

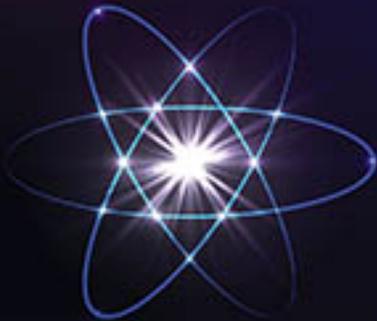


## NEWSLETTER

# WINTER 2020

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### DATES TO REMEMBER

Hands-On Training & Education Course Dates:  
 Two-week Practitioner Course Dates:  
 Jan 25-Feb 5, 2021      Aug 9-20, 2021

One-week Manager's Course Dates:  
 Apr 5-9, 2021      Jun 7-11, 2021

Course Registration:  
[https://ncsp.llnl.gov/trng\\_apply.php](https://ncsp.llnl.gov/trng_apply.php)

### LINKS TO REMEMBER

- [NCSP Website](#)
- [NCSP Program Management](#)
- [NCSP Mission and Vision](#)
- [NCSP Five-Year Execution Plan](#)
- [NCSP Planning Calendar](#)
- [Previous NCSP Newsletters](#)
- [CSSG Taskings](#)
- [Nondestructive Assay Program](#)



## FY22 Proposals

The Call for Proposals was issued October 15 and closed November 13. A total of 40 proposals were received by the NCSP Management Team. The proposals will be reviewed and ranked by the Nuclear Data Advisory Group (NDAG) and Criticality Safety Support Group (CSSG) as the FY2022 NCSP budget cycle begins.

## NCSP Technical Program Review and Joint Meetings

This year's NCSP Technical Review Program (TPR) and joint meetings will be held virtually, hosted by Oak Ridge National Lab (ORNL). Please mark your calendar for February 22 – 25. The schedule, agenda, website are in development. At this time, the NDAG and Analytical Methods (AM) working group will meet on Monday, February 22, the TPR will meet Tuesday and Wednesday, February 23 – 24 and the CSSG will meet Thursday, February 25. Dates for the meetings are subject to change. Information about the TPR is now being posted on the NCSP website: <https://ncsp.llnl.gov/annual-tpr.php>.

## A Message from Angela

Happy 2021! As most of you know, we have an approved budget, and NA-50 Safety and Environmental Operations, under which the DOE NCSP falls, received its full FY21 budget request. AFPs for distributing the FY21 budget allotment are expected in February.

Despite the setbacks and constraints that the COVID-19 pandemic presented, the NCSP was successful in meeting its major milestones, including completion of the TEX HEU baseline experiments, the CURIE critical experiment (see the article in this newsletter), conducting the two-week Hands-on NCS Course for a group of Y-12 and UPF students, participating (virtually) in the International Criticality Safety Benchmark Experiment Program meeting, and the CSSG performing a technical assist of the SRSPPF. Currently, NCERC is conducting Criticality Accident Alarm System testing for a new system that will be installed in to the UPF. We are preparing for the next two-week course, where, for the first time, we will conduct Week 1 virtually. I want to express my sincere appreciation for all that the NCSP community does and all that you endured this past year to keep the NCSP tasks going. I look forward to seeing you all (virtually) at the TPR in February.

Please contact Marsha Henley for information or contributions:  
[henleym@ornl.gov](mailto:henleym@ornl.gov)



## CURIE: Critical Unresolved Region Integral Experiment Performed at the National Criticality Experiments Research Center (NCERC)

The Critical Unresolved Region Integral Experiment (CURIE) measurement campaign was completed in June and July 2020 at the National Criticality Experiments Research Center (NCERC) at the Nevada National Security Site (NNSS). This measurement campaign provides five unique integral experiment configurations, with maximum sensitivity to the full unresolved resonance region (URR) of U-235. These configurations use Highly Enriched Uranium metal plates interleaved with polytetrafluoroethylene (better known as Teflon) and surrounded by a thick Copper reflector to provide much-needed integral experiment data sensitive to the URR for U-235. Rossi-alpha measurements were also performed over the range of configurations to provide information on the kinetics parameters, such as beta effective of the systems.

The URR is generally located in the intermediate energy neutron cross section region, after the resolved resonance region but before the fast cross section region begins (approximately 2.25 keV to 25 keV for U-235). Recent differential measurements in this region have provided cross section data to be incorporated into cross section datasets (ENDF/B-VIII.0, etc.). An integral experiment sensitive to these cross sections is needed to validate the results. Additionally, significant computational advances have occurred for simulating transport in this energy region, and the codes need experiments for validation.

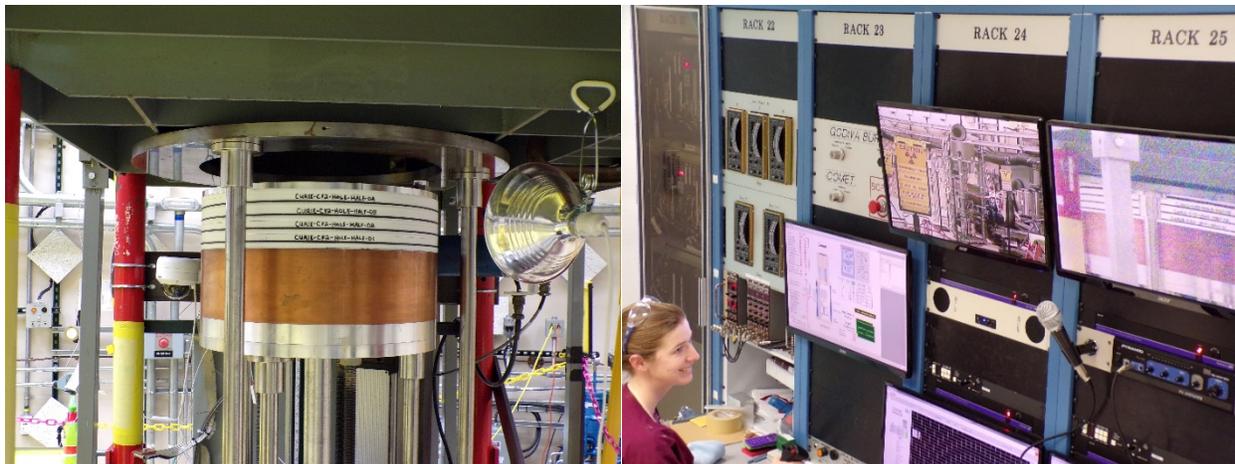


Fig 1: A portion of the lower half of the core for a CURIE configuration. The aluminum spacer on the top was used during the approach-to-critical process, but was not present in the final critical configuration.

Fig 2: Theresa Cutler operates Comet from the NCERC Control Room during the CURIE experiment.

Five different configurations of CURIE were measured, with varying amounts of Teflon moderator between the layers of HEU. These different configurations will provide multiple data points spanning the URR cross section sensitivity, providing for full validation of the region.

This will provide the experimenters with enough data to create a quality benchmark evaluation for submission to the International Criticality Safety Benchmark Evaluation Project (ICSBEP). The results will support criticality safety validation, cross section validation, and code validation of the U-235 URR. Now that experiment execution is complete, an in-depth analysis of the data with detailed simulation models of the experiment will be performed. Comparing the

measured and simulated data will be the foundation of the benchmark process. Overall, this will lead to a better understanding of the unresolved resonance region for U-235, and potentially an enhancement to the safety of processes that involve it.

Configuration	Reactivity (cents)	Period (seconds)
5/8" Teflon	32.31	14.74
6/8" Teflon	17.14	44.36
7/8" Teflon	34.95	12.54
8/8" Teflon	23.17	27.30
9/8" Teflon	15.11	53.46

The above table gives preliminary results for the five measured configurations. The configurations are named by the amount of Teflon between U-235 plates, while the reactivity is calculated from the measured reactor period values.

#### Acknowledgement

This work was supported by the DOE Nuclear Criticality Safety Program, funded and managed by the National Nuclear Security Administration for the Department of Energy.



#### IRSN/NCSP Collaboration

IRSN and the NCSP Manager have modified the IRSN/DOE Memo of Understanding (MOU) to extend their collaboration another 5-years. The new MOU is expected to be signed by both parties in the very near future. We look forward to continued collaborations with IRSN!

#### Nuclear Data Week (CSEWG-USNDP-NDAG)

The 2020 Nuclear Data Week was held virtually November 30 – December 4. Meetings included CSEWG, USNDP, WANDA, and the NCSP-NDAG. The NDAG held a meeting on December 3<sup>rd</sup> and the agenda included technical topics from the national laboratories as well as preliminary discussions for NCSP tasks related to the NCSP 5-year plan nuclear data priorities and helping to review and rank NCSP proposals for FY2022. The agenda and presentations for these meetings are available here: <https://indico.bnl.gov/event/7233/>.

## 2020 ANS Virtual Winter Meeting

The 2020 American Nuclear Society (ANS) Winter Meeting was held virtually November 16 – 19, 2020. The Nuclear Criticality Safety Division (NCSD) sponsored the technical session, “Recent Nuclear Criticality Safety Program Technical Accomplishments” on Monday, November 16 from 1 – 3:10 PM EST. It was attended by approximately 80 – 90 people

Presented papers included:

- “Data Testing of Polyethylene Thermal Scattering Law with New Thermal Epithermal eXperiments (TEX) Plutonium Baseline Benchmark, PU-MET-MIXED-002,” Catherine Percher (LLNL), Jesse Norris (LLNL), Soon Kim (LLNL) and David Heinrichs (LLNL)
- “Bayesian Monte Carlo Evaluation Framework for Cross Sections Nuclear Data and Integral Benchmark Experiments,” Goran Arbanas (ORNL), Jesse Brown (ORNL), Andrew Holcomb (ORNL) and Dorothea Wiarda (ORNL)
- “S/U Comparison Study with a Focus on USLs,” Jennifer Alwin (LANL), Forrest Brown (LANL), Justin Clarity (ORNL), Isabelle Duhamel (IRSN), Frederic Fernex (IRSN), Luiz Leal (IRSN), Robert Little (LANL), William J. Marshall (ORNL), Michael Rising (LANL), Ellen Saylor (ORNL), and Kristina Spencer (LANL)
- “Experiments at Sandia to Measure the Effect of Temperature on Critical Systems,” Gary Harms (Sandia), David Ames (Sandia)

## International Criticality Safety Benchmark Evaluation Project (ICSBEP) Technical Review Group (TRG) Meeting

The ICSBEP TRG was hosted virtually by the Organisation for Economic Co-operation and Development /Nuclear Energy Agency (OECD/NEA) in Paris, France the week of October 19, 2020. The various US laboratories participate in the ICSBEP meetings to ensure a rigorous review of proposed benchmarks. These high-quality benchmarks can then be used by the Department of Energy (DOE), National Nuclear Security Administration (NNSA) and commercial facilities throughout the country to perform validations supporting nuclear criticality safety analyses. Information about the ICSBEP and these activities can be found at the ICSBEP NEA website: [https://www.oecd-nea.org/jcms/pl\\_24498/international-criticality-safety-benchmark-evaluation-project-icsbep](https://www.oecd-nea.org/jcms/pl_24498/international-criticality-safety-benchmark-evaluation-project-icsbep).

## Training and Education

### Special Y-12 Course Completed in the Fall 2020

The NCSP held a special NCSP 2-week course in the fall of 2020 to help Y-12 with the training and qualifications for 16 new NCS staff. The lecture portion of the course was held in September and hands-on experimental portion of the course was held in November at NCERC. Ten Y-12 staff were able to attend the second week of the course.

### NCSP Hands-on Training and Education Courses

*\*\* At this time the training will be virtual. Planning efforts have begun on a virtual lecture portion (1<sup>st</sup> week) of the course.* Planning for the FY2021 courses will start in December 2020 and will include converting the lecture portion of the class to a virtual format until face-to-face courses can be re-established. The hands-on experiments will be conducted with limitations on the number of students that can attend due to COVID-19. To ensure student throughput is

maintained as much as possible, there may be additional course offerings as long as students are allowed to travel to the course. An update will be provided in the Spring 2021 newsletter.

**Two-week Practitioner Course Dates:**

**Jan 25-Feb 5, 2021                      Aug 9-20, 2021**

The first week of the NCS Practitioners Course will be held virtually while the second week will still be conducted at the National Criticality Experiments Research Center (NCERC) and Sandia National Laboratories. The courses are designed to meet the ANSI/ANS-8.26, "Criticality Safety Engineer Training and Qualification Program," requirement for hands-on experimental training. The NATM portion of the course involves virtual classroom lectures and workshops for NCS Evaluation development and the NCERC and SNL portions of the course involve hands-on experiments with the critical assemblies. Due to COVID-19, there will be limits on the number of students attending the course. MSTs, LANL, ORNL, LLNL, SNL, Y12 and NFO staff participate in the course execution.

**One-week Manager's Course Dates:**

**Apr 5-9, 2021                              Jun 7-11, 2021**

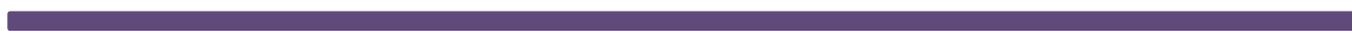
The Managers courses will be held at both NCERC and SNL. The courses are designed for fissile material handlers, process supervisors, line managers and regulators with criticality safety responsibilities. MSTs, LANL, ORNL, LLNL, SNL, Y12 and NFO staff participate in the course execution.



Class Information: <https://mcnp.lanl.gov/classes/classinformation.shtml>

Fees and Registration Information:  
<https://laws.lanl.gov/vhosts/mcnp.lanl.gov/classes/CostsRegistrationInfo.shtml>

Apr 5 – 9, 2021	Intermediate MCNP6 (online)
May 24 – 28, 2021	Introduction to MCNP6 (online)
June 7 – 9, 2021	Criticality Calculations with MCNP6 (online)





Course Information: <https://www.ornl.gov/scale/training>

Course Registration: <https://utconferences.eventsair.com/virtual-scale-winter-2021/register/Site/Register>

Fee information: <https://www.ornl.gov/file/scale-registration-fee-information/display>

February 22 - 25, 2021	SCALE/Polaris Lattice Physics, Depletion, and Uncertainty Analysis (online)
March 1 – 4, 2021	SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis Course (online)
March 8 – 11, 2021	SCALE Criticality Safety and Radiation Shielding Course (online)
March 15 – 18, 2021	SCALE Computational Methods for Burnup Credit (online)

## Safety Analysis Report for Packaging (SARP) Analyst Course

The DOE Packaging Certification Program (PCP), Office of Packaging and Transportation, is offering a Safety Analysis Report for Packaging (SARP) shielding and nuclear criticality safety (NCS) course for SARP analysts. The material is presented to emphasize the key elements of the shielding and criticality analyses.

The course will be hosted virtually from Oak Ridge National Laboratory (ORNL) March 1 – 5, 2021. The SARP Analyst Course ([NP 607 Radiation and Nuclear Criticality Analysis of RAM Packages](#)) provides detailed instruction on the radioactive material package shielding analyses and NCS evaluation fundamentals needed by analysts/practitioners (i.e., safety analysts and/or technical reviewers) to prepare and/or review technical analyses for the SARP documentation. The Analyst Course also provides an overview of regulations and guidelines in addition to detailed in-class exercises associated with the package shielding and NCS analyses. With regard to the in-class exercises, analysis teams will be faced with “staged” SARP examples in which a number of important decision processes in the generation of a SARP will be demonstrated and discussed. Please find more information and the registration web page on the SARP home page, <https://sarp.ornl.gov/>.