

NCSP 3rd Qtr FY2008 Accomplishments

INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT **INL**

- The annual International Criticality Safety Benchmark Evaluation Project (ICSBEP) meeting was held in Prague, Czech Republic, May 5 - 9, 2008. Representatives from 13 of the 20 participating countries attended, including the United States (BAPL, INL, ANL, LLNL, LANL, ORNL, SNL, and WSMS), United Kingdom, Japan, Russian Federation (IPPE, VNIITF), France (IRSN and CEA), Slovenia, Brazil, India, Canada, Czech Republic, Argentina, Spain, and Sweden. A total of 37 individuals participated in the meeting.
- Twenty-eight new evaluations and five revisions of previously published evaluations were reviewed and discussed. Twenty-four evaluations were approved for publication. Four evaluations are still in progress and were deferred until next year. If all of the approved evaluations are completed in time for publication, the 2008 Edition of the *International Handbook of Evaluated Criticality Safety Benchmark Experiments* will contain 4,215 critical or subcritical configurations, 24 criticality alarm/shielding configurations, and 145 configurations that have been categorized as fundamental physics measurements that are relevant to criticality safety applications.

ANALYTICAL METHODS DEVELOPMENT AND CODE SUPPORT

ANL

- Collaboration is ongoing with BNL, Petten and Vienna to implement the Monte Carlo-based methodology for evaluation of covariance data (D. Smith).
- Improved unresolved resonance sampling coding; improved computational repeatability across platforms, compilers, and optimization levels (R. Blomquist).
- Increased the number of drawer types that can be modeled (for the ICSBEP criticals).
- Publication: D. L. Smith, "A Unified Monte Carlo Approach to Fast Neutron Cross Section Data Evaluation," ANL/NDM-166 (January 2008).

LANL

- Sent ENDF70SAB, an MCNP thermal $S(\alpha,\beta)$ library based on ENDF/B-VII, to RSICC for testing.
- Presented a specialist class on "Theory and Practice of Criticality Calculations with MCNP" at Argonne National Laboratory (26 attendees).
- Presented two "Introduction to MCNP5 and MCNPX" classes during June. A total of 38 students were in attendance.
- Made significant progress on eliminating the underprediction of confidence intervals in eigenvalue calculations. Submitted a paper on this work for the ANS Winter Meeting.
- Presented two NJOY tutorials (ICRS11 in April and ANS Summer Meeting in June) to a total of approximately 65 people.
- Participated at "Workshop on Neutron Cross Section Covariances," June 24-27, Port Jefferson, NY. Presented the following poster:
- "Recent NJOY/ERRORJ experience (Kahler)
- Continued work on NJOY2008. ERRORJ conversion from F77 to F90 is ongoing.

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ORNL

- Provided 218 responses to users requesting technical assistance.
- SCALE development and website maintenance (www.ornl.gov/sci/scale):
 - Capability to sample from both delayed and prompt neutron spectra has been implemented into new KENO version with continuous energy capability.
 - Development of automated benchmark testing KENO is 80% complete.
 - Development of KENO-VI Primer is 75% complete.
 - Updates on 30 SCALE modules, data and program libraries for SCALE 6.
- AMPX Maintenance and Library Generation:
 - Implemented and tested capability to generate temperature-dependent pointwise energy meshes for data libraries—completes FY 2008 AMPX milestone.
 - Regenerated CE and MG ENDF/B-VI.8 and ENDF/B-VII.0 libraries with temperature-dependent energy meshes for SCALE 6.
 - Generated “comprehensive” SCALE 6 covariance library using evaluated and recently developed multi-lab low-fidelity covariance data—testing in progress.
- Development efforts on KENO-VI TSUNAMI-3D have concluded. Codes are being baselined for SCALE 6 release. Documentation is being prepared.
- All TSURFER features have been implemented. TSURFER HTML output is being finalized. Documentation is nearly complete.
- RSICC activities: See rsicc.ornl.gov for monthly newsletters.
 - Distributed 526 software packages and updated 6 software packages.
 - 77 SCALE and 125 MCNP packages distributed.
 - Electronic notebook entries for SCALE and MCNP.
 - RSICC quarterly report issued.
- Prepared two papers on TSUNAMI methods and applications for publication in *Nuclear Data Sheets*. Papers presented at the BNL Workshop on Neutron Covariances.
- Prepared PHYSOR-2008 paper on capability development and validation for new version of KENO with continuous energy.
- Invited presentation made on TSUNAMI tools and covariance data library at OECD/NEA Working Party on Scientific Issues of Reactor Systems (WPRS) expert group meeting on Uncertainty Analysis in Best-Estimate Modeling (UAM) for Design, Operation and Safety Analysis of LWRs – Second Workshop (UAM-2).
- Issued letter report on CED-1. Input obtained from LLNL and LANL on application focus and experiment constraints for CED-1.

NUCLEAR DATA

ANL

- Technical Program Chair and author/coauthor of 9 papers for the 2008 Workshop on Neutron Cross Section Covariances.
- Ongoing support of the OECD/NEA Expert Group on Uncertainty Analyses for Criticality Safety Assessment (UACSA).
- Provided NDAG review and input for NCSP Integral Experiment Requests (IERs).

BNL

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- Checked and reviewed new ORNL evaluation for 55-Mn with covariances in the resonance region. The file was included in ENDF/A as candidate for ENDF/B-VII.1.
- Completed covariance evaluations for 55-Mn and 90-Zr in the fast neutron region. Results were reported in the Covariance Workshop held in Port Jefferson, NY, June 2008.
- Completed paper describing production of low-fidelity covariances for more than 300 materials. The paper was submitted to Nuclear Science & Engineering.
- Completed scripts and design of Graphical User Interface (GUI), to be integrated into EMPIRE as its new resonance module.
- Organized Workshop on Neutron Cross Section Covariances, Port Jefferson, NY, June 24-27, 2008. This major event was attended by 53 scientists, including 37 from the United States and 16 from 10 foreign countries. The NNDC presented 6 papers.

LANL

- Participated at “Workshop on Neutron Cross Section Covariances,” June 24-27, Port Jefferson, NY. Presented the following talks:
 - “Covariances from light-element R-matrix analyses” (Hale).
 - “Covariance evaluation work at LANL” (Kawano).
 - “Low-fidelity covariance project” (Little).
 - “Uncertainty quantification on prompt fission neutron spectra” (Kawano / Talou).
- Participated in NDAG meeting during ANS summer meeting in Anaheim, CA. Reviewed and updated GANTT charts for Nuclear Data evaluations.
- Continued work on Ti isotopic evaluations. Resonance parameters have been updated based on Mughabghab’s compilation and radiative capture cross sections in fast energy range have been studied.
- Kahler attended annual ICSBEP meeting and contributed independent reviews to selected HEU/V evaluations.

ORNL

- Collaborated with KAERI on testing of ORNL-LANL U and Pu covariance data files in S/U analyses.
- Initiated preparation of ORNL/TM report documenting ^{19}F evaluation.
- Produced complete ^{41}K ENDF/B file with resonance parameters and covariance data—internal testing in progress.
- Initiated resolved resonance evaluation of new ORELA measured data for $^{52,53}\text{Cr}$ and $^{58,60}\text{Ni}$.
- Completed milestone for participation (Dunn and Leal) in June NDAG meeting.
- Completed milestone for participation (Dunn and Leal) participated in OECD/NEA WPEC meeting at JAEA.
- Completed assessment of ^{235}U capture issues for intermediate benchmark problems reviewed in collaboration with JAEA. Report given at WPEC meeting.
- Initiated transition plan for SAMMY apprentice.
- Completed milestone for combining low-fidelity covariance data from BNL and LANL with ORNL low-fidelity data—combined files distributed to ANL for testing.
- Prepared two ORNL papers for *Nuclear Data Sheets* as presented BNL Workshop on Neutron Covariances held in Port Jefferson, NY.
- Published two nuclear data papers via ANS Transactions (June).
- Completed and submitted five nuclear data papers for publication at PHYSOR-2008.

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DIFFERENTIAL MEASUREMENTS

ORNL

- Completed milestone for ^{53}Cr capture and transmission measurements.
- Data reduction completed for ^{53}Cr capture—data delivered to evaluator.
- Data reduction completed for natural Cr capture and transmission—data delivered to evaluator.
- Ordered enriched ^{48}Ti sample for measurement in 4th quarter.
- Data reduction completed for ^{58}Ni and ^{60}Ni neutron capture—data delivered to evaluator.
- Completed milestone for reliable ORELA operation with ~300 hours in 3rd quarter (~1100 hours FY YTD).

INTEGRAL EXPERIMENTS

INL

- The Commissariat à l'énergie atomique (CEA) dismantled and removed the previous plutonium solution device from the experimental cell located at the Valduc Nuclear Center. Assembly of the APPARATUS B experimental device and test operations were completed. The safety assessment report was also completed. All milestones for FY 2008 were met. The MIRTE experimental program is now ready to begin.
- United States Titanium plates have been manufactured and will be shipped to Valduc by mid July.

LANL

- Successfully supported all required DAF TSR surveillances, maintenance and operational activities as required.
- Purchase order for fabrication of Ni shells was awarded to Churchman's Machine Company.
- Continued with development of first two CEF training modules: neutron physics and reactor physics.
 - Three modules to be completed by 4th quarter.
- **CEF operations personnel traveled to SNL to participate in two training sessions in support of CX startup.**
 - This is the kickoff program intended to result in qualifying LANL operators to the SNL requirements for CX operation.
 - Discussions also initiated with UNM as to possible training opportunities.
- **Two CEF operations personnel attended the first two-week training installment at Valduc.**
 - **Also hosted French visitors both at Los Alamos and at the Nevada Test Site.**
- Continued with sensitivity analyses of proposed critical experiments 104 and 105.
- Received shipment of reflectors and miscellaneous materials from TA-18 to the CEF warehouse.
 - Completed all required warehouse surveillances.

ORNL

- Subcontract in place for retired expert who guided construction of last several chambers.
- Purchase orders in place for needed off-the-shelf parts.

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- Drawings located and reviewed for changes needed to obtain tighter tolerances for more reliable welding and dimensional changes to accommodate improved performance.

INFORMATION PRESERVATION AND DISSEMINATION

Fluor Hanford

ARH-600

- Review of Beta test version prior to release was performed. Issues are being resolved.
- Graph digitizing software has been acquired and installed to improve digitization of ARH600 graphs.
- Beta test library for distribution has been established. This includes most of the ARH600 graphs as well as select MCNP and Scale critical sphere curves.
- Funding was reduced by \$10K to provide additional funds for a special project (Anomalies Document Revision*).

55-GALLON DRUM

- Internal testing of question set completed.
- Established contact with recipients of questionnaire.
- Questionnaire sent to select endusers on 02/15/2008.
- Received responses to the initial questionnaire from SRS and INL based on telephone and email efforts.

ANOMALIES

- Several samples of figures were generated. These are currently awaiting review.
- The text was entered into word, and has been compared against the originals.
- Additional funds from another task (ARH-600) were made available to keep the effort progressing.

LLNL

- Completed DOE HQ request on NCSP website improvement on May 20, 2008.
- Implemented Multimedia NCSET module on May 31, 2008.
- Deployed beta version of FY2008 NCSP Users On-Line Questionnaire on June 30, 2008.
- Added 728 abstracts from Dyer/Thomas (ORNL) files to the NCSP Bibliographic database.

ORNL

- The ORCEF Heritage is in final editing (Hopper and Westfall) and DVD production by the ORNL Visual Instrumentation department. Final version contains 11 sessions with 32 topics and several hundred subtopics.
- The former Oak Ridge Electron Linear Accelerator (ORELA) Director has recorded audio introductions for the seven sessions of recording for the ORELA Heritage video. The final edit is underway.
- Discussions were conducted with the RSICC Director on potential pathways for distributing hard copies of the DVDs and/or making the videos available electronically.

TRAINING AND QUALIFICATIONS

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LLNL

- Completed a class on April 17, 2008.
- Manufactured ten new Lucite reflector shells.
- Manufactured new support posts for assembly machine.

ORNL

- The final draft of the NCSET module for subcritical noise analysis has been completed, internally reviewed, and distributed to external reviewers.

NUCLEAR CRITICALITY SAFETY PROGRAM SUPPORT

- Drafted and issued April 17, 2008 CSSG Suggestions for FY08 Taskings.
- Reviewed and developed assignments for NCSP Manager Taskings 2008-1, Y-12 CAAS Safety Basis Review.
- Initiated work on NCSP Manager Tasking 2008-2, Y-12 CAAS Safety Basis Review.
- Initiated the responded to NCSP Manager Tasking 2008-3, Assessment and Recommendation for DOE Needs for a large, multi-purpose horizontal split table critical assembly device.
- Participated in June 2008 CSSG Anaheim, CA meeting.