NCSP NEWS

## DATES TO REMEMBER FY2017

- Oct 1, 2017 FY18-22 Five Year Plan published

**Hands-On Training & Education Course Dates**

Two-week Practitioner Course Dates:

- Aug 14 – 25, 2017

Course Registration: http://ncsp.llnl.gov/classMain.html

## LINKS TO REMEMBER

- NCSP WEBSITE CSSG TASKINGS
- NCSP HISTORY & PROGRAM OVERVIEW
- NCSP ORGANIZATION CHART
- NCSP MISSION AND VISION
- NCSP FIVE-YEAR EXECUTION PLAN
- NCSP ACCOMPLISHMENTS
- NCSP PLANNING CALANDER
- PREVIOUS NCSP NEWSLETTERS

**Dr. Angela Chambers**
**NCSP Manager**

## A WORD FROM THE CRITICALITY SAFETY SUPPORT GROUP (CSSG)

The CSSG has been pretty busy since the last update. As indicated previously, the CSSG provided a revision to DOE-STD-3007 to AU. This revision made it into RevCom and went through the usual 60 day review cycle. Then, via Tasking 2017-03 the CSSG developed responses to the approximately 230 comments as deemed appropriate. These resolutions have since been entered into RevCom, and we are awaiting the next stage in the process.

The CSSG is continuing work with two previous Taskings (2016-04: Position of the CSSG on Natural Phenomena, and Other Extreme Events and 2016-05: Regulatory Impediments to Effective Operational Nuclear Criticality Safety). The first has been much more difficult than first envisioned to wrap our arms around, but it looks like we are now on a path to success. The second Tasking report has been drafted, but we are awaiting appropriate feedback to learn how/if it can be posted on the NCSP website.

This year we have completed two other Taskings (2017-01: Review of EM Letter to the DNFSB closing Criticality Safety issues at the Waste Treatment Plan, and 2017-02: Review of FY18 NCSP Proposals by the CSSG). The first has a revision posted, based on feedback received from the Office of River Protection on the original response. The second only includes the transmittal letter on the website, as the information in the accompanying spreadsheet was draft data provided to the NCSP for consideration.

We are looking forward to additional opportunities to support the NCSP and the DOE Criticality Safety Community. Just let the NCSP Manager, or any CSSG member, know if you see something/somewhere where you think we can assist.

David Erickson, CSSG Chair

**Find CSSG Taskings**

## KRUSTY NEWS

**(Kilopower Reactor Using Stirling TechnologY - *A Joint NCSP/NASA Project)***

On April 20, 2017, Angela Chambers, Doug Bowen and Steve Clement observed casting operations for the KRUSTY uranium core components. The NCSP team observed casting and heat treating operations in progress at the Y-12 National Security Complex. The team also toured other Y-12 facilities. These KRUSTY core components are slated to be machined to NASA specifications and shipped from Y-12 to the National Criticality Experiments Research Center NCERC for cold and hot critical assembly operations through early next year. Additional KRUSTY details at Y12 can be found at the following website: **http://www.y12.doe.gov/news/press-releases/fuels-final-frontier.**

***LANL will be hosting the "Nuclear and Emerging Technologies for Space 2018" Conference (NETS-2018) in Las Vegas:***
February 26 – March 1, 2018 as an ANS Topical Meeting. They hope to have lots of KiloPower papers following the successful completion of the KiloPower Reactor Demonstration (KRD) experiment at NCERC in the fall of 2017. General Chair for this conference is Steven Clement at clement@lanl.gov.

***NASA Seeks Nuclear Power for Mars:*** The article from Scientic American can be found at the following link:
https://www.scientificamerican.com/article/nasa-seeks-nuclear-power-for-mars/

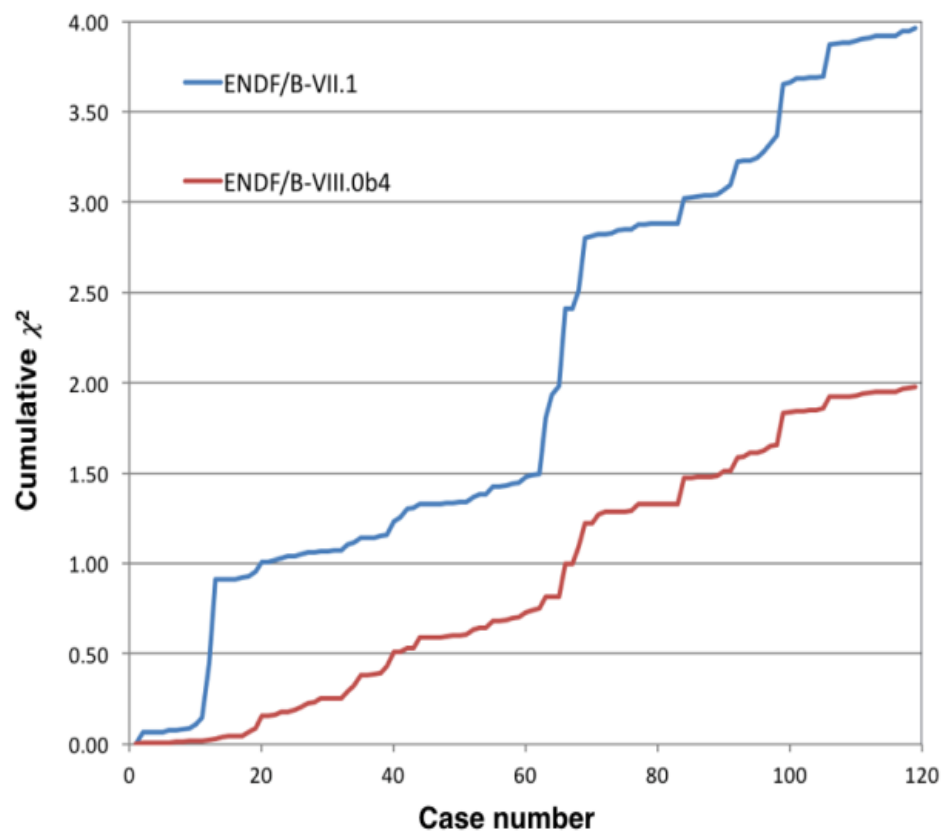
NCSP NEWS

## RECENT NCSP ACCOMPLISHMENTS

**Brookhaven National Laboratory (BNL):** **Status of ENDF/B-VIII** The ENDF/B library (www.nndc.bnl.gov/endf/) contains nuclear reaction data for use in criticality safety and many other nuclear applications. ENDF/B is the product of the Cross Section Evaluation Working Group (CSEWG), a long-running collaboration that includes the NCSP. Currently CSEWG is preparing a new release, due late 2017: ENDF/B-VIII.0. Major changes to ENDF/B include: New Neutron Standards cross-section evaluations; Complete standards-level evaluations from the CIELO pilot project: $^{235,238}$U, $^{239}$Pu, $^{56}$Fe, $^{16}$O, and $^{1}$H; Many new and improved neutron evaluations, (many funded by the NCSP); New atomic reaction data; Many new thermal scattering evaluations, most funded by the NCSP; Improvements to charged-particle reactions.

ENDF/B-VIII.0 is the best performing ENDF/B library to date as is shown in the figure. ENDF/B performance is typically measured by the agreement of experimental and calculated $k_{eff}$ of critical assemblies; the figure below shows the Cumulative $\chi^2$ from calculations of $k_{eff}$.

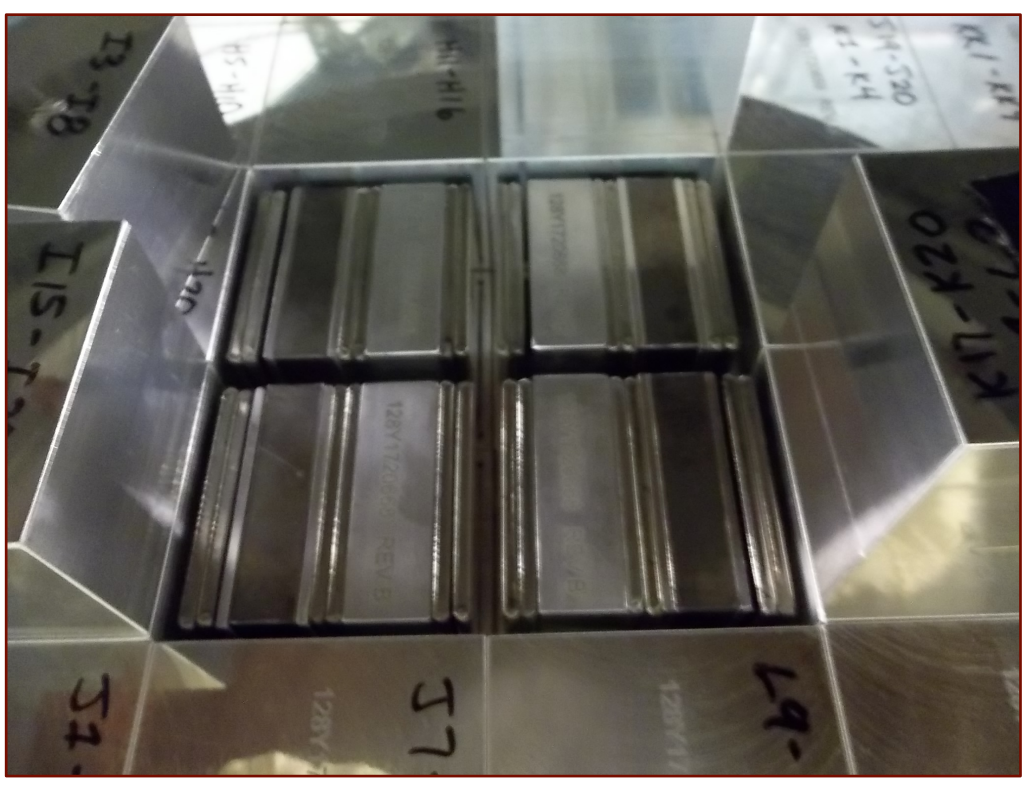
While ENDF/B-VIII.0 is not to be released until the end of 2017, the NCSP and the rest of CSEWG are actively preparing for it. The β5 release date is scheduled for 15 Sep 2017, and our annual Hackathon (in which we fix as many ENDF bugs as possible) is scheduled for 21-25 Aug 2017 at LLNL. This library is being issued in the traditional ENDF-6 format, as well as in an alternative new Generalized Nuclear Database Structure (GNDS) format.




**Los Alamos National Laboratory (LANL):** The mission of the Office of Removal (NA-232) within the Material Management and Minimization Program (NA-23) is to remove or confirm the disposition of weapons useable material. As part of the agreement to remove all HEU and Pu fuels from the Fast Critical Assembly (FCA) in Japan in advance of the 2016 Nuclear Security Summit, the U.S. and Japan decided to jointly conduct some of the FCA's planned experiments in the United States. LANL has led this effort using the NCERC capability. The experiments were designed to generate data for the JAEA design of an Accelerator Driven System (ADS) with lead-bismuth coolant and focus on lead cross section and lead void worth measurements.

The Jupiter experiment, the third in the series on the Comet critical assembly machine, was loaded to a critical configuration over the course of three weeks in May. Jupiter utilizes Pu plates originally manufactured for the ZPPR experiments. The Pu plates, along with thick lead plates, are loaded into aluminum boxes that are arranged in layers on Comet and are reflected on all sides by copper. Void measurements were performed by removing the lead in central positions and replacing it with Al spacers. These measurements were performed during the first two weeks of June. It was agreed that additional data is desired, and the experiments will continue with data being supplied to JAEA afterwards. Both additional void measurements and Rossi-alpha measurements will be performed.

The photos show open aluminum boxes, where four of the lead plates have been replaced by aluminum spacers (left) and the top layer loaded into the upper reflector (right).



## RECENT NCSP ACCOMPLISHMENTS *(continued)*

### Lawrence Livermore National Laboratory (LLNL):

**TEX**

Thanks to the hard work and dedication of Catherine Percher (Principal Investigator, LLNL) and Rene Sanchez (NCERC Crew Chief, LANL), the Thermal/ Epithermal eXperiment (TEX) IER-184 achieved 1st critical on June 27 on the Planet assembly machine. TEX is designed to be a flexible testbed plutonium assembly producing fast, intermediate and thermal neutron fission spectra. This is the first in a number of planned TEX critical assemblies which will provide unique, high precision, integral experiment benchmark data for use in validating nuclear data and analytical methods.

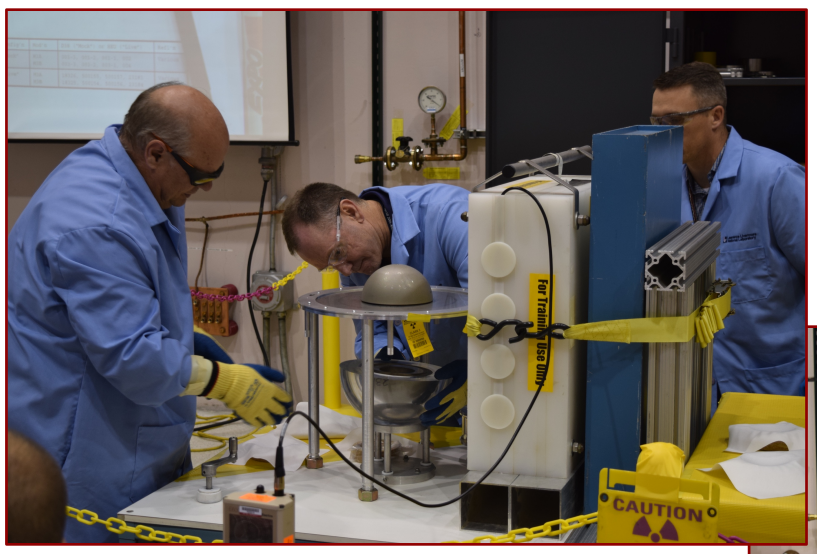
Photographed to the right, from right to left: Rene Sanchez, Catherine Percher, Rian Bahran, Jesson Hutchinson and George McKenzie.
Not pictured: Travis Grove and Theresa Cutler.

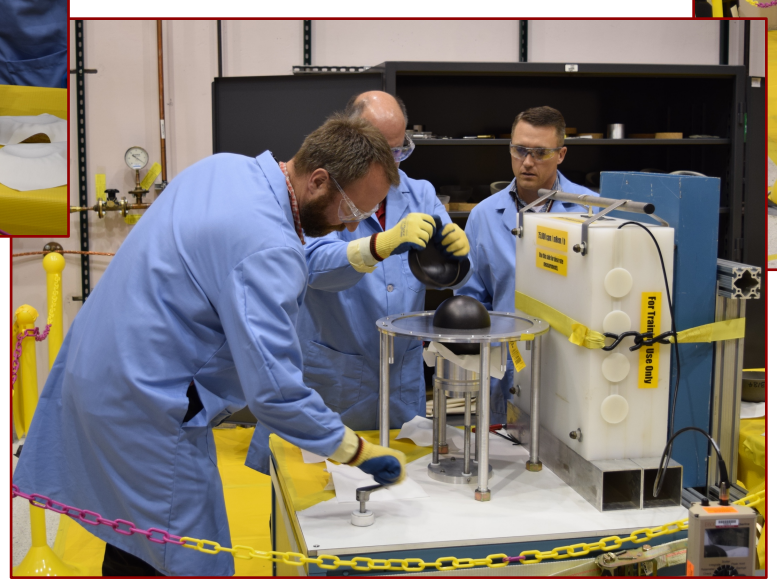
IER-252 measurements to establish reference dosimetry values for the mixed neutron and photon radiation field around the Flattop assembly at NCERC were performed during two weeks in May. The measurement campaign involved a large contingent of dosimetry and radiation detection experts from AWE, IRSN, LLNL and SNL, deploying a variety of precision instruments and activation targets for dose and spectrum reconstruction. LANL NCERC personnel operated the Flattop assembly and provided valuable assistance to the measurement team. Data analysis is in progress with a final report expected by the end of the calendar year.

Photographed to the left, from left to right: Marian Bauman, Matthieu Duluc, Lydia Tai, Francois Trompier, Bruno Asselineau, John Scorby, Dann Ward, Elliott Leonard, Leo Clark, Phil Angus, Karen Jeffers, Mark Jackson, Becka Hudson, Dave Hickman, Phil Scivier and Catherine Percher.
Not shown: Joetta Goda, Dave Hayes, Dave Heinrichs, Chris Wilson, Verity Woolhead, Gary Slavik, Todd Matz, Radoslav Radev, Edward Reedy, Soon Kim, Donny Kavanagh, Paul Yap-Chiongco and Greg Keefer.

**TACS**

The Training Assembly for Criticality Safety (TACS) is one of the experimental components of the NNSA Nuclear Criticality Safety Training Program. TACS utilizes 8 hemispherical highly enriched uranium shells along with a variety of non-fissile shells to demonstrate the effects of moderation, reflection, neutron poisons, and spacing on assembly multiplication. This “hands-on” approach of teaching provides an exceptional learning experience for the students.



NCSP NEWS

## RECENT NCSP ACCOMPLISHMENTS *(continued)*

**Nevada National Security Site (NNSS):** In support of the Kilowatt Reactor Using Stirling Technology (KRUSTY) Demonstration, NSTec is providing Project Management, Design and Systems Engineering, Procurement and Construction support to enable LANL to partner with NASA to perform the KRUSTY experiment on the Comet criticality machine at the Device Assembly Facility at the NNSS.

The intent of the experiment (called KiloPower by NASA) is to assemble and evaluate the operational performance of a compact reactor configuration that closely resembles the flight unit used by NASA to execute a deep space exploration mission.

NSTec formed an Integrated Project Team to provide the necessary design of the NASA-requested electrical systems to support operations for their equipment. Mechanical and Systems Engineering is providing required support for the cooling system for the experiment. The Safety Basis is being modified to address all safety concerns with the Project. NSTec has partnered with LANL and NASA to integrate the schedule for conduct of the experiment.

**Oakridge National Laboratory (ORNL):**

**Hands-on Training Courses – Quarter 2**

**1-Week Manager Course – June 19-23, 2017:** A 1-week NCS Manager Course at the National Criticality Experiments Research Center (NCERC) was successfully completed that involved a series of NCS lectures and hands-on experiments.

**Recent Commendation from the Defense Nuclear Facilities Safety Board (DNFSB)**
**(NCSP Hands-on Training Courses)**
*Bruce Hamilton (Deputy Chair DNFSB) recently participated in the 2-week hands-on training courses and wrote a letter commending the NCSP Hands-on Training Team, which consists of the following labs and sites: LANL, LLNL, NSTEC, ORNL, NSTEC, NFO, SNL and Y12. The course curriculum has been developed and refined by Nuclear Criticality Safety experts and has demonstrated a high success rate. The exemplary support staff consists of highly-knowledgeable and enthusiastic instructors and dedicated team players.*

**Renssalaer Polytechnic Institute (RPI):** Prepared experimental plan for Ta RRR and URR measurements and obtained sample quotes. Worked with CSEWG on the benchmarking the evaluation of Fe, Fe-56, against our capture and scattering experimental data. Completed neutron scattering measurements at SNS for samples of Lucite, Teflon, and Concrete. Compared the Lucite experiment to new ENDF/B-VIII.b4 evaluations and observed noticeable disagreement. Finished developing a new method for producing thermal libraries using DFT simulations and VISION instrument at SNS. Modulator production started at vendor site. Accelerator sections design purchase recommendation was submitted to NNL (KAPL).

**Sandia National Laboratory (SNL):** Conducted Hands-on Training courses. Continued efforts on Sandia Critical Experiments.

**Y12:** Participated in Hands-on Training course development and instruction.

## OTHER NCSP NEWS

**Nuclear Data Advisory Group (NDAG):** As many of you may already know, Skip Kahler has recently stepped down as the NDAG Chair. Mike Zerkle was elected earlier this year to serve as the new NDAG Chair and has assumed his responsibilities as the new Chair. We'd like to welcome Mike to his new duties as NDAG Chair (Michael.Zerkle@unnpp.gov).

We'd also like to thank Skip for his service to the community and wish him well on future endeavors. He will remain active as a member of the Nuclear Data community in the coming years and will continue to receive emails at his LANL address (akahler@lanl.gov).

A. C. (Skip) Kahler

Michael L. Zerkle