



Department of Energy  
National Nuclear Security Administration  
Washington, DC 20585



February 15, 2005

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

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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Dear Mr. Chairman:

Your letter of October 27, 2004, requested a report summarizing activities associated with the Defense Nuclear Facilities Safety Board Recommendation 93-6, "Maintaining Access to Nuclear Weapons Expertise in the Defense Nuclear Facilities Complex."

The Administrator requested that I reply. In addition to requesting the enclosed report, you expressed concerns that the Department of Energy (DOE) is not supporting commitments made in response to Recommendation 93-6. Although our processes have evolved substantially since the 1993 timeframe, as shown in the report, the DOE is committed to meeting the intent of the closed recommendation. During the early to mid-1990s, the Department lacked validated formal processes for capturing safety-related information. Since that time, the process has evolved into a more rigorous and comprehensive system to document hazard scenarios and weapon responses.

The quality and processes related to weapons response have become more formal due to the inclusion of Title 10, U.S. Code of Federal Regulations, Part 830, quality requirements and peer reviews. The use of the Weapons Response Database (WRD) for weapons response and the requirement to conduct activities in support of documented safety analyses also ensure a more rigorous and formal process to capture and document information. The WRD has proven to be a beneficial tool in capturing hazard scenarios and the weapons responses to those scenarios for each weapon system. The weapons safety specification is still used as the source material for hazard identification related to weapon design, aging, and surveillance activities.

The report shows a substantial amount of information that has already been archived and highlights several institutional processes to ensure continued access to nuclear weapons information. Interviews with employees in critical positions and retirees, scanning of documents, and video taping of interviews are some of the methods utilized to capture and document weapons information. Programs also exist to allow retired individuals, possessing critical knowledge, to contribute as consultants. The Nevada Test Site has a substantial program to ensure information is documented and accessible.



Archiving of weapons information has been ongoing, although it has evolved into a different form. The National Nuclear Security Administration considers maintaining access to nuclear weapons expertise and documentation of weapons information a high priority. The processes and methods will continue to be updated and modified as requirements change to ensure that weapons information is captured and archived.

If you have questions, please contact me or have your staff contact Mr. Michael Brown at 505-845-6258.

Sincerely,

A handwritten signature in black ink, appearing to read "Everet H. Beckner". The signature is fluid and cursive, with the first name "Everet" being more prominent.

Everet H. Beckner  
Deputy Administrator  
for Defense Programs

Enclosure

cc w/enclosure:  
W. Andrews, DNFSB  
D. Nichols, DNFSB  
M. Whitaker, DR-1

## **Defense Nuclear Facilities Safety Board** **Recommendation 93-6**

### **Introduction**

This report is in response to the October 27, 2004, letter from the Defense Nuclear Facilities Safety Board (DNFSB) regarding the Department of Energy's (DOE) support of commitments made in response to Recommendation 93-6, "Maintaining Access to Nuclear Weapons Expertise in the Defense Nuclear Facilities Complex." The purpose of this report is to provide evidence and documentation that, although our processes have evolved since Recommendation 93-6 was written, the DOE/National Nuclear Security Administration (NNSA) is still meeting the original intent of the recommendation.

The report is arranged in three sections: Weapon Safety Specifications (WSS); Weapons Operations Archiving Practices instituted by the Pantex Plant, Y-12 Plant, and the national laboratories; and Testing Operations Archiving at the Nevada Test Site (NTS). The WSS section provides a description and status of current documentation and plans for respective updates. The Weapons Operations Archiving Practices section provides a status, by site, of activities associated with the original 93-6 Implementation Plan, those that were institutionalized, and current and planned activities. The Testing Operations Archiving at the NTS provides a similar status. The report closes with a summary and conclusion regarding the DOE/NNSA's current approach and reinforced commitment.

### **I. Weapons Safety Specifications**

The DNFSB Recommendation 93-6 required that a WSS be developed for all weapons systems. The following provides a description and status of WSS documentation and plans for respective updates.

The WSS defines hazards inherent to the weapon design, component aging, normal assembly and or disassembly, and those associated with credible deviations from the normal condition or operations. Annual updates were planned initially, but situational updates proved to be more efficient. Updates occur when additional information is discovered during surveillance and maintenance program activities. The WSSs are used as the key initial input to the hazard assessment aspect of the Seamless Safety for the 21<sup>st</sup> Century (SS-21) process. A review and update of the existing WSS occurs as one of the critical items in each SS-21 program's project scope.

Currently, hazard scenarios developed during SS-21 activities are documented in the Weapon Response Database (WRD). The WRD provides a formal documented archive in which potential hazards/insults and associated weapon responses are captured. Weapon responses are in compliance with Title 10, U.S. Code of Federal Regulations, Part 830, (10CFR830) and are certified by the national laboratories for each weapon system. Should any new scenarios be identified for programs in the database that have already accomplished SS-21, the WRD is updated to reflect these new hazards and weapon responses. The WRD is under configuration management with access controlled on a need-to-know basis.

The WSSs and the WRD are derived and maintained by knowledgeable personnel that have demonstrated expertise in their respective fields. The current status of the WSSs is shown in the following table.

<b>Weapon System</b>	<b>Document #</b>	<b>Release</b>	<b>Release Date</b>	<b>Update/Status</b>
B53	SS301800-000	D	May 2002	Update in progress to address the latest dismantlement issues and revised LANL assessments HE and detonators
B61-3,4,10	SS707285-000	J	November 2004	Update in 2005 to reflect SS-21 process configurations
B61-7,11	SS301975-000	H	November 2004	Update in 2005 to reflect SS-21 process configurations
B83	SS458794	B	May 2002	Release C planned for release in 2005 as SS-21 activities are completed
W56	SS458330-000	H	September 2004	Reflects current process
W62	SS458511	F	August 2004	Reflects current SS-21 process
W76	SS707338	D	February 2004	Release E update initiated for 10CFR830 compliant Hazard Analysis Report and W76-1
W78	SS709978	D	December 2003	Release E is scheduled for February 2005
W80-0,1	SS301515	H	April 2002	Release I is in development and scheduled for release in 2005
W84	SS458969	C	July 2004	Update will occur in accordance with SS-21
W87	SS458804	A	September 1997	Release B is scheduled to be released May 2005
W88	SS709921	C	January 2005	Reflects current SS-21 process

## **II. Weapons Operations Archiving Practices (Y-12 Plant, Pantex Plant, Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), and Sandia National Laboratories (SNL))**

The Recommendation 93-6 requested that archiving programs be initiated to obtain and record undocumented anecdotal technical information deemed critical to enable safe weapons operations. The NNSA's weapons operations archiving process includes the development of processes to document design knowledge and process skills. The archiving process also includes a provision to review personnel losses that could impact the knowledge base of safe weapons operations and to obtain and document critical information from these individuals prior to their departure from the Nuclear Weapons Complex.

The following provides information, by site, regarding the methodology/programs currently implemented and planned to capture weapons safety information.

### **A. Y-12 Plant**

In support of the 93-6 Implementation Plan, the Y-12 Plant developed a Knowledge Preservation Program (KPP) using safety documentation and knowledge capture efforts to preserve capabilities associated with processing, assembly, disassembly, and quality evaluation and to establish an approach for preserving additional anecdotal knowledge with an emphasis on safety. A portion of the knowledge related to operational and safety aspects of the Y-12 Plant processes, quality evaluation, assembly/disassembly, and safety support functions were previously documented in build-book records, criticality safety approvals, class I operating, health and safety, and dismantlement procedures, and weapon materials characterization lists. Former (both reassigned and retired) personnel who held key functional positions were included in the program. The information was archived in text, videotapes, or other formats as required.

As part of the KPP, critical functional areas, key positions, and associated skills and knowledge were identified, and an assessment of projected personnel losses was conducted to ensure knowledge and skills will be transferred and preserved. The process included input from LANL, LLNL, and SNL as necessary. The Y-12 Plant KPP also includes information from other ongoing initiatives such as the Y-12 Plant Restart Effort, Recommendation 94- 4 Implementation Plan, the training and qualifications effort (Recommendation 93-3), and the Production Capability Assurance Program. The Y-12 Plant plan for implementation of 93-6 had two commitments;

**Commitment 1** - Issue the KPP document for the Y-12 Plant which describes the steps used to capture and utilize anecdotal safety aspects of quality evaluation, assembly/disassembly, processes, and safety support skills and knowledge.

**Commitment 1 Status:** The KPP Plan for the Y- 12 Plant, Y/DA-9370, was issued July 15, 1995. A list of accomplishments is included below:

- Identified key positions for each facility from the Y-12 Plant training implementation matrix (TIM);
- Identified key functional areas/positions (identified a total of 102 critical positions) using the TIM, critical safety elements, and critical functional areas list;
- Identification of current and former personnel with critical knowledge, skills, and abilities (initially, 175 names);
- Conducted 232 initial interviews;
- Institutionalized an exit questionnaire for personnel occupying critical positions;
- Derived a knowledge preservation database including information from interviews;
- Converted approximately 80 quality evaluation videotapes to the modern format;
- Developed a draft Generic Secondary Safety and Hazards Guideline;
- Utilized the preserved quality evaluation videotapes in personnel training;
- Utilized the archived interviews for procedural development, as appropriate, and generated a related operations and safety information sources list;
- Established the Y-12 Plant Retiree Corps Program with 34 retiree members and interviewed members of corps; and
- Created a knowledge preservation personnel list to flag upcoming retirement dates for key personnel to ensure that exit interviews were scheduled accordingly.

The knowledge preservation personnel list identified 296 employees of which 130 had been interviewed as of September 1997. Funding issues in the 1998 timeframe prevented interviews for the remaining 166 employees. Of the 296, 50 have since retired; however, 33 of those individuals are available as subcontractors. The list has not been updated since 1997. However, several individuals that have retired in the past 8 years are still accessible via post-retirement subcontract employment.

**Commitment 2** - Provide a status report detailing the progress on the implementation of the approved program document.

**Commitment 2 Status:** On May 31, 1998, the Y-12 Plant issued an initial report providing the status of the implementation of the KPP. The following outlines current actions in support of the archiving for future weapon dismantlement and modification operations.

- To ensure a continued commitment, the Y-12 Plant established a KPP Steering Group with a senior-line manager leader charged with 93-6 institutionalization. The Steering Group includes members from Defense Programs; Applied Technology, Engineering, Information and Materials; Human Resources; and other Subject Matter Experts (SMEs). The Steering Group will conduct and approve the actions listed below.
- Update the September 1997, Critical Skill Function and Incumbent List (estimated completion second quarter of Fiscal Year (FY) 2005).
  - i. Add categories and respective personnel for specific weapons system dismantlement and modifications planned for Y-12 Plant future operations including specific types of legacy records.
  - ii. Flag personnel within 6 months of retirement as high priority.
  - iii. Flag personnel with knowledge of planned dismantlement/modification weapon programs as priority.
  - iv. Establish a process to ensure a review and update of the list semi-annually addressing priorities/requirements.
- Review and update the knowledge capture interview questions. Utilize SMEs to contribute to the question revisions. Revise question sets to address the unique anecdotal knowledge possessed by the interviewee (estimated completion second quarter FY 2005).
- Identify personnel to conduct interviews and retrieve applicable records. Develop interview schedule. Develop the interview schedule based on priorities established by the updated critical skills, function and incumbent list (estimated completion second quarter FY 2005).
- As a triage action, as soon as the critical skills function and incumbent list is updated and no later than February 2005, commence interviewing personnel who are leaving within 6 months or have recently retired (first interview November 17, 2004, and four more interviews conducted as of December 20, 2004).
- Evaluate the format of existing archived information and determine if it supports current requirements for process knowledge extraction and training of new engineers and workers (estimated completion third quarter FY 2005).
- Evaluate the value added of re-instituting the Retiree Corp. Experience indicates access is feasible to most key experienced retirees via subcontracts (estimated completion second quarter FY 2005).
- Establish a dialogue with weapons laboratories to evaluate how to best coordinate our KPP (estimated completion second quarter FY 2005).

- Develop a site-wide procedure that institutionalizes the KPP process. Procedure will identify organizations responsible for and supporting KPP, Work Authorization Directive funding for institutionalization, organizations responsible for overseeing interviews and data archiving, and other key KPP functions and requirements (estimated completion third quarter FY 2005).

While the formal Y-12 KPP was not continued per se, significant knowledge capture efforts still occurred. For example, in support of the startup/restart of operations in the mid-1990's, the Y-12 Plant utilized the skills and knowledge of experienced personnel to upgrade existing criticality and facility safety analyses, develop and verify procedures for material processes, dismantlement/assembly procedures, and the generation of technical basis for various facilities, systems, and components. As part of the 10CFR830 implementation, the Documented Safety Analysis (DSA) was generated, reviewed, and approved by DOE. In support of the DSA process, extensive use was made of experienced and knowledgeable Y-12 Plant personnel from various disciplines to ensure the safety analysis included anecdotal information available only from these individuals.

## **B. Pantex Plant**

The Pantex Plant archiving process was originally established as a means to elicit operational and design knowledge from workers including production technicians, who had direct weapon system experience, and to preserve the information so that it was not lost with the normal attrition of the workforce. This process focused on documenting key safety and operational information for current and previous nuclear weapon processes, which were to be used as initial input during the development of more modern SS-21 processes to enhance the safety and efficiency of nuclear weapons operations. The archiving process occurred via historical document research, videotaping, and interviews. The following provides a list regarding the specific approach for each system.

Weapon programs that completed the Recommendation 93-6 archiving process by historical document research and video-taped interviews:

- W69 (existing BWXT Pantex Plant personnel only);
- W56 (existing and retired BWXT Pantex Plant personnel);
- W76 (joint video-taped session at SNL with Design Agency (DA) personnel); and
- B61 (joint videotaped session at the BWXT Pantex Plant with DA personnel; covered Mods 3/4/7/10/11).



Weapon programs that completed the Recommendation 93-6 archiving process by researching historical documents and conducting interviews are the B53, W62, and W84.

Weapon programs that completed knowledge capture of historical safety issues as part of SS-21 startup are the W78, W80, W87, W88, and B83.

### **Current approach to Archiving at the Pantex Plant**

While the initial archiving activities were being conducted, the approach for developing SS-21 processes was evolving into a robust, systematic, risk-based engineering effort focused on designing out process hazards. The current approach is highly reliant on input from experts from multiple safety disciplines (HE safety, nuclear explosive safety, radiation safety, industrial hygiene, etc.), as well as experts in risk analysis from both the site and the national laboratories, to optimize the safety of the SS-21 weapon operations. The decisions and tradeoffs from the SS-21 activities are also recorded in the DSA.

The rigor of the current SS-21 development process demands more substantial and detailed information than was previously required. In addition to the need for comprehensive weapon design and safety information, the risk-based hazard assessment efforts result in specific technical questions regarding weapon response. The request for weapon response is formally transmitted to the responsible national laboratory for determination. The laboratories prepare the formal response using the appropriate analytical or expert basis and conduct a peer review against the standards of compliance with the quality requirements of the 10CFR830. The weapon response is then formally released by the laboratories for use by the production agency. As stated earlier, the WRD provides the formal documented weapon response and resolution to many of these technical questions. In addition, 10CFR830 demands the highest level of quality and accuracy of the information represented in the WRD.

The evolution of the SS-21 process has resulted in significant improvements in the documentation of the process, the safety decisions, and tradeoffs considered in making the safety case for authorizing operations. This safety case provides a detailed description of the operations, equipment, and facility interactions associated with the process and the evaluation of postulated events related to these operations to determine specific weapon response and risk determination. Functional and maintenance requirements for the controls are also defined in the safety document. The formal documentation of the safety case for each weapon supports the DSA.

Along with the DSA, specific weapon process information is assembled into a comprehensive document that identifies pertinent weapon features and details, tooling design and analysis, and a detailed description of the weapon process. This document represents the formal input to the nuclear explosive safety study (NESS).

The following table delineates the type of safety documentation currently available for each weapon program.

<b>Weapon System</b>	<b>SS-21 Process</b>	<b>10CFR830 Documented Safety Analysis</b>	<b>10CFR830 Weapon Response</b>	<b>Comprehensive NESS Input Document</b>
B53				
B61	In Process	X	X	
B83	In Process	X	X	
W56	X	10CFR830 Exemption		X
W62	X	X	X	X
W69	X			
W76	D&I	X	X	
W78	X	X	X	X
W80	In Process			
W84				
W87	In Process	Submitted	X	
W88	In Process	Bay		

**C. Lawrence Livermore National Laboratory**

All planned archiving activities were also completed and institutionalized.

In FY 2001, LLNL developed a database to identify and track critical skills. LLNL periodically updates the database and is in the process of revising the format to support current needs for data retrieval. LLNL also maintains access to retired individuals with critical skills by using subcontracts.

The LLNL assures that weapons design and technical safety information is documented and maintained via training courses, lectures and mentoring. The courses provide weapons physicists and engineers in-depth information on a wide variety of topics including the weaponization process, basic primary and secondary design, testing, including nuclear, hydrodynamic, and development activities, and high explosives properties and initiation behavior. The lectures are more focused on details associated with primary physics and topics essential to the primary physics design and assessment. Lecture topics include the Hydro Program, equation of state, modeling, nuclear diagnostics, and design concepts. Many of the teachers and presenters are the original weapon program physicists and engineers some of which are brought in as retirees under subcontract.

For both the weapon's courses and lecture series, LLNL made extensive use of videotaping. Several hundred videos are currently online with digital formats providing for preservation of content streaming delivery.

The LLNL also utilizes mentoring to ensure that critical information is maintained and documented for future reference. Senior program staff and retirees are brought in to meet with the weapons program staff to assure the transfer and retention of stockpile systems information such as safety, component functionality, surveillance, life extension studies, and retirement (including dismantlement and storage of components).

The LLNL archiving efforts consist of evaluation of legacy documents, scanning, and storage of material.

- a) Legacy information includes documents from older systems written by individuals who have retired or otherwise left the complex. The evaluation includes an assessment by SMEs regarding the possible value to current and future weapon program activities.

Basic criteria for legacy document retention include:

- safety evaluations, including criticality studies;
- value to a future designer;
- value to stockpile evaluation;
- historical information;
- program descriptions;
- manufacturing process description;
- surveillance history;
- concepts that did not go into production;
- engineering test reports for systems in stockpile; and
- materials, contours, inspection reports, assembly records, test results etc., for nuclear tests, hydro tests, and engineering tests.

Formal drawings and specifications are stored by the Engineering Records Center and by SNL for production items.

- b) Scanning of pertinent documents from the LLNL weapon design vaults into the laboratory's Defense and Nuclear Technologies/Document Management System for electronic access by current employees.

Scanning activities have been ongoing for several years at the LLNL and some 65,000 documents (1.2 million pages) have been scanned and indexed for search and retrieval. The current effort supports the scanning of both legacy information and

current efforts. The LLNL recently created several safety related index pages as a stored search topic to facilitate direct access to such information. The LLNL also purchased and installed commercial document management systems and specialized systems for capture of new information in electronic form as it is generated.

- c) Storage of material that is not scanned but is recoverable by means of limited metadata. Generally this material relates to systems no longer active, but includes current information of historical value.
- Information for archival is both migrated to new media and converted to electronic form as quickly as possible to halt degradation.

All of the archiving activities listed above are ongoing. Funding for archiving activities at LLNL has been stable and substantial enough to provide for significant progress in the LLNL archiving effort.

#### **D. Los Alamos National Laboratory**

Many of LANL's archiving activities have been ongoing since the beginning of the nuclear weapons program. The LANL prioritizes nuclear weapons information archiving efforts by reviewing directed stockpile work (DSW) activities such as surveillance, significant finding investigation assessments, planned weapons system refurbishments, and the W88 pit manufacturing and certification. Data requirements are also established by the need to validate the Advanced Simulation and Computing Program simulation tools.

The LANL institutionalized the archiving activities program funded in the DSW category. Ongoing activity includes:

- data mining from old NTS events and hydro experiments;
- preservation of experimental data, calculations, and reports;
- document, microfilm, and drawing scanning; and
- document consolidation.

As of the end of FY 2004, the following activities were completed and institutionalized:

- Maintained ready access to electronic archival resources;
- Significant findings (SFI) activity documentation;
- digitized 1,100 videos with plans to have streaming video capabilities at the desktop for archive users;

- scanned W80 holdings for inclusion into the Engineering Science Applications (ESA) Division archive;
- 993,248 documents scanned;
- 334,357 microfilms scanned;
- 1,859 drawings scanned;
- completed case radiograph images of Shots 3101 and 3443;
- completed legacy experiment pit strip chart digitization for Shots 3421, 3422, and 3343;
- completed documentation of pit Shots 3010 and 3011;
- inventoried information on all W76 shots from the last decade per customer request;
- reanalyzed and documented 40 data sets of Rocky Flats pit measurement band files;
- implemented quantification of margins and uncertainties for W76 nuclear performance using accelerated strategic computing initiative code baseline; and
- identified tools and training programs for real-time knowledge preservation.

The LANL also conducted many video-taped interviews of weapons designers and engineers who were responsible for the development of LANL stockpile weapons systems. These interviews documented the design, nuclear tests, hydro tests, and engineering functional testing of each weapon system. The archiving portion of this requirement is ongoing as needs arise.

The following activities are planned for FY 2005:

- complete archiving and data analyses activities associated with hydrodynamic tests and NTS events as required for FY 2005;
- reanalyze reaction history curves for 12 NTS events;
- continue to build tools and training programs for real-time knowledge preservation;
- scan and index approximately 840,000 documents and 300,000 microfilms;
- transfer and train all users of ESA Explorer archive to ESA Stellant archive;
- reanalyze reaction history data (includes uncertainty estimates for reaction history curves);

## **E. Sandia National Laboratories**

The SNL's primary activity associated with archiving is the compilation and maintenance of the WSSs. For the initial derivation of and subsequent update to a WSS, the SNL weapon system project groups coordinate between the respective nuclear laboratory and the BWXT Pantex Plant. The update process includes a review of surveillance, test and SFI data, inclusion of previously identified concerns from similar weapon designs, and consistency of information among programs relating to Major Assembly Release exceptions. The WSSs are available in the SNL classified Image Management System on a need-to-know basis. At SNL, the requirements for WSSs described in the relevant engineering practices, technical business practice, and the Development and Production Manual are included in a stand-alone document titled "Nuclear Weapons Strategic Management Unit (NWSMU) Process: Weapon Safety Specification (WSS)," the most recent revision of which was updated and released in October 2002.

In addition to the WSS activities, SNL developed and initiated a KPP and designated an organization, Organization 2911, Weapon Knowledge Management, the responsibility to execute and manage the effort. This program established a process to identify individuals believed to possess key information to capture knowledge via videotaped interviews.

Initially, SNL created and prioritized a list of individuals to be interviewed. The SNL subsequently identified additional personnel using several methods including: evaluation of current and anticipated retiree roles by SNL Weapons Program Management, self identification by retirees via a questionnaire, specific identification by line management, and review and selection of employees by KPP personnel in conjunction with Weapon Program Management.

The interview process has evolved since the program's inception. Initially, the effort focused on retirees and individual interviews that were typically a broad-based review of the individual's career. The format was subsequently revised to be a "panel discussion" of a specific topic--technical area, weapon system, component, etc. Both currently employed technical experts and retirees were included on these panels. Most recently, the knowledge capture effort has shifted away from retirees to focus more on current developments, information, and personnel. Approximately 2,000 hours of interviews were conducted and videotaped between 1994 and 2000. As part of the SNL video archive, a number of Pantex Plant employees were identified and interviewed.

Since 2000, the KPP effort has focused primarily on processing and archiving information both to avoid the loss of information due to the degradation of the magnetic media and to make it easily accessible. This has involved creating transcripts and a searchable database that resides on the Sandia Classified Network and is accessible on a need-to-know basis.

### **III. Test Operations Archiving at the NTS**

The recommendation stated that the NTS was to develop a formal process to identify the skills/knowledge required to conduct safe nuclear testing operations and relevant safety analysis.

The following information describes archiving activities supporting the NTS test readiness posture. The archiving efforts reflect coordination between the national laboratories and the NTS community.

#### **NTS Planning, Engineering and Preoperational Activities**

Planning and preoperational archiving relates to ensuring the proper estimation of future test locations at the NTS and preoperational activities using existing information and data from past Underground Tests (UGTs).

- Issued the UGT Archiving Database containing testing dates, times, locations, types, etc., in the Document Management and Retrieval System (DMARS) via metadata to NNSA/NV and the laboratories.
- Developed a dynamic computer simulation depicting test operations. Includes parameters such as personnel, equipment, procedures, and authorization basis documentation required for UGTs.
- Produced an Interactive Geology compact disk (CD) depicting geology at the NTS. Information will support the safe emplacement for any future UGTs.
- Produced a textbook on the technical aspects of containment. Textbook has been reviewed for classification and is in the final stages of layout for printing.
- Produced "Drill Hole Inventory Source Book"-4 volumes, approximately 2,000 pages of data on the remaining emplacement holes at the NTS. Currently in draft stage waiting technical review by the national laboratories. The final document will be made available on CD-ROM.
- Produced fifty-two down-hole videos transferred to DV cam format; 45 down-hole shot image documents. Approximately 60 down-hole film CDs available. U.S geological survey surface effects data transfer for 24 UGTs, approximately 8,000 engineering drawings and 35,000 borehole-logging records scanned into DMARS database.

#### **NTS Operational Activities**

The loss of UGT-experienced personnel, both federal and contractor, is an ongoing concern. The current approach to maintaining a fully qualified workforce involves actual execution of representative high fidelity test activities in support of an UGT. Subcritical experiments (SCE) and above ground experiments (AGEX) exercise a number of these

technical skills. By designing and executing SCEs and AGEXs, the next generation experimental teams have the opportunity to predict experimental performance, execute and diagnose experiments, conduct control room operations, transport special nuclear materials, operate the Device Assembly Facility, analyze experimental data, and refine the computer models of physical phenomena based on specific experimental results. During FY 2004, previously archived data was fully utilized in DSA studies for emplacement, insertion, stemming, and timing and control.

- Conducted a drill back exercise at U19ad. As a part of this exercise, the Slant Hole Drill Rig (IRI-1100SH) and its supporting equipment were reconditioned, a hazards analysis for post shot drilling was completed, drillers were trained on core recovery procedures, communications equipment was tested and reconditioned as necessary, and the recovered core was transported back to Livermore, California to exercise the radiochemical analysis capability as well.
- Derived a vertical SCE, The Unicorn Experiment, to exercise UGT operational skills. During the early phases of site preparation, a number of old unusable diagnostics cables were used to conduct a cable down-hole familiarization activities using craft personnel to install cables in the drill hole. Additionally, Unicorn exercised emplacement operations using a heavy lift crane, stemming, diagnostics trailer park set up, data recovery, timing and firing operations, control room operations, event security, and reentry operations.

#### **NTS Institutionalization of Archives**

The following institutionalized items occur annually within the Bechtel Nevada Test Readiness Program's work scope.

- Scanning nuclear test documentation into a database. The documentation from the last five tests for both LLNL and LANL was scanned into the DMARS database. For LLNL, the tests were Coso, Montello, Foyada, Hoya, and Lubbock. For LANL, the tests were Bristol, Junction, Victoria, Galena, and Divider.
- Produced videotapes from group discussions with the aging work force and SMEs having specialized knowledge on a wide variety of activities concerning UGTs (approximately 235 tapes exist).
- Production of interactive CDs (including transcripts). Subjects include: post shot drilling, big hole drilling, event operations and security, device delivery and insertion, emplacement of heavy loads, emplacement of light loads, ground zero cranes, test controllers, recording trailer park/ground zero setup, event hole logging, rack/canister design, and transportation.
- Wrote and updated comprehensive critical position personnel requirements (similar to job task analysis) detailing the technical skills required for critical skill position certification.



- UGT-specific skills training courses exist and a training and mentoring program have been instituted.
- Maintained critical equipment and facilities.
- Generated annual reports assessing the status of personnel, assets, facilities, and the overall readiness to resume UGT.
- Archived video interviews.
- Conducted inventory and tag diagnostic and mechanical equipment (over 30,000 items listed).
- Developed and implemented safety management programs and processes required to comply with the 10CFR830 to support testing activities.
- The LLNL and LANL also participate in the yearly activity for estimating the overall readiness posture for the nuclear testing organization.
- As part of the routine maintenance of personnel records, LLNL, LANL, and NTS laboratories perform periodic reviews of job task analyses for critical skills.
- Ongoing stockpile stewardship experiments are planned and conducted that maintain skills relevant to UGT. These include assembly, delivery, SCE execution activities, ground zero operations, vertical emplacement, stemming, reentry, data analysis, etc.

Accomplishment of planned activities is largely dependent on available funding being available for readiness. Maintenance of infrastructure items is often deferred due to limited funding. These include lessons learned and the development and maintaining of personnel in key positions for each exercise/experiment.

### **Summary and Conclusion**

This report shows that the NNSA, through the SS-21 process, still relies on current WSSs as source material for hazard identification inherent to the weapon design, changes from aging, and to reflect any new information obtained during surveillance activities. The report also highlights the benefit of the WRD for formal documentation of defined hazards associated with weapon operations at the BWXT Pantex Plant and the application of weapon responses to those hazards. Although some of the specific activities related to archiving as written in the Recommendation 93-6 Implementation Plan did not continue as previously committed, the report shows that a substantial amount of archived information does exist throughout the complex. Since the 1993 timeframe, the laboratories have made extensive use of retirees through subcontracts. The NTS section shows significant effort to document previous testing activities that will facilitate a smooth transition in the event testing is resumed.

As stated earlier, the Recommendation 93-6 was written prior to the evolution of hazard identification, analyses, and weapon response processes, as they presently exist. The

formality of DSA, weapon response through the WRD, and the 10CFR830 quality requirements further resulted in a more rigorous method for documenting weapons information. These processes provide a more modern means of meeting the intent of Recommendation 93-6. The WSS update shows that these documents will continue to be updated as necessary.

The NNSA considers maintaining access to nuclear weapons expertise a high priority and will continue to modify methods and processes to ensure that weapons information is documented and archived.