

NCSP Activities and Accomplishments in FY2011

Analytical Methods

LANL AM

- MCNP51.60 is now being distributed by RSICC, including user support, documentation, bug fixes, and physics enhancements
- Expanded MCNP criticality validation suite to include 119 ICSBEP cases, report issued - LA-UR-10-06230. Verification of MCNP5-1.60 documented in LA-UR-10-0561
- A paper on adjoint-weighted tallies was published in Nuclear Science & Engineering journal (Kiedrowski, Brown, Wilson)
- 4 papers on Monte Carlo accepted for publication in Progress in Nuclear Science and Technology journal (Brown, Kiedrowski)
- Presented 6 papers at the ICNC-2011 meeting in Edinburgh, on MCNP methods, status, and V&V (Brown, Kiedrowski, Mosteller)
- Developed methods for the assessment of statistical behavior and measuring the efficiency of variance reduction parameters for large collections of tallies of use to those doing criticality accident assessment or criticality accident alarm system design presented at M&C and ANS Summer Meeting
- Identified issue of statistical coverage related to population diagnostics that demonstrates how Monte Carlo methods can predict k-effective incorrectly without warning. Created test problem demonstrating the issue and to serve as a reference for future methods development to solve the issue
- NJOY was upgraded to handle the new MT values approved by CSEWG for point wise processing (GROUPT updates are partially complete) and to process previously unused formats recently implemented in select JENDL-4 files that are also candidates for ENDF/B-VII.1 "beta." The NJOY paper ("Methods for Processing ENDF/B-VII with NJOY") was published in the December 2010 Nuclear Data Sheets
- Enhancements were made to the MCNP shielding suite for ENDF/B-VII.1 data testing
- Developed an automated Rossi-alpha validation suite
- Brown was an invited speaker on Monte Carlo at the ANL MeV Summer School
- The latest NJOY2010 version has been shared with Argonne, Oak Ridge, and Naval Reactors for use in processing candidate ENDF/B-VII.1 files
- Completed format definitions for continuous energy data tables for MCNP
- MCNP Conference presentations/papers: 1) *Invited plenary talk & paper at SNA+MC-2010;* 2) *3 papers at SNA+MC-2010 - criticality, perturbation, parallel;* 3) *1 paper at ANS 2010 winter meeting - V&V for perturbations;* 4) *1 paper for M&C-2011 - statistical tests;* 5) *3 papers for ANS 2011 summer meeting*

LLNL AM

- Completed PREPRO 2010 update in cooperation with the IAEA Nuclear Data Section, Vienna, Austria. The code, documentation, and recommended input parameters are available from RSICC and may be downloaded from the IAEA at:
<http://www-nds.iaea.org/ndspub/endl/prepro>

- PREPRO 2010 new and improved features are summarized in IAEA-NDS-39, Rev. 14, “PREPRO 2010, 2010 ENDF/B Pre-Processing Codes (ENDF/BVII Tested)”
- Provided CSG-TM-016, an introductory COG user training course for criticality safety practitioners, to NSTec/OMICRON criticality safety engineers at the NNS
- Heinrichs, Lee, Lent and Scorby attended CSEWG and NDAG meetings in Santa Fe, NM, on November 3-5, 2010
- Presented “PREPRO Accomplishments,” LLNL-PRES-470894 and “COG Accomplishments,” LLNL-PRES-470878” at the NCSP Technical Seminar
- Processed ENDF/B-VII nuclear data and published “Point 2011: ENDF/B-VII.1 Beta 2 Temperature Dependent Cross Section Library,” LLNL-TR-479947
- Provided LLNL-TR-479947 and the processed ENDF/B-VII.1 nuclear data to IAEA, NNDC (Brookhaven) and RSICC (ORNL) for unlimited public distribution
- Successfully installed Red Hat Linux 5.5 and COG10 on the LLNL machine and then assisted Y-12 to properly configure their machine to enable a successful COG10 installation
- Hosted an NCSP visit to LLNL by Jim Felty, Nichole Ellis and Dick McKnight (ANL) to finalize the CEEdT process and Manual, IER form and Nuclear Data Request form
- A joint NNSA (HQ), LSO and LLNL (Institution) Software Quality Assurance assessment of COG was conducted on March 22-24, 2011
- Published LLNL-CONF-492113, “COG11 – Available Now to Criticality Safety Practitioners,” in the ICNC 2011 proceedings
- Presented LLNL-CONF-492113 at ICNC 2011 on September 19, 2011
- Updated CSG-TM-016, “Training Module: COG Software,” to include LINUX SUSE 9.3 sample results
- Provided CSG-TM-016 training to criticality safety practitioners at the Atomic Weapons Establishment (AWE) at Aldermaston, UK
- Successfully processed ENDF/B-VII.1β4 using PREPRO
- Attended the Joint Meeting of the CSSG, NDAG and Task Managers with the NCSP Manager at Las Vegas, NV, on August 23-25, 2011

ORNL AM

- A user patch for SCALE 6.0 was posted to the SCALE website
- Details of all SCALE enhancements since SCALE 6.0 are available on SCALE website: <http://home.ornl.gov/~x4s/open/summary.html>
- Verified SCALE inputs and sensitivity data for 78 benchmark experiments and an updated version of VIBE that operates as a plug-in to DICE were provided to OECD/NEA for inclusion in the 2010 ICSBEP distribution
- An overview of enhancements for SCALE 6.1 was published at the ANS Annual meeting
- Corrected PUFF-IV covariance processing module to correct issue with Reich-Moore Limited Resonance Parameter format used by 19F evaluation
- Added new modules to improve SCALE resonance self-shielding capabilities
- Generated a multi-group JENDL 4.0 library to ensure correct processing of ENDF/B-formatted evaluations from international data sources
- Processed new ORNL 50Cr and 54Cr evaluations, corrected minor formatting issues and submitted evaluations to NNDC
- Completed benchmark measurements at the CEA Valduc SILENE facility

- Updates made to configuration controlled SCALE version: 9 module revisions and 4 data revisions; numerous enhancements implemented in KENO and TSUNAMI to facilitate criticality safety analyses with SCALE 6.1
- Completed 28 benchmark inputs with associated TSUNAMI data files through the VALID process for use in SCALE validation report and distribution through the ICSBEP
- Improved CE library reading and writing capabilities to allow for easier updates of selected cross-section values (e.g., mass ratio) in the library after processing
- Obtained and reviewed draft CEA/Valduc report documenting geometric and material configurations of the SILENE CAAS benchmark experiments updated SCALE benchmark models based on new/additional information provided by the CEA/Valduc report
- Successfully tested ad joint Monaco with neutron only multigroup cross sections
- Distributed 1,715 software packages and updated 17 software packages
- 422 Scale and 791 MCNP packages distributed
- Scale 6.1 released from RSICC and subsequently released from the NEA Data Bank
- Addressed 514 technical assistance/information requests from Scale users
- Conducted two weeks of Scale training at ORNL
- Participated in WPNCS Expert Group meeting in London
- Presented two papers at ICNC 2011, Scale 6.1 overview and TSUNAMI data for ICSBEP
- Improved treatment for CE libraries by adding more data points to better describe thermal scattering law data—updated Scale CE libraries for internal testing

Integral Experiments

ANL IE

- Argonne staff (R. McKnight and G. Imel) provided technical support for the Workshop on Thermal Epithermal Experiments (TeX) at SNL and the Workshop on Subcritical Measurements at LANL

INL IE

- The annual MIRTE-1 Program Review was held in November 2010
- Completed Safety Analysis for the new experiments with Molybdenum that will be performed at VNIITF
- The first MIRTE-1 Evaluation entitled, “*MIRTE Program: Four 4.738-wt. % - Enriched Uranium Dioxide Fuel Rod Arrays in Water Separated by Titanium*” was submitted to the ICSBEP for review in March

LANL IE

- Successfully started up the Planet and Comet Assemblies as part of execution of the NCERC startup plan
- Received startup authorization for NCERC as a new Hazard Category 2 nuclear facility
- Completed Testing of Passive mode of data acquisition to V&V expected design performance of PATRM system

- Completed comparisons of MCNP simulations' list-mode output to relevant sub-critical benchmark experiments for code validation. It was necessary to develop external source and tally routines to allow us to use any recent or future versions of MCNP that require no modifications to MCNP source code
- Completed preliminary measurement and simulation comparisons of LANL's SNAP and NPOD neutron detector output (count rate and list-mode data) using bare and polyethylene-reflected Berp ball measurements performed in May 2010
- Provided a version of MCNP-DSP running on an HPC machine
- Inventoried and evaluated fission chamber detector collection that was located and used previously at TA-18
- Fission with Cold Neutrons, Rene Sanchez
- Comparison of Feynman Variance-to-Mean Measurements using Measured and Simulated Data, Jesson Hutchinson
- Began operating NCERC vault
- Initiated nuclear material moves into NCERC vault
- First new data from a criticality experiment
- Maintained the facility operations envelope without any TSR violations
- Presented five papers and one poster at the ICNC: 1) *One and Two-Dimensional Excursion Modeling of GODIVA-IV*; 2) *CALIBAN using the MRKJ Code*, William L. Myers; 3) *Critical Experiment Accidents < Redux*, David Hayes; 4) *Criticality Experiments Facility: a New Beginning to Answer Some Old (and new) Questions*, David Hayes; 5) *Direct Calculation of Measured Observables in a Multiplying Sub-Critical System*, Avneet Sood

LLNL IE

- LLNL repeated beta-counting measurements at LLNL of the sulfur NAD elements in geometries that required crushing and melting since these operations were prohibited at CEA-Valduc
- Participated in the CAAS benchmark experiment and deployed LLNL-calibrated detectors and data acquisition equipment at the Silene reactor at CEA-Valduc
- LLNL liaised with CEA and their agent, Regis Martelet, for the return of US nuclear accident dosimetry (NAD) equipment and irradiated materials from CEA-Valduc (France) and paid all US customs duties
- LLNL submitted an IER to determine "Reference values of the Godiva radiation field in DAF" in support of future nuclear accident dosimetry exercises
- LLNL submitted an IER for the "2012 International Intercomparison Exercise for Nuclear Accident Dosimetry at the Device Assembly Facility using Godiva"
- Presented "Criticality Alarm System Testing at LLNL, UC-Davis, and CEA-Valduc," LLNL-PRES-470831, at the NCSP Technical Seminar at ORNL on March 1, 2011

- Published “Rocky Flats Neutron Detector Testing at Valduc, France,” LLNL-TR-466251
- Published “Cs-137 Gamma Ray Shots for Rocky Flats Neutron Detectors,” LLNL-ABS-467896
- Presented “Nuclear Accident Dosimetry Exercises at CEA-Valduc,” LLNL-PRES-470942, at the NCSP Technical Seminar at ORNL on March 1, 2011
- Completed “Evaluation of LLNL’s Nuclear Accident Dosimeters at the Caliban Reactor, September 2010,” which includes the final LLNL results of the 2010 exercise at CEA-Valduc
- Participated in the ANSI N13.3, “Dosimetry for Criticality Accident Dosimetry,” standard working group meeting at Charleston, SC, on February 7, 2011
- Distributed the LANL, SNL, SRS and Y-12 final reports of their participation in the Nuclear Accident Dosimetry (NAD) Exercise at CEA-Valduc using the CALIBAN Reactor. These reports together with the LLNL final report are available on <http://ncsp.llnl.gov>
- Assisted CEA-Valduc in obtaining unpublished CALIBAN data for ICNC presentation
- Continued to participate in the working group for ANSI/HPS-N13.3-2011, “Dosimetry for Criticality Accidents”
- Liaised with AWE/Aldermaston and CEA-Valduc regarding their participation in future NCSP activities including determining reference values for radiation fields in DAF and future participation in NAD exercises at the NNS

NNS IE

- Validated NSTec DAF support scope to NCERC operations/Criticality Safety Program has been validated by NSTec and LANL
- Completed and obtained DOE Authorization to Operate the NCERC - Multi Site Milestone with NSTec
- Completed one pilot training class

ORNL IE

- Prepared and presented presentation on FY10 MIRTE-II experiment design investigation at the NCSP Technical Seminar held at ORNL March 1-2, 2011
- Complete final CED-2 tasks for CAAS/SILENE benchmark experiment at CEA Valduc and performed experiment in October 2010
- Participated in NCSP TEX feasibility meeting at SNL July 12-13, 2011—ORNL provided presentation on MIRTE-II experiment design investigation using Scale sensitivity/uncertainty analysis tools
- Participated in review of critical experiments performed at NCERC for hands-on pilot training course August 29—September 2, 2011

SNL IE

- The first approach-to-critical experiment for the second 7uPCX benchmark evaluation began in late March and completed in early April

- The critical configurations that will be part of the second set of benchmarks for the Seven Percent Critical Experiment were measured

Information Preservation and Dissemination

ANL IP&D

- Contributed validation results for ENDF/B-VII.beta1 to BNL Mar. 30-31, 2011 micro-CSEWG meeting
- Reviewed Archival records on ZPR/ZPPR materials and an electronic database format with catalog, index, keywords and search capability has been created from a representative sample.
- “Quality Assurance Requirements for ENDF/B-VII.1 Covariances” (<http://www.nndc.bnl.gov/csewg/covdocs.jsp>) by D.L. Smith.
- “The ENDF ‘Lumped Reactions’ Covariance Format” (<http://www.nndc.bnl.gov/csewg/covdocs.jsp>) by D.W. Muir
- “The Contribution of Individual Correlated Parameters to the Uncertainty of Integral Quantities,” by D. W. Muir , accepted for publication in *Nuclear Inst. and Methods in Physics Research, A*
- Participated in meeting Jan. 24-25, 2011 of OECD/NEA Expert Group on Assay Data for Spent Nuclear Fuel in support of burn up credit
- March 10-11 meeting with C_EdT manager and NCSP webmaster to provide NDAG input to C_EdT Process Manual and IER website and input on formation of NCSP Nuclear Data Request website
- Participated in March 1-2, 2011 NCSP Technical Seminar at ORNL

HANFORD IP&D

- ORNL developed a preliminary SCALE model for Type OIIN fuel in B Reactor. If successful this model may be used to support sensitivity studies
- An updated CritView data library containing added MCNP calculations and LA-10860 data are available through the NCSP website
- Four letter reports were completed for public release and are available through the NCSP website: 1) *MCNP5 Calculations Replicating ARH-600 Nitrate Data*; 2) *Development of LA-10860 Database for CritView*; 3) *Hanford IP&D Subtask 3 Actinide Cross-Section Extraction Status Report*; 4) *Potential Benchmarks for Actinide Production in Hanford Reactor*

LLNL IP&D

- Created a new IER form section for “CEdT Members Access Only” allowing the Requestor to interact directly with the CEdT task team as well as the PI to aid in pushing the experiment/measurement process forward
- Created and deployed beta version of Nuclear Data Request Form on NCSP beta version website – <http://ncsp-beta.llnl.gov>
- Performed a live demonstration of the Nuclear Data Request Form at the NDAG meeting in Santa Fe, NM, on November 5, 2010

- Installed Taclane for NTS-SLAN communications from DAF to Building 23-600 (Mercury)
- Completed the testing of the Protected Outlet Boxes (POBs) at CEF in support of the CEF Classified Red Network
- Received Approval To Operate (ATO) from the Los Alamos Site Office for the CEF Red Network (NTS-SLAN) at DAF
- Created a new IER form section for “Facility Members Access Only” to limit access to the status of a specific category of experiments
- Created on-demand pop-up text boxes on IER request form
- Attended the ANS 2011 Annual Meeting and DOE NCSP Workshop in June 26 – July 1, 2011, Hollywood, Florida
- Implemented credential-based access control to web pages on “Approved Experiments CEEdT Members and Current Status,” “CEEdT Members General Access Only,” and “CEEdT Members Limited Access Only”
- Attended Joint Meeting of the CSSG, NDAG Chair, and Task Managers with NCSP Manager at Las Vegas, August 23 – 25, 2011
- Created and deployed searchable CSE database
- Processed and deployed ORELA Heritage video series (8 DVDs) on NCSP website
- Deployed ICSBEP web contents from INL on the NCSP website

ORNL IP&D

- Established contract with Disc Interchange (third party vendor) to perform test reading of initial set of ORELA measurement tapes that represent the various types of magnetic tapes
- Completed inventory record (database) of Dixon Callihan's personal NCS library (~ 900 reports)

Nuclear Data

ANL ND

- Participated in Nov. 2010 CSEWG meeting, including organizing and chairing the Covariance Committee (D. L. Smith), participating in the Executive Committee and presenting data validation results testing performance of the new NCSP and IAEA evaluations on ENDF/A for ^{239}Pu , ^{240}Pu , ^{55}Mn , $^{52,53}\text{Cr}$ and $^{58,60}\text{Ni}$
- Led the discussion (D. W. Muir and D. L. Smith) to define QA Requirements for ENDF/B-VII.1 covariances
- Assisted (D. W. Muir) in implementation of 1994 Fröhner proposal for ENDF format of MF32 data
- Continued collaboration with IAEA on development of covariance methodologies including use of the Unified Monte Carlo Method and the Total Monte Carlo Method

- Organized and chaired Nov. 2010 NDAG meeting; produced and distributed minutes for the Nov. 2010 NDAG meeting
- Participated in Nov. telecons and meeting of NCSP Task Force on identifying and prioritizing integral experiments
- Provided input and feedback on NCSP IER website; NDAG reviews and recommendations on all IERs; and input on formation of NCSP Nuclear Data Request website
- Provided complete revision of the draft C_EdT Process Manual to C_EdT manager
- Collaborated on revision of ICSBEP Benchmark Prioritization Process and revision of ICSBEP Benchmark Review Process

BNL ND

- Modified/updated cross section evaluations from ORNL and LANL for 6-Li, 19-F, 35-Cl, 55Mn, Cr-isotopes, 243Am, 240-Pu, 237-Np, and thermal scattering file for SiO₂ from ORNL were included in the GForge based ENDF/A library. Format and physics consistency checking has been performed and several corrections performed at NNDC
- Beta4 version of the ENDF/B-VII.1 library has been assembled verified and released for testing on September 9, 2011. It contains full set of covariances foreseen for the final release with several corrections introduced after release of beta3. All NCSP supported evaluations submitted to NNDC were verified for format correctness and process ability and included in the beta releases
- Update of Atlas of Neutron Resonances: data for 157Gd were revisited and reverted to the value very close to the one in ENDF/ B-VII.0
- Organized CSEWG and NDAG meeting at BNL in November 2011

LANL ND

- 16O: During FY10, the evaluated cross sections for n+16O were extensively revised below 7 MeV using the results of a new R-matrix analysis of reactions in the 17O system. In FY11, we completed the construction of detailed covariance files for the cross sections, including one for the L=1 Legendre coefficient of the differential elastic cross section (μ -bar in the c.m. system)
- An updated evaluation for V-51 was completed and submitted to NNDC for inclusion in ENDF/B-VII.1
- The Prompt Fission Neutron Spectra (PFNS) of the thermal and 0.5 MeV neutron-induced fission reaction on Pu-239 were evaluated using our new Monte Carlo capabilities, following the decay of each fission fragment, from its formation near scission to its final state (before beta-decay). The evaluated PFNS is significantly different from the one evaluated using the Los Alamos model, currently used in the ENDF/B-VII.0 library, but remains within the one-sigma band evaluated recently [Talou et al., Nucl. Sci. Eng. 166, 254 (2010)]. At the lowest outgoing energies, i.e., below ~ 300 keV, the new spectrum lies 10-15% higher than ENDF/B-VII.0, while being lower in the 0.3-5.0 MeV region. This evaluation has been submitted to ENDF/A for data testing
- Participated in CSEWG and NDAG meetings in November and June

- Five peer-reviewed papers accepted for publication in December issue of Nuclear Data Sheets (topics: Evaluations for ENDF/B-VII.1, Validation of ENDF/B-VII.1, Covariances, and Fission-Product Yields)
- Little and Chadwick were invited to participate in November ANS Workshop on “Neutron Cross Sections for Nuclear Engineers”
- n+12C: evaluation completed. Major improvements in the 4.8 – 6.4 MeV region, where the old evaluation did not use an R-Matrix evaluation
- Provided simulation results supporting the CED-2 process for IER 163
- Prepared several talks on NCERC experimental plans for stockpile stewardship and global security programs

LLNL ND

- Presented LLNL-PRES-460638, “Delayed Fission Gammas”, to the CSEWG Validation Subcommittee and NDAG at Santa Fe, NM, on November 3 and 5, respectively. The presentation documented:
 - 1) The technical basis of two models of ^{235}U (n, f) time-dependent and total delayed photon multiplicity and spectra; 2) Verification of the model data to measured data from Los Alamos and the Naval Radiological Defense Laboratory; 3) Verification of COG11x calculated criticality accident doses for criticality safety applications by comparison to the ORNL “Updated Nuclear Criticality Slide Rule” 4) Proposed ENDF-6 format changes to represent the model data
- Completed work on a “high fidelity” model to generate time-dependent and equilibrium delayed photon multiplicity and spectra data using the England and Rider fission product yield database with the JENDL/FPD- 2000 photon library
- Completed “high fidelity” model calculations of delayed fission gamma emission from ^{232}Th , ^{233}U , ^{234}U , ^{235}U , ^{236}U , ^{238}U , ^{239}Pu , ^{240}Pu , and ^{241}Pu
- Presented LLNL-PRES-470895, “Delayed Fission Gammas,” at the NCSP Technical Seminar at ORNL on March 1, 2011. The presentation included COG11dg calculational results of delayed fission gamma emission doses from fast-neutron fission of ^{234}U , ^{235}U and ^{238}U (in Godiva) that was in good agreement to the ORNL Slide Rule
- “High fidelity” model calculations of delayed fission gamma emission from all (52) thermal, fast and 14 MeV neutron-induced fission targets in the England and Rider database are in progress using the JENDLFPDD2000 database of 1221 FP half-lives, daughter branching ratios, and discrete and/or continuous gamma energy spectra
- Similar “high fidelity” model calculations are in progress using the JEFF311RDD database (in place of JENDL-FPDD2000) for the purpose of inter-comparison for independent verification.
- “High fidelity” model calculations were completed for delayed fission gamma emission from all (52) thermal, fast and 14 MeV neutron-induced fission targets in the England and Rider database using the NuDat 2 database of FP half-lives, daughter branching ratios, and discrete and/or continuous gamma energy spectra

- Studies comparing the results of “high fidelity” model calculations using the JENDL, JEFF and NUDAT2 fission product decay databases continue
- The best “high fidelity” model data will be implemented in the “COGDFG” data library
- The feasibility of extending these LLNL “high fidelity” model calculations to delayed neutron emission is under investigation in support of an IAEA Coordinated Research Project starting in 2013

ORNL ND

- Finalized ^{63}Cu capture measurements at IRMM and started data reduction tasks for ^{63}Cu .
- Completed ^{65}Cu neutron-capture measurements at IRMM
- Determined sample properties for Cu integral experiments at MIT reactor
- Finalized and transferred all measured data for ^{182}W , ^{183}W , ^{184}W , ^{186}W to evaluator for resonance analysis—performed preliminary fitting with SAMMY
- Obtained ^{56}Fe inelastic scattering data from IRMM and performed initial SAMMY analysis from 850 keV to 2 MeV
- In collaboration with LANL, updated ^{239}Pu and ^{240}Pu evaluations to investigate resonance region updates with new LANL fission spectrum data for solution systems—performed SCALE S/U analyses to investigate data adjustment needs for Pu evaluations
- Participated in November 2010 NDAG and CSEWG meetings—chaired ENDF/B Formats Committee
- *Phys. Rev. C* article about $^{58,60}\text{Ni}$ capture cross-section data published: PHYSICAL REVIEW C **82**, 057601 (2010)
- SAMMY covariance matrix computation optimized by linking code to parallelized matrix-matrix multiplication routines—several orders of magnitude performance improvement achieved on multi-core CPUs—paper describing results submitted to the M&C 2011 conference
- Exact Doppler broadening of Legendre moments of angular distribution of elastic scattering was computed for the first time in order to quantify the effect of approximations currently used in SAMMY—paper describing results submitted to the M&C 2011 conference
- SAMMY technical support to ORNL internal and external users was provided
- RPI measurement capability improvement Preliminary analysis indicates C6D6 detector array will be best option due to low sensitivity to scattered neutrons
- Produced natural W transmission data from old ORELA measurements
- Produced and obtained natural W transmission data with two different sample thicknesses from IRMM measurements
- Constructed IRMM accelerator resolution functions and performed resonance analysis of measured isotopic tungsten data—produced preliminary resonance fits for tungsten isotopic data

- Massachusetts Institute of Technology (MIT) graduate student performed initial thermal cross-section measurements on ^{63}Cu and ^{65}Cu isotopes to support ORNL Cu evaluation effort—Luiz Leal visited MIT to work with student on thermal cross-section measurements and analyses
- Performed integral and differential data investigation into impacts of new LANL ^{239}Pu prompt neutron fission spectrum coupled with ORNL resonance parameter analysis to support OECD/NEA WPEC SG34 effort
- Completed WPEC URR subgroup report and submitted report to OECD/NEA Nuclear Data Bank
- Developed two draft papers covering ORNL NCSP cross-section and covariance data evaluation work for inclusion in the ENDF/B VII.1 Nuclear Data Sheets journal issue to be released in December 2011
- Differential data measurements at IRMM completed capture measurement for metallic Ca using 60 m flight path
- Finished ^{235}U fission chamber measurements to determine high-energy neutron flux shape needed to support Cu and Ca capture experiments
- Completed data sorting and reduction tasks at IRMM for $^{63,65}\text{Cu}$ neutron capture experiments
- Updated $^{63,65}\text{Cu}$ resonance evaluations to include thermal cross-section measurements performed by MIT graduate student at MIT—student paper submitted for publication at the November 2011 ANS meeting
- Produced preliminary resonance parameter evaluations for ^{182}W , ^{183}W , ^{184}W , and ^{186}W —analyses identified need to re-measure ^{182}W , ^{183}W , ^{184}W transmission data in low keV region at IRMM to resolve issue in measured data—transmission measurements planned at IRMM in FY12
- RPI recently measured ^{56}Fe total cross section that will be included in evaluation effort during FY12
- Produced new ^{239}Pu resonance evaluation and performed benchmark calculations for critical ^{239}Pu thermal solution systems—testing and resonance evaluation effort performed in collaboration with CEA/Cadarache as part of WPEC Subgroup 34 ^{239}Pu evaluation effort
- Published three nuclear data measurement and evaluation papers at the 2011 ICNC Meeting in Edinburgh, UK
- RPI completed SAMMY analysis for Gd isotopes
- RPI completed calculations to estimate efficiencies for detector concepts
- RPI purchased prototype detector and completed initial scoping measurements
- RPI completed ^{56}F total cross-section measurements (0.5 MeV – 20 MeV)

Criticality Safety Benchmark Evaluation Project

INL ICSBEP

- Completed Publication of the 2010 Edition of the *International Handbook of Evaluated Criticality Safety Benchmark Experiments*
- A benchmark prioritization meeting was held in conjunction with the annual NDAG Meeting in November
- Completed US efforts to verify data in DICE

Training and Education

ANL T&E

- Contributed validation results for ENDF/B-VII.1 and co-authored “ENDF/B-VII.1 Neutron Cross Section Data Testing with Critical Assembly Benchmarks” paper to be published in Nuclear Data Sheets, Vol. 112/12 (2011)
- Contributed to the QA Review of ENDF/B-VII.1 covariance data
- Participated in NCSP FY 2012 Budget Execution Meeting in Nevada
- Participated in 2011 meeting of OECD/NEA Working Party on Nuclear Criticality Safety and meetings of WPNCs Expert Groups on Uncertainty Analysis for Criticality Safety Assessment (UACSA), Burnup Credit (BUC) and Assay Data for Spent Nuclear Fuel (ADSNF)
- Participated in September meeting of the DICE Technical Advisory Group
- Participated in International Conference on Nuclear Criticality (ICNC2011) and contributed to the DICE Workshop
- Provided support to NCSP Managers regarding C_EdT and nuclear data input (GANNT Charts) to 5-Year Plan
- NCSET Module 16 “Burn up Credit for Criticality Safety Analysis of commercial Spent Nuclear Fuel” was completed and posted to NCSP website

LANL T&E

- Completed one week LANL Pilot training course for criticality safety engineers being developed by NCSP
- Executed modules at NCERC developed by LANL as part of week two hands on demo portion of the Pilot training course for criticality safety engineers being developed by NCSP

LLNL T&E

- Presented LLNL-PRES-470940, “4 Day Hands-on Criticality Course FY 2010 Accomplishments”, at the NCSP Technical Seminar on March 1, 2011
- Completed mission transfer of the Training Assembly for Criticality Safety (TACS) from LLNL to NNSS

- Passed the JNPO-NSTec Management Requirements Confirmation Board (MRCB) readiness review and Contractor Readiness Assessment (CRA) with no findings and received start up approval for TACS operations on August 17, 2011
- Attended the T&EP meeting at Las Vegas, NV, on August 25, 2011
- Provided hands-on instruction using the TACS during the NCSP T&EP “hands-on” pilot course at DAF during the week of August 29, 2011
- Participated in weekly NCSP Training & Education Planning (T&EP) teleconferences
- Updated the NCSP website to include the latest information regarding the two week T&EP hands-on training course, including course flyer, class registration, syllabus, course dates, prerequisites, and travel information
- Presented LLNL-CONF-503010, “An Experimental Study of the Effects of Operator Hands on the Reactivity of a Fast Metal System,” at ICNC 2011, this won the award for Best Poster

ORNL T&E

- ORNL NDA expert initiated work on NDA fundamentals for NCSET Module
- Completed pilot training courses at LANL, NCERC and SNL

SNL T&E

- The Sandia pilot hands-on critical experiments training course was delivered August 15 – 19
- The Level Two milestone “Obtain DOE authorization to achieve criticality using water height and/or control rods (RTBF Level 2 Milestone) (Q4)” was satisfied on July 26, 2011
- The first approach-to-critical experiment on water level was completed on July 28, 2011

Criticality Safety Support Group (CSSG)

- Completed CSSG 2010-01 Tasking on Seismic vs. Crit. Regulations
- Completed CSSG 2010-02 Tasking on Hazard Categorization
- Completed CSSG 2011-1 Tasking and Response on review of 420.1C
- Completed drafting of CSSG 2011-2 Tasking on review of 3009 re-write and support of 3009 re-write team
- Completed CSSG Tasking 2011-2; DOE-STD-3009 comments
- Completed 2011-03; DNFSB & Seismic Design
- Completed CSSG Tasking 2011-04; UPF
- Continued working 2010-1 rev 1 (Seismic)

- The CSSG held four meetings in FY11, November 2010 at the ANS meeting (Las Vegas), March 2011 in Oak Ridge, June 2011 at the ANS meeting (Florida) and September 2011 at the DAF
- Group of CSSG members supported NCSP leadership in meeting with the DNFSB staff in Washington DC on the DNFSB staff comments on Tasking 2010-1, 2011-3 and 2011-4