



**Department of Energy**  
Washington, DC 20585

May 10, 2000

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DNF SAFETY BOARD

The Honorable John T. Conway  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, N.W.  
Suite 700  
Washington, D.C. 20004

Dear Mr. Chairman:

The Implementation Plan (IP) for Defense Nuclear Facilities Safety Board Recommendation 97-2 requires a quarterly status report. Enclosed is the Department of Energy's quarterly status report for the second quarter, Fiscal Year (FY) 2000.

The IP contains 30 milestones, 27 of which have been completed. Milestone 6.6.1.1., *Expand the LACEF Training Course*, was completed during this quarter. The Department has completed all actions identified under Commitment 6.6.1 and proposes closure of this commitment. All three of the remaining milestones are overdue. Recovery Plans, which were established to complete these milestones, are included in Attachment B to this report to chronicle progress. The Management Team is working very hard to complete all remaining milestones and to continue implementing the Nuclear Criticality Safety Program.

As I am sure you are aware, on April 11, 2000, the Secretary of Energy announced his decision to transfer Los Alamos Technical Area (TA)-18 capabilities to another location. One of the capabilities housed at TA-18 is the combination of equipment, special nuclear materials, and knowledgeable people necessary to conduct general purpose critical experiments and criticality safety training. An environmental impact study on the proposed transfer of TA-18 capabilities and materials will begin immediately and is scheduled to be completed in December 2000. An orderly transition will take place during the transfer of capabilities to a new location, and care will be taken to assure continuity of Departmental programs and commitments. My staff is involved in these activities and will work to assure that Nuclear Criticality Safety Program needs are met throughout the relocation process.



While the Department has not completed all Recommendation 97-2 Implementation Plan commitments, we have made significant progress and are working very hard to assure that the Nuclear Criticality Safety Program infrastructure is maintained for safe, secure, and efficient fissile material handling. We are committed to working with you in that regard.

Sincerely,

A handwritten signature in black ink, appearing to read "D. H. Crandall", written in a cursive style.

David H. Crandall  
Acting Assistant Deputy Administrator  
for Research, Development and Simulation  
Defense Programs

Enclosure

cc (w/encl):  
M. Whitaker, S-3.1

QUARTERLY STATUS OF THE IMPLEMENTATION PLAN  
FOR  
DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 97-2  
SECOND QUARTER FISCAL YEAR 2000

The Department of Energy (DOE) began implementing Defense Nuclear Facilities Safety Board Recommendation 97-2 in January 1998 by formally establishing the Nuclear Criticality Safety Program (NCSP). Each of the seven NCSP Tasks (Critical Experiments, Benchmarking, Analytical Methods, Nuclear Data, Training and Qualification, Information Preservation and Dissemination, and Applicable Ranges of Bounding Curves and Data) is dependent upon the others for a successful program. Implementation of the NCSP is being accomplished according to the Five-Year NCSP Plan which was published in August 1999.

The Nuclear Criticality Safety Program Management Team (NCSPMT) and the Criticality Safety Support Group (CSSG) are performing their respective chartered functions in supporting the Responsible Manager's execution of the Implementation Plan (IP). During the quarter, the NCSPMT and CSSG coordinated activities aimed at completing IP milestones and continued to provide justification necessary for maintaining funding support. Of particular note was CSSG participation in criticality safety program reviews at the Hanford Plutonium Finishing Plant and Rocky Flats Building 371. This activity supported the Secretarial initiative aimed at strengthening Departmental criticality safety programs. Field reports for each of these reviews have been issued, and the compendium report to the Secretary will be issued soon. In addition, the CSSG has been asked by the Offices of Defense Programs (DP) and Environmental Management (EM) to provide technical review of criticality safety self assessments performed by DP and EM site contractors.

The NCSP held its annual program review on March 27, 2000, in Albuquerque, NM. The review focused on criticality safety community outreach. Feedback questionnaires were passed out and made available on the web site to collect feedback from the community. Feedback from the criticality safety community will be factored into future program planning to assure alignment of NCSP products with criticality safety practitioner priority needs.

This quarterly report provides a status of activities for each of the seven NCSP elements, as well as Recommendation 97-2 IP Milestones and Recovery Plans. Milestone 6.6.1.1., *Expand the LACEF Training Course*, was completed during this quarter. The Department has completed all actions identified under Commitment 6.6.1 and proposes closure of this commitment. All three of the remaining milestones are overdue. Recovery Plans, which were established to complete these milestones, are included in Attachment B to this report to chronicle progress. The Management Team is working very hard to complete all remaining milestones and to continue implementing the NCSP.

This report outlines steady progress in all seven NCSP task areas. All activities that were curtailed due to delayed funding, as reported in our last quarterly status report, have been resumed. There are two attachments to this report: Attachment A is a table depicting the status of all IP Deliverables and Milestones, and Attachment B contains Recovery Plans for the three remaining milestones.

Accomplishments and key issues in each of the program task areas which arose during the period are as follows.

### **Critical Experiments**

A status of experimental activities conducted at the Los Alamos National Laboratory (LANL) during the period by critical assembly is as follows:

**Flattop:** Flattop was inoperable for almost this entire quarter due to a malfunction of one of the control rod drive systems. A path forward for re-start of Flattop which includes replacement of the 50-year old control rod drive system and the performance of a full readiness assessment has been developed and submitted to the Department of Energy, Los Alamos Area Office (DOE/LAAO). For these reasons, it is unlikely that Flattop will be operational for the remainder of this Fiscal Year.

**Comet:** Several additional proton recoil, Rossi-alpha, and foil irradiation measurements were made this quarter to further characterize the spectrum in the Zeus intermediate energy spectrum experiment. At this point, essentially all of the measurements that can possibly be made for this configuration have been made. No further measurements will be made with Zeus until approval is received from DOE/LAAO to proceed with the remaining experiments. (A request to continue with these experiments and all of the supporting safety documentation was submitted to DOE/LAAO in December of 1999.) The Comet machine is currently in the process of being defueled to assure fuel integrity while awaiting approval from DOE/LAAO to proceed.

**SHEBA:** SHEBA was declared operable on February 10, 2000. [SHEBA had been stood down as a result of a discrepant-as-found condition with the Remote Autoranging Picoameters (RAPs)]. Several SHEBA operations were performed in support of the three criticality safety classes held during the quarter and for operator training.

**Godiva:** Godiva assembly operations were terminated in the fourth calendar quarter of 1999 due to the discovery of a Potentially Inadequate Safety Analysis (PISA). The PISA originated when an error was discovered in a calculation performed by another group at Los Alamos. This calculation provided a part of the technical basis for DOE/LAAO's approval of a prior unreviewed safety question (USQ), hence the declaration of the PISA. The USQ for the PISA was originally submitted to DOE/LAAO for approval in the fourth calendar quarter of 1999 and then resubmitted on 6 January 2000. Approval of the USQ was received on April 11, 2000, but DOE/LAAO is requiring the implementation of several additional controls prior to authorizing operations. Authorization to restart Godiva operations is anticipated by the end of May 2000.

Planet: Planet operations were performed for the three criticality safety classes conducted during this quarter and Planet experiments to characterize the reactivity worth of waste matrix materials continued.

## **Benchmarking**

Fiscal Year 2000 Funding for the International Criticality Safety Benchmark Evaluation Program (ICSBEP) was received and distributed to working group participants during February 2000, and work was restarted. Preparations for the next ICSBEP Working Group Meeting were initiated. This meeting will be held June 26, 27, and 28, 2000, in St. Petersburg, Russian Federation. Technical tours of the critical facilities at the Russian Research Center "Kurchatov Institute" in Moscow and at the Institute of Physics and Power Engineering in Obninsk are being arranged for June 29 and 30. Representatives from the United States, United Kingdom, Russia, France, Japan, Yugoslavia, Spain, Israel, China, and the OECD are expected to attend this meeting. Twenty-five evaluations are in progress and are expected to be completed in time for the Working Group Meeting in June. Thirteen of these evaluations are being contributed from outside the United States.

The ICSBEP Internet Site (<http://icsbep.inel.gov/icsbep>) was revised and updated. One previously approved, but unpublished evaluation and a significant amount of additional spectra data were made available on the site. Additional information on the project organization and status was added. A feedback questionnaire for the ICSBEP was prepared and submitted to DOE for inclusion on the DOE Criticality Safety Web Site.

Some ICSBEP personal participated in the FY-2000 NCSP Review and Nuclear Criticality Technology and Safety Project (NCTSP) Workshop in Albuquerque, New Mexico. Presentations on the ICSBEP were given in both of these meetings.

## **Analytical Methods**

Staff at the Oak Ridge National Laboratory (ORNL) and LANL continued to maintain KENO and MCNP software and assist the nuclear criticality safety community in the use of this software. At ORNL this included completion of the software utilized by the new SCALE/CENTRM/KENO sequence to include the standard SCALE options for cross-section weighting (pin or cell) and fissile system analysis (1D Discrete Ordinates or 3D Monte Carlo). The document on SCALE/CENTRM validation for mixed oxides was published (ORNL/TM-1999/299). Additional design work to provide for resonance processing of more than one fissile mixture was performed. Preparations were made for a five-day KENO/SCALE Workshop to be conducted at ORNL in early April.

At LANL the MCNP4C code was completed and sent to Radiation Shielding Information and Computational Center (02/29/00) for packaging and distribution. It has ten major new features: 1) unresolved resonance probability tables, 2) perturbation enhancements, 3) superposed mesh weight window generator, 4) alpha eigenvalues, 5) macrobodies, 6) ENDF/B-VI improvements, 7) PC enhancements, 8) electron physics enhancements, 9) parallelization enhancements, and 10)

delayed neutron treatment. As a measure of recent code maintenance, approximately 40 errors were detected and corrected by the MCNP staff during the development of version 4C. Four verification and validation reports were published in 1999. Seven MCNP workshops are scheduled for Fiscal Year 2000.

At the Argonne National Laboratory (ANL), further studies on Monte Carlo source convergence were performed with a comparison of the superhistory and stratified sampling techniques. A detailed proposal on the specific work areas of the new OECD/NEA Task Force on Source Convergence in Criticality Safety Calculations will be presented at the Working Party on Nuclear Criticality Safety meeting in September 2000, and at the Nuclear Science Committee meeting. Additional covariance data files for use in the AROBCAD Task were developed and additional features were added to the new VIM web page.

### **Nuclear Data**

Nuclear cross-section data measurement activities continued at the Oak Ridge Electron Linear Accelerator. Sample holders for the U-233 thick foil measurements have been designed and fabricated. These measurements will allow us to improve the U-233 cross section representation in the unresolved energy region. Fabrication and retrieval of the thick samples from Building 3019 has been a slow process, but is progressing. Reduction of the chlorine data has been completed and is ready to be analyzed. Reduction of the silicon data has been started.

Nuclear cross section data evaluation activities also progressed. Review of the documentation on the resolved resonance region evaluations for Al-27 and U-233 is underway. At LANL, some additional work on Cl-35 and Cl-37 evaluations was done and an improved R-matrix analysis of O-16 below 6.2 MeV was performed. Extensive changes were made at higher energies based on new experimental data.

The following publications were released: ORNL/TM-13723 "REVIEW OF ENDF/B-VI FISSION-PRODUCT CROSS SECTIONS"; and ORNL/TM-2000/19, "NUCLEAR DATA COVARIANCE WORKSHOP, April 22-23, 1999."

At ANL, work on resonance theory continues to focus on improved treatment of the probability table methods in the unresolved resonance energy range. The treatment for zero temperature has been done by analytical means and the coding for numerical treatment is in progress. ANL is also continuing to provide covariance information for ENDF/B-V cross sections used in the AROBCAD Task.

### **Training and Qualification**

This program element includes three sub-elements: (1) hands-on criticality safety training at LANL; (2) training development; and, (3) criticality safety qualification program activities.

Hands-on criticality safety training continued at LANL. The new advanced 5-day class was conducted in February. A basic five-day class and a three-day class were both held in March. Five additional training courses are scheduled for the remainder of Fiscal Year 2000.

Training development activities were essentially discontinued this quarter due to the delay in funding distribution. One additional training module, Module 7, *Introduction to the Monte Carlo Method*, which was already in the pipeline, was reviewed and reformatted, then loaded onto the NCSP web site. Fiscal Year 2000 funding for this activity was included in the April Financial Plan, so work can be reinitiated in early May.

Regarding qualification activities, the Department is in the process of drafting a page change to DOE O 420.1 that requires contractors to implement a training and qualification program for Nuclear Criticality Safety Staff. Final wording for the page change is still in preparation and technical comments received on the initial draft are being resolved prior to issuance for external review which is anticipated by the end of May 2000 (see Recovery Plans for IP Milestones 6.6.3.3 and 6.6.3.4).

Departmental criticality safety personnel are working towards qualification by December 2000 (see IP Recovery Plan for Milestone 6.6.4.2). At least sixteen Federal employees from around the Complex plan to qualify. Milestone 6.6.4.2 will have been met when at least one Federal employee has qualified from each site which has a criticality safety program. The Department is tracking progress of these individuals. No one has completed the qualification process to date. Four plan to be finished by mid summer, and the remainder plan to be qualified by November or December 2000.

### **Information Preservation and Dissemination**

This program element currently contains two sub-elements: (1) the Criticality Safety Information Resource Center (CSIRC); and (2) NCSP web page development.

Regarding the CSIRC Program, the following progress has been made. Compact Disks have been produced for the references to LA-10860 and distribution will be made to those requesting such through the web site. The 147 references to LA-12808 and the available references to the Criticality Accident Report (LA-13638) have been scanned into electronic format. Arrangements are being made with Dave Smith to videotape him in the near future. A videotaping conference is being planned for September 2000 at LANL to bring together criticality safety pioneers from ORNL and LANL to videotape their personal reminiscences of their years of work in criticality safety and recollections of particular experiments. The following reports are in the process of being published: editing of LA-13638, the Criticality Accident Report, has been completed and publication and distribution are planned for the next quarter; Robert E. Rothe, LANL consultant, is currently documenting the history of the critical experiment effort at Rocky Flats (over 30+ years). On February 17, 2000, Barbara D. Henderson made a CSIRC presentation to the Los Alamos Women in Science (LAWIS). It was well received, and a summary of the paper was published on the LAWIS web site.

The NCSP web site at Lawrence Livermore National Laboratory is being maintained and improved. This web site provides technical information and serves as a pointer to other web sites which are important to the NCSP. During the second quarter of Fiscal Year 2000, the NCSP web site highlights included:

- (1) Announced the NCSP Review Meeting and published the Agenda;
- (2) Presented a NCSP web site demonstration at the NCTSP;
- (3) Enhanced the web site system to meet all cyber-security requirements;
- (4) Added a banner to announce the NCTSP meeting, and included of a copy of the meeting agenda on the web page;
- (5) Added Training Module 7, *Introduction to the Monte Carlo Method*;
- (6) Announced availability of the report, "Sensitivity and Uncertainty Analyses Applied to Criticality Safety Validation" and provided of a hyperlink to the data source web site;
- (7) Conducted an e-mail drive to encourage web site users to register at the web site to update the website users e-mail directory; and
- (8) Added the NCSP Feedback Questionnaire to the web site.

Finally, some interesting web site statistics have been collected:

- \* The site hosted more than 6200 visitors in 1999.
- \* Currently, there are approximately 200 registered users.
- \* The site now contains 7 training modules.  
There have been more than 1000 downloads of these training modules.
- \* The Bibliographic references databases are the most visited section of the web site.  
Thus far, there have been over 7000 accesses and searches on these databases.

### **Applicable Ranges of Bounding Curves and Data**

The five tasks of the AROBCAD program address Recommendation 97-2 commitments to develop technically justifiable methodologies and user tools for validating bounding data and calculations in areas where benchmark data is unavailable or excessively sparse and to aid in the selection or design of appropriate benchmarks, thereby providing greater confidence in the calculational validation. During the second quarter of Fiscal Year 2000, three of the five tasks were addressed and progress reports were provided to the NCSPMT and the NCTSP workshop audience. Additionally, a solicitation-for-feedback questionnaire was developed for the NCSPMT to assess criticality safety community support for AROBCAD task.

TPP Task 1 - *Implement use of optimization techniques for establishing bounding values.* The prototypic SWAN-SCALE one-dimensional material-optimization code has been completed and



incorporated into an ORNL SCALE driver system. The final draft of the user manual is with the University of California Berkeley (UCB) staff for final review, revision and discussion with ORNL staff before editorial review and approval for printing. Printing is projected by the end of the third quarter of Fiscal Year 2000. The issuance of the codes is still not projected to occur before the end of 2001.

TPP Task 2 - *Investigate means to resolve or incorporate anomaly and discrepancy effects into bounding values.* The draft technical report on the investigation of discrepancies in the National Institute of Standards and Technology experiments has been completed and is still expected to be published in the third quarter of Fiscal Year 2000.

TPP Task 3 - *Investigate utilization of sensitivity and uncertainty (S/U) and statistical methods for identifying experimental needs.* Work continued on the reduction of data and drafting of the report about sensitivity and uncertainty studies that were performed on a previously proposed sludge transfer from the Hanford K-Basin to Tanks and National Spent Nuclear Fuel (SNF) disposal parameters as compared to a suite of approximately 425 benchmarks. The draft report is expected to be completed in the third quarter of Fiscal Year 2000.

TPP Task 4 - *Develop guidance for interpolating and extrapolating bounding values.* Effort on this subtask currently continues at ORNL considering various methods for evaluating computational biases and uncertainties due to cross section and experimental benchmark measurements using various integral parameters derived from S/U information and Generalized Linear Least Squares Method. This subtask will progress as further relevant information is generated and evaluated using the results of AROBCAD Tasks 3 and 5.

TPP Task 5 - *Develop guidance for establishing bounding margins of subcriticality.* No work was conducted during the second quarter of Fiscal Year 2000 on the draft assessment report of the US nuclear criticality safety community, commercial and contractor, practices and methods for establishing bounding margins of subcriticality. It is expected that the report will be completed during the third quarter of Fiscal Year 2000.

## ATTACHMENT A: IP COMMITMENT AND DELIVERABLE/MILESTONE STATUS

Commitment	Deliverable/Milestone	Due Date	Status
6.1 Assess critical experiments program	1. Assessment report of criticality research program	March 1998	Completed
6.2.1 Perform CSIRC pilot program	1. Identify an experiment to archive	November 1997	Completed
	2. Archive logbook(s) and calculation(s) for that experiment	December 1997	Completed
	3. Videotape original experimenters	January 1998	Completed
	4. Digitize data and calculations	February 1998	Completed
	5. Publish data and calculations	April 1998	Completed
6.2.2 Continue to implement the CSIRC program	1. Collocate logbooks (copies or originals) from all U.S. critical mass laboratories	December 1998	Completed
	2. Screen existing logbooks with original author/experimenter	December 1998	Completed
	3. CSIRC program plan	December 1998	Completed
6.3 Continue and expand work on ORNL sensitivity methods development	1. Technical program plan	July 1998	Completed
	2. Document initiation of priority tasks from the program plan in the quarterly report to the Board	January 1999	Completed
6.4 Make available evaluations, calculational studies, and data by establishing searchable databases accessible through a DOE Internet web site	1. DOE criticality safety web site	March 1998	Completed
	2. Y-12 evaluations on DOE web site	June 1998	Completed
	3. Calculations compiled by the Parameter Study Work Group on DOE web site	September 1998	Completed
	4. Nuclear Criticality Information System Database on DOE web site	March 1999	Completed
6.5.1 Revise and reissue DOE-STD-3007-93	1. Revise DOE-STD-3007-93	September 1998	Completed
6.5.2 Issue a guide for the review of criticality safety evaluations	1. Departmental guide for reviewing criticality safety evaluations	May 1999	Completed
6.6.1 Expand training course at LACEF	1. Expanded LACEF training course	July 1998	Completed: February 2000

Commitment	Deliverable/Milestone	Due Date	Status
6.6.2 Investigate existing additional curricula in criticality safety	1. Assessment of additional training needs and review of available supplementary curricula	June 1998	Completed
	2. Initiate a program which addresses identified needs	December 1998	Completed
6.6.3 Survey existing contractor site-specific qualification programs	1. Report on the review of site qualification programs	June 1998	Completed
	2. Guidance for site-specific criticality safety training and qualification programs	September 1998	Completed
	3. Guidance to procurement officials specifying qualification criteria for contractor criticality safety practitioners	September 1998	Overdue: Expected completion date is September 2000 - See Recovery Plan in Attachment B.
	4. DOE Field will provide line management dates upon which contractors will have implemented guidance in Deliverable #2, above	March 1999	Overdue: Expected completion date is March 2001 - See Recovery Plan in Attachment B.
6.6.4 Federal staff directly performing criticality safety oversight will be qualified	1. Qualification program for Departmental criticality safety personnel	December 1998	Completed
	2. DOE criticality safety personnel qualified	December 1999	Overdue: Expected completion date is December 2000 - See Recovery Plan in Attachment B
6.7 Each site will conduct surveys to assess line ownership of criticality safety	1. Individual sites issue report of findings	June 1998	Completed
6.8 The Department will form a group of criticality safety experts	1. Charter for Criticality Safety Support Group approved by the NCSPMT	January 1998	Completed
6.9 Create NCSPMT charter and program plan	1. NCSPMT charter	January 1998	Completed
	2. NCSPMT program plan	June 1998	Completed

## ATTACHMENT B: RECOVERY PLANS FOR OVERDUE MILESTONES

### Recovery Plan for IP Milestone 6.6.3.3: Guidance to procurement officials specifying qualification criteria for contractor criticality safety practitioners (was due 9/98).

<u>Action</u>	<u>To Be Completed By</u>	<u>Responsibility</u>
1. MA issues draft Page Change to Field Management Counsel (FMC) for initial review.	March 2000	Completed
2. FMC comments received and incorporated.	May 2000	DP-10
3. FMC approves release of Draft Page Change for review and comment.	May 2000	DP-10
4. MA issues draft Page Change for 60-day for review and comment.	May 2000	DP-10
5. Comments due; EH-31 starts comment resolution.	July 2000	Reviewers
6. EH-31 completes comment resolution; forwards final draft Page Change to MA.	September 2000	EH-31
7. MA releases approved Page Change.	October 2000	DP-10

### Recovery Plan for IP Milestone 6.6.3.4: DOE Field will provide line management dates upon which contractors will have implemented guidance in Milestone 6.6.3.2 (was due 3/99).

<u>Action</u>	<u>To Be Completed By</u>	<u>Responsibility</u>
1. MA releases approved Page Change (Action #7 of Recovery Plan for Milestone 6.6.3.3).	October 2000	DP-10
2. Contractors inform DOE Field as to dates by which they will have implemented site specific training and qualification programs.	April 2001	Field
3. Field reports status to DP-10.	April 2001	Field

**Recovery Plan for IP Milestone 6.6.4.2: DOE criticality safety personnel qualified ( was due 12/99).**

<u>Action</u>	<u>To Be Completed By</u>	<u>Responsibility</u>
1. DP will inform the FMC about the Federal Qualification Program.	June 1999	Completed
2. Publish Federal Qualification Standard.	November 1999	Completed
3. Lead Program Secretarial Officers (LPSOs) Task Field Managers.	March 2000	Completed
4. Fed Qual Plans Submitted to LPSOs.	May 2000	Field
5. DOE criticality safety personnel qualified.	December 2000	Field