



# 3rd Quarter Report—April/May/June 2013

## ACCOMPLISHMENTS & LOOK AHEAD

### April

- Staff presented a workshop, judged presentations, and presented best paper awards at Student ANS.
- Frances Marshall presented on ATR NSUF at University of Massachusetts, Lowell, the IAEA Technical Working Group on Research Reactors in Vienna, Austria, and the Missouri University of Science and Technology.

### May

- Ian Robertson, University of Wisconsin, led a colloquium on the relationship between evolved microstructure and mechanical properties.
- John Jackson attended the ICG-EAC meeting in Japan and a discussion on the ATR NSUF role in EPRI's Advanced Radiation Resistant Materials program.

### June

- 2013 Users Week was held June 10-14.
- Joy Rempé attended the ANIMMA meeting in France, presented a paper, and gave an invited workshop on reactor experiment instrumentation to CEA staff.
- The open proposal call closed June 27.
- The RTE call closed June 30.
- Jim Cole attended the ANS meeting in Georgia and participated in the Material Science and Technology Division committee meeting.
- 8 rapid turnaround experiments were awarded to: Boise State University, Idaho National Laboratory, Idaho State University, University of Florida, University of Idaho, University of Michigan, and University of Wisconsin (2).

### July

- The ATR NSUF Scientific Review Board will meet July 16.
  - Jennifer Jarvis, MIT, will lead a colloquium on PWR primary water chemistry modeling for studying zircaloy-4 fuel cladding July 11.

## Open Calls for Proposals

- Third quarter call for RTE proposals closes Oct. 31, 2013.
- Call for irradiation, PIE and APS experiments tentatively closes Oct. 10, 2013.
- 2014 FSRT call closes Dec. 2013.

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## NOTEWORTHY NEWS

### Nuclear on the Brain: Nuclear Academics and Professionals Converge for 6th Annual Users Week

How do you design a nuclear reactor experiment? Why are experiments crafted in a particular way? How do I propose research that will be funded? These questions and more were answered at this year's 6<sup>th</sup> annual Advanced Test Reactor National Scientific User Facility (ATR NSUF) Users Week held June 10-14 at University Place (the satellite campus for Idaho State University and University of Idaho) in Idaho Falls.

This nuclear research-themed week is the user facility's opportunity to update the user community on nuclear energy issues and tools, conduct a research forum where users can come and present their research, run specialized workshops, and facilitate collaboration building among academic, industry, and government institutions. Users Week is key to fulfilling the user facility mission to provide nuclear energy researchers access to world-class capabilities to advance nuclear science and technology.



*Materials and Fuels Complex researcher Curtis Clark shows attendees just one of the many testing capabilities at the Fuels and Applied Science Building during the Users Week site tour.*

"The goal of Users Week is to encourage students to pursue research that will impact the future of our country's energy needs and enable them to build relationships with INL and other nuclear fuels and materials researchers," said Frances Marshall, ATR NSUF program manager and acting scientific director.

Each Users Week event is tweaked to offer users something new. This year the event was organized around the user experience – how a user can successfully propose and get research done. Organizers kept the most popular aspects from previous years, but instead of focusing solely on ATR NSUF research and techniques, added a component on how specific experiments align with the current focus of INL and the U.S. Department of Energy-Nuclear Energy (DOE-NE) programmatic goals: Light Water Reactor Sustainability, Fuel Cycle Research and Development, and Generation IV Nuclear Energy Systems.

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## Users Week continued

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“With this change in format, participants should gain a greater understanding of current DOE-NE programs, research trends and issues, ATR NSUF research, and our partner facilities,” said Jeff Benson, ATR NSUF Education Coordinator.

Understanding the interaction with DOE-NE is important because a key criterion to receive an ATR NSUF proposal award is that proposed research must be consistent with one of the DOE-NE missions. A great idea will never get off the ground if it is not aligned with our national needs.

The week-long event opened with a workshop on ATR NSUF research and the capabilities the user facility offers, then continued with sessions grouped together under one of the DOE-NE programmatic goals. Users Week also featured a site tour highlighting INL research capabilities and a specially tailored workshop on post-irradiation examination of nuclear fuels and materials.

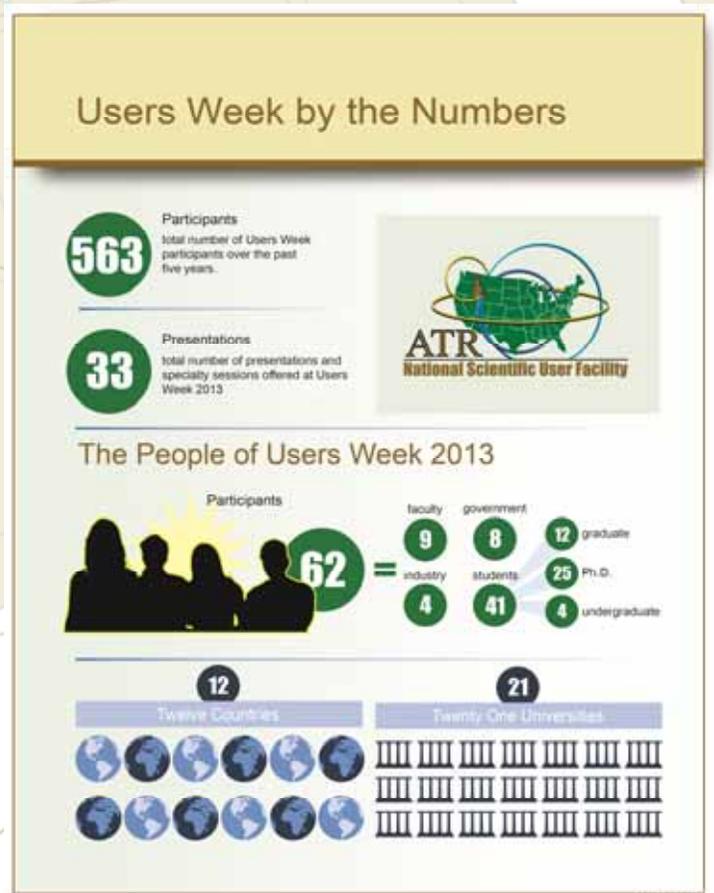
Yongho Sohn, Professor and Associate Director of the Materials Science and Engineering Department at the University of Central Florida (UCF), is well-acquainted with Users Week. He attended the very first Users Week and returned as a presenter this year. Sohn said he finds the event particularly valuable to students and brought four students with him from UCF this year. "I recommend the event to my students because at the university they typically work on a small and focused piece of the nuclear puzzle," said Sohn, "but Users Week shows them the big picture and how the research they're doing fits into the larger objectives of the technology."

Most of the week's presenters are directly involved in ATR NSUF research projects and in addition to sharing their research, also gave potential users advice on working through the proposal and research process. Full irradiation experiments – those that begin in the experiment design stage, are irradiated in a reactor, and continue all the way through post-irradiation examination – have great knowledge value, but can take a very long time to complete. Presenter Darryl Butt, Materials Science and Engineering Professor at Boise State University and an Associate Director of the Center for Advanced Energy

Studies, explained this lengthy process during his presentation on LWR fuels. “An irradiation experiment is like eating an elephant,” Butt said, “it can be done, but you have to eat it one bite at a time.” He encouraged users to recognize the timeline and planning requirements for this type of experiment and not be discouraged.

Organizers also invited three ATR NSUF partner facilities to give spotlight presentations on the capabilities their facilities offer and discuss any current research projects utilizing their facilities. Guest speakers presented on part-

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## ATR National Scientific User Facility

### Users Week continued

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ner facilities at the Westinghouse Materials Center of Excellence Laboratories (MCOE) Hot Cell Facility, Microscopy and Characterization Suite in the Center for Advanced Energy Studies, and Massachusetts Institute of Technology Reactor.

In his presentation, Gordon Kohse, a Principal Research Engineer at MIT, said being an ATR NSUF partner facility is proving to be a win-win situation. Kohse indicated that being a partner facility has enabled them to gain more experiment experience that makes them more desirable to both ATR NSUF users and other customers. It has also helped them build technical relationships and boost visibility so more people know about their capabilities.

The Wednesday of Users Week was filled with laboratory tours showcasing some key Idaho National Laboratory capabilities available to users. Participants visited facilities at the ATR Complex to learn how experiments are designed, assembled, and irradiated in the reactor. A surprise rain and hail storm at the reactor complex gave the group some unique insight to what being a nuclear researcher at a facility in the Idaho desert entails, but it didn't dampen their enthusiasm.



*Participants from twelve different countries and 21 universities had the opportunity to attend 33 different presentations ranging from research to program information to facility capabilities.*

Soggy but undeterred, the group travelled to the historic EBR-I museum for lunch and to experience in-person the location where the first usable amount of nuclear energy was generated. The group continued on to the Materials and Fuels Complex to learn about post-irradiation examination methods and INL capabilities available to investigate materials after they are irradiated.



*The historic Experimental Breeder Reactor I museum was just one of many INL facilities participants visited during the Users Week site tour.*

#### **Collaborate and Share: Research Poster Session**

After a full day of touring INL site facilities, participants returned to the Center for Advanced Energy Studies for a combined poster session and social event. During the event, students shared their research posters with other attendees and the top three student poster submissions won a 2013 Neutron Award.

the same," said Jeff Terry, Chair of the Advanced Test Reactor Users Organization and Associate Professor at the Illinois Institute of Technology.

At stake were the Golden, Silver, and Thermal Neutron awards. Posters were judged, keeping the presenter's aggregate educational level in mind, by awarding points in the following categories: Scientific/Engineering/Technology Approach (35pts), Content (10pts), Thoroughness and Understanding (20pts), Novelty of Approach (15pts), Potential Impact on the Community and/or the Public (10pts), and Clarity and Neatness of Presentation (10pts).

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## ATR National Scientific User Facility

### Users Week continued

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Each winner received a certificate and a one year gift membership to the American Nuclear Society. This year's deserving recipients of the Neutron Awards were:

- **Golden Neutron Award Winner:**  
*Ahmad Alsabbagh, Department of Nuclear Engineering Ph.D. Candidate, North Carolina State University, "Consequences of Neutron Irradiation on ECAP Steel."*

Alsabbagh's research looks at the effects of neutron radiation exposure on microstructure and mechanical properties of low carbon steel following equal channel angular pressing (ECAP) to obtain ultra-fine grain size. Corresponding studies are made on conventional grain sized material. The materials were exposed to high energy neutrons using the PULSTAR reactor at North Carolina State University at 1 MW for 200 hours to relatively low fluence ( $\sim 1.15 \times 10^{-3}$  dpa). The low dose irradiations of ultrafine grained carbon steel revealed minute irradiation effects in contrast to commonly observed radiation hardening and embrittlement in coarse grain structure steel counterparts. Current studies are performed at relatively low dpa and investigations are underway to characterize radiation effects in these steels following 1 and 2 dpa levels being irradiated in the ATR at Idaho National Laboratory.



ATR NSUF Users Organization Chair Jeff Terry (right) presents the Golden Neutron Award to Ahmad Alsabbagh (left).

Ahmad Alsabbagh said he sees a lot of value in Users Week, particularly for student researchers like himself. "I like the Users Week event and participated last year too," said Alsabbagh. "It gives students and researchers the opportunity to explore the different experiments that ATR NSUF can facilitate and to learn more about the procedures needed to write an ATR NSUF proposal." He also liked the opportunity to meet fellow researchers. "At Users Week you meet people from different schools and they all work with nuclear engineering projects. It gives you a very good idea about what is new in the field and what you can do to improve your research," Alsabbagh said.



Somayeh Pasebani (left) accepts the Silver Neutron Award from ATR NSUF Users Organization Chair Jeff Terry (right).

- **Silver Neutron Award Winner:**  
*Somayeh Pasebani, Department of Materials Science & Engineering Ph.D. candidate, University of Idaho, "Spark Plasma Sintering of Lanthana Bearing Nanostructured Ferritic Steels."*

Pasebani's research is focused on fabricating and characterizing the advanced Oxide Dispersion Strengthened Steels (ODS) using Spark Plasma Sintering (SPS), mechanical tests and advanced microstructural characterization.

This year was Pasebani's third year attending Users Week and each year she encourages her colleagues to attend too. "This is a wonderful opportunity to find out about possible collaborations, available grants and research funds as well as networking and meeting people in the Nuclear/Materials Science community." Pasebani said some of her favorite as-

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## ATR National Scientific User Facility

### Users Week continued

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pects were, “meeting other researchers, asking about their research, and exchanging new ideas...I learned more about great opportunities provided by ATR NSUF and INL to perform my research in an even better way.”

- **Thermal Neutron Award Winner:** Harn Chyi Lim, Materials Science Department School of Engineering of Matter, Transport and Energy (SEMTE) Ph.D. Candidate, Arizona State University, “Microstructural Effects on Thermal Conductivity of Uranium Oxide.”

Lim’s research poster highlighted microstructural effects on the thermal conductivity of uranium oxide. The goal of his research is to look into the effects of grain and grain boundary properties of  $UO_2$  using a 3-D finite element model with microstructurally explicit information. The model developed is versatile in a way that it takes advantages of the characterization results from serial sectioning techniques with Focused Ion Beam (FIB) and Electron Backscattering Diffraction (EBSD) to predict the fuel performance. The model can also conduct multi-physics simulations which allows the study of the coupled effect of thermal and fission products transport. These simulations can provide input and insight into the fuel pellet behaviors at the initial stage of power generation when burnups are low.

Lim said he definitely found Users Week valuable. “I would recommend attending Users Week to others. It is just a great experience that everyone who is doing research in the area needs to have,” he said. “The experience makes you a better researcher. For me, it helped me create new research ideas and made my simulation model more realistic after taking other aspects of nuclear fuels into considerations.”

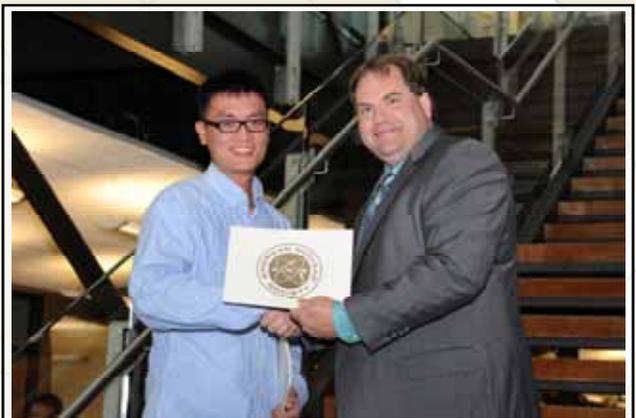
Lim said that highlights for him were the opportunity to network with other researchers, learn about the latest research people are working on worldwide, and participating in the site tour. “The ATR facility tour along with interactions with other researchers brought out a lot of new ideas for my own work,” he said.

“I’m very proud of all of the 2013 Neutron Award winners,” said Terry. “The future is in great hands.”

In addition to students planning to pursue careers in the nuclear field, a number of students training to be science teachers also attended the Users Week sessions. Terry encouraged their continued participation in Users Week and the poster session next year.

“It was great to see the science teaching students at Users Week this year. It is very important to train teachers to elucidate the challenges of delivering instant-on electricity to their students,” he said. “We look forward to having even more great posters to evaluate next year from students like them and those studying nuclear energy issues.”

To learn more about the proposing research and capability offerings, visit the ATR NSUF website at <http://atrnuf.inl.gov>.



*ATR NSUF Users Organization Chair Jeff Terry (right) presents Harn Chyi Lim (left) with the Thermal Neutron Award.*



## ATR National Scientific User Facility

### Users Organization Elects New Executive Committee

During the 2013 Users Week, the ATR NSUF Users Organization (UO) welcomed a new set of executive committee members. The UO Executive Committee is comprised of up to 6 members including a Chair, Secretary, three general members, and one student member. Any member of the UO can vote in the election. In his Users Week presentation on the UO, outgoing Chair Jeff Terry, of the Illinois Institute of Technology, announced the results from the recent election. The new general members are Mitra Taheri of Drexel University, Peng Xu of Westinghouse, and Yong Yang of University of Florida. The new student member is Dan LaBrier of Idaho State University.

#### 2013 ATR NSUF Users Organization Executive Committee:

**Chair:** Dave Senor – Pacific Northwest National Laboratory (served as Secretary on 2012 committee)

**Secretary:** TBD

#### Regular Members:

Jim Tulenko – University of Florida (2nd term)

Mitra Taheri – Drexel University

Peng Xu – Westinghouse

Yong Yang – University of Florida

#### Student Member:

Dan LaBrier – Idaho State University

**Ex-officio Chair:** Jeff Terry

The purpose of the Users Organization is to exchange information and advice between the ATR NSUF principal investigators and management, serve as an advocacy group for the experimental activities at ATR NSUF, provide a communication channel among ATR NSUF users, and educate the public and decision makers on the benefits of Nuclear Energy.

Terry said he would like to see the UO members continue outreach efforts to push for more funding, actively engage decision makers, and serve on National User Facility Organization committees.



*Outgoing executive committee student member Peter Wells (left) of University of California, Santa Barbara welcomes new student member Daniel LaBrier (right) of Idaho State University.*

Following Jeff Terry's presentation, outgoing executive committee student member Peter Wells, of University of California, Santa Barbara, discussed the role of the student member and the benefits of being a member of the UO.

Wells explained, "The duties of the student member are to quantify the impact of ATR NSUF on students and their research/education, be an advocate for student members of the Users Organization, and recruit new student membership."

The student member has a unique perspective and serves as a student advocate to the ATR NSUF program office. They help student peers address any kind of issue with their user facility experiment and help prevent issues from happening in the future. Also, the student member can pass along ideas for specific capabilities that would be useful for users, but are not currently offered by ATR NSUF.

#### CONNECT WITH THE ATR NSUF USERS ORG!

**Twitter**—@ATRNSUOChair

**Website**—<http://nuclearstreet.com/advanced-test-reactornational-scientific-user-group/default.aspx>

**Join the Users Org!** Send an email to [mary.thelen@inl.gov](mailto:mary.thelen@inl.gov) or [labrdani@isu.edu](mailto:labrdani@isu.edu).

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## New Executive Committee continued

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Thank you to the outgoing executive committee members for all of your hard work.

### **Outgoing Members of the 2012 ATR NSUF Users Organization Executive Committee:**

**Chair:** Jeff Terry - Illinois Institute of Technology

**Secretary:** Dave Senor - Pacific Northwest National Laboratory (now serving as 2013 Chair)

### **Regular Members:**

Denis Beller – University of Nevada, Las Vegas

K. L. Murty – North Carolina State

### **Student Member:**

Peter Wells – University of California, Santa Barbara

Membership of the UO has many benefits including receiving emails about upcoming calls for proposals, voting privileges for electing the Executive Committee, and opportunities to share work and collaborate with others working on ATR NSUF projects. To join the Users Organization and stay up-to-date on all of the latest UO news and events, contact Daniel LaBrier ([labrdani@isu.edu](mailto:labrdani@isu.edu)) or Mary Catherine Thelen ([mary.thelen@inl.gov](mailto:mary.thelen@inl.gov)).

## Westinghouse now First ATR National Scientific User Facility Industry Partner

Westinghouse Electric Company LLC is now ATR NSUF's newest partner facility. The company treads new ground as the first industrial organization to join the ranks of ATR NSUF partners. The addition of Westinghouse, a leading supplier of nuclear plant products and technologies, provides ATR NSUF researchers access to an even wider variety of capabilities for nuclear materials and fuels research.



*A manipulator arm moves radioactive materials in a Westinghouse Hot Cell.*

As an ATR NSUF partner, Westinghouse is offering its Materials Center of Excellence Laboratories (MCOE) Hot Cell Facility and accompanying laboratories to provide experimental support to ATR-related nuclear energy materials research programs. The Westinghouse facilities in Churchill, Pa., are housed in four cells that provide a broad range of testing, evaluation and characterization capabilities for both unirradiated and irradiated materials. In-place capabilities include the ability to test under a variety of environments, an extensive mechanical testing laboratory, a specialized corrosion and stress corrosion cracking lab, and materials microstructure and chemical characterization instruments. Specialized facilities are also available to measure the radioactivity properties of materials under investigation as well as neutron and gamma sources facilities, which can be employed to assess materials' response to in-situ radiation.

"Becoming an ATR NSUF partner facility provides a win-win situation for the interactions of INL ATR basic research programs with our industry-driven initiatives," said Jim Brennan, vice president, Westinghouse Engineering Services.

"We believe that opening our facilities to the nation's scientific investigators will facilitate more effective technical information exchanges between the DOE nuclear energy and university programs and the interests of the commercial nuclear power generating industry."

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**ATR**  
National Scientific User Facility

## First Industry Partner Facility continued

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Westinghouse learned about INL and ATR NSUF through collaborative subcontract research. The request to become an ATR NSUF partner facility to share capabilities and expertise with ATR NSUF experimenters is a testament to the value seen by Westinghouse in the unique research that the ATR NSUF facilitates.

"In addition to bringing an outstanding set of new capabilities, having an industry partner opens up ATR NSUF opportunities for our university users to more easily collaborate with commercial nuclear power industry organizations," said ATR NSUF Industry Programs Lead John Jackson. "Through these kinds of collaborations, university users will learn about the research needs of the nuclear power industry, and by learning about industry needs, these university users are in a better position to propose research experiments that solve some of the challenges this industry faces."

By leveraging partner facility capabilities spanning the U.S., ATR NSUF has expanded opportunities for science and technology research, building on the foundation of offering users the capabilities at INL, the DOE's lead nuclear energy laboratory. Partners add value to the ATR NSUF program because they bring capabilities that are either not offered at INL or that typically become oversubscribed.

"Partner facilities enable the ATR NSUF program to better meet the needs of the nuclear research community by facilitating access to capabilities that might not otherwise be available to researchers," said Frances Marshall, ATR NSUF program manager and acting scientific director. "Adding Westinghouse to our partnership program will increase the ATR NSUF network of users and expand the research capability of the partner facilities, in turn expanding the research capabilities for the whole nuclear research community."

The addition of Westinghouse makes a total of 11 ATR NSUF partner facilities: eight university partners, two national laboratory partners, and now one industry partner. Since its designation as a National Scientific User Facility in 2007, ATR NSUF has awarded 69 research experiments involving 20 universities and three other national laboratories.



*Operators use manipulators to perform work inside a Westinghouse hot cell.*

### 2012 Annual Report Available



The ATR NSUF 2012 Annual Report is now available in hard copy and will be available in electronic form on the website shortly. If you would like a hard copy of the Report, send an email request with your name and mailing address to [julie.ulrich@inl.gov](mailto:julie.ulrich@inl.gov).

#### ATR NSUF Quarterly Report

For comments, questions, or story ideas, contact:

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To learn more about ATR NSUF, visit <http://atrnsof.inl.gov>.