

NCSP 2nd Qtr FY2008 Accomplishments

INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT **INL**

- ICSBEP participants focused on new evaluations that will be submitted to the annual ICSBEP Technical Review Group Meeting. Twenty-eight new evaluations are scheduled for review at this meeting. Independent Review of thirteen of those evaluations was completed and those evaluations were distributed to the ICSBEP Technical Review Group in preparation for the review meeting.
- Arrangements for the annual ICSBEP Technical Review Group Meeting, including travel arrangements were finalized. This meeting will be held in Prague, Czech Republic, 5 – 9 May 2008.

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.
- Provided ANL calculations in collaboration with R. MacFarlane *et al* on inter-code comparisons using the BIGTEN benchmark assembly.
- Implemented combined (prompt and delayed) fission spectra in VIM processing codes.
- Initiated review of R.N. Hwang paper describing new unresolved resonance region (URR) methodology for publication in Nuc. Sci. & Eng. Note that Luiz Leal (ORNL) is collaborating with ANL on this task.

LANL

- Sent MCNP5 1.50 to RSICC for testing.
- Sent ENDF70, an MCNP continuous-energy neutron library based on ENDF/B-VII, to RSICC for testing.
- Presented an MCNP criticality class at INL with 32 students in attendance.
- Prepared revised and expanded class notes for MCNP criticality classes (F.B. Brown, “Theory and Practice of Criticality Calculations with MCNP5,” LA-UR-08-0849).
- Completed preparation of NJOY tutorial material (LA-UR-08-2149).
- Debugged and improved the capabilities of the newly installed ERRORJ module in NJOY to handle recent actinide evaluations.
- Initiated revision of the NJOY manual.
- Supported MCNP and NJOY users.
- Performed final QA of ENDF70SAB, an MCNP S(α,β) library based on ENDF/B-VII.
- Submitted paper (accepted) for ANS Summer Meeting (F.B. Brown and N. Barnett, “One-group MCNP5 Criticality Calculations with Anisotropic Scattering,” LA-UR-08-0567).

LLNL

- Identified COG as “safety software” and completed software risks grading as required by the LLNL Institutional SQA Program. Supported MCNP and NJOY users.

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ORNL

- Provided 165 responses to users requesting technical assistance.
- SCALE development and website maintenance (www.ornl.gov/sci/scale):
 - January 2008 issue of SCALE Newsletter published.
 - Development of automated benchmark testing for CE-KENO and MG-KENO is 50% complete.
 - Development of KENO-VI Primer is 25% complete.
 - Updates on 24 SCALE modules, data and program libraries for SCALE 6.
- AMPX Maintenance and Library Generation:
 - Implemented CE and MG ENDF/B-VI.8 and ENDF/B-VII.0 libraries for testing with SCALE 6.
 - SCALE 5.1 cross-section and covariance libraries updated with ENDF/B-VII ²³³U for supporting ISOTEK—data update available from SCALE website.
- Spatial mesh needed for TSUNAMI calculations with KENO-VI was improved to provide accurate angular moment calculations. Test cases now provide consistent results with KENO V.a TSUNAMI.
- RSICC activities: See rsicc.ornl.gov for monthly newsletters.
 - Distributed 830 software packages and updated 4 software packages.
 - 115 SCALE and 254 MCNP packages distributed.
 - Electronic notebook entries for SCALE and MCNP.
- RSICC quarterly report issued.
- TSUNAMI training was provided to 19 participants from eight countries at OECD/NEA Data Bank in Paris.
- Half-day seminar on SCALE, KENO and TSUNAMI was provided at MCNEG workshop in UK.

NUCLEAR DATA

ANL

- Ongoing technical discussions (D. L. Smith and Y-S. Yang) to resolve issues with the ENDF/B formats for covariance.
- Principal author of the final report for the OECD/NEA WPEC Subgroup-26 (SG-26) on nuclear data needs which is heavily involved in generation and use of covariance information for criticality safety applications.
- 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).
- Provided input to the Task Force for Preserving the ZPPR Materials.
- Published: A. B. Smith, "The Neutron Spherical Optical Model Absorption," Annals of Nuclear Energy, 35, 890-903, 2008.

BNL

- Continued collecting new evaluations for ENDF/B-VII.1. Reviewed new covariance evaluations for 233,235,238-U and 239-Pu as submitted by ORNL and provided comments.
- Moved all codes written in FORTRAN 77 to Linux (codes by S. Mughabghab needed for new resonance module in Empire).

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- Prepared BNL report describing low-fidelity covariances for structural and heavy nuclei. The report is available on OSTI.
- Started with preparations for the Workshop on Neutron Cross Section Covariances, Port Jefferson, NY, June 24-27, 2008.

LANL

- Completed the production of “Low-Fidelity” covariances for light materials (all ENDF/B-VII isotopes from ^1H through ^{19}F , except ^7Li) and sent the data to Oak Ridge.
- Submitted abstract on Low-Fidelity project to Port Jefferson Workshop on Neutron Cross Section Covariances.
- Finalized report “Assessment of the ENDF/B-VII $^{235}\text{U} + \text{n}$ Data Evaluation,” by P.G. Young and P. Talou. Included in the report are recommendations of future analyses to address deficiencies with the current neutron scattering and fission spectra.
- Performed independent review of several ICSBEP evaluations, including two containing V – a material we plan to evaluate next FY.
- Based on simplified estimates of evaluated uncertainties in the prompt neutron fission spectra of ^{239}Pu , we determined that the impact on keff for Jezebel is +/- 0.3-0.4%.

ORNL

- Completed resonance evaluation for ^{55}Mn and submitted ENDF/B Evaluation to NNDC on March 31, 2008.
- Completed File 32 to File 33 covariance data for ^{233}U , ^{235}U , ^{238}U , and ^{239}Pu —submitted ENDF/B evaluations to LANL and NNDC March 31, 2008.
- Completed ^{19}F resonance parameter analyses using Russian inelastic measured data—corrected problem with AMPX/PUFF-IV processing of ^{19}F covariance—initiated final testing of ^{19}F evaluation in preparation for submittal to NNDC.
- Resolved normalization issue with recent ORELA ^{41}KCl capture data—initiated revision to ^{41}K resonance parameter evaluation based on recent ORELA ^{41}KCl transmission and capture data.
- Initiated investigation into a discrepancy in experimental ^{41}K resonance capture integral values reported in literature—resolution needed to complete evaluation.
- Received peer review comments for NS&E journal articles for ^{232}Th and ^{238}U evaluations—modifications sent to ANS.
- Initiated resolved resonance evaluations for ^{52}Cr , ^{53}Cr , ^{58}Ni and ^{60}Ni using existing ORELA transmission data.
- Completed ORNL/TM report on ENDF/B-VII ^{233}U cross-section data update for SCALE 5.1—published as ORNL/TM-2007/115.
- Leal visited JAEA to investigate ^{235}U capture issues for intermediate benchmark problems.

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DIFFERENTIAL MEASUREMENTS

ORNL

- Discovered bad module in ORELA data acquisition equipment that impacted 1st quarter measurements—repaired equipment and repeated ^{52}Cr and $^{58,60}\text{Ni}$ measurements in 2nd quarter. Measurements completed.
- Ordered ^{53}Cr samples needed to initiate measurements in 3rd quarter.
- Completed measurement plan and cost estimate for ^{240}Pu and ^{237}Np and submitted to NCSP manager March 31, 2008.
- Completed reliable ORELA operation for ~500 hours in 2nd quarter (~800 hours FY YTD)—satisfies ORELA operation milestone.

INTEGRAL EXPERIMENTS

INL

- Assembly of the experimental device and test operations are in progress at Valduc. The first metallic screens will be delivered to Valduc in May. Sketches of the glass screens were validated by CEA and IRSN enabling fabrication to begin soon. The safety assessment report is in progress and the safety authorization is expected in June. The previous experimental device for the plutonium solution experiments has been completely dismantled and the experimental cell and the pool of APPARATUS B are now ready. The experimental device will be assembled in June. The next milestone for FY-2008 is not due until 30 June 2008.
- United States Titanium components were ordered and should be ready to ship to Valduc by early June.

LANL

- Successfully supported all required DAF TSR surveillances, maintenance and operational activities as required.
- Supported NDAG and other NCSP tasks as required.
- Supported ICSBEP evaluators and reviewers on HEU-MET-THERM-034.
- Completed the BRP Ball reflected by Acrylic experiment.
- Completed Section 1 of the ICSBEP for the subcritical BRP Ball reflected by Acrylic experiment.
- Initiated procurement of Ni shells for the next subcritical experiment (4th quarter deliverable)
- Conducted internal ICSBEP review of “GODIVA-IV Delayed-Critical and Static Prompt Supercritical Experiments”.
- Developed final draft agreement for Valduc training and submitted to Valduc for review/approval.
- Coordinated Valduc colleagues visit to LANL scheduled for April 2008.
- Initiated CED-1 for the “Spherical Lattice” experiment.

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INFORMATION PRESERVATION AND DISSEMINATION

Fluor Hanford

ARH-600

- Review of Beta test version prior to release was performed. Issues are being resolved.

55-GALLON DRUM

- Internal testing of question set completed.
- Questionnaire sent to select endusers on 02/15/2008.

LLNL

- Fixed major software bugs on IER requestor's form and Postgres database.
- Worked with LLNL computer security organization to mitigate hacking attempts from China, South Korea, Indonesia, Colombia, Netherlands and Spain on NCSP website.
- Revamped FY2008 NCSP Users On-Line Survey Questionnaire and milestone.
- Procured and deployed Adobe Flash Media Server on NCSP web server.

ORNL

- The ORCEF Heritage is in final editing and DVD production by the ORNL Visual Instrumentation department. Final version contains 11 sessions with 32 topics and several hundred subtopics.
- Contract extended for former Oak Ridge Electron Linear Accelerator (ORELA) Director to edit seven sessions of recording for the ORELA Heritage video.

TRAINING AND QUALIFICATIONS

LLNL

- Completed a class on 02/21/2008.
- Completed a class on 02/28/2008 for DNFSB.

ORNL

- TSUNAMI primer has been edited and improved.
- Initial draft of NCSET module for subcritical noise analysis has been completed.

NUCLEAR CRITICALITY SAFETY PROGRAM SUPPORT

- CSSG members participated in initial planning for the April 2008 CSSG meeting including a) reviewing ~ 59 NCSP proposals, and b) participating in teleconferences regarding proposal reviews and resolution of proposal prioritization.