

**American Nuclear Society**  
**Nuclear Criticality Safety Division Newsletter**  
**Spring/Summer 2016**



**Editor: Ning Zhang**

**Have you seen our website? Yes we have one!**

**<http://ncsd.ans.org>**



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# Message from the Chair

*NCSD Chair: Sedat Goluoglu*

Dear NCSD member,

I want to start this Newsletter by reporting on a great achievement. Our Division finally had enough funds to make our Pioneers Scholarship a fully-funded one. Per ANS, \$60K is needed to create a fully-funded scholarship fund. Every year we give out one \$3000 scholarship to a student. In the past we were using our general funds to pay for the scholarship. From now on, the scholarship awards will be paid from this fully-funded scholarship account. With the generous contributions of many of you we were able to jump start the funds in our Pioneers Scholarship account. With very successful past topical and the 2015 ICNC meetings, again through very hard work of many of you, we were able to add the final funds into the scholarship account. Congratulations to and many thanks to those who made this become reality! Our Division is financially healthy.

As you are aware the ANS Annual meeting is just around the corner (June 12-16) in New Orleans, LA. This is a great opportunity to meet and network with your colleagues. Many of us belong to multiple Divisions and always have to juggle attendance in different Division meetings, sessions and activities. I want to provide you a summary of NCSD activities and encourage you to attend all or at least some of them.

Our Division governance meetings are on Sunday June 12.

Education Committee Meeting, 1-2 PM

Program Committee Meeting, 2-3 PM

Executive Committee Meeting, 3-4:30 PM

All our governance meetings are open to all attendees. We have updated our website and continue to add information to it. If there are certain items you would like to see on our website please let me know. Below are the Committees in our Division. We are always looking for volunteers who are willing to contribute to the Division and make a difference. If you see Committees you would like to join, please send me an e-mail or come find me at the Annual meeting. I would like to encourage all members including young members and students to take an active role in the Division governance. Per our by-laws, students can take on any of the positions except vice-Chair and Chair positions. In addition, at this Annual Meeting, we have six sessions planned. Hopefully you can make it to some if not all of those sessions.

Mark your calendars! Our next Topical Meeting will be in Carlsbad, NM on September 10-15, 2017. General Chair of the Topical Meeting is Jean-Francois (Jef) Lucchini. He has a very dedicated team of volunteers and strong support from Carlsbad area folks. We are very excited about this next topical meeting. We need your help to make this yet another very successful meeting. We will be reaching out to some of you and asking you to be part of the Technical Program Committee. If you are willing to help contribute to the success of this meeting by volunteering, please send me ([goluoglu@mse.ufl.edu](mailto:goluoglu@mse.ufl.edu)) or Jef ([lucchini@lanl.gov](mailto:lucchini@lanl.gov)) an e-mail.

During the last ANS Winter meeting in Washington, D.C. we had a very successful and fun Awards Banquet on Tuesday November 10 from 6:00-9:00PM at the Maggiano's Italian Restaurant in Chevy Chase Village. Our Awards Banquets are one of the best and are great to network with peers, connect with old friends and of course recognize our members' achievements. This past year we recognized our Technical Excellence Award winner, Forrest Brown (LANL) and Distinguished Service Award winner, Cecil Parks (ORNL). See page 19 for details.

Finally, our Division provides communication among nuclear criticality safety professionals through the development of standards, the evolution of training methods and materials, the presentation of technical data and procedures, and the creation of specialty publications. In these ways, the division furthers the exchange of technical information on nuclear criticality safety with the ultimate goal of promoting the safe handling of fissionable materials outside reactors. Through your membership in the Nuclear Criticality Safety Division we hope you will enhance your professional expertise through in-depth topical seminars, Proceedings of our meeting and networking with the leaders in the field. We are here to support you if you ever have any questions.

We are looking forward to seeing you at the Annual Meeting!

With kind regards,

Sedat Goluoglu, Chair

# **Nuclear Criticality Safety Standards, ANSI/ANS-8 Series**

## **Scope and Current Status of the ANS-8 Series Standards**

**By Brian Kidd & Doug Bowen**

There are currently 18 active ANS-8 standards. The ANS-8 series standards are very active and a great deal of work in progress. The following is a summary of the standard scope, a listing of the working group chairs, and the current status of the standard.

### **ANS-8.1, Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors**

Work Group Chairs: Doug Bowen/Nick Brown

This standard is applicable to operations with fissionable materials outside nuclear reactors, except for the assembly of these materials under controlled conditions, such as in critical experiments. Generalized basic criteria are presented and limits are specified for some single fissionable units of simple shape containing  $^{233}\text{U}$ ,  $^{235}\text{U}$ , or  $^{239}\text{Pu}$ , but not for multiunit arrays. Requirements are stated for establishing the validity and areas of applicability of any calculational method used in assessing nuclear criticality safety. This standard does not include the details of administrative controls, the design of processes or equipment, the description of instrumentation for process control, nor detailed criteria to be met in transporting fissionable materials.

**Status:** Revised in 2014 (Maintenance).

### **ANS-8.3, Criticality Accident Alarm System**

Work Group Chair: Shean Monahan

This standard is applicable to all operations involving fissionable materials in which inadvertent criticality can occur and cause personnel to receive unacceptable exposure to radiation. This standard is not applicable to detection of criticality events where no excessive exposure to personnel is credible, nor to nuclear reactors or critical experiments. This standard does not include details of administrative actions or of emergency response actions that occur after alarm activation.

**Status:** Reaffirmed in 2012 (Revision).

### **ANS-8.5, Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material**

Work Group Chair: Jerry Hicks

This standard provides guidance for the use of borosilicate-glass Raschig rings as neutron absorber for criticality control in ring-packed vessels containing solutions of  $^{235}\text{U}$ ,  $^{239}\text{Pu}$ , or  $^{233}\text{U}$ . The chemical and physical environment, properties of the rings and packed vessels, maintenance inspection procedures, and operating guidelines are specified.

**Status:** Reaffirmed in 2012 (Maintenance).

### **ANS-8.6, Safety in Conducting Subcritical Neutron-Multiplication Measurements in Situ**

Work Group Chair: Bill Myers

This standard provides safety guidance for conducting subcritical Neutron-Multiplication Measurements where physical protection of personnel against the consequences of a criticality accident is not provided. The objective of in situ measurements are either to confirm an adequate safety margin or to improve an estimate of such a margin. The first objective may constitute a test of the criticality safety of a design that is based on calculations. The second may effect improved operating conditions by reducing the uncertainty of safety margins and providing guidance to new designs.

**Status:** Reaffirmed in 2010 (Maintenance).

### **ANS-8.7, Nuclear Criticality Safety in the Storage of Fissile Materials**

Work Group Chair: Kevin Kimball

This standard is applicable to the storage of fissile materials. Mass and spacing limits are tabulated for uranium containing greater than 30 wt-%  $^{235}\text{U}$ , for  $^{233}\text{U}$ , and for plutonium, as metal and oxides. Criteria for the range of application of these limits are provided.

**Status:** Reaffirmed in 2012 (Revision).

### **ANS-8.10, Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement**

Work Group Chair: Andy Prichard

This standard is applicable to operations outside of nuclear reactors with  $^{235}\text{U}$ ,  $^{233}\text{U}$ ,  $^{239}\text{Pu}$ , and other fissile and fissionable materials in which shielding and confinement are provided for protection of personnel and the public, except the assembly of these materials under controlled conditions, such as in critical experiments. Criteria are provided that may be used for criticality control under these conditions. The standard does not include the details of administrative procedures for control, which are considered to be management prerogatives, nor details regarding the design of processes and equipment or descriptions of instrumentation for process control.

**Status:** Revised in 2015 (Maintenance).

### **ANS-8.12, Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors**

Work Group Chair: Debdas Biswas

This standard is applicable to operations with plutonium-uranium oxide fuel mixtures outside nuclear reactors, except the assembly of these materials under controlled conditions, such as in critical experiments. Basic criteria are presented for plutonium-uranium fuel mixtures in single units of simple shapes containing no more than 30 wt% plutonium combined with uranium containing more than 0.71 wt%  $^{235}\text{U}$ . The limits for uniform aqueous mixtures (solutions) are applicable to homogeneous mixtures and slurries in which the particles constituting the mixture are uniformly distributed and have a diameter no larger than 127  $\mu\text{m}$  (0.005 in.), i.e., are capable of being passed through a 120 mesh screen. This standard does not include the details of administrative controls, the design of processes or equipment, the description of instrumentation for process controls or detailed criteria to be met in transporting fissionable material.

**Status:** Reaffirmed in 2011 (Maintenance).

### **ANS-8.14, Use of Soluble Neutron Absorbers in Nuclear Facilities Outside Reactors**

Work Group Chair: Larry Berg

This standard provides guidance for the use of soluble neutron absorbers for criticality control. This standard addresses neutron absorber selection, system design and modifications, safety evaluations, and quality control programs.

**Status:** Reaffirmed in 2016 (Maintenance).

### **ANS-8.15, Nuclear Criticality Control of Selected Actinide Nuclides**

Work Group Chair: Charlie Rombough

This standard is applicable to operations with the following:  $^{232}\text{U}$ ,  $^{234}\text{U}$ ,  $^{237}\text{Np}$ ,  $^{236}\text{Pu}$ ,  $^{238}\text{Pu}$ ,  $^{240}\text{Pu}$ ,  $^{242}\text{Pu}$ ,  $^{241}\text{Am}$ ,  $^{242\text{m}}\text{Am}$ ,  $^{243}\text{Am}$ ,  $^{242}\text{Cm}$ ,  $^{243}\text{Cm}$ ,  $^{244}\text{Cm}$ ,  $^{245}\text{Cm}$ ,  $^{246}\text{Cm}$ ,  $^{247}\text{Cm}$ ,  $^{249}\text{Cf}$ , and  $^{251}\text{Cf}$ . Subcritical mass limits are presented for isolated fissionable units. The limits are not applicable to interacting units.

**Status:** Revised in 2014 (Maintenance).

### **ANS-8.17, Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors**

Work Group Chair: Brian Kidd

This standard provides nuclear criticality safety criteria for the handling, storage, and transportation of LWR fuel rods and units outside reactor cores.

**Status:** Reaffirmed in 2014 (Maintenance).

### **ANS-8.19, Administrative Practices for Nuclear Criticality Safety**

Work Group Chair: John Miller

This standard provides criteria for the administration of a nuclear criticality safety program for outside-of-reactor operations in which there exists a potential for nuclear criticality accidents. Responsibilities of management, supervision, and the nuclear criticality safety staff are addressed. Objectives and characteristics of operating procedures are addressed.

**Status:** Revised in 2014 (Maintenance).

### **ANS-8.20, Nuclear Criticality Safety Training**

Work Group Chairs: Ron Knief /Deborah Hill

This standard provides criteria for nuclear criticality safety training for personnel associated with operations outside reactors where a potential exists for criticality accidents. It is not intended for the training of nuclear criticality safety staff.

**Status:** Reaffirmed in 2015 (Maintenance).

### **ANS-8.21, Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors**

Work Group Chair: Dave Erickson

This standard provides guidance for the use of fixed neutron absorbers in an integral part of nuclear facilities and fissionable material process equipment outside reactors, where such absorbers provide criticality safety control.

**Status:** Reaffirmed in 2011 (Revision).

### **ANS-8.22, Nuclear Criticality Safety Based on Limiting and Controlling Moderators**

Work Group Chair: Michael Crouse

This standard applies to limiting and controlling moderators to achieve criticality safety in operations with fissile materials in a moderator control area. This standard does not apply to concentration control of fissile materials.

**Status:** Reaffirmed in 2016 (Maintenance).

### **ANS-8.23, Nuclear Criticality Accident Emergency Planning and Response**

Work Group Chair: Jim Baker

This standard provides criteria for minimizing risks to personnel during emergency response to a nuclear criticality accident outside reactors. This standard applies to those facilities for which a criticality accident alarm system, as specified in American National Standard “Criticality Accident Alarm System,” ANSI/ANS-8.3-1997 (R2003) is in use. This standard does not apply to nuclear power plant sites or to licensed research reactor facilities, which are addressed by other standards.

**Status:** Reaffirmed in 2012 (Revision).



### **ANS-8.24, Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations**

Work Group Chair: Larry Wetzel

This standard provides requirements and recommendations for validation, including establishing applicability, of neutron transport calculational methods used in determining critical or subcritical conditions for nuclear criticality safety analyses.

**Status:** Reaffirmed in 2012 (Revision).

### **ANS-8.26, Criticality Safety Engineer Training and Qualification Program**

Work Group Chair: Kevin Reynolds

This standard presents the fundamental content elements of a training and qualification program for individuals with responsibilities for performing the various technical aspects of criticality safety engineering. The standard presents a flexible array of competencies for use by management to develop tailored training and qualification programs applicable to site-specific job functions, facilities and operations.

**Status:** Reaffirmed in 2012 (Maintenance).

### **ANS-8.27, Burn-up Credit for LWR Fuel**

Work Group Chair: Dale Lancaster

This standard provides criteria for accounting for reactivity effects of fuel irradiation and radioactive decay in criticality safety control of storage, transportation, and disposal of commercial LWR UO<sub>2</sub> fuel assemblies. This standard assumes the fuel and any fixed burnable absorbers are contained in an intact assembly. Additional considerations could be necessary for fuel assemblies that have been disassembled, consolidated, damaged, or reconfigured in any manner.

**Status:** Revised in 2015 (Maintenance).

### **ANS-8.28, Administrative Practices for the Use of Non-Destructive Assay Measurements for Nuclear Criticality Safety**

Work Group Chair: Jeff Chapman

This standard provides guidance to help ensure that data from NDA measurements will be accurate and technically defensible when used by NCS personnel in determining subcriticality of operations under normal and credible abnormal conditions.

**Status:** Active Project.

# 2015 ICSBEP Handbook Information

By John Bess

The 2015 edition of the International Handbook of Evaluation Criticality Safety Benchmark Experiments (ICSBEP Handbook) has been completed and are available for distribution starting January 2016. A summary of the following changes and additions is provided for those interested in requesting a new copy. It should be noted that HST020 was revised for an error in the diameter of the level indicator pipe diameter based on engineering drawings. ICT015 had some minor errors in the sample input decks provided that have since been repaired. IMF-020 and -022 were improved to include some additional data recently publicly released regarding the FR0 experiments.

## Minor Revisions to Existing Evaluations

HEU-SOL-THERM-020 -- Unreflected Cylinders of Uranyl-Fluoride in Heavy Water

IEU-COMP-THERM-015 -- Single Cores of 30.14% U-235 Enriched UO<sub>2</sub>/Wax Mixtures - Bare and with Single Reflector Materials

IEU-MET-FAST-020 -- The FR0 Series 1: Copper-Reflected "Cylindrical" Uranium (20 % U-235) Metal

IEU-MET-FAST-022 -- The FR0 Experiments with Diluted 20%-Enriched "Cylindrical" Uranium Metal Reflected by Copper

Incomplete Arrays of Water-Reflected 4.738-wt.-%-Enriched Uranium Dioxide Fuel-Rod Arrays

## Revisions to Include Additional Critical Configurations

HEU-COMP-FAST-004 -- Critical Configuration for Beryllium Reflected Assemblies of U(93.15)O<sub>2</sub> Fuel Rods (1.506-cm Pitch and 7-Tube Clusters)

## Benchmark Adopted from the IRPhEP Handbook

HEU-MET-FAST-099 -- Fast Neutron Spectrum Potassium Worth for Space Power Reactor Design Validation

## New Evaluations

HEU-MET-FAST-074 -- Orallo 93.2 U-235) Bare Metal Annuli

HEU-MET-FAST-077 -- Experiments with HEU (93.14 wt.%) Metal Annuli with Internal Graphite Cylinder

IEU-SOL-THERM-005 -- Critical Dimension of Unreflected Aqueous Solution of U(37 %)O<sub>2</sub>F<sub>2</sub> in Spherical Geometry

LEU-COMP-THERM-067 -- Critical Loading Configurations of the IPEN/MB-01 Reactor Composed of Fuel and Molybdenum Rods

LEU-COMP-THERM-096 -- Partially-Reflected Water-Moderated Square-Pitched U(6.90)O<sub>2</sub> Fuel Rod Lattices with 0.67 Fuel to Water Volume Ratio (0.800 cm Pitch)

ALARM-TRAN-AIR-SHIELD-001 -- Neutron Activation and Thermoluminescent Detector Responses to a Bare Pulse of the CEA Valduc SILENE Critical Assembly

The recent ICSBEP and IRPhEP Annual Technical Review Meetings was held in Paris, France April 18-22, 2015. Those interested in future benchmark evaluations, serving as reviewers, and/or attending the benchmark meetings should contact John Bess ([john.bess@inl.gov](mailto:john.bess@inl.gov)).

# Program Committee

Chair: Deborah Hill

## Detailed NCSD Plans for the 2016 Annual Meeting

A busy NCSD schedule is planned for the 2016 Annual Meeting in New Orleans, including the following sessions:

- Data, Analysis and Operations in Nuclear Criticality Safety *{Three sessions}*
- Criticality for Spent Fuel Pools and Transport Casks
- Sharing of Good Industry Practices in Criticality Safety
- ANS-8 Standards Forum

We hope to see you there!! Plus a big thank you to all those who reviewed the papers submitted to these sessions – your help has been invaluable.

## Provisional NCSD Plans for the 2016 Winter Meeting

Whilst this is still in the planning stage, the provisional NCSD schedule for the 2016 Winter Meeting in New Orleans is also shaping up to a busy one. The following sessions are being considered:

- Data, Analysis and Operations in Nuclear Criticality Safety
- ANS-8 Standards Forum
- Recent Nuclear Criticality Safety Program Technical Accomplishments
- The Impact of Chemistry in Nuclear Criticality Safety Evaluations
- Critical and Sub-Critical Experiments *{Co-sponsor of a Paper Session and a Workshop being led by NNPD}*
- Lessons Learned Over My Career *{Co-sponsor of a Panel Session being led by NISD}*

## General Plea for Feedback & Help!

The NCSD Program Committee is keen to provide sessions that benefit the NCSD community. Hence, if you have any ideas regarding a topic for an NCSD session at the ANS meetings (either a Paper Session, a Panel Session or a Workshop / Tutorial), then please get in touch with Deborah Hill ([deborah.a.hill@nnl.co.uk](mailto:deborah.a.hill@nnl.co.uk), +44 1772 764359). Plus we are always extremely keen to hear from anyone who is interested in helping to organize a session for the meetings – again, if you're interested, please get in touch with Deborah.

# ICNC 2015 Meeting Summary

By Larry Wetzel

ICNC 2015 was hosted by NCS D in Charlotte, NC September 13<sup>th</sup> – 17<sup>th</sup> 2015. The meeting was last held in the US in 1995. The organizing committee consisted of:

|   |                         |
|---|-------------------------|
| Honorary General Chair                  | Elliott Whiteside       |
| General Chair                           | Dr. Robert Busch        |
| Assistant General Chair                 | Sandi Larson            |
| Co-Technical Program Chair              | Dr. Michaele Brady Raap |
| Co-Technical Program Chair              | Larry Wetzel            |
| International Advisory Committee Chair: | Dr. Cecil Parks         |
| Corporate Sponsorship Chair:            | Hatice Akkurt           |

There were 264 attendees at the meeting with about half from the US and half from international. The participants came from 15 different countries. The meeting opened with a reception on Sunday evening. The plenary was held on Monday morning with opening remarks from Bob Busch and Elliott Whitesides. Plenary speakers included Jerry McKamy, Neil Harris, Kenya Suyama, Kotaro Tonoike, Jim Gulliford, and Michaele Brady Raap. The meeting had nine technical tracks. They were:

1. Development of Standards and Assessment Methodology
2. Operational Practices
3. Criticality Codes and Nuclear Data
4. Criticality Experiments
5. Uncertainty and sensitivity Analysis
6. Analysis of Criticality Accidents and Incidents
7. Criticality Safety in Used Fuel Management
8. Storage, Transport, and Disposal of Fissile Material
9. Professional Development Issues

There were 175 technical papers. There was one workshop entitled: “Second level criticality modelling: beyond k-effective calculation, nuclear criticality safety begins...” which was put on by IRSN. On Friday, there were two technical tours: V.C. Summer Nuclear AP1000® Nuclear Plant Construction and Columbia Fuel Fabrication Facility Plant. Both of these were sold out. A few attendees went on a golf outing.

On Monday evening, a reception was held at the Mint Museum. Tuesday, a reception was held in conjunction with the poster session. On Wednesday evening, the conference banquet was held at Founder’s Hall with the keynote address being given by Elliott Whitesides.

The meeting was a great success. The presentations were very good, friendships were renewed and new ones made and enough money was made to fully fund our scholarship. The next meeting will be in Paris in 2019.

# Upcoming Events

## At a Glance

| <b>Dates</b>                | <b>Meeting</b>  | <b>Location</b>             |
|-----------------------------|---|-----------------------------|
| June 12-16, 2016            | 2016 ANS Annual Meeting                                 | New Orleans, LA             |
| August 6-12, 2016           | 2016 EFCOG Nuclear & Facility Safety Technical Workshop | Argonne National Laboratory |
| November 6-10, 2016         | 2016 ANS Winter Meeting                                 | Las Vegas, NV               |
| June 11-15, 2017            | 2017 ANS Annual Meeting                                 | San Francisco, CA           |
| September 10-15, 2017       | 2017 Nuclear Criticality Safety Division Topical        | Carlsbad, NM                |
| October 29-November 2, 2017 | 2017 ANS Winter Meeting                                 | Washington, D.C.            |

## 2016 EFCOG Nuclear & Facility Safety Technical Workshop

Criticality Safety Task Group to facilitate panel/paper sessions on general software quality assurance issues, use of sensitivity/uncertainty techniques, dose consequence from a criticality accident, and implementation of revised DOE guidance as pertains to NCS

The Energy Facility Contractors Group (EFCOG) is a volunteer organization comprised of senior contractor executives, working-level personnel, and DOE officials who support DOE's mission goals and address a broad range of operational challenges across the DOE complex. The Nuclear & Facility Safety (NFS) is a key subgroup within EFCOG organization, and within that subgroup, Criticality Safety (CS) is an active Task Force actively engaged in promoting Lessons-Learned, conferring on DOE criticality safety policy and practices, and acting as an effective "end-users" group.

The NFS Subgroup will be hosting its biennial Technical Workshop from August 6–12, 2016 at Argonne National Laboratory (ANL). More information can be found at <http://efcog.org/wp-content/uploads/2015/12/2016-EFCOG-NFS-Workshop-Flyer-final.pdf>. Safety analysis and criticality safety related training is offered during the weekend, with the technical sessions scheduled for Tuesday through Friday. Of particular interest to the criticality safety community will be training and facilitated discussion on the use of the sensitivity and uncertainty tools contained within the TSUNAMI and Whisper codes in the SCALE and MCNP code packages. Other topics delving into validation and software quality assurance of codes, implementation of criticality safety controls, evaluation of criticality design-basis accident scenarios of criticality safety at DOE nuclear facilities, and Lessons Learned are often presented at the these workshops.

For more information concerning the overall Technical Workshop, please contact Mark Joseph via [mjoseph@anl.gov](mailto:mjoseph@anl.gov) or at (630) 252-6311. For more information regarding the criticality safety related topics, please contact James J. Kuropatwinski via [wujek@lanl.gov](mailto:wujek@lanl.gov) or at (505) 412-8027.

## 2017 Nuclear Criticality Safety Division Topical



**Get involved  
in the next NCSD Topical  
September 10-15, 2017**

**Carlsbad, NM,  
home of the Carlsbad Caverns and the Waste Isolation Pilot Plant**



We are in the process of forming the Technical Program Committee, and the Technical Program for the meeting. We are looking for your participation. Please contact Sedat Goluoglu, NCSD Chair ([goluoglu@mse.ufl.edu](mailto:goluoglu@mse.ufl.edu)) or Jef Lucchini, General Chair ([lucchinijf@pvtnetworks.net](mailto:lucchinijf@pvtnetworks.net)).



# Education Committee

**Chair: Jason McCall**

The Education Committee met during the November ANS meeting in Washington, D.C. During this meeting, several issues were discussed.



The status of the Whitepapers and the proposed plans were discussed. The table below shows the status/activities for the existing Whitepapers.

| <b>General Process</b>                                     | <b>Primary Author</b>                | <b>Activity</b>   |
|--|--------------------------------------|---|
| Integrating Nuclear Criticality Safety into Design         | Kevin Reynolds<br><i>New Author</i>  | New Whitepaper<br><i>This Whitepaper is undergoing comment resolution phase. Once existing comments have been resolved this paper must be resubmitted to the Education Committee for approval to move forward.</i>            |
| NCSD Whitepaper Overview and Process Lifecycle             | Lon Paulson                          | Recently published in 2015.   |
| Successful NCS Mentorship Program                          | Kristan Wessels<br><i>New Author</i> | Latest Revision 6/06 (Rev. 0)-Reaffirmed 11/15<br><i>This paper has been reaffirmed as of November 2015. The NCSD webpage still needs updating.</i>   |
| Nuclear Criticality Safety Evaluations                     | John Miller<br><i>New Author</i>     | Latest Revision 11/09 (Rev. 1)<br><i>Revision 2 is undergoing comment resolution phase. Once existing comments have been resolved this paper must be resubmitted to the Education Committee for approval to move forward.</i> |
| Nuclear Criticality Accidents in the Workplace: Fact Sheet | John Miller<br><i>New Author</i>     | Latest Revision 6/06 (Rev 1)<br>Minor Revision 4/09 (Rev 1)-Reaffirmed 11/15<br><i>This paper has been reaffirmed as of November 2015. The NCSD webpage still needs updating.</i>   |

Finally, Alyse Scurlock will be assuming all NCSD Education Committee Chair responsibilities at the conclusion of the 2016 Annual Meeting in New Orleans.

# Executive Committee

**Chair: Sedat Goluoglu**

| Division Officers   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• <b>Chair:</b><br/>Sedat Goluoglu<br/><a href="mailto:goluoglu@mse.ufl.edu">goluoglu@mse.ufl.edu</a><br/>Phone: 352-294-1690<br/>University of Florida</li> <li>• <b>Vice Chair:</b><br/>John Miller<br/><a href="mailto:millerj@sandia.gov">millerj@sandia.gov</a><br/>Phone: 505-284-0875<br/>Sandia National Laboratory</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Treasurer/Finance:</b><br/>Larry Wetzel<br/><a href="mailto:llwetzel@bwxt.com">llwetzel@bwxt.com</a><br/>Phone: 434-522-6580<br/>BWX Technologies, Inc.</li> <li>• <b>Secretary:</b><br/>Chad Pope<br/><a href="mailto:popechad@isu.edu">popechad@isu.edu</a><br/>Phone: 208-540-2832<br/>Idaho State University</li> </ul> |

| Executive Committee   |  |  |
|---|--|--|
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## **NCSD Executive Committee Meeting Notes from 2015 Winter Meeting**

The Chairman summarized the content of the ANS President's meeting. The importance of ANS facilitating technology transfer was discussed along with the upcoming ANS IT system update. The ANS collaboration initiative, similar to LinkedIn, was also discussed. Additionally, the ANS is examining the overall society function including meeting schedules and frequency.

The Chairman also reviewed recent Division votes which included: committee appointments, past meeting minutes, formation of a special committee to review bids to host the 2017 topical meeting, establishment of a lifetime achievement award, selection of the topical meeting location (Carlsbad, NM), and removal of Lon Paulson from the Education Committee. All items were approved with the exception of the establishment of a lifetime achievement award which was tabled.

The Chairman also discussed the composition of the division membership and the need for liaisons with the student section and membership committee. Andy Prichard volunteered to serve as the student section liaison. Julie Ezold volunteered to serve as the membership committee liaison.

The Vice Chairman discussed the November 7, 2015 National Program Committee meeting. The Vice Chairman noted that Division Officers should contact Toni Bishop for login information to the ANS archive system. The Vice Chairman also noted the potential change in topical meeting protocol to incentivize embedded topical meetings in the summer meeting.

Movement of items from the collaborative area to the archive area was also discussed. It was decided that the Division Secretary would perform this task. Committee Chairs will inform the Secretary when an item is complete and is ready to be archived.

Robert Bush gave a summary of the ICNC meeting held in Charlotte, NC. The meeting is held every four years with a five country rotation. The meeting was last held in the US in 1995. The meeting had 264 registrants with 176 papers. The meeting attendees were roughly half from the US and half international. Revenue from the meeting is shared with 65% going to ANS and 35% going to the Division. The amount going to the division is approximately \$39K.

Representatives from the 2018 topical addressing the applicability of radiation-response models to low dose protection standards provided information about the upcoming topical and solicited Division support.

There was also discussion regarding assembling a document that outlines how the NCSD and NCS related ANSI/ANS standards function. The document would be primarily used to help new NCSD members. Additionally, there was discussion regarding NCSD interaction with the scholarship award recipients. In particular, the possibility of covering some of the cost of attending the ANS winter meeting to strengthen their interaction with the NCSD.

# Recognition

## Machine Learning in NCS

Many of us have heard Peter's recent presentations on Machine Learning (ML) applications in NCS. Peter presented his approach of taking a popular algorithm or subset of ML that involved Artificial Neural Networks (ANNs) and applied it to function fitting CRAC and SILENE criticality excursion data to determine the peak fissions and fission rate across a broad spectrum of solution excursion parameters. This work was presented at the 2013 winter ANS meeting and subsequently published in the March 2015 issue of Nuclear Technology (Volume #189 p.219-240), where it represents the first application of ML to NCS within any peer-reviewed technical journal.

In his own words Peter “started working with ML to better understand how patterns in multivariate data can be better applied across a broad spectrum of NCS considerations. For NCS applications, this involves the study and construction of algorithms that can learn from and make prediction on data.” In talking with Peter, he understands that most NCS practitioners are not usually exposed to this paradigm and its introduction into NCS work will likely be met with skepticism.

However, he notes that many other disciplines and industries consider ML to be a 21st century approach to data analysis and predication. ANNs can be used for function fitting of any type, uncertainty estimation, time-series prediction, dynamic simulation, and classification. Peter, sees it as the next evolution for exploiting unknown relationships amongst large data sets in the NCS field. Essentially, the process takes some known input independent variables and their values, presents those values to the network, then learns relationships between those inputs and known dependent variable outputs, and then adapts the network “weights” or connections that would result in the smallest delta between “predicted” and known outputs.

This is what Peter did with the CRAC and SILENE data. A second application of the ANN that Peter is pursuing is considerations for criticality code validation, presented at the 2015 ICNC in Charlotte NC, and currently in preparation for another Nuclear Technology journal article submittal. Peter is also involved in developing a dynamic prediction network which would be used to “emulate” time-dependent criticality excursion parameters. This is ongoing work funded under a Plant Directed Research and Demonstration (PDRD) project at Y-12. The application of a criticality excursion “emulator” could be used by emergency planners and technical staff to better evaluate “predicted accident characteristics” and address the likelihoods of recriticality as noted in ANS-8.23. Peter sees a broader applications of ML in NCS as the relationships between different types of data (both static and dynamic) are further explored.

# Honors and Awards

**Chair: Tracey Henson**

## NCSD Awards Dinner

The NCSD annual awards dinner was held on Tuesday, November 10, at Maggiano's Little Italy in Washington, D.C. We enjoyed connecting with friends, networking with peers, recognizing our members' achievements, and eating a delicious multi-course dinner.

We would like to acknowledge our sponsor who through their generous donations helped keep the cost of the dinner more affordable. Our sponsors this year were:



ATKINS Global  
Dr. and Ms. Goluoglu  
Nuclear Fuel Services  
Paschal Solutions, Inc.  
Richard Taylor



Bob Busch  
Jerry Hicks



Forrest Brown  
David Erickson  
Thomas McLaughlin  
Chris Perfetti  
Andrew Prichard  
Larry Wetzel

During the awards dinner, the NCSD Technical Excellence and Distinguished Service awards were presented.

### TECHNICAL EXCELLENCE AWARD

Dr. Forrest Brown, Los Alamos National Laboratory, was recognized for his outstanding contributions to the development and application of Monte Carlo codes for nuclear criticality safety; his contributions to the advancements of random number generators, verification and validation of computational methods; and application of parallel and cluster computing to Monte Carlo methods.

### DISTINGUISHED SERVICE AWARD

Dr. Cecil Parks, Oak Ridge National Laboratory, was recognized for his outstanding service to the Nuclear Criticality Safety Division, with deep appreciation for all his elected leadership positions within the Division; his role in establishment of the honors and awards program; his major role in organizing topical and division meetings; and his contributions to the formality, technical content, and quality of NCSD technical publications.

The Best Paper Award for the NCSD Summer 2015 meeting was presented to Forrest Brown. Additionally, Jerry Hicks was recognized for his service as NCSD Chair.



Nominations for the 2016 NCSD awards are due no later than August 31. The criteria and the nomination forms are available on the NCSD website (<http://ncsd.ans.org/honors-awards/>).