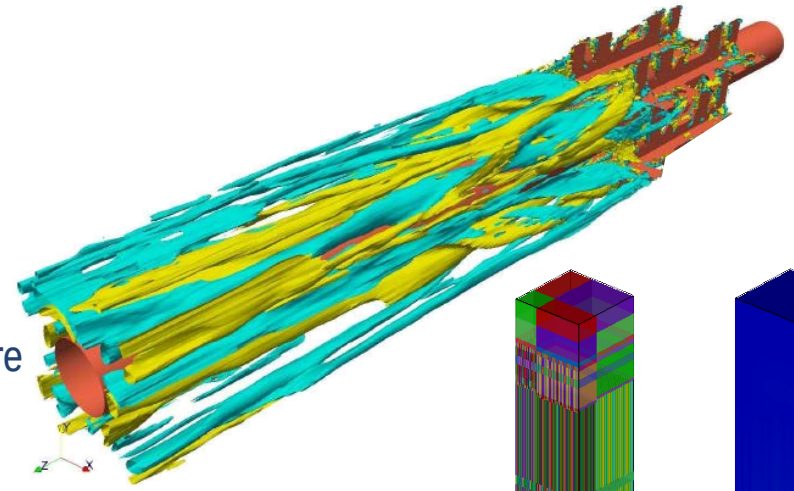
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

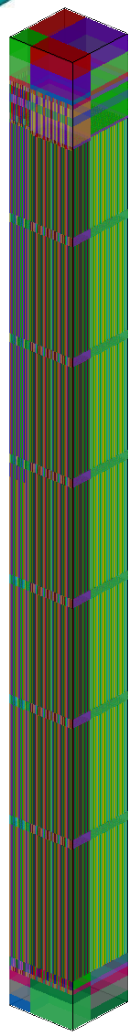
First Submission of CASL Software to the Radiation Safety Information Computational Center (RSICC)

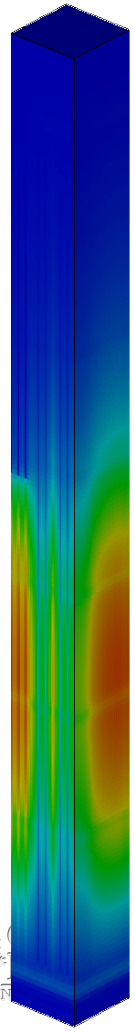
Science Highlight

Description

- Submission is to support first formal "Beta" release of selected components of CASL's Virtual Environment for Reactor Applications (VERA)
- Currently limited to CASL partners
- Precursor to deployment for partner Test Stands and more broad releases in FY13
- Completes L2 Milestone VRI.P5.02





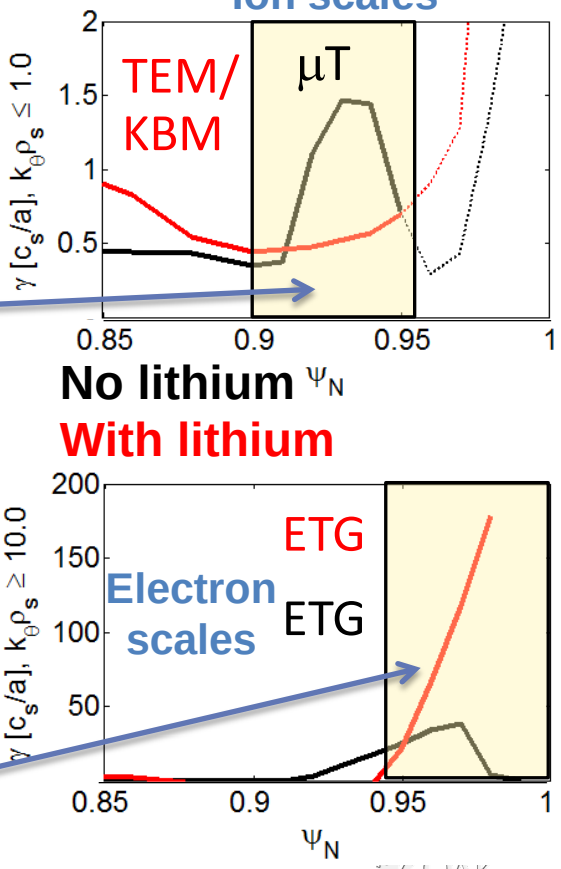


Physics Area	Application Area(s)	VERA Component(s)	Simulation Capability Supported
Coupling	All	LIME + DAKOTA	coupling software infrastructure + uncertainty quantification (UQ)
Neutronics	Multiple	Denovo	pin-homogenized transport
Neutronics	Multiple	DeCART	pin-resolved transport
Neutronics + CFD	Multiple	LIME-coupled Star-CCM+ & DeCART	pin-resolved transport + commercial computational fluid dynamics (CFD)
Thermal-Hydraulics	Multiple	COBRA-TF	subchannel thermal-hydraulics
Thermal-Hydraulics	Multiple	COBRA-TF + DAKOTA	subchannel thermal-hydraulics + sensitivity analysis / UQ
CFD	GTRF, CRUD	Hydra-TH	CFD

Modeling suggests how lithium coatings can alter edge plasma transport to improve confinement, stability in National Spherical Torus Experiment

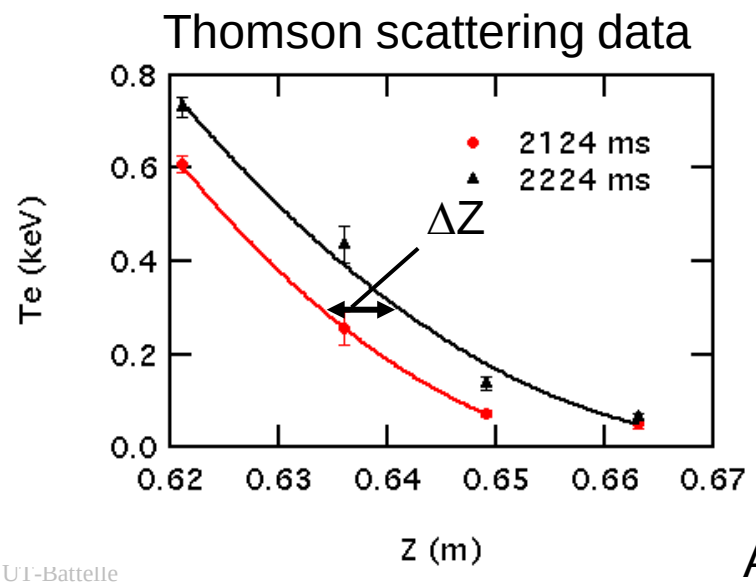
- **Lithium previously shown to improve confinement and eliminate periodic expulsions (ELMs) of plasma from edge in NSTX** (Maingi, PRL 2009; Maingi PRL 2011; Maingi NF 2012)
- **2D plasma-neutrals modeling shows confinement improved at top of pedestal with lithium** (Canik PoP 2011)
  - **Gyrokinetic calculations show stabilization of micro-tearing (μT) modes (ψ_N<.95) may reduce electron transport** (Canik IAEA 2012)
- **Stiff electron temperature (T_e) profile, increased transport seen very near plasma boundary (ψ_N>.95)**
  - **Stability analysis showed the importance of this in stabilizing ELMs**
  - **Electron temperature gradient (ETG) driven modes calculated to be more unstable with lithium, could clamp T_e profile** (Canik IAEA 2012)

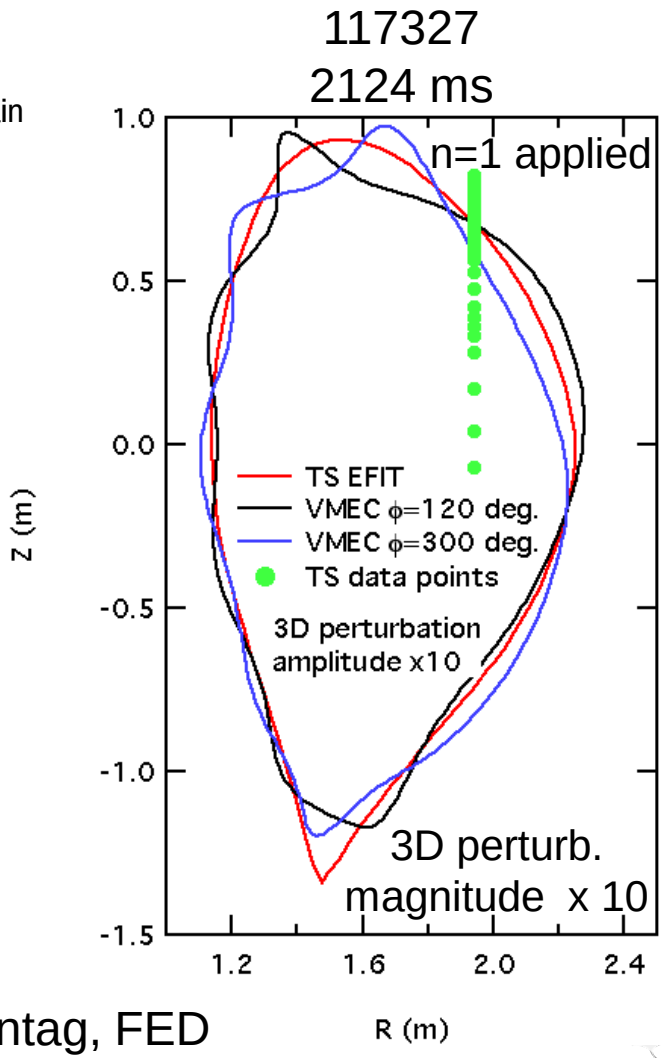
Growth rate of Micro-instabilities



ORNL 3D MHD modeling tools resolve discrepancy in DIII-D data, show importance of 3D effects in tokamaks

- Plasma edge moves as non-axisymmetric (n=1) perturbation is rotated
  - Thomson scattering used to measure vertical location of plasma edge
  - axisymmetric MHD equilibrium reconstruction (EFIT) is unable to explain
- VMEC used to model 3D equilibrium
  - EFIT profiles for current and pressure are retained
  - flux surfaces allowed to have non-axisymmetric (3D) perturbations
- 3D flux surfaces have ~1.2 cm variation in ΔZ
  - 1.1 cm variation measured with Thomson scattering



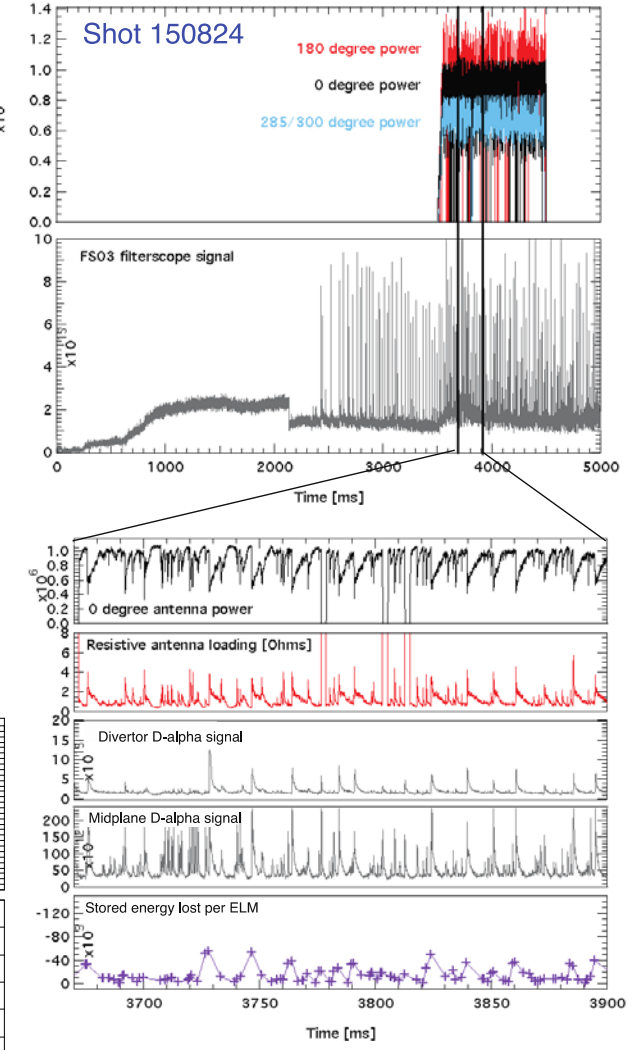


A. Sontag, FED

ELM behavior during FW discharges increases resistive antenna loading

Science Highlight

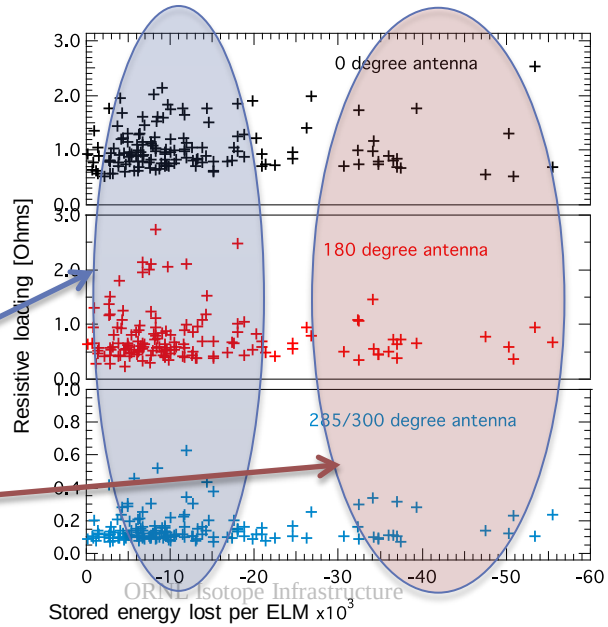
- Rapid Type II ELMs observed to precede Type I ELMs during ITER baseline scenario discharges
  - **ELMs result in edge density profiles that more closely resemble L-mode profiles**
- Resistive antenna loading, R_L, increased during ELM events
  - Observed in all 3 fast wave antennas
  - Broader density profile during ELMs improves R_L
  - Antenna R_L response more closely correlates with midplane D-alpha signal rather than divertor D-alpha signal



- **Preliminary analysis of data does not show any correlation between antenna loading and ELM type**
  - Type I and Type II ELMs present in ITER baseline discharge
  - Observed in a wide range of stored energy lost per ELM

Type II ELMs

Type I ELMs



S. Diem, FED

Radiation Safety Information Computational Center 50th Anniversary

Event

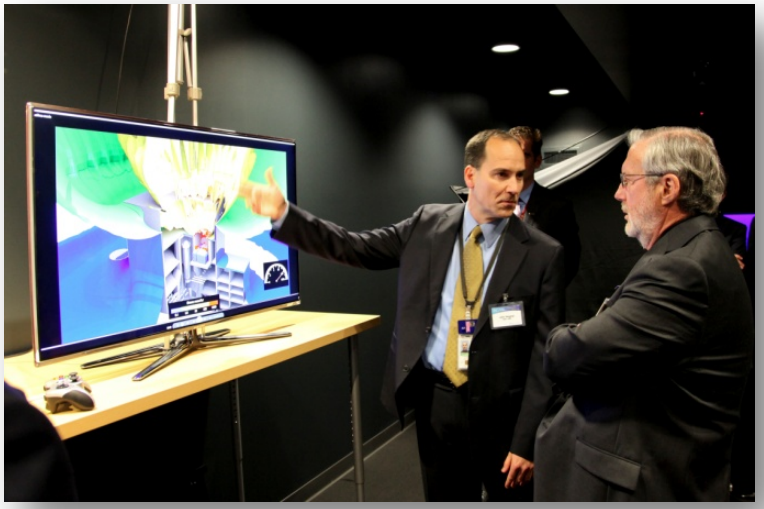
A recognition ceremony was held on October 9th to commemorate RSICC's 50th anniversary.

The Radiation Safety Information Computational Center is a library of software and data providing a broad range of nuclear computational tools and services to nuclear researchers worldwide.

Pete Lyons , Assistant Secretary for Nuclear Energy

Pete Lyons (center) at CASL with Doug Kothe, CASL director (right) and Cecil Parks, RNS Division Director (left)

Dr. Pete Lyons, Assistant Secretary for Nuclear Energy visited ORNL in October to attend the ceremony celebrating the 50th anniversary of RISCC. Following the festivities, Dr. Lyons toured the CASL VOCC lab after which he met with NSED management.



Pete Lyons (right) and John Wagner of RNSD (left)

Nicole Holmes, Chief Operating Officer of Global Nuclear Fuels

Nicole Holmes, Chief Operating Officer of Global Nuclear Fuels, visited ORNL and gave a presentation at the Oak Ridge Women in Nuclear and American Nuclear Society meetings. While visiting the area, she was given a tour of the REDC and HFIR and met with Jeff Binder.

University of Illinois event

Alumni as well as faculty and current students of the College of Engineering from the University of Illinois at Urbana-Champaign visited ORNL on October 11th. The group toured HFIR, SNS, CASL and the graphite reactor then they convened in the lobby of 5100 for a reception and presentation by NSED's ALD Jeff Binder who is himself an alumnus of the university.

Winner of the Young Scientist Oral Presentation Awards

Kurt Terrani received the Young Scientist Oral Presentation Award for Outstanding Contribution at *NuMat 2012: The Nuclear Materials Conference,* held in Osaka, Japan, October 22-25, 2012. The title of Dr. Terrani's presentation was "Severe Accident Behavior of SiC-based Materials and Advanced Steels."

CONGRATULATIONS !

Best Paper Award

James D. Freels, Prashant K. Jain, and Randy W. Hobbs received the Best Paper Award 2012 at the COMSOL Conference in Boston, MA, October 3–5, 2012, for their paper titled, “Design and Nuclear-Safety Related Simulations of Bare-Pellet Test Irradiations for the Production of Pu-238 in the High Flux Isotope Reactor using COMSOL.”

CONGRATULATIONS

Appointments

R. Maingi was appointed to chair a U.S. Burning Plasma Organization subgroup to develop a U.S. position on "Modes of participation in ITER".

R. Maingi was re-elected to serve on the Edge Coordinating Committee, and was also elected to serve a two-year term as Secretary.

CONGRATULATIONS

Appointments

Lou Qualls of RNSD has been named the Lead Systems Engineer for the joint DOE/NASA Advanced Stirling Radioisotope Generator (ASRG) Project. The ASRG is a modular, self-contained producer of electrical power designed to meet generic "multi-mission" requirements that include both deep space and Mars surface environments. Qualls will lead a multi-institutional team that is preparing for the first flight system launch in 2016.

CONGRATULATIONS

TISS Workshops on Global Nuclear Security

Educational Outreach

The Triangle Institute for Security Studies (TISS) Workshop on Global Nuclear Security was held at ORNL on October 12, 2012

- ✓ Attended by 12 students and three professors from North Carolina State University, Duke, and the University of North Carolina
- ✓ The goal of this workshop is to educate participants on global nuclear security, current nuclear threats and issues, nonproliferation programs and efforts, and the role of the International Atomic Energy Agency
- ✓ This was the second TISS workshop held at ORNL and is scheduled to be a recurring event each fall.

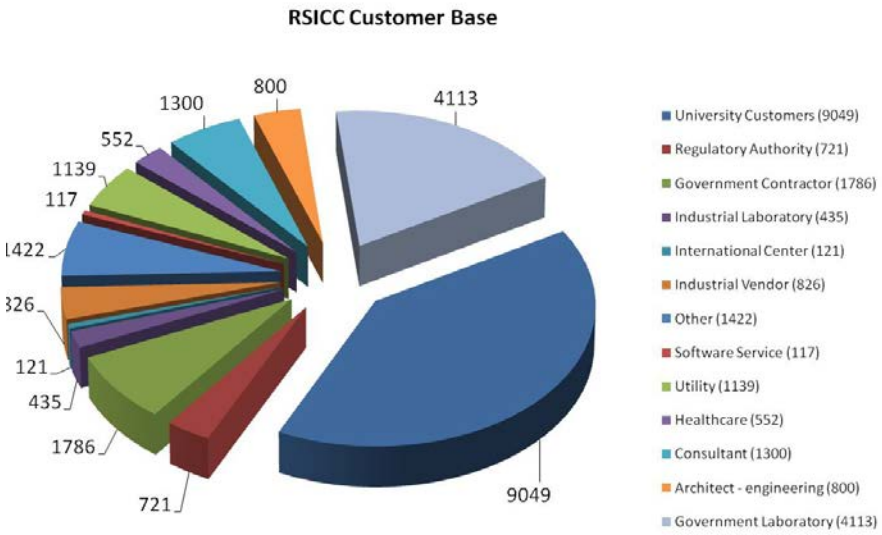
Isotope Seminars at the University of Florida

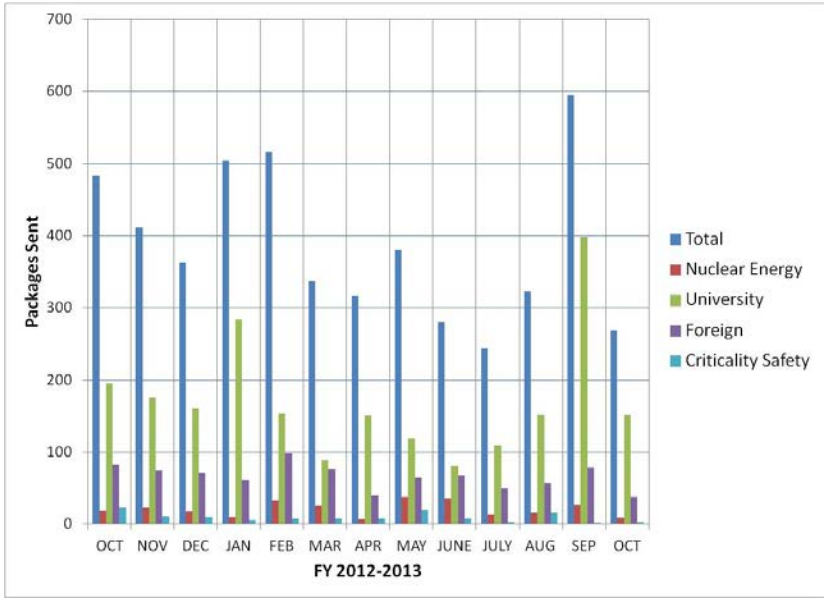
Educational Outreach

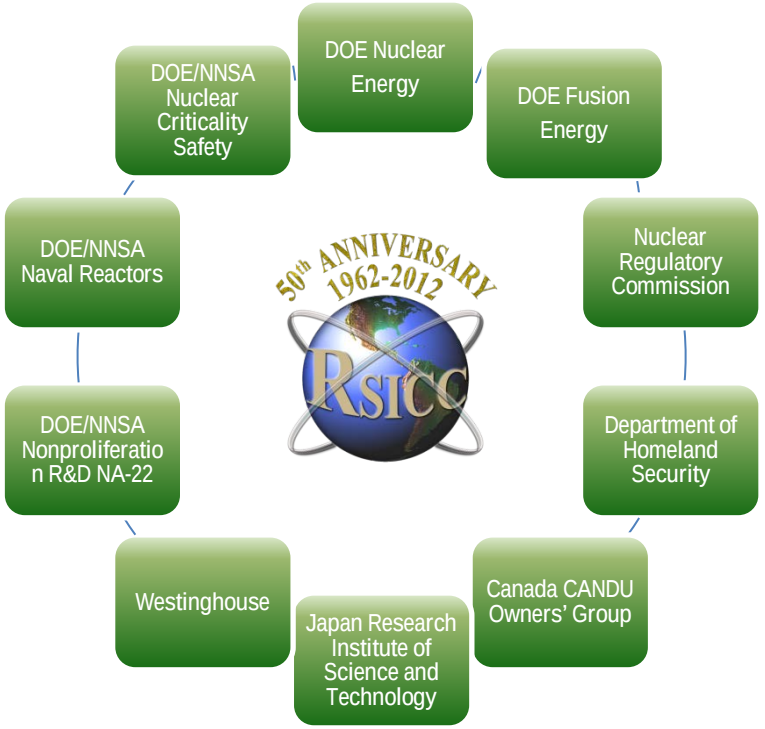
Staff member Julie Ezold was invited to present two seminars to the graduate and undergraduate students at the University of Florida Nuclear Engineering Program

- ✓ The graduate seminar was on novel irradiation schemes for actinide production and the undergraduate seminar was on isotope production at ORNL
- ✓ ORNL internship opportunities were presented at each seminar

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







- Software and data packages distributed FY2013: 269
- 6 package updates and revisions October 2012

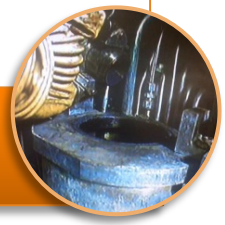
Radioisotope Production

Isotopes

- Completed Hydroxide Precipitation on Cm material slated for Target Fabrication.
- Material is stored in 7920 Hot Cells storage tank until program is ready to make solution into oxide.
- Completed consolidation of Campaign 75 rework material which will be stored until Heavy Element Campaign 76.

Heavy Element Campaign C75

- Began preparation of MK-18A disposition and cost estimates
- Difficulties due to an emulsion formation during the reverse TALSPEAK separation with the Mk-42 solutions are believed to be attributed to the presence of Zr. A batch CLEANEX extraction will be investigated to remove the Zr.

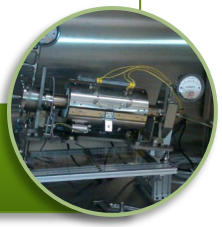


Americium-Curium Processing

- Two Cf-252 shipments were made to separate customers in advance of the estimated ship date - Both customers had requested shipping ASAP and this was accomplished two to four weeks ahead of the normal production schedule.

Cf-252 Production

- Received Pu238 Capsule from HFIR.
- Removed pellet from Capsule and dissolved pellet for analyses.
- Continuing with Glove box and equipment preparations for preparing partially loaded and fully loaded targets.
- Receipt of PuBe Cask containing two PuBe sources.



Pu238 Operations

- Completed production run 103 , with Shipments of 4.4 mCi to corporate customer,10.7 mCi to corporate customer, 48 mCi to a University customer , and 12.4 mCi to a Medical Facility
- Shipped 2.1 mCi Ra-225 to a National Lab and 14 mCi to a medical facility

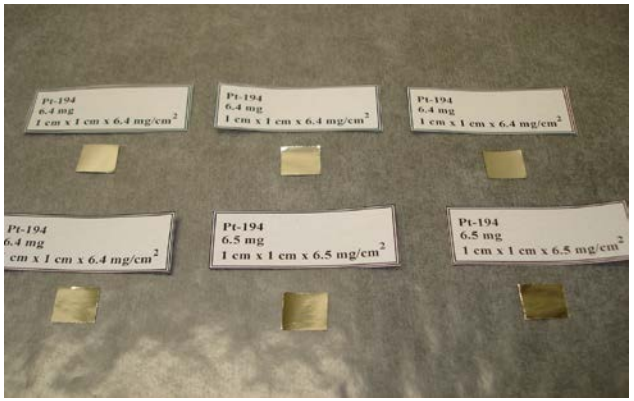
Actinium Production

- The Remote Hot-Cell Target Fabrication Equipment Upgrade Project is in progress at REDC - Continued design of the transfer arm for Cubicle 1; initiated solicitation of vendor concepts and budgetary proposals for replacing the Cubicle 2 target assembly machine; and, initiated troubleshooting of the Cubicle 3 pellet fabrication systems with initial emphasis on hoist repair.

Target Fabrication Equipment Upgrade

Enriched stable isotope technical services and shipping

- Seventeen shipments of 48 enriched stable isotopes were made in October
- Seventeen custom technical services were completed in October



Pt-194 foils @ 1 cm x 1 cm x ~6.4 mg/cm^2

Pressed Gd-156 oxide pellets, 0.75” diameter x 0.418” x 10,000 mg in a custom HDPE target holder ($100K lease)

Ag-109 metal foil 0.463” x 0.715” x 0.024”.

Radioisotope & Fuel Cycle R&D

Isotopes

- The twelve sources enriched in Cf-251 were recovered from the 7930 storage pool and the initial source dissolved to recover ~90% of the Cf present

Caifornium-251 Recovery LDRD

- Completed a cost study for the purification and dispensing of Pa-231
- Completed a cost study for the production of HSA Co-60 in HFIR
- Continued working on cost studies for production of K-40, Sr-89, and Gd-153
- Seed Money proposal on Lanthanide separations awarded

Proposal Initiatives

- Continued data collection from customer designed power output device
- Completed the initial spontaneous depositions of Po, to form small diameter wire sources.
- DTRA funding was awarded to RMD, Inc. with ORNL as a subcontractor to create a radioisotope doped scintillator

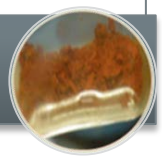
Radioisotope Power Sources

- Initiated a joint project between ANL, Y-12, and ORNL to test U-foil targets in HFIR and to test foil target processing methods in the 7920/3525 hot cells in FY 2013.

Mo-99 Target Development and Front End Testing

- A roadmap outlining the a path forward for full development of NO_2 voloxidation and nitration processes has been developed.
- Preparations for experiments to determine quantities of I-129 release from NO2 voloxidized used fuel with higher accuracy using neutron activation are underway.

Voloxidation R&D



Radiation Portal Monitor

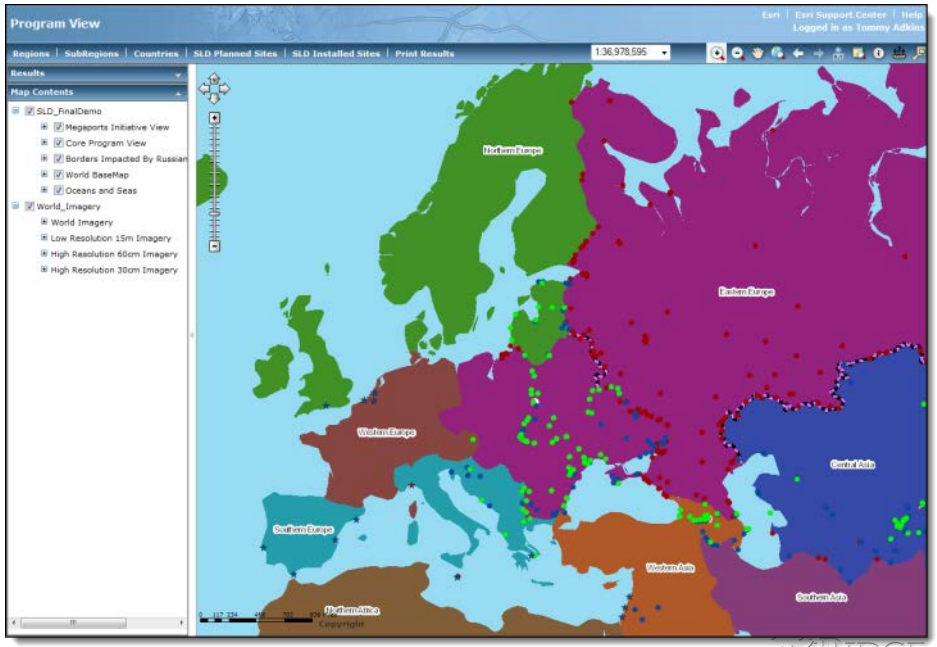
Drive through testing with the Radiation Portal Monitor (RPM) kicked off in the 7600 area on Thursday, October 25, 2012

- The ability to send useful quantities of Highly Enriched Uranium through a vehicle portal monitor under real-world conditions is a capability unique to ORNL
- The team from the Safeguards and Security Technology Group accomplished these tests with very limited resources

Technical Improvement Project Milestones

- A new gamma shield that will be used to minimize background for making quality NDA measurements on the ultra-pure U-233 samples was received and installed
  - These measurements should improve the quality of all reference spectra associated with U-233
  - Measurement activities are planned to begin in November.

- A new Web application was deployed for the Second Line of Defense (SLD) program using ArcGIS to identify partnership locations geographically
  - The Geospatial Reporting Tool Application (GeRT-A) brings the SLD program another step closer to having a single integrated system for accessing all program related information contained in disparate systems



GNSTD project highlights

- GNSTD Threat Reduction Initiative Group staff completed a Site Assurance Activity for the Russian Far Eastern Regional Hospital's pending confirmatory analytical laboratory for the Ministry of Defense (MOD) Personnel Reliability Program.

- ORNL personnel led a project to renovate, construct and equip Krasnoyarsk Regional Training Center (KRTC) near Krasnoyarsk, Russia which will provide training for personnel who maintain/operate security systems at RF MOD nuclear sites.
  - ✓ ORNL personnel also participated in three additional sustainability assurance activities at upgraded RF MOD facilities during the month of October.

- GNSTD staff traveled to Kandy and Columbo, Sri Lanka to oversee the transportation effort of removing radioactive sources for shipment from Kandy, Sri Lanka to the port of Columbo, where they were to be shipped to India.

- Staff traveled to Kiev and Donetsk, Ukraine to conduct public relations activities to introduce a pilot project on radioactive source amnesty to explain to the public and to local enterprises that illegal trafficking of radioactive materials brings no significant benefit.
  - ✓ Tabletop exercises were also conducted in the Donetsk region.

Consolidation Effort Highlights

Bldg 3500 Multiphase Cleanup Effort – An NMDC team's multiphase cleanup effort has resulted in additional space for research; while providing an opportunity to consolidate sealed sources and research equipment into one building location.

Designated sealed source room

Sources clearly labeled and organized

Training & Education Activities

KENYA WILDLIFE SERVICE

Chemical, Biological, Radiological, Nuclear and Explosives Commodity Identification Training in Kenya

Terry Donaldson was the technical leader and an instructor for a workshop on Chemical, Biological, Radiological, Nuclear and explosives (CBRNe) Commodity Identification Training (CIT) workshop the Kenya Wildlife Service Manyani Training School

Training & Education Activities

BADAN PENGAWAS TENAGA NUKLIR
Nuclear Energy Regulatory Agency

Advanced Non-Destructive Assay (NDA) Workshop in Indonesia

In support of the NNSA/NA-24 International Nuclear Safeguards and Engagement Program (INSEP), the U.S. team conducted an advanced Non-Destructive Assay (NDA) workshop on the quantification of nuclear material. This work was conducted with Badan Pengawas Tenaga Nuklir (BAPETEN) of Indonesia on Action Sheet 13 as part of the continued DOE/NNSA technical assistance for effective implementation of Indonesia's State System of Accounting for and Control of nuclear material (SSAC). The workshop focused on three different detection systems:

1. The In-Situ Object Counting System (ISOCS) for quantifying the thorium content in mining tailings,
2. The identiFINDER handheld radiation detector for measuring uranium enrichment and verifying the presence of nuclear material, and
3. The Multi-Group Analysis for Uranium (MGAU) code for measuring uranium enrichment in unfavorable measurement conditions.

IdentiFINDER handheld detector

Overall, the class enhanced BAPETEN's ability to make complex NDA measurements and declare their results to the IAEA.

National Nuclear Security Administration

Press Release - Recognizing BDMS – *"New Technology Allows Early Closure of the NNSA Monitoring Station, Saves Taxpayer Dollars"*


National Nuclear Security Administration

Our Mission | About Us | Media Room | Federal Employment | Blog

Home > Media Room > Press Releases > New Technology Allows Early Closure of NNSA ...

Press Release

New Technology Allows Early Closure of NNSA Monitoring Station, Saves Taxpayer Dollars

Oct 22, 2012

WASHINGTON, D.C. – The National Nuclear Security Administration (NNSA) today announced that it has closed its Monitoring Office (TMO) in Novouralsk, Russia ahead of schedule. The early closure was made possible by the succe designed unattended monitoring technology in Russia and will save U.S. taxpayers approximately $1 million.

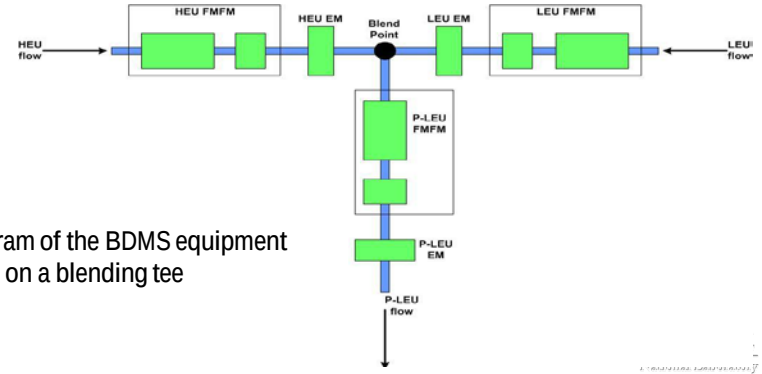
In an October 22, 2012 press release, the National Nuclear Security Administration recognized the ORNL and LANL designed Blend Down Monitoring System (BDMS) as the reason for early closure of its Transparency Monitoring Office (TMO) in Novouralsk, Russia. Use of this unattended monitoring system will save the U.S. taxpayers approximately $1 million.

The entire release can be viewed at the following link:
http://nnsa.energy.gov/mediaroom/pressreleases/tmo102212

Blend Down Monitoring System

The role of the BDMS is to ensure that non-proliferation goals are met in the down-blending of Russian weapons-grade uranium. A primary system requirement was that the BDMS operate for many years in a continuous and unattended mode of operation. The system has been implemented at the following three HEU down blending facilities in Russia: the Urals Electrochemical Integrated Enterprise at Novouralsk (installed February 1999), the Electrochemical Plant at Zelenogorsk (installed March 2003), and the Siberian Chemical Enterprise at Seversk (installed October 2004).

The BDMS consists of two subsystems developed by LANL and ORNL personnel: ORNL's fissile mass flow monitor (FMFM), for mass flow measurements, and LANL's 235U enrichment monitor (EM), for enrichment measurements. These instruments measure flow and enrichment of the gaseous UF6 in the three separate flow streams of the blending tee.



Block diagram of the BDMS equipment installation on a blending tee

CASL Collocation

The CASL Collocation for October 2012 was held October 8-12, 2012 and consisted of the following:

- **GTRF Meeting, Oct 8-9**
- **FY13 CRUD Milestones, Budgets, Planning**
- **Meshing Planning Meeting**
- **PoR-5 Milestone Review, Oct 10-12**
- **FA Participation in VUQ Efforts**
- **NE-KAMS & Validation Data Working Group**
- **RIA / LOCA Challenge Problem Planning**
- **CASL THM Meeting**

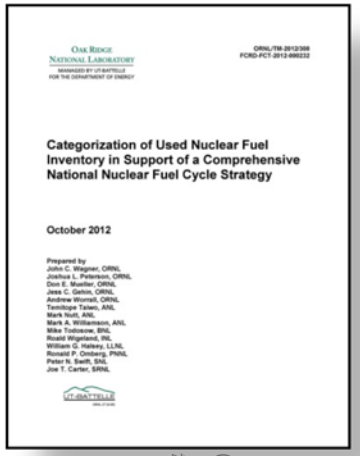
VOCC Tours in October

The following list of groups and individuals toured the VOCC in October.

- **Generation mPower Industry Advisory Council**
- **Lyons**
- **LLNL and LBNL (General Counsel)**
- **Transocean Senior Executives**
- **Strategic Advisory Board (SAG) Part II**
- **Rob Faibish (US Senate Committee for Energy and Natural Resources Science Fellow)**
- **University of Illinois Alumni**
- **Georgetown University Medical Center Partnership**
- **EPRI**
- **BBC for Titan Interview**
- **Anandtech for Titan Interview**
- **NPR for Titan Interview**
- **HPCWire for Titan Interview**
- **NBC for Titan Interview**
- **Nvidia for Titan Interview**

RNSD highlights and activities

- Larry Ott was one of three plenary speakers at the DOE Enhanced Accident Tolerant LWR Fuels National Metrics Workshop
  - Ott reviewed the reactor performance issues that had to be considered in assessing accident tolerant fuel candidates
- Nesrin Cetiner has led a team effort to design and fabricate rabbits use in a graphite irradiation program that will generate data on irradiation performance of a fine grain high purity isotropic graphite
  - The 38 rabbits have been designed and located in HFIR to cover the range of temperature and fluence conditions of prismatic and pebble bed high temperature gas cooled reactors
  - Fourteen rabbits were inserted in Cycle 444 of HFIR, and an additional 24 rabbits will be inserted in subsequent cycles
- A multi-lab technical assessment study led by ORNL, “Categorization of Used Nuclear Fuel Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy,” was issued to DOE-NE
  - The report provides recommendations on categorizing civilian and defense used fuel into three categories: Disposal, Research, and Recycle


Oak Ridge National Laboratory

Categorization of Used Nuclear Fuel Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy

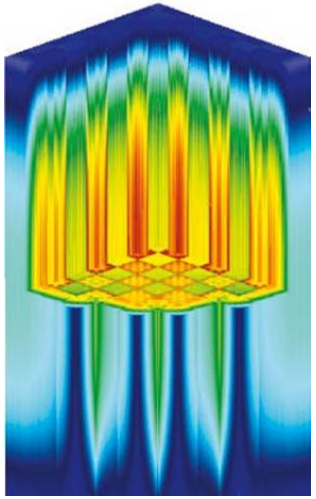
October 2012

RNSD highlights and activities

- Tom Burton and Derek Halverson of NRC's Office of Nuclear Regulatory Research visited ORNL to perform an assessment of the NRC project JCN N6736, Digital I&C Inventory and Classification
  - The ORNL POC for the assessment was Gary Mays.
- The DOE Office of Science Advanced Scientific Computing Research (ASCR) has funded the proposal submission, "MCREX: Using Monte Carlo Algorithms to Achieve Resiliency and Performance" as one of five proposals funded nationally in the $4.2M ASCR Extreme-Scale Solvers program
- Germina Ilas participated in the 9th International Reactor Physics Experiment Evaluation Project Meeting at OECD Nuclear Energy Agency Headquarters in Paris, France

TITAN Supercomputer

- As one of the six flagship science applications for Titan, the capabilities of the Denovo radiation transport code were illustrated on the new Titan hardware cabinet.
- Tom Evans, the Denovo team lead, was interviewed by *HPCWire, BBC*, *Scientific American*, and *ORNL Review* for the launch of ORNL's new TITAN supercomputer.



Training courses held for the SCALE code system

- Three hands-on training courses offered:
  - Criticality Safety Calculations
  - Lattice Physics and Depletion
  - ORIGEN Activation, and Decay
- 32 attendees representing nine countries: USA, Canada, China, Germany, India, Italy, South Korea, Sweden, United Kingdom.

RNSD Visits and tours

- Hidetaka Imai, Akira Kawano, and Kenji Tateiwa of Tokyo Electric Power Company visited ORNL on October 2. They presented a first-hand account of the Fukushima accident, discussed the current status of the reactors at Fukushima Daiichi, and were briefed on the status of the core-concrete interaction modeling being conducted by ORNL and ANL. Hosted by Matthew Francis of RNSD.
- Jack Bailey of m-Power was hosted by Gary Mays of RNSD on October 9 for discussions on OR-SAGE, an ORNL-developed siting assessment tool.
- October 9–11, Mike Dunn of RNSD hosted a multi-lab team working to develop a Mission and Vision plan for the DOE Nuclear Criticality Safety Program.
- Suibel Schuppner of DOE-NE visited ORNL on October 10 to discuss ORNL capabilities that relate to the Nuclear Energy Enabling Technology I&C programs.

International collaboration

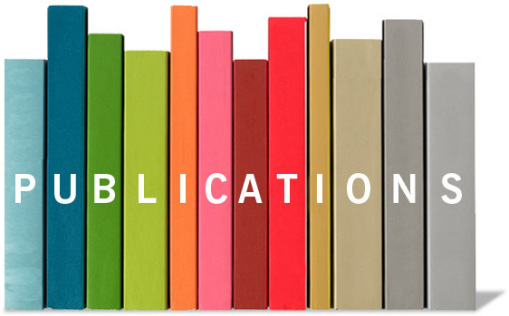
- Cecil Parks of RNSD joined Thom Mason and Phil Britt (CSD) on a trip to China as part of a DOE-NE delegation participating in the Executive Committee Meeting for the MOU between the Chinese Academy of Sciences and the DOE on Cooperation in Nuclear Energy Sciences and Technology.
  - DOE delegation led by Pete Lyons, Assistant Secretary of Nuclear Energy.
  - Parks presented collaboration activities of the Working Group on Molten Salt Systems which has been focused on activities associated with fluoride salt high-temperature reactor (FHR) R&D.
  - Phil Britt presented collaboration activities of the Working Group on Uranium Fuel Resources which has been focused on activities associated with R&D for uranium recovery from seawater.
  - Tour of two Westinghouse AP-1000 units under construction at Sanmen were a part of the delegation activities.

U.S. DEPARTMENT OF ENERGY

FHR
Fluoride Salt Cooled High Temperature Reactor

RNSD Publications

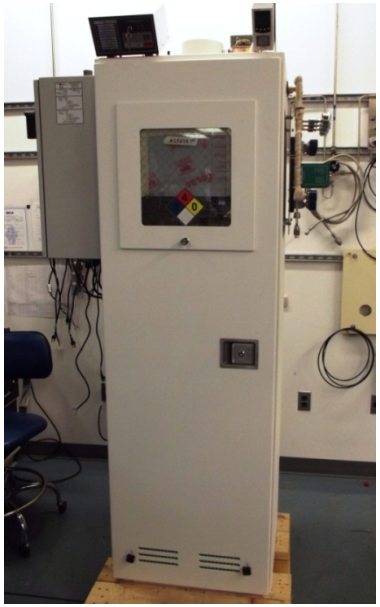
- Conference Paper - 1
- ORNL/TM – 1
- Journal Article - 1



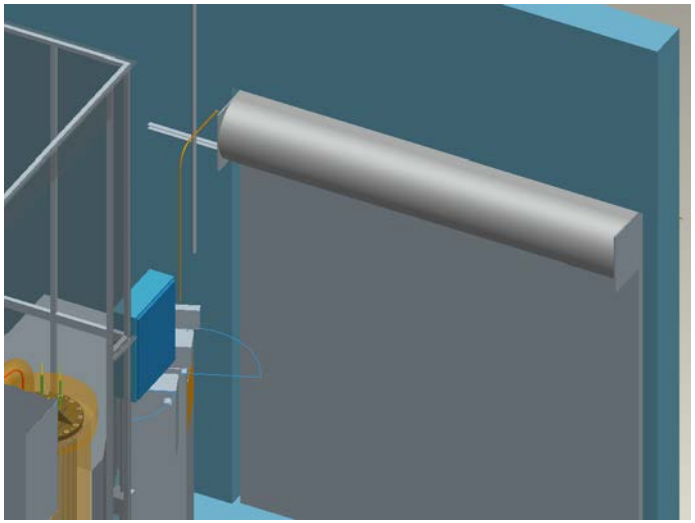
R. L. Kozub, G. Arbanas (RNSD), A. S. Adekola, D. W. Bardayan, J. C. Blackmon, K. Y. Chae, K. A. Chipps, J. A. Cizewski, L. Erikson, R. Hatarik, W. R. Hix, K. L. Jones, W. Krolas, J. F. Liang, Z. Ma, C. Matei, B. H. Moazen, C. D. Nesaraja, S. D. Pain, D. Shapira, J. F. Shriner, Jr., M. S. Smith, and T. P. Swan, "Neutron Single Particle Structure in ^{131}Sn and Direct Neutron Capture Cross Sections," *Phys. Rev. Lett.*, Volume 109, Issue 17, 172501 (2012).

Assembly of the Thermal/hydraulic Test Loop for Salt Coolant

- Gas Cleaning System for FLiNaK Salt Loop
  - Continued comment resolution on AES' Activities Hazards Analysis
  - Developed implementation matrix for AES to comply with UT-B's 851 Worker Safety & Health Plan
  - Initiated both hot and penetration permits
  - Continuing pursuit of 2 SBMS variances for relief valves and regulators (ultra-high purity needs)



AES H2/ HF Gas Cabinet at Manufacturer's Shop



Depiction of H2 Line Penetration Location in D111

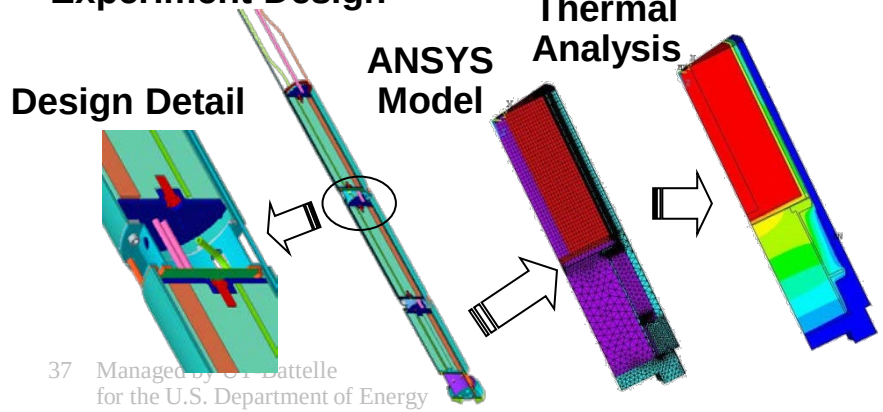
EMPO is providing project management assistance with this project

Materials irradiation – October

RNSD

Project	Format	Sponsor	Stage					Notes
			Newly proposed	In Design	In Fabrication	In Reactor	Removed	
Titan Metal	Rabbit	DOE, FE US-Japan				18 in Cycle 443 2 in Cycle 446		Tungsten and steel
Composite Flexure	Rabbit	DOE, FE			3	5 (3 waiting)		SiC
Mini-Composite	Rabbit	DOE, FE		4		Cycle 446		SiC
Round-bar Tensile	Rabbit	DOE, FE		4+				Steel
Hydrided Clad	Target	DOE, NE			2	2	2	Zircaloy
Ibiden	Rabbit	WFO, Ibiden				26 (12 waiting)		Graphite
Nippon	Rabbit	WFO, Nippon		31		2013		Graphite
UO2 TEM disks	Rabbit	Texas A&M			1	Cycle 446		UO2
Titan Tensile	Rabbit	DOE			13	6		V-4Cr4Ti, SiC, Graphite, steel
EPRI	Large VXF	EPRI			3	2013		Steel, Inconel
Toyo Creep	Target	Toyo Tanso		3		2013		Graphite
PU238	Capsule	NASA			1	Cycle 445		Tensile
Inconel springs	Rabbit	AECL		~60				Inconel
Graphite Creep	Rabbit	EDF		4		2013		Irr. Graphite
SHINE	Rabbit	DOE		TBD				Mo-99

Experiment Design



Experiment Fabrication

Irradiation

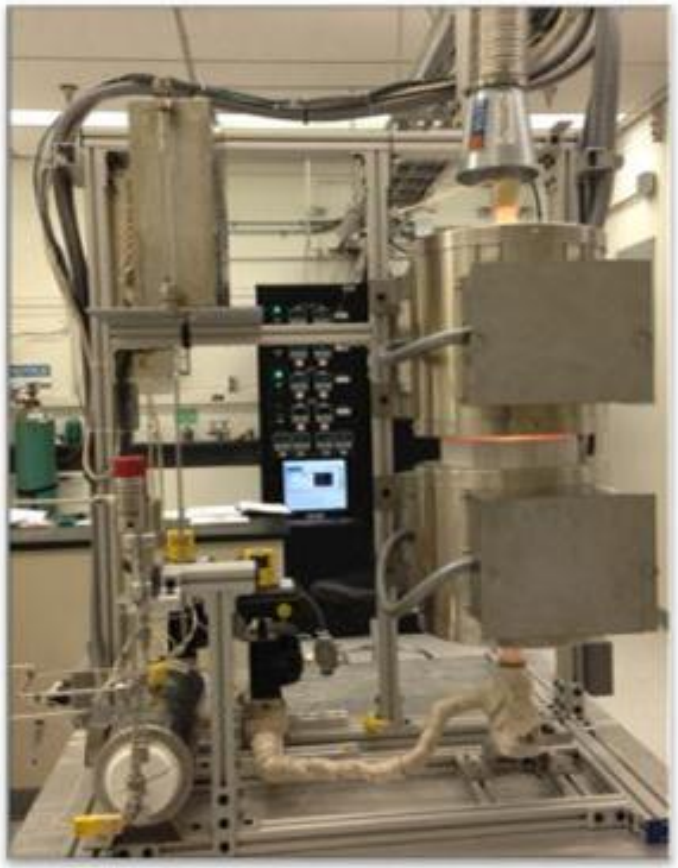
Severe Accident Test Facility

This High Temperature Module is part of the Severe Accident Test Station currently in operation in Building 4500S

- **This module is scheduled to be installed in the north cell in Building 3525 by the end of FY13**

A second module, the Loss of Coolant Accident (LOCA) testing furnace, is scheduled to be attached to this stand in FY13

This work is being performed in support of DOE-NE's Accident Tolerant Fuel initiative



Mercury Stockpile Stewardship Program (MSSP)

ORNL shipped the prototype mercury metric ton container fabricated at ORNL to the Tooelle Army Depot (TEAD) for their use in fabricating hundreds of similar units for the Defense Logistics Agency (DLA)

- The specification was produced by ORNL – The unit is designed for holding the contents of 29 three-liter mercury flasks
- The ORNL research team is tracking quality and production for the DLA
  - The task includes utilization of ORNL fabrication, welding experts and QA/QC expertise.
- The final welding specifications were reviewed and a DLA contract awarded for production by TEAD
  - Delivery is to be made timely with start-up and operations of the Mobile Mercury Transfer System (MMTS)
- ORNL also recently completed the kick-off meeting for detail design of the MMTS with Building Solutions Incorporated, Reno, Nevada

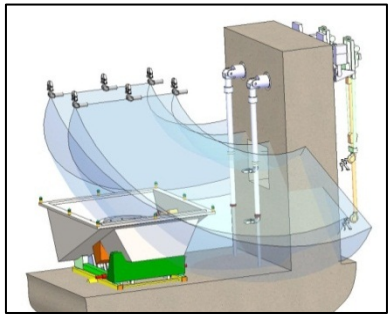
Prototype Mercury Metric Ton Container

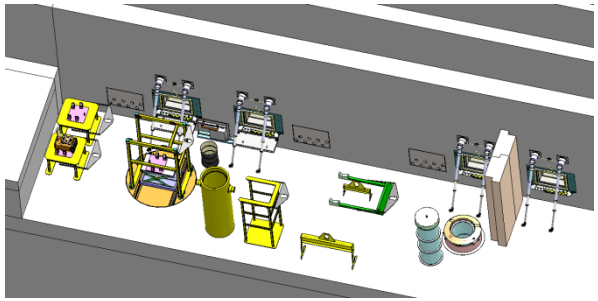
Kick-off Meeting with Building Solutions, Inc.

Facility for Rare Isotope Beams - Design Review

A design review for the Master-Slave Manipulators (MSMs) and the shield windows for the Facility for Rare Isotope Beams (FRIB) was held at Michigan State University on October 24

- The FCID Remote Systems Group was responsible for the development of these specifications and their review.
- These components, along with others that require embedments installed in the facility concrete during construction, are considered early procurement items.
- The review was very positive, with no significant recommendations to the specifications expected.





FRIB Shielded MSM Window Workstations

Fuel Cycle and Isotopes Division activities

- **Building 4501 Hot Cell D Clean-Out is Underway**
- **Isotope Dispensing – Two requests for Tc-99 were met without delay or incidence**
  - **Joint efforts from NMP group and NNFD ensured safe and timely dispensing activities**

Pu-238 R&D

Critical Decision Equivalent-1 project review held October 16-17, 2012 at ORNL. Project is addressing follow-up items from the review.

Completed the fabrication of 4 tensile specimen targets for irradiation in cycle 445, capsules will be used to study Np pellet / aluminum clad interactions

Spectrophotometric Study of Np Valence States for Pu-238 Production R&D Project is in process

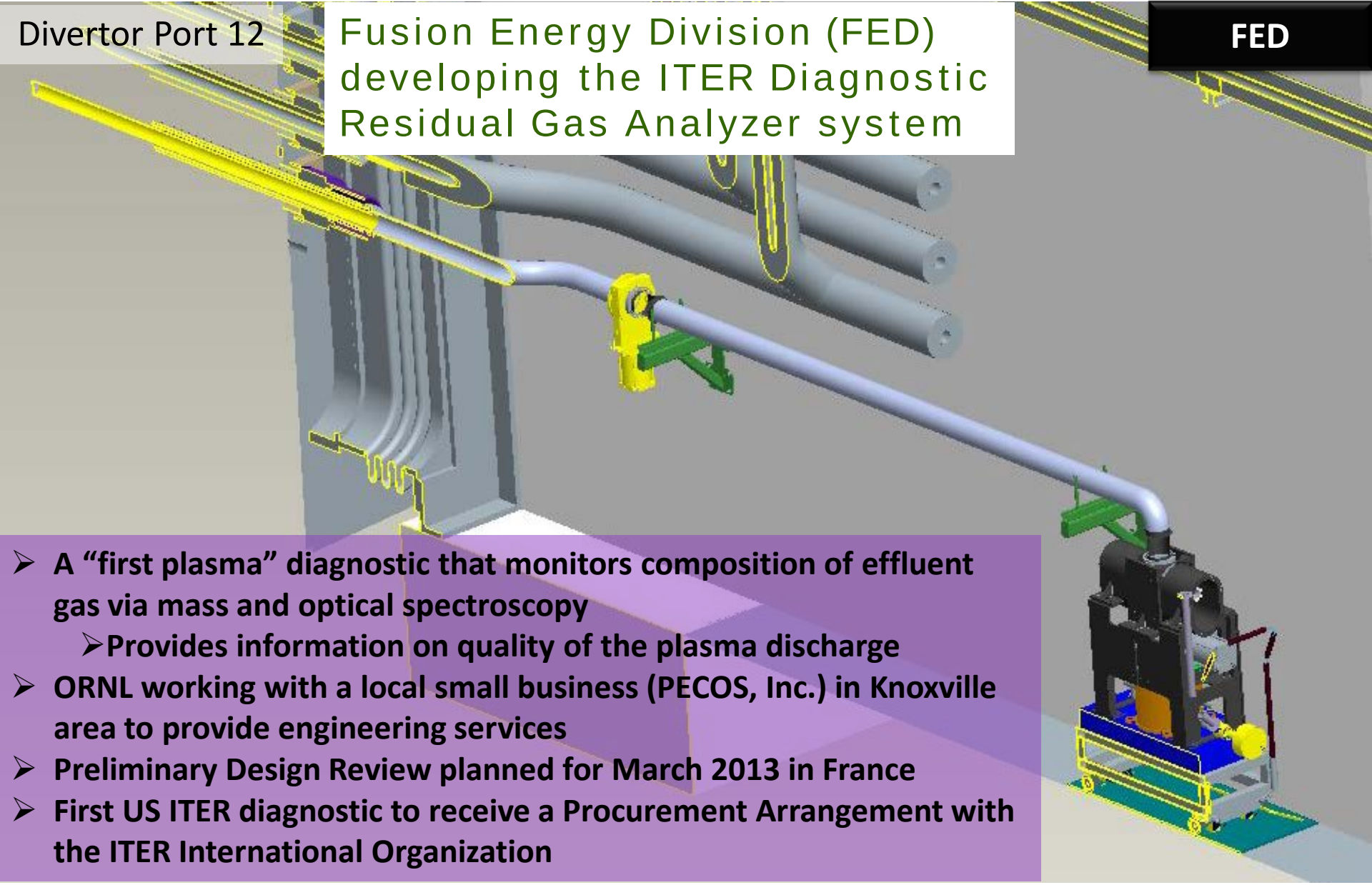
Completed PIE on 3 of 5 irradiated capsules

In support of Pu-238 R&D began dissolution of a small number of irradiated Np-237 pellets.

Divertor Port 12

Fusion Energy Division (FED) developing the ITER Diagnostic Residual Gas Analyzer system

FED



- A “first plasma” diagnostic that monitors composition of effluent gas via mass and optical spectroscopy
  - Provides information on quality of the plasma discharge
- ORNL working with a local small business (PECOS, Inc.) in Knoxville area to provide engineering services
- Preliminary Design Review planned for March 2013 in France
- First US ITER diagnostic to receive a Procurement Arrangement with the ITER International Organization

iter china eu india japan korea russia usa

ITER US

OAK RIDGE National Laboratory

PECOS

OAK RIDGE National Laboratory

Publications and Presentations

Larry Baylor's American Physical Society (APS) and International Atomic Energy Agency presentations were highlighted in a APS press release. The title of the press release is, "Frozen Bullets Tame Unruly Edge Plasmas in Fusion Experiment."
http://www.aps.org/units/dpp/meetings/vpr/2012/index.cfm

A paper authored by Joon-Wook Ahn about the ELM and H-mode study at the Korea Superconducting Tokamak Advanced Research (KSTAR) was published in October in *Nuclear Fusion*, NF 52 (2012) 114001. This paper summarizes the results of the experimental investigation on the H-mode confinement and pedestal profile evolution, which was carried out through the ongoing international collaboration between the U.S. and Korea.

Fusion Energy Division Support Activities

–Building 7625

- LOTO Assessment conducted and report in process of being generated
- Cost estimate in progress for installation of vertical material lift and modification/update of exhaust ventilation system to support R&D use

7625 Exhaust Ventilation System

LOTO Assessment

NNFD is providing assistance with 7625 projects and operations

4500 Area Gaseous Waste Reconfiguration and Stabilization Project

NNFD

- Reconfiguration contractor completed installation of HEPA filter housings, fans and duct work
- Reconfiguration contractor completed initial cold testing of new systems
- NNFD completed installation of three 4501 hood exhaust blower units in attic
- Stabilization subcontractor completed removing and packaging of equipment from 4556 Filter Pit
- Stabilization subcontractor demobilized from ORNL
- EMPO prepared documentation package to transfer 4507 and 4556 facilities back to DOE-EM
- EMPO gained concurrence from LGWO to begin investigative activities at 3106 Filter Pit

Completing Installation of New 4501/4505 Cell Ventilation System Fans

Lifting HEPA Housing from 4556

Placing Housing on Cribbing

EM project integration support

- UT-B loaded and shipped the SNAP-7D and RCA Source RTGs to NNSS. Also loaded the SNAP-7C/ Weather Bureau “double stack” for shipment the first week of November in support of the SEC Miscellaneous Facilities Project.
- The RTGs loaded this month contained over 130,000 Ci of ^{90}Sr-Titanate.
- EM Contractor SEC/Perma-Fix continued their investigations of 3026D Cell A. They are preparing to remove additional sets of plugs to improve access to items in the cell. Starting LLW item removals in November. UT-B assisting in determining the material types and origins of numerous apparently metallic objects in the cell.
- EM Contractor SEC/Perma-Fix began removal of LLW items from 3026D Cell B.
- EM Contractor SEC/Perma-Fix and UCOR completed the transition Building 3038 to UCOR.

Loading of SNAP-7C/ Weather Bureau Double Stack

Close-up of RCA Source/ Shaich

Central Campus Legacy Material Removal Project

NNFD

2026 Activities

- Continued waste sorting and segregating activities
- Loaded full waste boxes into Sealand
- Procured additional B25 and ordered Sealand
- Packaged 240cf of waste for a cumulative total of 480cf

4501 D Cell Activities

- Performed ventilation balancing
- Completed in cell sampling of equipment and surfaces.
- Inspected/certified in-cell hoist

Waste Sorting and Segregation at 2026

Waste Staged for Disposal in Sealand

NNFD FY2013 Cumulative Facility Metrics

NNFD

Hot Cell Availability

97.15% Bldg 7920

98.00% Bldg 7930

100% Bldg 3525

100% Bldg 3025E

Facility Upgrades and Maintenance Activities

7920

- Programmed maintenance operations.
- Annual Hot Cell Fire System Testing

- TSR Calibrations / Surveillances and Functional Testing

7930

- Performed S.R. 4.1.1.3 E-1 HEPA Filter Efficiency Tests
- Replaced HEPA Filters and tested on E-16 Exhaust System
- Replaced HEPA Filters and tested on E-10 Exhaust System
- Annual 7930 Emergency Diesel Generator PM completed
- Semi Annual EF-1 and EF-2 PM's compete

3525

- Programmed maintenance operations
- Installation of new 3525 Back-up generator

- Completed final "punch list" items for glove box system installation.

3025E

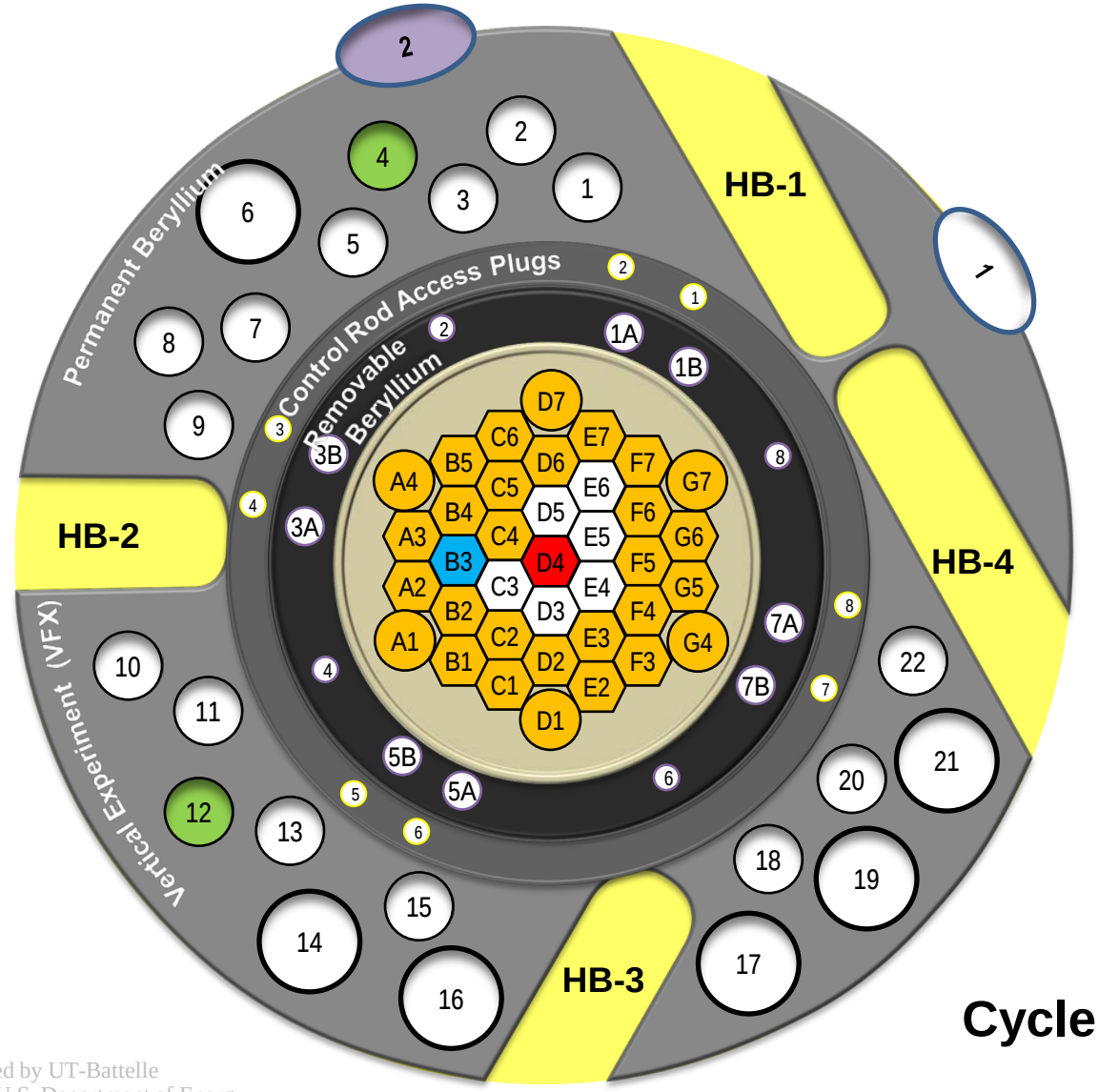
- Several minor MSM Maintenance repairs completed in Operations Area
- Monthly fire protection inspection completed
- Several minor maintenance tasks on facility PCM-1B units completed

HFIR Materials irradiations remain near record levels in cycle 444 during October

HFIR

October 2012						
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	31			

Reactor ON



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

Cycle 444 summary

The number of Cycle 444 HFIR irradiations being driven by materials research

Materials and Fuels Experiments

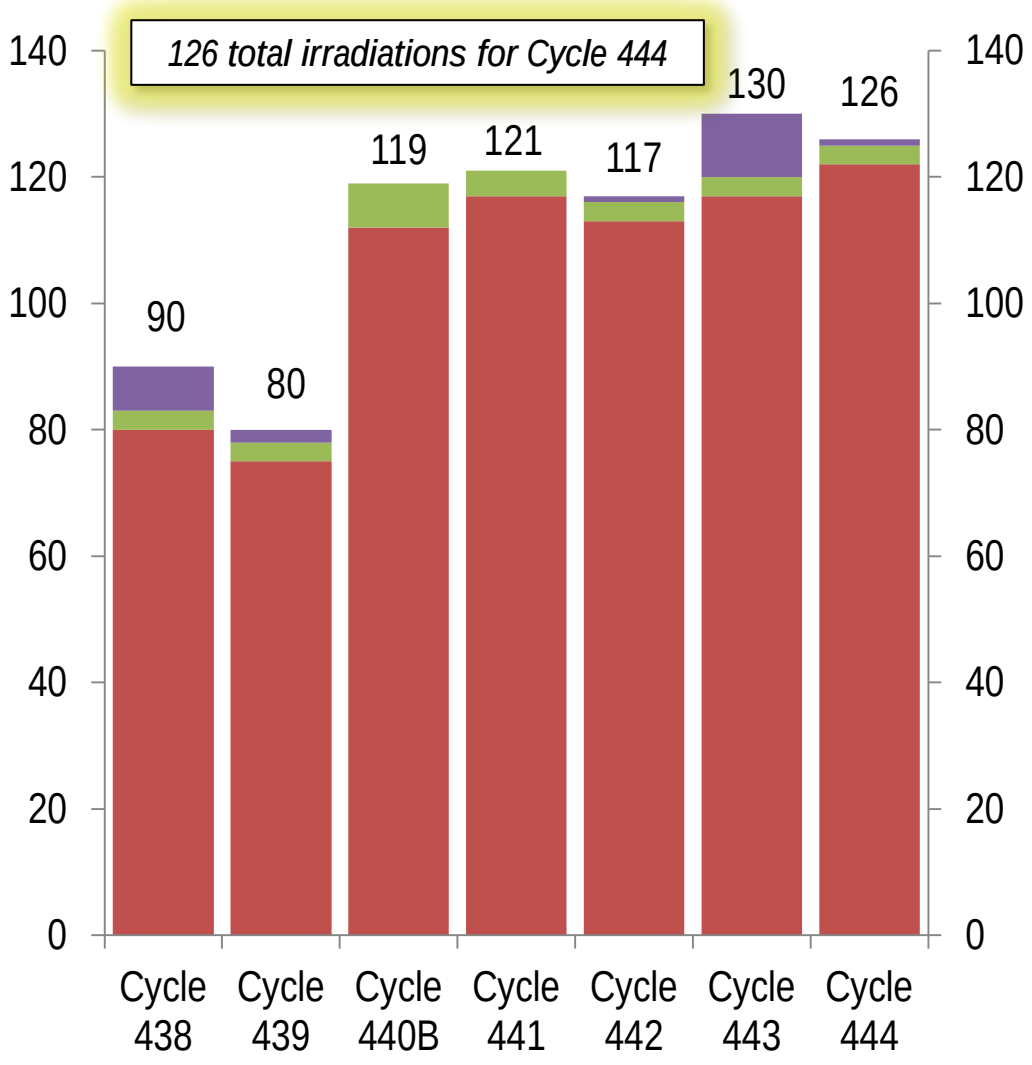
- Silicon Carbide
- V, Mo, & Cu alloys
- Zircaloy
- UO_2 Fuels
- UCN Fuels
- Graphite
- Steels

Commercial Isotope Production Capsules

- Selenium (Se-75) - production

Isotopes for Research

- See NAA irradiations slide



Significant number of NAA irradiations during cycle 444 at HFIR

HFIR

NAA irradiations during Cycle 444 include

- 76 IAEA Pre-inspection checks
- 17 blank IAEA swipes for rabbit closure blanking
- 8 flux monitors 5 normal flux monitors
- 19 trace elements in human hair
- 1 radium 228 source for measurement of fundamental nuclear parameters for production of Th-229 (for Alpha Therapy radioisotope production)
- 1 Silver foil for 5 microcuries activity production for fundamental gamma-gamma coincidence counting
- 11 rabbits for silver mordenite iodine sorption studies
- 1 rabbit for Pa-233 production from Th-232, about 10 microcuries for nuclear forensics spike preparation
- 4 blank poly rabbits for torture test of extended irradiation – at 30-minutes exposure, rabbit was significantly embrittled but did not break

Total 138