

# **Safety Accomplishments and Activities at Major Defense Nuclear Sites**

The discussion of safety accomplishments and activities at the defense nuclear sites in this appendix is organized by mission sponsor—Energy and Science or the National Nuclear Security Administration (NNSA)—and then by the responsible Department of Energy (DOE) field element as follows. Within the Energy and Science category, the Office of Environmental Management (EM) has responsibility for most of the relevant field elements, sites, and activities. However, the Office of Nuclear Energy (NE) is the lead program secretarial officer for Idaho Operations Office activities, and the Office of Science is the lead program secretarial officer for Oak Ridge Office activities.

- A. Carlsbad Field Office
- B. Idaho National Laboratory
- C. Livermore Site Office
- D. Los Alamos Site Office
- E. Nevada Site Office
- F. Oak Ridge Office
- G. Office of River Protection
- H. Pantex Site Office
- I. Richland Operations Office
- J. Sandia Site Office
- K. Savannah River Operations Office
- L. Savannah River Site Office
- M. Y-12 Site Office

For the Savannah River Site, NNSA and EM have primary management responsibilities for certain aspects of operations. Most site operations at the Savannah River Site, including cleanup efforts, are overseen by the Savannah River Operations Office under the auspices of EM. Tritium facility operations are overseen by the Savannah River Site Office under the auspices of NNSA.

The following information is gathered from the above identified Site Offices and Contractors and is presented as it was provided, with only minor editorial changes and corrections.

## **A. Carlsbad Field Office**

The Carlsbad Field Office (CBFO) manages the DOE National Transuranic (TRU) Waste Program Office and the Waste Isolation Pilot Plant (WIPP) facility operations, and serves as an international center for the study of waste management. The CBFO coordinates the program for the permanent disposal of TRU radioactive waste at Department sites, national laboratories, and other participants.

WIPP, located in the desert of southeastern New Mexico, is a non-reactor nuclear facility providing safe and permanent disposal of defense TRU and TRU-mixed waste in subterranean salt beds 2,150 feet underground. Since its first opening in 1999 for TRU waste disposal, WIPP has played a crucial Departmental role by helping to meet its commitments to environmental cleanup around the nation. The demonstrated success of WIPP has resulted from the integration of safety into the entire programmatic mission: safe characterization, transportation, and permanent disposal of TRU waste.

### **Operational and Safety Accomplishments at the Waste Isolation Pilot Plant**

WIPP continues to be a significant contributor to the Department's progress toward completing cleanup throughout the EM complex. WIPP has received more than 8,000 shipments and disposed of over 64,000 cubic meters of TRU waste since opening. Significant efforts were made by management and line workers at all levels, which resulted in the following operational and safety accomplishments during 2009:

- As of mid-November 2009, WIPP is on a pace to receive and dispose of over 6,000 cubic meters (more than 1,000 shipments) of TRU waste in this calendar year.
- WIPP received its 8,000th shipment of TRU waste on November 4, 2009, accounting for over 18 million miles traveled by TRU waste transporters without a radiation-related incident.
- WIPP has safely received more than 300 shipments of remote-handled TRU waste. This effort involved close coordination of characterization, transportation, safety, quality assurance, security, waste handling, and engineering operations.
- In FY 2009, WIPP achieved a low Total Recordable Case rate of 0.57, which included all participant organizations. WIPP also achieved a 0.33 case rate for Days Away, Restricted, or Transferred (1,712,780 exposure hours since the last injury causing days away from work.).
- In January 2009, WIPP completed the first extended maintenance outage for some extensive facility upgrades. Disposal operations resumed without a single recordable injury occurring.
- WIPP was honored with a transportation safety award from the United States Transport Council, which was presented to the Carlsbad Field Office by former DOE Assistant Secretary for Environmental Management James Rispoli.
- DOE submitted the Compliance Recertification Application to the U.S. Environmental Protection Agency (EPA) and New Mexico Governor Bill Richardson.
- WIPP celebrated 10 years of safe operations on March 26, 2009.
- Oak Ridge National Laboratory, the Savannah River Site, the Los Alamos National Laboratory and the Vallecitos Nuclear Center began shipping remote-handled TRU waste to WIPP.
- The Nevada Test Site became the 15th site to be cleared of Legacy TRU waste on June 9, 2009.
- Implementation of the Documented Safety Analysis was declared complete on June 24, 2009.

### **Activities Related to Implementation of Board Recommendations**

The WIPP is committed to implementing Defense Nuclear Facilities Safety Board (Board) recommendations. As of November 2009, WIPP has no overdue Board-related commitments or actions.

## **B. Idaho National Laboratory**

### **1. BBWI Safety Initiatives**

The Advanced Mixed Waste Treatment Project (AMWTP) is a performance cornerstone to DOE's commitment for complex-wide TRU waste cleanup. Managed by Bechtel BWXT Idaho, LLC (BBWI), safety and compliance are paramount to operations at the AMWTP. Summarized below are the 2008 safety initiatives and accomplishments for the AMWTP; first by Defense Nuclear Facilities Safety Board (DNFSB or Board) Recommendations applicable to AMWTP, followed by Related Safety Initiatives.

#### **a) DNFSB Recommendations**

BBWI is continuing performance efforts ensuring effective implementation of the three open DNFSB Recommendations applicable to the AMWTP; no further actions are necessary by BBWI to satisfy the DOE Headquarters implementation plan.

#### **Recommendation 2002-1: Quality Assurance for Safety-Related Software**

Meeting the intent of this recommendation, AMWTP has properly implemented and continues to use the following DOE tool box codes: the safety analysis MACCS2 code for dispersion modeling; and the criticality safety MCNP code for criticality modeling. Code implementation continues to follow standardized processes for ensuring the quality of the software used to analyze and guide safety-related decisions, the quality of software used to design or develop safety-related controls, and the proficiency of personnel using the software. Both of these tool box codes were used frequently in 2009, and the accident analyses using the MACCS2 code were fully implemented in the safety basis revisions that were made effective in February 2009.

#### **Recommendation 2002-3: Design, Implementation, and Maintenance of Administrative Controls**

With this Recommendation, the DNFSB is concerned with the adequacy of implementation of Administrative Controls, particularly Specific Administrative Controls (SACs) per DOE-STD-1186. BBWI has verified/validated that AMWTP SACs in the AMWTP Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR) documents were properly designed and field implemented. An Implementation Validation Review (IVR) was performed upon implementation of revisions to these documents in February 2009, and another IVR is scheduled to be performed in late November 2009 for the 2009 revision to the DSA and TSR documents.

#### **Recommendation 2004-1: Oversight of Complex, High-Hazard Nuclear Operations**

DOE's implementation plan for this Board Recommendation involved revitalization of Integrated Safety Management (ISM). Continuing with the successful 2007 re-verification of the AMWTP Integrated Safety Management System (ISMS), BBWI prepared for and completed both the 2008 and 2009 annual ISMS effectiveness review. BBWI also prepared for and, in mid-2009, received DOE Voluntary Protection Program (VPP) certification at the highest – STAR – level.

Integral to obtaining and maintaining both the ISMS and VPP Star certifications are BBWI's empowered Employee Safety and Improvement Team (ESIT), employee involvement processes such as the Keep Everyone and Yourself Safe (KEYS) program, and continued vigilance using the approved Contractor Assurance System (CAS).

As testament to BBWI's vigilance with respect to safety, during 2009, AMWTP celebrated over one million work hours without an Occupational Safety and Health Administration (OSHA) recordable injury, in addition to reaching more than nine million work hours without a lost-time accident. Exercising oversight of operations also took precedence in safely executing additional work scope under President Obama's American Recovery and Reinvestment Act (ARRA). BBWI successfully executed 100% of the ARRA work during 2009, with no abnormal events or injuries, and DOE's readiness assessment for ARRA work resulted in zero findings.

Conduct of Operations (COO) continued to be a priority for improvement efforts, and BBWI instituted several noteworthy initiatives in this area during 2009. These include: dedicating experienced personnel to be Facility Compliance Representatives, analogous to the DOE Idaho Operations Office (DOE-ID) Facility Representatives; instituting a Senior Conduct of Operations Council to provide visibility and direction to the program and evaluate and correct deficiencies; completing implementation of the computer log keeping system (eSOMS) throughout the facility following its successful piloting in 2008; and enhancing worker involvement in COO by adding the Conduct of Operations committee as a subcommittee of the successful employee-driven ESIT.

#### b) Related Safety Initiatives

##### **Risk Reduction Through Stabilization of Excess Nuclear Materials and Waste**

A primary mission of DOE is safe risk reduction and cleanup of the environmental legacy. Currently, over half of the estimated 65,000 cubic meters of the waste historically managed as TRU waste at AMWTP has been safely shipped from Idaho.

#### 2. Worker Protection Initiatives and Improvements

BBWI's Human Performance Improvement (HPI) program continued initiatives to improve human performance in project operations. In 2009, BBWI completed training the work force to recognize the manageable elements of human performance, resulting in a stronger culture of employing a "what if" attitude. Field execution of the HPI elements and techniques was also enhanced through establishment of a dedicated HPI subject matter expert (SME), and employment of trained HPI investigators on all root cause analyses and accident investigations, which contributed to determining accurate, human-based causal factors and formulating effective corrective actions.

In 2009, BBWI implemented proactive measures to significantly improve worker safety and establish personal ownership of safety. These included executing a Winter Safety Plan, which resulted in significantly reducing the number of weather-related injuries and accidents compared to previous years. In addition, all BBWI employees completed a personalized hazard analysis for their work, called Personal Safety Plans (PSPs). These PSPs have recently been updated by all employees to incorporate lessons learned and to prepare for the new winter weather season.

#### 3. Safety Directives

In 2009, BBWI completed the implementation of a revised Unreviewed Safety Question (USQ) process that rigorously implemented requirements and guidance and also featured a first-of-a-kind electronic process. The use of this completely paperless system for reviewing proposed changes and addressing Potentially Inadequate Safety Analysis (PISA) issues has been a resounding success, by both increasing

the speed and efficiency of the USQ process and also allowing near-real-time assessments of the quality of USQ reviews by the program SME.

#### 4. Idaho Cleanup Project Safety Initiatives

The Idaho Cleanup Project (ICP) involves the safe environmental cleanup of the Idaho National Laboratory (INL) site, contaminated with legacy wastes generated from World War II-era conventional weapons testing, government-owned research and defense reactors, spent nuclear fuel reprocessing, laboratory research, and defense missions at other DOE sites.

CH2M-WG Idaho (CWI) manages the cleanup effort for DOE. The project focuses on reducing risks to workers, the public, and the environment, and protecting the Snake River Plain Aquifer, the sole drinking water source for many Idaho residents.

During 2009, significant new scope was added to the ICP contract due to the ARRA funding made available by DOE, which resulted in significant job savings and the addition of 274 new and subcontracted employees. ARRA work scope includes: demolition of ~90 facilities and structures; receiving, transporting, processing and disposing of remote-handled (RH) TRU and other wastes; and constructing two new waste retrieval enclosures (ARPs VI and VII) and beginning exhumation in ARP VI at the subsurface disposal area of the Radioactive Waste Management Complex (RWMC). These initiatives were well underway at the end of FY 2009 and will be continuing through FY 2011.

##### Risk Reduction:

- A total of 253 fuel handling units were transferred from pool storage at the Idaho Nuclear Technology and Engineering Center (INTEC) to dry storage at INTEC.
- CWI loaded and shipped a total of 8 Large Cell Casks containing Navy Fuel from storage at INTEC to the Naval Reactors Facility (NRF) at the INL.
- Received and unloaded 15 ATR casks from the Reactor Technology Complex (RTC) in FY 2009.
- Initiated transfers of Shippingport Atomic Power Station spent nuclear fuel clusters from a wet storage basin to interim dry storage at INTEC.
- Completed closeout and turnover to Operations of the CPP-659 Embedded Lines Project implementing Resource Conservation and Recovery Act (RCRA) requirements.
- Exhumed 1,092 cubic yards of waste material for a cumulative 9,872 cubic yards of waste material exhumed from ARP III.
- Transmitted the Phase 1 Remedial Design/Remedial Action Work Plan for Operable Unit 7-13/14 for distribution to EPA and the Department of Environmental Quality (DEQ).

##### Safety Performance:

- For the last three years, ICP has reduced the total number of recordable injuries on the project. In FY 2009, ICP reduced the total number of recordable injuries by 10%. Within the ICP project,

Waste Management has not had a recordable case for two years, and Deactivation and Decommissioning (D&D) improved the recordable cases by 75%. The overall company Total Recordable Case rate with the Integrated Waste Treatment Unit (IWTU) included was 1.28.

- ICP continues to maintain the International Standards Organization (ISO) 14001 Environmental Management System (EMS) with the most recent surveillance conducted in October of 2009. A strength noted this year is CWI's integration of the requirements of Executive Order 13423 and DOE Order 430.2B into EMS documentation. Additionally, ICP has not received a Notice of Violation or regulatory fine since the start of the contract with over 24 inspections conducted by regulatory agencies in every media – air, water, RCRA, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and Toxic Substances Control Act (TSCA).
- Implemented significant improvements in Work Planning and Work Control processes to address deficiencies identified by internal and external assessments, including one performed by the DNFSB staff. The first of two effectiveness reviews was conducted in FY 2009, and no programmatic deficiencies were identified. An additional effectiveness review is planned in early FY 2010.

#### Sodium-Bearing Waste Treatment Project:

- In the February 2009 DNFSB Quarterly Report to Congress for providing progress and status of issues the Board was tracking relative to design of DOE facilities, all open issues which were being tracked for the Sodium Bearing Waste Treatment Project were reported as being resolved satisfactorily.
- In September 2009, all of the six major process skids for the steam reforming process were completed, delivered to the construction site, and set into the shielded process cells. This major project milestone was witnessed by a DNFSB member and staff.
- The Sodium Bearing Waste Treatment Project has been implementing an agreed upon approach for applying ANSI/ISA-84.00.01 requirements to the safety-significant process control functions associated with the IWTU. At the end of FY 2009, the final design and calculations were in review, to be issued early in first quarter FY 2010.
- The IWTU Comprehensive Performance Test Plan was certified and transmitted to DOE-ID on September 18, 2009, and subsequently certified by DOE and transmitted to DEQ on September 30, 2009.
- On April 17, the mammoth, tent-like weather enclosure over the IWTU was removed. At the end of FY 2009, sufficient process building structural steel was in place to allow siding installation to commence so that the building will have weather protection in place prior to the Idaho winter weather.

#### Deactivation and Decommissioning:

- Completed D&D of WMF-671 Weather Enclosure (GEM).
- Completed D&D of PBF-609 (WERF Incinerator Bldg).

- Completed demolition of CPP-641 (Waste Holdup Pump House).
- Completed demolition of the VES-NCE-140-1 and VES-NCE-140-2 diesel tanks.
- Completed above-ground Sodium Processing Facility piping removal at the Materials and Fuels Complex (MFC).
- Completed MFC EBR II Hazard Assessment Document (HAD) in support of NE D&D scope.
- At INTEC, completed grouting inside D, P, and Q-Cells, the Waste Trench and WG/WH Deep Tank Control Room in CPP-601.
- In all, D&D was accomplished for 10 industrial facilities, 7 nuclear facilities, and 3 radioactive facilities in FY 2009.
- Disposed of 21,309 cubic meters of remediation waste from D&D and cleanup activities in the Idaho CERCLA Disposal Facility (ICDF).

#### Environmental Cleanup Activities:

- Submitted the CD-1A package for the Calcine Disposition Project to DOE for review and approval at the end of FY 2009. This package primarily addresses the retrieval and transport of high-level waste (HLW) calcine from the storage bin sets to the IWTU facility for treatment/packaging.
- Accelerated Retrieval Project-III (ARP-III) crews and equipment began retrieving targeted waste – plutonium-contaminated filters, graphite molds, sludges, and oxidized uranium material – December 10 at the RWMC. Operations commenced after a thorough Contractor Readiness Assessment was completed.
- Construction for the waste exhumation facility in Pit 5 (ARP IV) at RWMC was completed with a planned startup assessments schedule for early FY 2010.
- Completed recovery and relocation of 114 containers of Hot Fuel Examination Facility (HFEF) waste from the MFC to INTEC.
- Processed and characterized 7 HFEF-5 cans producing 14 drums for EPA audit and CBFO waste stream approval in Building CPP-659. Five shipments of RH TRU are ready to ship pending CBFO waste stream approval.
- Building CPP-666 hot cell construction and tooling have been completed for continued repackaging of up to a total of 161 HFEF-5 canisters at INTEC. The Management Self Assessment and both Contractor and DOE Readiness Assessments will be conducted in early FY 2010 prior to startup authorization.
- A Management Self Assessment for new RWMC laboratory operations was conducted, actions were closed, and laboratory operations startup commenced on September 30. This allows the operations previously performed at INTEC for TRU waste characterization to be relocated to RWMC.

- Completed closure on 10 Voluntary Consent Order systems (63 total to date under CWI).
- Completed environmental restoration of 9 release sites (99 total to date under CWI).
- Safely abandoned 53 monitoring wells.

### **C. Livermore Site Office**

The Livermore Site Office (LSO) oversees Lawrence Livermore National Laboratory (LLNL) in Livermore, California. LLNL is managed and operated by Lawrence Livermore National Security, LLC (LLNS). Safety accomplishments and activities at LLNL in FY 2009 are summarized in the following sections.

#### **1. LLNL Plutonium Facility**

In the last year, various safety enhancement projects were proposed for the LLNL Plutonium Facility (Building 332), the most significant of which is the inventory reduction of special nuclear material (SNM), scheduled to be completed in 2012. The goal of inventory reduction is to remove SNM to significantly reduce its risk as a terrorist target and to render any potential accidents incapable of presenting a significant risk to the public. The inventory reduction project is currently ahead of schedule, with approximately 70 percent of the total SNM inventory removed.

The following facility projects were completed in FY 2009: (1) replacement of two defense-in-depth Confinement Ventilation System (CVS) fans, and (2) replacement of 128 safety-class CVS final HEPA filtration filters. The following projects will be carried forward into FY 2010: (1) continued upgrade of the room Contamination Air Monitors (CAMs), and (2) reconfiguration of the firewater tanks to be self-sufficient and installation of regulators as necessary on the firewater supply that serves the final high efficiency particulate air (HEPA) filters for the Room Ventilation System and the Glovebox Exhaust System.

#### **2. Confinement Ventilation System Evaluation**

Building 332 was evaluated against the criteria established in the U.S. Department of Energy Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2004-2, Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems. Building 332 is a hazard category 2 facility with a safety-class building structure, safety-class and safety-significant active ventilation systems with final stage HEPA filtration, and a safety-class emergency power system for containment control and worker protection.

While no new gaps were identified during this evaluation, two existing safety enhancements were previously identified and noted in the DSA for Building 332. The first was a proposed installation of pressure differential switches across the first stage HEPA filters, allowing automatic shutdown of the exhaust fans. This planned modification, at an estimated cost of \$500K, was deferred. After further consultation with DNFSB staff and a DOE/NNSA complex-wide working group, a modified system that includes remote monitoring with manual shutdown of ventilation exhaust fans, while considered, was also deferred. The deferrals were based in part on: (1) recognition that the amount of SNM in the facility has been significantly reduced, and (2) the availability of other methods (such as indication of stack monitor activity) for determining whether manual shutdown of the ventilation exhaust fans is necessary.



### 3. Significant Maintenance Measures

Building 332 replaced the safety-class room ventilation final HEPA filtration filters. In addition, Emergency Power safety-class Transformer T410 and Switchgear were relocated and replaced.

The following Category 3 nuclear facilities had their main power transformers replaced: the Radiography Facility (Building 239), the Tritium Facility (Building 331), and the Hardened Engineering Test Facility (Building 334). Each of these transformers was more than 30 years old and showed significant signs of aging.

### 4. Implementation of Actions Associated with Nuclear Criticality Safety

LLNL achieved all possible points available in the FY 2009 performance metrics for criticality safety and earned a rating of Outstanding. At present, LSO has no major issues or concerns associated with the LLNL criticality safety program.

### 5. Nuclear Material Packaging

In support of DNFSB Recommendation 2005-1 and DOE Manual 441.1-1 implementation, LLNL developed the Nuclear Material Packaging Technical Basis Document, which was recently revised to clarify interim storage packaging actions during inventory reduction. The Inventory Reduction Project continues to be a higher priority than the interim repackaging effort due to competing resources. Additionally, to support both initiatives, operators would be required to handle packages twice, which would increase their dose. However, the Inventory Reduction Project processes nuclear material to meet DOE-STD-3013. To date, LLNL has packaged and shipped off-site approximately two-thirds of its nuclear material and is 7% ahead of schedule. When inventory reduction activities are completed, LLNL will re-evaluate additional DOE Manual 441.1-1 implementation.

### 6. Tritium Facility Modernization (TFM)

LLNL's Tritium Facility (Building 331) has successfully completed a Laboratory and NNSA Readiness Review. One of the major purposes of TFM is to fill tritium-containing targets for the National Ignition Facility and other potential applications.

## **D. Los Alamos Site Office**

The Los Alamos Site Office (LASO) oversees the Los Alamos National Laboratory (LANL), a multi-discipline national laboratory with 16 nuclear facilities (8 of which are Nuclear Environmental Sites). Los Alamos National Security, LLC (LANS) manages LANL under contract with DOE. Safety accomplishments and ongoing actions during 2009 are discussed below.

### 1. Nuclear Material Stabilization and Packaging

LANS has been stabilizing and repackaging nuclear materials in response to Board Recommendations 94-1, 00-1, and 05-1. In 2009, the Plutonium Facility nuclear material inventory was evaluated, risk-ranking of items was rebaselined, and a disposition path for each material category was determined. All 22 of the highest risk items were stabilized by repackaging into more robust containers or were dispositioned

by shipping to the Waste Isolation Pilot Plant. A new-generation standard nuclear material container that will meet the requirements of DOE Manual 441.1-1 has passed preliminary drop tests and has nearly completed Phase 1 testing; Phase 2 testing and container procurement will be initiated in FY 2010. Additionally, LANS produced 13 qualified STD-3013 containers of excess plutonium oxide. Construction of equipment to clean out the large dynamic test vessels (i.e., Bolas Grande) is expected to start in early FY 2010. An updated program execution plan is expected in mid-FY 2010.

## 2. Plutonium-238 Operations

In FY 2009, LANS over-packed 60 Russian Product Containers and introduced into glove-box lines and vented another 40 legacy containers of plutonium-238, thereby addressing concerns related to pressure buildup in these non-safety-class containers. LANS also implemented controls to check the plutonium-238 vault water bath level daily and to correct the water level when necessary to ensure that it remains above the tallest non-safety-class container. An NNSA letter dated May 19, 2009, described the actions taken. The Board acknowledged these actions in a letter dated July 28, 2009. The site has committed to over-packing the remaining non-safety-class containers by June 30, 2010.

## 3. Transuranic Waste Operations

During FY 2009, LANL and the Carlsbad Field Office contractor shipped about 15,000 curies in approximately 2,300 transuranic waste drums and 16 remote-handled canisters to the Waste Isolation Pilot Plant, totaling 131 shipments. Efforts continue to safely accelerate transuranic waste shipments and achieve Area G closure by 2015, consistent with the State of New Mexico Consent Order.

## 4. Fire Protection

On September 30, 2008, NNSA and Los Alamos County entered into a cooperative agreement for fire department services. Under this agreement, LASO, LANS, and Los Alamos County have provided emergency responder radiological training, conducted hazardous material exercises, provided familiarization tours of nuclear and high hazard facilities, and updated pre-incident plans for nuclear and hazardous facilities. In 2009, the site completed an updated baseline needs assessment (BNA) for fire, hazardous material, and medical emergency response and completed an implementation plan to address BNA recommendations. NNSA reported the status to the Board in letters dated March 10, 2009 and September 24, 2009.

## 5. Formality of Operations

In 2009, LANS met approximately 90% of its milestones for achieving and verifying implementation of conduct of operations, engineering, and maintenance in the site's nuclear and high hazard facilities. LANL also completed initial assessments for the site's roughly 100 credited nuclear safety systems. Efforts in FY 2010 will focus on achieving the remaining milestones, sustaining and maturing these safety management programs, and improving the confidence in the operability of credited safety systems.

## 6. Plutonium Facility

In December 2008, NNSA approved the first safety basis upgrade for the Technical Area 55 Plutonium Facility (PF-4) in 12 years. The NNSA safety evaluation report endorsed LANS pursuing about 30 sub-projects during a 5-year period that will improve the PF-4 nuclear safety posture, considering the entire

spectrum of analyzed accident scenarios. About a third of the sub-projects are related to establishing a safety-class active confinement capability for non-seismic operational events.

In a letter dated June 16, 2009, NNSA provided the Board the final ventilation system evaluation for PF-4, as well as a report summarizing the nuclear safety improvements underway. On October 26, 2009, the Board issued Recommendation 09-2 on PF-4 seismic safety, which was motivated by Board concerns involving one of the 20 accident scenarios analyzed in 2008, particularly the post-seismic-fire event. In December 2009, LANS is scheduled to submit an update to the safety basis that will improve both the understanding of the risk and the selection of controls for this accident scenario.

#### 7. Nuclear Criticality Safety

The LANS criticality safety improvement plan was rebaselined in 2009 to incorporate lessons learned during the extensive augmented limit reviews conducted in 2007 and 2008. LANS continues efforts to hire additional criticality safety analysts and to update criticality safety evaluations.

#### 8. Project Management

The Chemistry and Metallurgy Research Building Replacement Project has completed preliminary design of the nuclear facility and anticipates starting final design in FY 2010. In September 2009, both the Board and NNSA submitted certification reports to Congress on the design. Issues raised and resolved in 2009 centered on the structural seismic design; the confinement ventilation seismic design; the identification of safety-related controls, functional requirements, and performance criteria; and the preliminary documented safety analysis and system design description documentation of requirements.

Also in FY 2009, NNSA approved the 60% preliminary documented safety analysis for the Radioactive Liquid Waste Treatment Facility Upgrades Project; NNSA expects the final design and its preliminary documented safety analysis to be submitted in FY 2010.

TA-55 Reinvestment Project (TRP) Phase I construction continues and is expected to be completed in June 2010. TRP Phase II is seeking a Critical Decision 2A (CD-2A) in November 2009 for scope that includes the glove-box seismic upgrades pilot 1 and air dryer replacement. Obtaining a CD-2A decision in November will preserve FY 2011 line item construction funding needed for initiation of physical upgrades to the facility through TRP II.

The TRU Waste Replacement project was placed on hold in early FY 2009 pending completion of additional enduring waste management planning. NNSA and LANL completed several Integrated Nuclear Planning workshops in 2009, and LANS issued an updated Enduring Waste Management Strategy and a Hazardous and Radioactive Solid Waste Management Implementation Plan. The TRU Waste project will be reinitiated in early FY 2010 to address a consolidated suite of solid waste management capabilities for LANL, with the goal of supporting Critical Decision 1 in mid-FY 2010.

### **E. Nevada Site Office**

The NNSA Nevada Site Office (NSO) maintains the capability at the Nevada Test Site (NTS) and other remote facilities to implement DOE initiatives in stockpile stewardship, crisis management, waste management, environmental management, non-defense research and development, and work for others, as well as supporting other DOE programs. Major non-reactor nuclear facilities at the NTS

include the Device Assembly Facility (DAF), Criticality Experiments Facility (CEF), and Joint Actinide Shock Physics Experimental Research (JASPER) Facility. The U1a Complex is not categorized as a nuclear facility; however, certain limited-duration experiments may be conducted as nuclear activities.

FY 2009 was the first year where the NTS management and operating contractor, National Security Technologies, LLC (NSTec), maintained full responsibility and accountability for managing and operating all facilities at NTS, including facilities previously managed by the national weapons laboratories. This change was directed early in FY 2008 by the NNSA Principal Assistant Deputy Administrator for Operations, based on a shift over the years to “authorization basis-driven activities” and the need for a consistent application of safety basis requirements and potentially more efficient uses of resources. Activities and accomplishments associated with NTS facilities and projects are discussed below.

#### 1. Environmental Management Activities

The Low-Level Waste (LLW)/Mixed Low-Level Waste (MLLW) sub-projects provide disposal services and facilities for DOE and U.S. Department of Defense generators at NTS and across the United States. During FY 2009, the sub-projects safely accepted and disposed of 1,196,327 cubic feet of LLW in 1383 shipments and 77,144 cubic feet of MLLW in 129 shipments at the Nevada Test Site Area 5 Radioactive Waste Management Complex (RWMC).

The TRU Waste sub-project was responsible for the disposition of legacy TRU waste stored at the Area 5 RWMC. During FY 2009, the Visual Examination and Repackaging Building in Area 5 completed its mission to repackage legacy stored mixed TRU waste for WIPP disposal. One amendment was made to the safety basis via page change with appropriate reviews. This change was made to accomplish remote venting of drums discovered in oversize boxes.

The 24 oversize boxes that remained at the close of FY 2008 were sorted, reclassified, and repackaged by December 16, 2008. Approximately 40% of the total volume was characterized as TRU waste. Using a variety of technologies, the other 60% of the waste was determined to be LLW and MLLW that was safely disposed of at NTS, resulting in significant cost savings. Characterization and repackaging of 40 drums was completed in April 2009. In FY 2009, 17 TRU waste shipments, including 78 standard waste boxes and 82 drums, were made to the regional characterization site at the Idaho National Laboratory. The last TRU waste shipment was made on July 10, 2009, in turn completing the final Site Treatment Plan milestone to complete disposition of oversize box waste. The TRU project closeout report was completed in July 2009, with two remaining experimental spheres transferred to Radioactive Waste Programs for management until a disposal pathway is determined.



**Final Legacy TRU waste shipment leaving the NTS, July 10, 2009**

## 2. Device Assembly Facility

Early in FY 2009, NSTec, under the direction of the Deputy Administrator for Defense Programs (NA-10), assumed responsibility for managing operations at the DAF. Lawrence Livermore National Laboratory (LLNL) was the prior DAF managing and operating contractor. Under NSTec management, the DAF continued supporting NNSA and work-for-others missions throughout the year. In addition, the new DAF management team continued to support the CEF construction and startup activities. These criticality experiments were previously conducted at the Technical Area (TA)-18 facility in Los Alamos, New Mexico.

To enhance the performance, availability, and reliability of existing safety systems, NSTec continued to improve the DAF physical infrastructure. Based on the Fire Suppression System Reliability Project completed in FY 2008, NSTec initiated actions to improve the fire suppression system to address legacy corrosion and code-compliance issues. NSTec replaced 13 of 27 existing fire suppression system strainers with code-compliant strainers. The new strainers have greater capacity to maintain the minimum required fire water flowrate under anticipated coal tar loading scenarios. NNSA/NSO also submitted two FY 2012 line-item funding requests to NNSA Headquarters for replacement of the existing fire suppression system lead-in lines and fire water storage tank.

NSTec developed a draft Preliminary Safety Design Report (PSDR) that provides facility and design details associated with a new stand-alone fire suppression system that will be used to augment the existing wet-pipe fire suppression system in certain DAF buildings. The stand-alone units will be procured under a design/build subcontract and will be sized to provide sufficient suppression coverage to protect the associated building volume. The stand-alone system will be UL/FM listed/approved for

the specific hazards, will comply with National Fire Protection Association (NFPA) 750, and will meet the DOE requirements for safety and seismic design.

Other programmatic accomplishments include the completion of the 2009 DAF Nuclear Explosives Safety Master Study by a team of experts from NNSA. The overall results indicate a significant increase in the DAF's level of readiness for conducting nuclear explosive operations in the future. DAF management continued supporting activities for the Barolo and Bacchus subcritical experiments. DAF management also supported Department of Homeland Security First Responder and Radiological Counter-Terrorism Training. DAF was also host to the Fall Classic Project, sponsored by the Associate Administrator for Emergency Operations (NA-40).

### 3. Criticality Experiments Facility

The CEF project is a \$149,000,000 line-item project that includes modification of a dedicated portion of the existing DAF to accommodate installation of four critical assembly machines and associated operations infrastructure such that the previous LANL TA-18 mission can be continued at the NTS. The scope of the project also includes modifications of the critical assembly machines and their associated control and safety systems. The critical assembly machines being relocated as part of the CEF project are Comet, Planet, Flattop, and Godiva IV. Completion of the project is currently scheduled for FY 2010.

The final installation and acceptance testing of all four critical assembly machines and control systems was completed in FY 2009. The remaining physical modifications to the DAF were also completed in FY 2009, and subsequently, the construction phase of the project was declared complete on August 27, 2009. The conditions of approval associated with the CEF addendum to the DAF Documented Safety Analysis (DSA) were completed and approved. A Contractor Management Self Assessment (MSA) of readiness was completed. The project is in the process of closing out findings from the MSA in preparation for the Contractor Operational Readiness Review.



**Flattop Reflectors**



**Planet Critical Assembly Machine**



**Godiva Critical Assembly Machine**

#### 4. Joint Actinide Shock Physics Experimental Research Facility

The JASPER Facility enables researchers to acquire high-quality performance data associated with nuclear and surrogate materials. A high-velocity gas gun and associated diagnostics designed for shock physics experiments provide equation-of-state data to better understand phase change relationships of weapons materials under varying pressures and temperatures.

The JASPER Facility operated under an NNSA-approved interim safety basis, consisting of a justification for continuing operations, hazard analysis report, and special controls and conditions document, until July 21, 2009. A Rule-compliant DSA for the JASPER Facility was approved by NNSA/NSO in January

2009. Implementation of the DSA was delayed due to a contamination event that occurred inside the Secondary Confinement Chamber on February 25, 2009. All significant radioactive materials, including target assemblies, were subsequently removed from the JASPER Facility to enable management of the facility as a less than hazard category 3 nuclear facility (i.e., a radiological facility) in the interim while the Secondary Confinement Chamber replacement project is executed. Implementation of the new DSA will proceed once the new Secondary Confinement Chamber is installed and associated acceptance testing is complete. Safety basis implementation is currently scheduled for completion in September 2010.



**JASPER Facility gun assembly**



**Replacement of the JASPER Facility secondary confinement chamber**



## 5. U1a Complex

The U1a Complex provides an underground experiment test bed for the conduct of subcritical experiments using high-explosive and SNM. Although the U1a Complex is not categorized as a nuclear facility, certain subcritical experiments may be considered hazard category 2 and 3 nuclear activities. Accordingly, a Rule-compliant safety basis is developed, approved, and implemented prior to executing subcritical experiments that exceed hazard category 3 threshold quantities of radionuclides.

The day-to-day operations that take place at the U1a Complex involve mining and construction, drilling operations, excavation, utilities installation and modification, maintenance, heavy equipment operations, system operations, and other underground operations to prepare for and support the fielding and execution of subcritical experiments. Although the U1a Complex is not a nuclear facility, it is a “facility of interest” to the DNFSB.

The Large Bore Powder Gun Project is a series of 24 subcritical experiments designed to investigate the properties of SNM and improve the understanding of the plutonium equation of state. These experiments will be performed underground in a zero room, originally designed for another LLNL-sponsored experiment. The experiments will be conducted with a reusable large-bore powder gun firing into a primary confinement vessel equipped with a fast closure valve. Immediately following execution of the shot, rapid closure of the valve ensures total confinement of the SNM and avoids contamination of the zero room. If the primary confinement fails for any reason, the zero room is equipped with a containment barrier to ensure total containment of the SNM. This plan envisions preserving the zero room and therefore leveraging the large investment by the NNSA/NSO, LLNL, and LANL associated with its construction over several series of Dynamic Plutonium Experiments.

The Barolo Project is designed to examine the strength and damage properties of plutonium to improve understanding of some performance differences identified in previous experiments. The information obtained from Barolo is expected to provide an important component of the data suite needed to resolve the initial conditions for boost. The Barolo Project will be conducted as a vessel experiment within an existing drift in the U1a Complex. The Barolo Project is designed to study the effects of damage, spall, and re-compaction in shock regimes of interest in primary performance.

The Barolo Project includes a series of three experiments. The first will be a confirmatory experiment without SNM to validate U1a Complex readiness, physics package design, and experimental set-up. The remaining two experiments will be identical to the confirmatory except that SNM will be the material tested. All three experiments will require use of the existing Cygnus machines. Basic diagnostics will include x-ray imaging, Photon Doppler Velocimetry, Velocity Interferometer System for Any Reflector (VISAR), Shadowgraphy, and High Explosive pins.



Cygnus radiographic imaging capability at the U1a Complex.



Cygnus radiographic imaging capability at the U1a Complex.

## **F. Oak Ridge Operations Office**

The DOE Oak Ridge Office (OR) is responsible for major DOE science, technology, and environmental management programs. OR is responsible for activities at Oak Ridge National Laboratory (ORNL), the East Tennessee Technology Park, and other areas of the Oak Ridge Reservation. Safety accomplishments and activities at Oak Ridge projects and facilities are provided in the following sections.

### **1. Uranium-233 Project**

In December 2008, Isotek Systems, LLC (Isotek) completed the Implementation Validation Review and closed findings to fully implement Revision 2 of the Documented Safety Analysis (DSA) and Revision 2 of the Technical Safety Requirements for the Building 3019 Complex. This allows for surveillance and maintenance operations for the 3019 Complex. Isotek is currently preparing Revision 3 to the DSA,

which will allow for construction activities to commence. A draft version of DSA Revision 3 should be completed by the end of the calendar year.

The design effort on the U-233 Down-blending Project continued through calendar year 2009. A DOE 60% design review was held during the month of September with participation of DNFSB staff members. The review concluded that overall the U-233 Project had reached the point of 60% design. In parallel with the design review the U-233 Project supported the first Construction Project Review, which evaluated both DOE and Isotek management's effectiveness over a broad spectrum of management and functional areas.

The Preliminary Safety Design Report (PSDR) was submitted in support of the 60% design package during the month of September, and a Preliminary Safety Validation Report was issued by DOE. The integration of the design and the safety basis following DOE-STD-1189 continues to reap benefits that should save DOE money in the long run. As part of the 90% design package Isotek will submit for DOE's approval the Preliminary Documented Safety Analysis.

In late 2008, the Project reviewed historical data and determined the Consolidated Edison Uranium Solidification Project material contains only trace quantities of transuranic isotopes. As a result, the material would not be eligible for disposition at WIPP as previously thought. The Project proceeded to evaluate other available drying and packaging alternatives, and proposed a baseline change in May 2009 reflecting an approach that would result in a waste form suitable for disposal at NTS. The Project has prepared a phased test plan to demonstrate that the chosen technology will produce a waste form that meets the waste acceptance criteria at NTS. To date, testing has shown that the down blended uranyl nitrate solution can be converted to a solid nitrate/diuranate matrix that will meet the waste acceptance criteria (WAC) for NTS. Testing is currently focused on optimizing the process and setting operational control limits.

In July 2009, DOE approved Isotek's annual update to the Worker Safety and Health Program in accordance with 10 CFR 851. Revision 1 of the Safety Design Strategy was submitted to DOE in June 2009, and approved in September 2009. Revision 1 resolved technical issues identified in the approval of Revision 0; however, a Condition of Approval was included associated with the seismic design strategy for structures outside Building 3019A. In August 2009, DOE approved Isotek's Conceptual Safety Design Report for the Building 3019 Annex, a separate facility associated with drying and packaging operations.

The project is currently performing core boring in areas of the planned construction to ensure that the appropriate soil conditions assumed in the structural calculations are correct.

## 2. Transuranic Waste Processing Center

The Transuranic Waste Processing Center (TWPC) is managed by EnergX TN, LLC under Contract DE-AC05-98OR22516 with DOE. The TWPC's mission is to receive legacy and newly-generated TRU waste and high alpha radiation-emitting waste from ORNL and other sites as directed by DOE. Waste is characterized and processed inside protective containments in the TWPC. Repackaged and characterized waste is sent for disposal at WIPP, NTS, or other facility as appropriate for its classification.

Currently three waste types – contact handled (CH) solids/debris, remote handled (RH) solid/debris, and CH soils wastes are being processed at the TWPC. In 2004, the TWPC completed processing of liquid

supernate, which was disposed of at NTS as LLW. Future major scope tasks include processing of RH Sludge waste.

### **TWPC ARRA Activities**

In FY 2009, TWPC was provided ARRA funding to begin a ramp up for accelerated CH and RH waste production. ARRA funding provided for sourcing, hiring, training, and qualifying a full second shift of CH and RH production activities. These activities began in April, and on September 14, TWPC initiated 2nd shift process operations. A total of 86 ARRA personnel were hired.

### **TWPC Metrics and Safety Performance Highlights**

No lost time or restricted work day injuries or illnesses were experienced at the TWPC during 2009, thus extending the TWPC's record to more than 2.1 million hours (2779 days) since the last such case.

### **VPP/Safety Record Recognition**

In May 2009, the TWPC under EnergX management was awarded "VPP Star" status in the DOE Voluntary Protection Program (VPP) on the follow-up review. The TWPC team immediately began efforts to retain VPP Star status, the highest level of VPP participation. In addition to the VPP recognition, the TWPC received its sixth consecutive National Safety Council Perfect Record award. The TWPC also received from the National Safety Council a Safety Leadership Award for its lengthy safety record and an Occupational Excellence Award for an outstanding safety record relative to similar industries.

### **TRU Waste Operations (CH)**

TWPC contractor EnergX met or exceeded Tennessee Department of Environment and Conservation (TDEC) Site Treatment Plan (STP) milestones for CH Debris waste for FY 2009. In cooperation with the Central Characterization Project (CCP), DOE's TRU waste characterization and certification contractor, the TWPC exceeded the cumulative STP goal of 587 cubic meters for CH waste processing by processing 274.8 cubic meters of CH material in FY 2009. Also, CCP, in cooperation with the TWPC operating contractor, achieved certification for waste shipments to WIPP. Four TRUPACT II shipments to WIPP were completed in FY 2009.

### **TRU Waste Operations (RH)**

TWPC continued processing of RH Debris waste in the Hot Cell in 2009. Waste production processing was impacted by the discovery of significant volumes of water in certain RH waste casks scheduled for processing. The water required engineering and installation of a system to remove bulk water from RH casks and transfer it into containers outside of the Hot Cell. The system was completed and placed into service in mid FY 2009. Also required was treatment of wetted waste to meet the WIPP WAC. Production was further impacted by the discovery of RH waste with neutron levels that exceeded Transportation criteria. The high neutron issue is being addressed by a CBFO initiative to design, test, and obtain Nuclear Regulatory Commission approval for shielded 72B Canisters that will sufficiently shield neutrons to meet Transportation criteria. The modified 72B Canister is scheduled to be approved for use in the fall of 2010. As a result of these impacts, the TDEC milestone for RH waste processing was extended with TDEC approval. TWPC/CCP received certification for RH Debris waste, and eight 72B Cask shipments were made in 2009.

### **Environmental Management System**

The EnergX TWPC Environmental Management System (EMS) received ISO 14001:2004 re-certification in May. The re-certification was earned via an independent examination of TWPC programs to address

environmental issues. The EnergX TWPC re-evaluation did not result in any findings or observations. TDEC annual RCRA audit was conducted, with no findings or observations.

#### **Contractual/Administrative Changes**

DOE contract DE-AC05-98OR22516 for operation of the TWPC was novated in January 2008 from Foster Wheeler Environmental Corporation to EnergX TN, LLC. The current contract for EnergX TN, LLC has been extended through November 14, 2009, awaiting award and transition to a new Prime Contractor for TWPC. A Small Business designated competitive procurement is in the final stages of the selection process, and announcement of the winning Prime Contractor is expected in the October/November 2009 timeframe.

#### **Sludge Build-out**

Detailed planning and conceptual design progressed for mobilization of sludge from the current storage tanks and for sludge process systems build-out in FY 2009. Sludge hot operations are currently scheduled for the 2nd quarter of FY 2013.

#### **Drum Venting/Safety Basis**

Construction of a Drum Venting Building and installation of the Drum Venting System were completed. Drum Venting System readiness preparation activities, such as procedure revisions, design basis document preparations, and air handling equipment testing, are approaching completion in support of a revision to the DSA/TSR. Startup of the Drum Venting System is expected in spring 2010, after completion of appropriate operational readiness reviews.

### 3. Tank W-1A

Tank W-1A at ORNL is an emptied, abandoned tank surrounded by highly contaminated soils. These soils contribute to an ongoing release of radioactive contaminants to groundwater, which subsequently discharges to a down-gradient stream. The scope of work includes excavation; size reduction (as required); packaging and transport for disposal of approximately 355 cubic yards of contaminated soil, the tank shell, and the concrete pad and tank supports; and characterization of the area along the pipeline north of the tank to delineate further soil to be removed.

During 2009, efforts continued to finalize a cleanup approach for the tank and associated soils, and to procure necessary contractor support to execute the work. Analyses performed by the CCP, Technical Evaluation of the Radiological Characteristics of the Contaminated Soil at ORNL, indicate that excavated soils will likely not exceed transuranic threshold concentrations and that therefore disposal of soils as TRU waste should not be required. A technical basis document and NTS profile are being prepared to enable disposal at NTS.

Current schedules call for procurement and other preparatory activities to be completed in FY 2010, and for actual excavation activities to be completed in FY 2011.

## **G. Office of River Protection (ORP)**

ORP is responsible for retrieving, and treating for disposal, the 53 million gallons of chemically complex radioactive waste stored in 177 underground tanks on the Hanford Site. Working together with prime contractors Bechtel National, Inc. (BNI) and Washington River Protection Solutions LLC (WRPS), ORP's mission is to remove the waste from the tanks, design and construct the Waste Treatment and

Immobilization Plant (WTP) to vitrify the waste (turn it into a stable glass waste form) for long-term storage and ultimate disposal, and close the tank farms.

1. Waste Treatment and Immobilization Plant (WTP) Project

**WTP Project Status of Construction**

In 2009, WTP passed the half-way point and is now more than 50% complete. Through September 2009, approximately 190,000 cubic yards of concrete, 14,000 tons of structural steel, 520 tons of heating, ventilation, and air conditioning ducting, 49 miles of piping, 53 miles of conduit, and 47 miles of cable and wire have been installed. Engineering design is approximately 77% complete.

Significant accomplishments include VPP Merit Status, completion of the Analytical Laboratory hot cell, initiation of slab concrete pours at the Pretreatment Facility (PT) 77 foot elevation (the 4th of 5 floors), transitioning of the fire service water system from the Construction organization to the Commissioning organization, resolution of three of the last five technical issues from the External Flowsheet Review Team (a total of 31 issues were identified in their 2006 report), and completion of the Pretreatment Engineering Platform testing.

Table I displays the project design, procurement, and construction status of each of the five WTP facilities at the end of FY 2009.

**Table I. Status of WTP Completion by Facility though End of Fiscal Year 2009.**

Facilities	Total Facility (Dollars)	Design (Dollars)	Procurement (Dollars)	Construction (Dollars)
Low-Activity Waste	67%	91%	76%	56%
Analytical Lab	47%	79%	70%	55%
Balance of Facilities	52%	78%	42%	55%
High-Level Waste	47%	82%	53%	23%
Pretreatment	47%	77%	38%	27%

**WTP Project Occupational Safety Record**

WTP is the government’s largest construction project in the Federal sector and continues to exceed industry safety records. Through October 2009, the WTP achieved 3 consecutive months without a day-away-from-work injury, for a cumulative rate through October of 0.08. The CY 2009 cumulative total recordable injury case rate through October is 1.00, compared to a rate of 1.22 for all of CY 2008. Through October 2009, the onsite WTP construction project achieved over 900,362 hours without a day lost to accident or injury. The overall project (construction site, material lay-down yard, administration support) worked over 1.8 million hours safely without a day lost to accident or injury.

**WTP Project Voluntary Protection Program Site Assessment**

The DOE Office of Worker Safety and Health Assistance completed an onsite DOE VPP certification review of the WTP. The WTP received VPP Merit status in April 2009 and is working toward Star status in 2010.

## **Project Completion Status**

As of September 30, 2009, the WTP project is 51% complete, with engineering 77% complete, procurement 52% complete, and construction 47% complete.

## **WTP Technical Issues**

The status and progress for various technical issues at WTP are as follows:

- **WTP Structural Issues.** Summary Structural Reports (SSRs) are being finalized for the PT and HLW Facilities to summarize the calculation methodologies for the structural design based on the revised ground motion criteria. The original SSRs were updated to incorporate the modified design methodology and were submitted to the DNFSB in January 2008 for review and comment. The reports were updated with Board staff review comments and were subsequently resubmitted in June 2008 for review in anticipation of closure of issues by December 2008. However, in following up with further DNFSB staff reviews, DOE/ORP formally submitted Revisions 1 and 2 of the PT and HLW Facilities' SSRs to DNFSB on April 9, 2009, and September 30, 2009, respectively. DOE/ORP is expecting concurrence to the updates from DNFSB staff in anticipation of closure of the issues. The final versions of these SSRs will be issued during 2012/2013 at the completion of WTP structural design, while incorporating required interim updates recommended by DNFSB staff.
- **External Flowsheet Review Team (EFRT) Issue Resolution Activities.** During the External Flowsheet Review, completed in March 2006, several plant waste processing issues and concerns were evaluated. The team identified 31 issues, of which 19 were considered major (i.e., one that would likely prevent satisfaction of contractual treatment rates). As of October 2009, all but two of the EFRT issues have been resolved and closed. The two remaining are (1) process stream sampling, which will be closed in November 2009; and (2) pulse jet mixing in low-solids-containing vessels, which is planned for closure no later than June 2010.
- **Pulse Jet Mixer Technical Issues.** Significant resources have been allocated to conduct scaled and prototypic testing to ensure a satisfactory outcome to complete design and fabrication/modification of the vessels in question. For example, the project designed and constructed a scaled pulse jet mixed vessel supported by flume testing representing full scale pulse jets.
- **Material at Risk (MAR) and Hydrogen in Piping and Ancillary Vessels (HPAV).** As the preliminary design proceeded in the years leading up to 2008, ORP became concerned about the complexity of the design in the PT and HLW Facilities. ORP chartered two task teams (MAR and HPAV) early in 2009 to assess such concerns and to determine whether action was appropriate to identify alternate design approaches that would simplify the facility for construction and operation while maintaining necessary conservatism and adequate assurance of safety.

MAR: In January 2009, ORP commissioned a group of experts to assess whether the contract MAR was causing the functional safety classification of systems to be inconsistent with the level of risk posed by the WTP. The group of experts issued a report entitled Evaluation of Important Uncertainties and Resulting WTP Design Conservatisms (HNF-40122), documenting five recommendations aimed at "balancing the risk between the Tank Farm and WTP for achieving acceptable waste feed, primarily based on operational and economic considerations without compromising safety." The MAR expert team recommendations led to the development of a

revised Unit Liter Dose<sup>1</sup> calculation based on improved understanding of the character of the waste, adoption of the widely accepted DOE toolbox code for consequence analysis, and more realistic modeling of hydrogen generation.

HPAV: ORP chartered another team of experts to review whether unwarranted conservatism in the evaluation and design requirements for hydrogen accommodation was driving operational complexity to the detriment of operational reliability and safety. The team published a report (WTP – Control of Hazards Associated with Hydrogen Accumulation in Piping and Ancillary Vessels, Alternative Evaluation and Design Approaches, CCN 201897, dated February 26, 2009) containing five recommendations for evaluating hydrogen in piping and ancillary vessels. Implementing two of the five recommendations (i.e., reevaluate selected assumptions and methods of accident analysis, and reduce the levels of conservatism in methodology and acceptance criteria) has resulted in revised accident analysis assumptions and methods, more realistic bounding HPAV assumptions based on testing, analysis of piping fragmentation, improved piping calculations, and improved understanding of gas retention characteristics in Newtonian vessels. The classification changes support fewer redundant systems, fewer active hydrogen controls for piping systems, and reducing the redundancy required based solely on fragmentation concerns, thereby reducing the total number of required safety components. Additional confirmatory testing is being conducted by BNI and ORP/California Institute of Technology.

ORP approved a revision of the preliminary documented safety analysis for the PT Facility in October, 2009, to be followed by the HLW evaluation later in FY 2010.

- Projected Increased Sodium Additions in WTP. ORP issued a report, Sodium Issue Management Plan for the River Protection Project, in October 2008, to address concerns identified in recent studies that indicate that up to an additional 34,000 metric tons of sodium hydroxide may be required to prepare Hanford tank waste for vitrification. The plan will be used to identify and select specific strategies and technologies to minimize the amount of sodium hydroxide needed to process tank waste in the WTP. The initial set of strategies was identified and recommended before September 2009. These included continued development of waste loading improvements for low-activity waste (LAW) and HLW. Additionally, consideration of an aluminum removal facility to be incorporated into the River Protection Project (RPP) system prior to the WTP is being pursued. Currently, the results of ORP-directed glass development has allowed for a doubling of concentrations of aluminum destined to HLW for treatment. This equates to a near 70% reduction in the projection for the 34,000 metric tons of additional sodium. The second detailed assessment phase, scheduled for completion in September 2011, will include in-depth evaluations of technology readiness, flowsheet effectiveness, facility system impacts, and risk-cost-benefit analysis. The assessment will lead to the recommendation of specific strategies and technologies for further development and demonstration by the RPP.

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<sup>1</sup> The calculation of radiological consequences per liter of waste (the Unit Liter Dose) facilitates accident evaluation for different possible vessel sizes or fill levels.



### **Structural Steel Fire Protection Coatings**

ORP and the contractor proposed providing fireproof coatings on primary structural steel members that are necessary to prevent loss of confinement or structural collapse, and elimination of fireproofing on secondary members not required for stability or confinement. ORP and the contractor provided documentation and demonstrated structural integrity to the DNFSB. Thus, the issue is closed, as documented in the "Nineteenth Annual Report to Congress" issued by DNFSB in March 2009. The Board performed independent evaluation of the technical issue and concluded that the fire protection strategy at WTP is acceptable from a nuclear safety perspective.

### **Fire Protection of WTP Confinement Ventilation**

The WTP authorization basis invokes DOE-STD-1066, Fire Protection Design Criteria, which includes requirements in Section 14 for fire protection features within nuclear facility ventilation systems to protect HEPA filters from damage during a facility fire. The radial flow HEPA filter configuration used in the WTP ventilation systems does not support explicit compliance with DOE-STD-1066-99. The WTP design is based instead on facility-specific fire hazard analyses and the Integrated Safety Management process.

BNI developed and submitted to ORP an alternative design option that provides comparable safety and mission protection as allowed by DOE-STD-1066, and in accordance with DOE Order 420.1B. The alternate approach does not provide all of the fire protection features prescribed in Section 14 of DOE-STD-1066, but does provide multiple levels of fire protection features that adequately protect final HEPA filters from fires.

The alternate approach was identified by ORP as a gap in implementation of DNFSB Recommendation 2004-2, Active Confinement Ventilation Systems. EM accepted the gap analysis in July 2009. ORP directed BNI to implement the alternate approach in the authorization basis documents and the design. BNI has completed its implementation of the alternate approach in the Authorization Basis. ORP is currently reviewing BNI's implementation.

### **Authorization Basis Changes (Design and Standards Change Approvals)**

The Safety Requirements Document was prepared when the WTP was envisioned to be a privatized facility and provides the nuclear, process, and radiological safety requirements for the WTP. Five significant changes to this document were approved in FY 2009. These included:

1. Applicability of 10 CFR 50.49 and IEEE-323 to the WTP Project
2. Clarification of the use of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section VIII, Divisions I and 2, for vessels qualified to Seismic Category I and II requirements
3. Incorporation of DOE Order 420.1B
4. Clarification of use of AISC M016-89, manual for steel construction
5. Change to Natural Phenomena Hazards Design Criteria.

DOE reviewed 17 changes to the Preliminary Documented Safety Analysis (PDSA) in FY 2009. DOE only approved 8 during the fiscal year, as the others were potentially impacted by the MAR/HPAV effort described above, resulting in changes to some structures, systems, and components (SSC) functional classifications (i.e., safety class to safety significant). Significant among these changes were the implementation of controls for implementing DOE-STD-1066 discussed above. There were 108 changes to the PDSA in FY 2009 that required only contractor approval. The number of DOE-approved changes is

much less than last fiscal year as the design of the facilities has matured to the point where significant changes are not expected.

### **Assessments of WTP Contractor Activities**

In 2008, ORP initiated several quality assurance (QA) assessments of the BNI QA Program, application of QA program grading, corrective action management system, procurement of items important-to-safety and commercial material, commercial grade dedication (CGD), and supplier inspections of BNI vendors. Assessment and inspection activities have identified the need for improvements in BNI's procurement and Corrective Action Management System program implementation. As a result, BNI is strengthening its overall application of graded approach and NQA-1 to the complete suite of nuclear related procurements. Significant quality issues include:

- **Black Cell Piping** – BNI identified that approximately 14,000 “black cell” (cells that will not be accessible after completion of construction) and hard-to-reach pipe spools had been procured without proper material history documentation and the specified radiographic examination as required. All of the identified spools were reviewed to ensure they had adequate documentation of required non-destructive examination and material history. 1489 spools had additional non-destructive examination performed. 290 of those spools required weld repairs. The contractor provided closure notification for all corrective actions associated with the direct review of Black Cell and Hard to Reach area spools on June 19, 2009. The contractor provided responses to issues raised by DOE-ORP's Black Cell Piping Corrective Action Review on October 27, 2009.
- **Broad Based Review (BBR)** – As part of the corrective actions and extent-of-condition determination for the “black cell” piping spool issue, BNI assembled a team of engineers to review five specific component engineering and procurement activities and five program activities that have cross-cutting engineering and procurement impacts. The scope of the BBR was to examine upper-tier requirements from the Design Criteria Database, such as contract and Authorization Basis requirements, and verify they have cascaded down to lower-level procurement documents and construction drawings. The review examined seven systems and four component classes in vertical and horizontal slices respectively. The review phase of the BBR is complete. All identified issues have either been vetted through BNI engineering and determined to be non-issues or entered into the Contractor Corrective Action Program for tracking to final resolution. The final BBR report was issued December 31, 2008. Approximately 60% of the issues have been closed through the Contractor Corrective Action Program. The majority of the issues are scheduled to be closed by the end of CY 2009.
- **WTP Quality Assurance** – ORP vendor oversight activities of two BNI suppliers identified significant findings regarding the manner in which the suppliers were utilizing CGD to upgrade commercially procured materials for use in safety significant applications. A subsequent ORP vendor surveillance, performed as part of the Vendor Shop Initiative, identified additional issues with performance of CGD of commercial material for use in safety related applications: 1) installing valves on pipe spools without the required valve supplier instructions, making the valve quality indeterminate; and 2) not segregating non-conforming materials in accordance with NQA-I. BNI has completed documenting the vendor CGD program issues in the DOE regulatory Non-conformance Tracking System and has performed a root cause analysis. BNI is in process of performing an extensive extent-of-condition review and correcting deficiencies in the quality of vendor CGD programs, and the controls these vendors, in turn, apply to their sub-tier

suppliers. The BNI WTP Project and ORP are visiting vendor shops to evaluate and mentor suppliers on CGD requirements. BNI is reviewing all items that have been procured outside of an NQA-1 program to determine if the items have been appropriately Commercial Grade Dedicated and if not, what actions are required.

ORP oversight of the BNI Safety Software QA Program identified several findings, which included: 1) training and qualification did not meet requirements established in Software QA documentation, procedures, or implementation guidance; 2) Aspen Process Performance Simulation (APPS) Software QA life cycle documentation did not meet BNI Software QA procedure requirements; and 3) examples were noted where established Software QA processes were not compliant with the QA Program requirements. It was also noted that the BNI WTP Project's software quality documentation is not yet fully in compliance with the requirements of DOE Order 414.1C. In response to the findings, BNI is retiring applications that are no longer needed and upgrading documentation on current programs to attain full compliance.

ORP oversight activities also reviewed, verified, and closed several quality-related issues, which included: Closure Verification - Black Cell Pipe Cell Issues; Closure Verification - WTP CGD procedure did not meet NQA-I-1989 requirements; Closure Verification - Deficiencies in BNI Nuclear Safety Culture; and Closure Verification - Storage of Pipe Spools with In-Line Valves.

## 2. Tank Farms Project

Hanford's tank farms contain 53 million gallons of radioactive and chemical waste that resulted from more than three decades of plutonium production. The waste is stored in 177 large underground tanks. ORP and its Tank Operations Contractor, WRPS, are removing and transferring this waste from the older 149 single-shell tanks (SSTs) to the newer 28 double-shell tanks (DSTs) to reduce the environmental risk posed by the older tanks.

### **Integrated Safety Management System**

On October 1, 2008, when WRPS took over operations of the Tank Farm Operations Contract (TOC) they received a functional Integrated Safety Management System (ISMS) from the previous contractor. Because it was important to DOE that the new contractor demonstrate that they had ISMS integrated in their processes and activities, ORP incentivized the contractor to pursue the satisfactory completion of the DOE ISMS review during the first year of the contract. The contractor performed the required ISMS Phase I & II reviews and declared readiness for the DOE ISM review on July 28, 2009. In August, ORP performed a combined phase I & II ISMS review using an independent review team. The review was performed in accordance with DOE Manual 450.4-1, Integrated Safety Management System Manual and DOE-HDBK-3027-99, Integrated Safety Management Systems (ISMS) Verification DOE Team Leader's Handbook. The review team concluded that ISMS functions and principles have been effectively described in WRPS's and ORP's management systems and effectively implemented. DOE line management and independent oversight organizations continue to perform oversight of the contractor processes and activities to ensure that ISMS is effectively implemented to ensure mission success.

### **Occupational Safety**

The Tank Operations Project worker accident/injury performance continues to be excellent, working 1,508,589 hours or 196 days without a Lost Time Workday Injury. The TOC reduced the Total Recordable Case (TRC) rate by 48% (1.49 to 0.78), while the Days Away Restricted or Transferred (DART) case rate significantly decreased by two-thirds (0.50 to 0.16) from the previous year.

Tank farms contractor incurred 10 TRCs in FY 2009, compared to 15 in FY 2008. The FY 2009 TRC was 0.8, compared to the FY 2008 TRC of 1.5. WRPS had only 2 Work Days Lost (WDL) cases in FY 2009.

**Table II. Washington River Protection Solutions LLC.**

Organization(s): 4707104 Year: 2009								
Fiscal Year	Fiscal Quarter	Hours	TRC	TRC Rate	DART Case	DART Case Rate	DART	DART Rate
2009	1	572,178	3	1.0	0	0.0	0	0.0
2009	2	581,345	4	1.4	2	0.7	206	70.9
2009	3	664,680	0	0.0	0	0.0	0	0.0
2009	4	758,848	3	0.8	0	0.0	0	0.0
Total for 2009		2,577,051	10	0.8	2	0.2	206	16.0
Total For Query		2,577,051	10	0.8	2	0.2	206	16.0

**Table III. Advanced Technologies and Laboratories International, Inc. (at the 222-S Laboratory).**

Organization(s): 4702004 Year: 2009								
Fiscal Year	Fiscal Quarter	Hours	TRC	TRC Rate	DART Case	DART Case Rate	DART	DART Rate
2009	1	29,534	0	0.0	0	0.0	0	0.0
2009	2	31,289	1	6.4	1	6.4	23	147.0
2009	3	32,084	0	0.0	0	0.0	0	0.0
2009	4	33,776	0	0.0	0	0.0	0	0.0
Total for 2009		126,683	1	1.6	1	1.6	23	36.3
Total For Query		126,683	1	1.6	1	1.6	23	36.3

**Commercial Grade Dedication (CGD)**

In December 2008, an ORP review of the WRPS process for performing CGD in support of safety-related equipment determined that two commercial grade item dedication (CGID) packages did not provide sufficient objective evidence that the dedicated items met design criteria to be upgraded to a safety related component: Stop Pushbutton/Contact Block and C-Farm Waste Retrieval System 3-way Jumper Valves [2-inch, 2-way ball valve]. During discussions, it was identified that the 2-inch ball valve CGID package was indicative of up to 26 valves in the transfer path for an upcoming tank-to-tank transfer. Based on these reviews, WRPS prepared a Justification for Continued Operations, which was approved by ORP to allow two series of tank-to-tank high level waste transfers. Two follow-up integrated

surveillances performed by ORP of the WRPS implementation of corrective actions identified a continued lack of understanding of implementation of the fundamentals of CGD. WRPS has documented this programmatic issue in the DOE Regulatory Non-compliance Tracking System and has implemented several actions to address the issues.

#### **American Recovery and Reinvestment Act (ARRA)**

ORP was provided an additional \$326M through ARRA to support tank farm upgrades. ORP directed WRPS to accelerate work under the TOC and ensure that organization and management systems are in place to support completion of ARRA-funded projects by the end of FY 2011. The primary objectives of the ARRA for ORP were the following: Create jobs to execute the ARRA work scope; accelerate life cycle extension upgrades to tank farm infrastructure and waste feed delivery systems required to support the delivery of tank waste to the WTP for treatment; improve reliability and availability of waste feed delivery systems, which reduce surveillance and maintenance costs over the life cycle of the TOC Project; and, through D&D activities, further reduce tank farm surveillance and maintenance costs and eliminate potential sources of contamination. Since ARRA-funded work began in April, a significant number of accomplishments have been made. Some of the most notable accomplishments are as follows: The ARRA work scope was definitized in Contract Mod 030; all milestones contained in Mod 030 were completed on time; hiring of ARRA personnel is 30% ahead of schedule; and the project has undergone 13 internal/external audits in total, with no findings and only minor recommendations for improvement.

#### **Baseline**

The Tank Farm Project has developed a revised life-cycle baseline to reflect revised technical changes; regulatory strategies and drivers; cost and schedule revisions; and risk mitigation activities. The revised baseline was reviewed by an Independent Review Team the week of November 2, 2009, and no significant issues were identified.

#### **DOE VPP, Tank Farm Contractor**

In 2009, WRPS retained VPP Star status in the Waste Feed Operations and the Analytical Technical Services. WRPS is currently combining all of their operations into one VPP application to seek Star status for the entire organization. WRPS will conduct self assessments in December 2009, with plans to deliver the VPP application to ORP in January 2010. The DOE Office of Health, Safety and Security will then schedule a VPP review in 2010.

Advanced Technologies and Laboratories, LLC Inc. (ATL) at the 222-S Laboratory retained Star status in 2009.

The DOE Office of Health, Safety and Security conducted three VPP reviews for Tank Farms in FY 2008. As a result of those reviews, CH2M HILL Analytical Technical Services retained continued recognition at the Star level; ATL (at the 222-S Laboratory) and Intermech, Inc. (at the WTP Project) were awarded recognition at the Merit level. The team noted that the ATL review revealed only a single opportunity for improvement; this is a level of performance rarely achieved during a DOE-VPP onsite assessment. ATL is the first small business prime contractor in the DOE complex to earn this recognition. Intermech, Inc. is the first construction contractor in the DOE complex to be awarded Star status.

### **Environmental Impact Statement (EIS)**

In February 2003, a Notice of Intent for the Retrieval, Treatment and Disposal of Tank Waste and Closure of Single-Shell Tanks EIS was issued. At the same time, the Hanford Solid Waste EIS was in preparation. The Washington State Department of Ecology entered into litigation with DOE regarding the Hanford Solid Waste EIS. A decision was made to combine the scope of the Hanford Solid Waste EIS with the scope of the Retrieval, Treatment and Disposal of Tank Waste and Closure of Single-Shell Tanks EIS and the scope of the Fast Flux Test Facility EIS as a result of a court settlement agreement related to errors in the Hanford Solid Waste EIS. This new EIS, the Tank Closure & Waste Management EIS, analyzes new approaches to completing the groundwater analysis and enhancing the scope of the document to include a more quantitative cumulative impact analysis. The draft Tank Closure & Waste Management EIS was released for public comment on October 30, 2009. The 140 day public comment period is scheduled to be completed March 19, 2010. The EIS is required to support future tank waste treatment, storage, and disposal; disposition of waste generated at Hanford; waste to be potentially shipped to Hanford from other DOE sites; and the final disposition of the Fast Flux Test Facility.

### **Double-Shell Tank Integrity Accomplishments for FY 2009**

The Hanford Tank Integrity Program focuses on controls and inspections for the 28 Hanford DSTs that were constructed from 1967 to 1986. The DSTs consist of a primary and secondary carbon steel tank within an outer reinforced concrete structure. These tanks have a nominal capacity of approximately one million gallons each. Because some of these tanks are beyond their original design life and will be needed to support tank waste through the life of the WTP, additional testing, inspection, and monitoring are performed to assess and monitor the condition of these tanks as required by DOE Order 435.1, Waste Management. Specific accomplishments include:

- Installation of corrosion probes into tanks 241-AY-101 and 241-AY-102. The design for a probe in 241-AN-107 was initiated in FY 2009 and will be fabricated and installed in FY 2010. The probes monitor the corrosion potential of the waste to ensure that the potential is not in the range that would cause corrosion of the liner. The potentials of concern have been determined by laboratory testing that has been guided by an Expert Panel Oversight Committee. The probes also contain metal coupons of the same material as the tank that can be extracted after extended exposure to the waste and examined in the laboratory.
- The DST Integrity Program completed the Ultrasonic Testing (UT) of three more second round DSTs: 241-AW-101, 241-AW-105, and 241-AW-106. This brings the number to twelve of DSTs that have had two rounds of UT. The program is scheduled to complete three to four UT measurements per year to allow for the examination of all DSTs every eight to ten years. The UT examinations are a key element the DST leak integrity program.
- Completed primary and annulus videos of the three tanks that had UT, as well as tanks 241-AN-103, 241-AP-104, 241-AP-106, 241-AY-101, 241-AZ-101 and 241-SY-102.
- Completed the replacement of valve funnels and valve positioning pointers in valve pits 241-AN-01-A and 241-AW-B.
- An Expert Panel Oversight Committee guided research in three areas of chemistry optimization of the waste stored in the DSTs:

- Minimum value inhibitor testing for the prevention of stress corrosion cracking (SCC). This work led to the determination of the minimum concentration ratio of nitrite to nitrate and pH to prevent SCC.
- Parametric testing of nitrite, pH, and nitrate impact on SCC. This work also looked at the influence of the open circuit potential on these relationships.
- Test methods for liquid-air interface were developed during FY 2009. Preliminary tests were conducted to refine the techniques.
- Thermodynamic modeling and laboratory testing were conducted and continue in FY 2010 to better understand corrosion in the vapor space region of the DSTs.

### **Single-Shell Tank Integrity Assessment Accomplishment for FY 2008**

149 SSTs were constructed at the Hanford Site from 1943 to 1964 to hold radioactive waste created by the production and separation of plutonium and other radionuclides. The SSTs are underground, reinforced-concrete structures (i.e., a concrete tank with a concrete dome) with a carbon steel liner covering the concrete base and walls. Of the 149 SSTs, 133 are large-capacity tanks with nominal capacities ranging from 530,000 to 1,000,000 gallons each, and 16 are smaller tanks with a 55,000 gallon capacity each. Specific accomplishments include:

- At the request of ORP, WRPS established a Single-Shell Tank Integrity Panel. The panel consists of nine nationally-recognized members from industry and academia in the areas of structural integrity, non-destructive evaluations, corrosion, nuclear waste chemistry, soils and vadose zone, and material properties. The panel was chartered to evaluate SST conditions and provide recommendations for the best technical approach to maintain SST structural integrity and leak integrity. The panel met in January and again in May 2009. The panel provided a recommendations report in September, which included recommendations pertaining to confirmation of tank structural integrity, assessment of the likelihood of future tank liner degradation, leak identification and prevention, and mitigation of contaminant migration. WRPS and ORP will use this report and subsequent revisions to the report in the development of SST Integrity and Oversight Programs.
- A modern finite-element structural analysis of record began in FY 2009 for the SSTs. This analysis of record was one of the recommendations provided by the expert panel and will be a multi-year project.
- Work was completed to identify missing benchmarks and work needed to maintain existing benchmarks. These benchmarks are surveyed periodically to provide early warning of issues that may be of structural concern for the SST. The benchmarks will continue to be used for the life of the tanks. Identifying and correcting maintenance issues will ensure the monitoring program is maintained for the remainder of the tank life.
- Two leak assessments were completed in FY 2009: Tanks 241-C-105 and 241-A-103. Tank 241-C-105 was recommended to remain classified as sound pending the outcome of additional field work to be completed in FY 2010. Tank 241-A-103, which is currently classified as an “assumed leaker,” was recommended to be classified as sound. The assessment panel found that the surface level fluctuations that caused the tank to be classified as an “assumed leaker” were

most likely caused by the tank waste properties, which caused gas-release events. A leak assessment for Tank 241-T-102 is currently underway to determine whether radiation readings in a nearby drywell are due to a tank leak. There is no indication to date that the tank has leaked, and the assessment is ongoing while the drywell continues to be monitored.

## H. Pantex Site Office

In FY 2009, Pantex successfully exceeded commitments to fully support the Directive Schedule and Defense Program (DP) "Getting the Job Done" Goals. These goals were achieved within constrained budgets in Directed Stockpile Work (DSW), Readiness in Technical Base and Facilities, and Safeguards and Security. At the same time, significant safety system upgrades were completed to enhance the safety of nuclear explosive operations.

Significant improvements in production support operational processes were also implemented. The accuracy of material movements improved to 99.99%; shipping backlog was reduced by 48.5%; and production Inventory Record Accuracy improved to 95.2%, exceeding industry standards.

Pantex accomplished the NNSA weapons production mission while achieving a level of safety that ranks among the top "safety leaders" in the NNSA complex over the last four years. The lowest ever Total Recordable Case rate of 0.43 and Lost Time Case rate of 0.09 were achieved.

In conjunction with the NNSA Pantex Site Office (PXSO), B&W Pantex jointly deployed the Pantex High Reliability Organization (HRO) framework Plant-wide to minimize the potential for a high-consequence, systems accident. This experience was shared with other NNSA sites. B&W Pantex further demonstrated its commitment to the success of the Pantex Plant by investing in a comprehensive and ongoing plan to actively engage employees across the organization through empowerment, training and and career advancement.

B&W Pantex continued to performance through improvement of its (CAS). Assessments were year through Management critique evaluation feedback, continued effectiveness of Safety Management and Prime Contract List B recognized during the HS-64 Environment, Safety and the procurement of safety-grade dedication, and suspect/counterfeit items.

Pantex excelled in fostering a system of recognized by the DOE/NNSA



engage employees across the employee outreach, recognition, support, and professional growth

enhance nuclear safety effective and continuous Contractor Assurance System substantially improved during the Self-Assessment (MSA) training, and a focus on verifying the requirements from TSRs/DSAs, Programs, and DOE Order 410.1, requirements. B&W Pantex was Oversight Inspection of Health for its robust processes in class components, commercial preventing the introduction of

environmental stewardship by environmental management and was presented the "NNSA



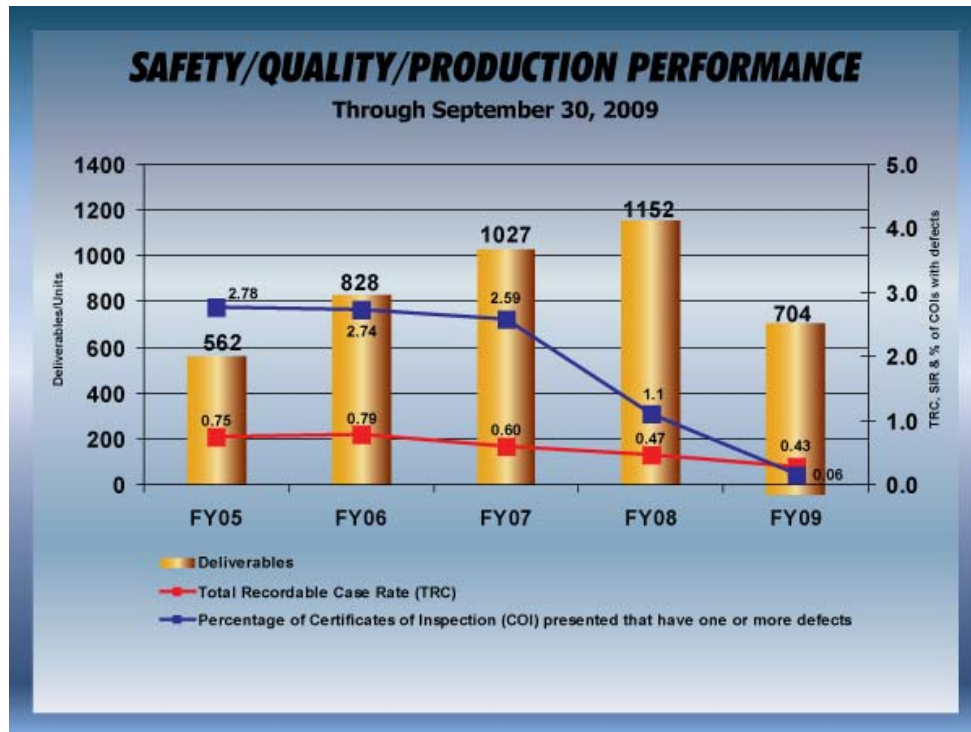
2009 Pollution Prevention Program Environmental Stewardship Award.” The Pantex Plant Environmental Management System (EMS) was established as an ISO 14001-type system months ahead of DOE requirements. B&W Pantex was chosen to receive three NNSA Environmental Stewardship Awards for the Pantex Recycling Initiatives, Pantex Environmental Management System Program, and the Replacement of X-Ray Processor Chemical & Photographic Film Process with Digital X-Ray Equipment.

FY 2009 marked the completion of all Environmental Restoration cleanup projects at the Pantex Plant. The Final Preliminary Construction Completion Report was approved by the EPA on July 29, 2009, documenting completion of more than 20 years of work at Pantex to finish environmental investigations, ecological and human health risk assessments, contaminant modeling, corrective measures studies, and corrective measures design and construction.

Looking ahead to 2010, Pantex will continue to uphold a high standard of excellence in safety, security, and quality to provide the foundation for sustained nuclear weapons production and improved capabilities to support NNSA’s long-term plan for a viable and efficient Nuclear Security Enterprise (NSE). We will continue to work with partners within the NSE to focus on planning scenarios and projects that support footprint reduction as well as positioning the site to meet future staging and surveillance requirements.

**Operational Excellence**

B&W Pantex demonstrated outstanding leadership within the Pantex Plant, as well as the NSE, by providing the direction, coordination, and communication required to successfully deliver on NNSA goals, while retaining its recognized status as one of the safest companies in the United States. Pantex continues to strive for operational excellence by proactively identifying and resolving issues to improve execution in mission performance, as Pantex emerges as an HRO.



In FY 2009, B&W Pantex and PXSO mutually embraced the concept of “One Team, One Plant, and One Customer.” This alignment was a natural outgrowth of the cooperative partnership between B&W Pantex and PXSO over the past several years in effectively managing through challenging budget and technical issues to successfully meet the Plant’s mission. The shared value between B&W Pantex and PXSO leadership is sustaining operational excellence at Pantex.

### **Safe Performance**

Pantex Plant received 12 awards from the National Safety Council for outstanding safety performance. Several long-term, employee-driven safety initiatives designed to increase and sustain employee engagement and to achieve higher levels of Plant safety performance include:

- Voluntary Protection Program (VPP) Steering Committee – The Committee submitted the Pantex VPP application to the PXSO on September 30, 2009.
- Ramp Safety Committee – Works to improve conditions in the Plant ramps and is composed of representatives from the Metal Trades Council and Pantex Guards Union.
- Enhanced Behavior Based Safety (BBS) Program/Process – Improved electronic data analysis capabilities and formed two BBS employee-driven/owned teams to resolve Plant issues based on data trend analysis.

### **Nuclear Safety Improvements**

B&W Pantex completed the development and installation of the Automated Next Generation Weather Surveillance Radar (NEXRAD) system on February 28, 2009. The Iwatch System is used to notify operations personnel of impending severe weather. Additionally, the use of the Static Potential Monitoring System was implemented on February 28, 2009. The system provides another method to detect the threat of lightning.

Twelve new ASME NUM 1 Type 1B seismically qualified hoists were installed and approved for weapon program operations. Electrostatically dissipative floor coatings were installed in 16 more nuclear facilities. Seismically qualified emergency lights were upgraded in three facilities, and the remaining seismic issues in the operating cell facilities were addressed.

Obsolete ADT fire alarm panels were replaced and converted to a single new fire alarm receiving station. Thirty-five panels were installed, including eight in the material access area. Construction was authorized to replace the aging piping for the fire water distribution system.

Pantex implemented a Weapon Program Trainer Maintenance program and evaluated all 14 trainers identified in the FY 2009 plan two months ahead of schedule to improve training and qualification of weapon program production technicians.

### **Weapon Operations**

B&W Pantex successfully met or exceeded product delivery commitments to fully support the FY 2009 Directive Schedule and DP “Getting the Job Done” Goals. Accomplishments in FY 2009 include: completing 109% of the baselined weapons deliverables and finishing the B61 life extension program deliverable ahead of schedule; completing 118% of planned dismantlements; and completing all planned Joint Test Assembly (JTA) deliverables on time in support of their scheduled military flight tests.

Significantly, B&W Pantex completed First Production Units (FPU)/First Disassembly Units (FDU) – W76-1 JTA1, W80-1 JTA8, W88 JTA2 Refresh FPU, B83 AFT Assembly – and obtained authorization for weapon program operations – W78 disassembly and inspection (in a 5kV electrostatic discharge environment) and W88 cell and Mass Properties operations. The W88 team’s innovative approach led to the development of the first horizontal physics package disassembly, significantly improving high explosives handling and control.

A strong focus on cost controls resulted in a reduction of FY 2009 premium labor (over time) costs by 51% compared to FY 2008 expenditures.



Major General Donald Alston, Strategic Deterrence and Nuclear Integration, USAF (second from left), and Robert Smollen, NNSA Deputy Administrator (second from right) visited Pantex.

Notable Pantex initiatives to improve accomplishing the DSW mission in support of DP “Getting the Job Done” include: completing fabrication of four Power-Free Gas Sampler units that simplify the gas sampling process for weapon operations; authorizing Permissive Action Link (PAL) operations outside of the current facility – this change will make the current PAL facility available for other uses in the future; and expanding the utilization of the High Explosives Transportation Cart to insensitive high explosive main charges to improve operational safety and efficiency.

### **Special Nuclear Material Operations**

B&W Pantex is committed to continuous improvement in management and execution of required SNM mission activities. Notable examples of improvements in FY 2009 include: developed a software program that calculates performance metrics for all SNM operations equipment; refined the Microfocus X-ray system operation to enhance pit surveillance activities; delivered a SNM Storage/Staging Contingency Plan, ahead of schedule, defining low-cost options for increasing pit storage capacity at Pantex; completed Laser Gas Sampling for W78 pits; and obtained LANL approval for Microfocus X-ray use in W78 gas sampling operations and reduced the backlog of W78 pit surveillances by 53%.

Additionally, B&W Pantex completed all scheduled nuclear material container surveillances and pit surveillance objectives during the year, including shipping container reacceptance, AT-400A container visual inspections, and AL-R8/SI 2030/SI 2040 container surveillances. Pit storage sample surveillances not funded during FY 2008 (defined as “backlog”) were combined with the FY 2009 selections, and both were completed this year. Pantex also completed the following container-related activities: identified and qualified softwood Celotex as a replacement for cane Celotex in AL-R8 2030 Sealed Insert (SI) containers to assure no impact to packaging operations; installed and completed startup activities for the 2040 SI bell jar ; qualified two coordinate measuring machines to meet capacity demands and provide enhanced reliability in support of pit requalification and pit surveillance programs; completed re-packaging of all backlogged Canned Sub Assemblies (CSAs) currently authorized for packaging and re-packaged 160% of CSAs from the FY 2009 baseline; packaged and shipped 136% of the baseline FL units to the national laboratories for further testing; packaged and shipped 111% of the baseline tritium reservoirs, including implementation and utilization of the T568 tester; and procured, installed, and completed testing of a universal bell jar capable of conducting leak checks of all pit storage and shipping containers with containment vessels.

### **Excess Material Disposition**

B&W Pantex completed the removal of over 167,000 components to free up critical warehouse space. 640,000 pounds of scrap metal were recycled.



**Scrap Metal Pile Before and After**

### **Deactivation and Decommissioning Program**

The demolition of Building 12-R-9 and 12-R-9B was completed in FY 2009. This project concludes the very successful Facilities and Infrastructure Recapitalization Program (FIRP) Facilities Disposition program. Between 2001 and 2009, 61 buildings and 35 other structures at Pantex Plant were demolished. The Plant footprint was reduced by 125,731 square feet, surveillance and maintenance costs were reduced more than \$150,000 per year, and Deferred Maintenance was reduced by more than \$3M. Cost efficiencies and unused contingency accrued over the life of the program resulted in the return of approximately \$780,000 to FIRP for use on other projects at Pantex Plant.



**Before Demolition of Building 12-9**



**Mid-Point of Demolition of Building 12-9**



**After Demolition of Building 12-9**

#### **Engineering Campaign, Enhanced Surveillance Program**

B&W Pantex completed installation and equipment qualification of the high-resolution computed tomography (CT) radiography system (CoLOSSIS) supporting surveillance transformation. The system was used to image B83 and W87 pits. B&W Pantex also provided data to the Design Laboratories on high explosive performance for detonators and main charge explosives as a function of age and evaluated advanced tools and diagnostics for surveillance transformation by completing tests of high explosives while developing and integrating Photonic Doppler Velocimetry.

#### **National Laboratory High Explosive (HE) Initiatives**

B&W Pantex performed scale model tests to establish the maximum conventional HE limit that can be supported in certain buildings while providing the required personnel protection. Plant personnel constructed and tested scale models of the facilities with worst-case accidental detonations of varying HE weights and specific load-time histories for structure elements were captured for use with dynamic response predictions.

## **Performance Assurance**

Pantex developed, formalized, and implemented a process that reflects a CAS focus on TSRs, the Safety Management Program, and DOE Order 410.1 and Prime Contract List B flowdown requirements. B&W Pantex performed 120 requirement assessments and 244 risk-based and other required assessments, bringing the total number of assessments performed in FY 2009 to 364.

The quality of CAS assessments was enhanced during the year by requiring MSA team leads to complete new training prior to leading an assessment. Additionally, B&W Pantex continued to evaluate critiques using a defined set of criteria to fortify the Issues Management process. Significant improvement has been realized in the critique process, including more structured personnel statements and improved event fact sheets.

B&W Pantex worked closely with PXSO to develop meaningful Line Oversight of Contractor Assurance System (LOCAS) metrics. On August 28, 2009, Tier 3 metrics on the NNSA LOCAS Portal were submitted, as scheduled, for review by DOE Headquarters Functional Area Leads.

Trending and analysis of reportable and non-reportable events and conditions were enhanced through tools such as the Nuclear Safety Indicators (precursor analysis) and the Quarterly Performance Analysis Report, which included a TSR violation analysis to assure a better understanding of the significance of issues, events, and conditions at Pantex.

Pantex worked to facilitate increased understanding and implementation of HRO concepts and techniques over the course of FY 2009. Achievements include:

- Completed HRO training for all managers at PXSO and B&W Pantex
- Developed and integrated a new “HRO Introduction” into new hire orientation for proper HRO indoctrination of new hires
- Integrated the Human Performance Improvement Process into the HRO efforts
- Provided first-line supervisors with tools for reviewing human performance error precursors and identifying barriers, a key component to getting HRO implemented on the line in a proactive vs. reactive way
- Distributed a Pantex Seminar Announcement to NNSA sites to provide HRO Introduction to senior managers. As a result, the following were conducted:
  - HRO seminar presented to NA-70 and all security senior managers within NNSA (Federal and contractors)
  - HRO Seminar to DOE Headquarters (NA-17) and the Office of Health, Safety and Security
  - HRO and causal factors analysis (CFA) seminars presented to DOE and contractor organizations, August 2009
  - Hosted an HRO seminar as a joint effort with the United States Air Force

- Based on the large interest within the DOE community, B&W Pantex had the Government Printing Office publish and make available to anyone the Pantex HRO and CFA texts. Over 1600 copies were ordered by the Government Printing Office for sales.

## **I. Richland Operations Office**

The DOE Richland Operations Office (RL) is reaching closer to its plan to reduce the active footprint of the 586 square mile Hanford Site to 75 square miles by the year 2015. This 2015 Vision for Hanford Cleanup will not only reduce the active cleanup footprint, but will also free up resources, reduce risk, and most importantly demonstrate measurable progress towards cleanup of the site.

Implementing the \$1.635 billion of ARRA funds will help DOE-RL make this vision a reality. By the close of FY 2009, ARRA funds enabled RL to save and create 4,407 jobs. The first wave of workers hired by the stimulus completed their initial job training in June.

In April 2009, the Mission Support Contract (MSC) was awarded to Mission Support Alliance, LLC. A 90-day contract transition from the PHMC (Project Hanford Management Contract) to the MSC commenced on May 26th. The MSC is the last of three new major prime contracts awarded for cleanup at the Hanford Site as part of the Department's Central Plateau acquisition strategy, which calls for contracts covering tank farm operations and closure, waste and facility disposition on the Central Plateau, and mission support. The Tank Operations Contract awarded in May 2008 serves the principal mission of Hanford's Office of River Protection (ORP), while the Plateau Remediation Contract awarded in June 2008 serves many of RL's principal cleanup missions. The MSC includes mission support functions of the PHMC scope of work, which expired on July 15, 2009. The MSC provides cost-effective infrastructure and site services integral and necessary to accomplish the Hanford Site environmental cleanup mission. The scope of the MSC contract includes five primary functions: Safety, Security and Environment; Site Infrastructure and Utilities; Site Business Management; Information Resources/Content Management; and Portfolio Management. The contract is a cost-plus-award-fee contract valued at approximately \$3 billion over ten years (a five-year base period with options to extend it for another 5 years).

On July 1, a Washington Closure Hanford (WCH) employee fell about 50 feet through an access door while on a catwalk working on a crane to prepare for the demolition of the 336 building in Hanford's 300 Area. The worker sustained a number of very serious injuries. The DOE accident investigation found that the work being performed had not been fully analyzed for appropriate safety precautions, and that workers became distracted after the job scope informally changed. DOE is mandating a number of improvements, including substantive changes to fall protection and work control processes. Among the report's recommendations are that the contractor should: 1) instill a workforce culture in which employees understand and take appropriate action when the work being performed begins to extend beyond the planned and analyzed work scope; 2) balance its work schedule commensurate with its trained and qualified work supervisors; and 3) re-evaluate the fall protection program in its entirety and retrain workers.

RL also completed a review to determine how Federal actions and oversight of the contractor's safety programs could be improved. A number of improvement opportunities were identified, and a formal corrective action plan is being prepared.

In July, DOE performed a Phase I verification of the Plateau Remediation Contract Integrated Safety Management System (ISMS). The ISMS Phase I Review Team found that CH2MHill Plateau Remediation

Company had documented an adequate ISM system description, along with its associated policies, procedures, and manuals of practice, consistent with ISMS requirement and approved the ISM system description on the condition that corrective actions are taken to correct the seven Opportunities for Improvement documented.

Hanford EM contractors prepared a sitewide Chronic Beryllium Disease Prevention Program (CBDPP), which was approved by ORP and RL during FY 2009. The CBDPP will standardize contractor approaches for complying with the requirements of 10 CFR 850, Chronic Beryllium Disease Prevention Program. The sitewide CBDPP will be implemented during FY 2010. In addition, several other sitewide safety programs are scheduled for completion during FY 2010.

RL has had much success during FY 2009. Highlights are described below.

### 1. Burial Grounds

Contractors have finished excavating the 618-1 Burial Ground. This burial ground was one of the earliest at Hanford, and it was the last burial ground left to clean up in the 300 Area.

#### a) 618-7 Burial Ground

DOE and its River Corridor cleanup contractor, WCH, have met a Tri-Party Agreement milestone by safely remediating one of the most hazardous burial grounds along the Columbia River, the 618-7 Burial Ground. It is composed of three trenches that, from 1960 to 1973, received waste from a nearby nuclear fuel fabrication facility. Among the dangerous contents of the trenches was thorium. The trenches also contained chips of zircaloy, which can spontaneously ignite. Less volatile but still hazardous substances, such as lead, beryllium and cadmium, were also among the trench contents.

#### b) 618-10 Burial Ground

ARRA funding will be used to perform nonintrusive characterization at the 618-10 Burial Ground. The work scope includes determining the precise location of 94 vertical pipe units and 12 waste trenches within the burial ground. The vertical pipe units are five bottomless 55-gallon drums welded end-to-end into which Cold War-era Hanford workers dumped highly radioactive waste in the mid-1950s and early 1960s.

### 2. Environmental Restoration Disposal Facility (ERDF)

Construction of two new waste disposal cells at ERDF has been completed this year. Each pair of cells is 500 feet wide by 1,000 feet long and 70 feet deep, and each has a capacity of 2.8 million tons. With the addition of cells 7 and 8, the capacity of ERDF is now about 11 million tons.

WCH has started excavation for ERDF Supercell 9. This work is being accelerated from 2012 by using ARRA funding. ARRA funding is also being used to upgrade ERDF infrastructure in preparation for receiving increased volumes of waste from all over the site (resulting from accelerated cleanup). Most of the facility and equipment upgrades are designed to facilitate safe and compliant increases in production as work accelerates at the lined landfill. Facility upgrades include expanding the transfer area, rerouting roadways and traffic patterns, and building additional dump ramps.



### 3. N Reactor

During May, work began to place the 105-N Reactor into Interim Safe Storage. 105-N Reactor was the only reactor used to produce both electricity and plutonium. The work to cocoon N Reactor will be more extensive than cocooning other reactors. The 100 Area used to contain more than 100 buildings but is now approximately 50% demolished.

### 4. Plutonium Finishing Plant (PFP)

De-inventory of surplus plutonium and plutonium-bearing material, a DOE strategic initiative, began in 2007 and was completed this fiscal year. All special nuclear material has been shipped off-site. This de-inventory supports National Security Policy and eliminates the need for continued safe, secure, and long-term storage of surplus special nuclear materials at PFP. DOE is another step closer to having all PFP facilities slab-on-grade by the end of FY 2013.

Concurrent with de-inventory, the contractor completed equipment removal and decontamination and removal of 45 glove boxes from the main PFP facility.

### 5. Groundwater

The Project's environmental cleanup goals include removing contaminated soil and treating groundwater to remove contaminants. The contaminant considered of greatest concern in 100 Area groundwater is hexavalent chromium.

Recently in the 100 Area, CH2M HILL completed upgrades and expansions of the K Area groundwater treatment system, including adding an additional treatment facility; initiated site preparation activities to support the 100-DX Area groundwater remediation pump and treatment facility; and completed the first few groundwater remediation wells

The 60% design review for the new 200-West Area groundwater remediation pump and treatment facility was completed. The new facility increases groundwater treatment from 500 gpm to 25,000 gpm and treats both rad and non-rad contaminants.

### 6. U Plant

ARRA-funded activities have begun at the U Plant Zone. The overall scope of the project includes demolishing ancillary facilities, dispositioning tanks, grout-filling processing cells in the plant, and clearing the plant's canyon deck.

### 7. Waste Disposal Project

- Retrieved 461 cubic meters of radioactive waste from the low-level burial grounds.
- Completed the treatment of 1,266 cubic meters of mixed low-level waste volumes.
- Completed construction and readiness for the Interim Safe Storage Area for miscellaneous irradiated fuel storage.

## 8. K Basin Closure (KBC) Project

### a) K East Basin removed

Workers at the DOE Hanford Site finished removing the K East reactor basin on September 9, meeting an important milestone in the regulatory agreement governing Hanford cleanup, the Tri-Party Agreement. Remediation of the soil underneath the basin was started on September 27, 2009, thereby meeting another regulatory milestone.

The 1.2-million-gallon basin once held 1,100 tons of spent nuclear fuel, as well as sludge, a byproduct of fuel corrosion during years of storage. Workers finished removing the spent nuclear fuel from the basin in 2004 and the sludge in 2007. Water was drained from the basin in 2008, and the facility was filled with 5,100 cubic yards of sand mixed with grout. The sand provided shielding from radioactivity in the basin's concrete walls and was a platform for the heavy machinery that demolished the basin's superstructure in 2008.

### b) KBC Sludge Treatment Project

The DOE Implementation Plan commitment date for completion of sludge treatment and packing by November 2009 in response to Recommendation 2000-1 has been revised. A technology readiness assessment in July 2007 indicated that the proposed technologies were not sufficiently mature. The DNFSB members and their staff have been informed of the need to revise the commitment date and are continually updated on the status of the project.

Three primary sludge waste streams must be addressed by this project: the Engineered Container (EC) sludge stream, the Settler Tube (ST) sludge stream, and the Knockout Pot (KOP) material stream, with most of the volume in the EC stream.

Subsequent to completing an analysis to evaluate different approaches for treating all the sludge, the Sludge Treatment Project was reorganized into two phases for the EC and the ST sludge streams. Phase I involves removing the EC and ST sludge from the K West Basin to T-Plant in the Central Plateau for interim storage. Phase II involves the treatment and packaging of these streams on the Central Plateau and shipping them to the Waste Isolation Pilot Plant (WIPP, in Carlsbad, New Mexico) or appropriate facility for final disposal.

The KOP stream will be processed in K West basin to separate the coarse material (size >600 microns) from the remainder, package that fraction into multi-canister overpacks, transfer it to the onsite Canister Storage Building for interim storage, and eventually dispose of it with Department high-level waste. Fine KOP material (size <600 microns) will be captured by the existing fuel washing integrated water treatment system process, and it will ultimately be processed in the same manner as the EC and ST sludge streams for disposal at WIPP or appropriate facility. The KOP material washing, separations, and packaging for storage at the Canister Storage Building will be completed by June 30, 2012.

The EC and ST sludge is scheduled to be removed from K West basin and stored in T-Plant by December 31, 2015. Currently the Department is not in a position to propose a new end date for the EC and ST sludge material to be treated and packaged for shipment to WIPP or other appropriate facility. The Department initiated an 18-month alternative analysis to identify and develop ET and ST treatment and

packaging technologies in October 2009. RL will provide the Board an update on Sludge Treatment Project Phase II progress and potential Critical Decision dates by March 2011.

#### 9. Open DNFSB Commitments

R00-01 120W Containerized sludge in the K West Basin will be removed and treated to meet the applicable waste acceptance criteria. The Board was verbally notified by RL in May 2008 that the November 2009 due date would not be met. Revising the completion date is needed due to the Sludge Treatment Project being reset to a conceptual design status, between Critical Decision (CD)-0 and CD-1.

### J. Sandia Site Office

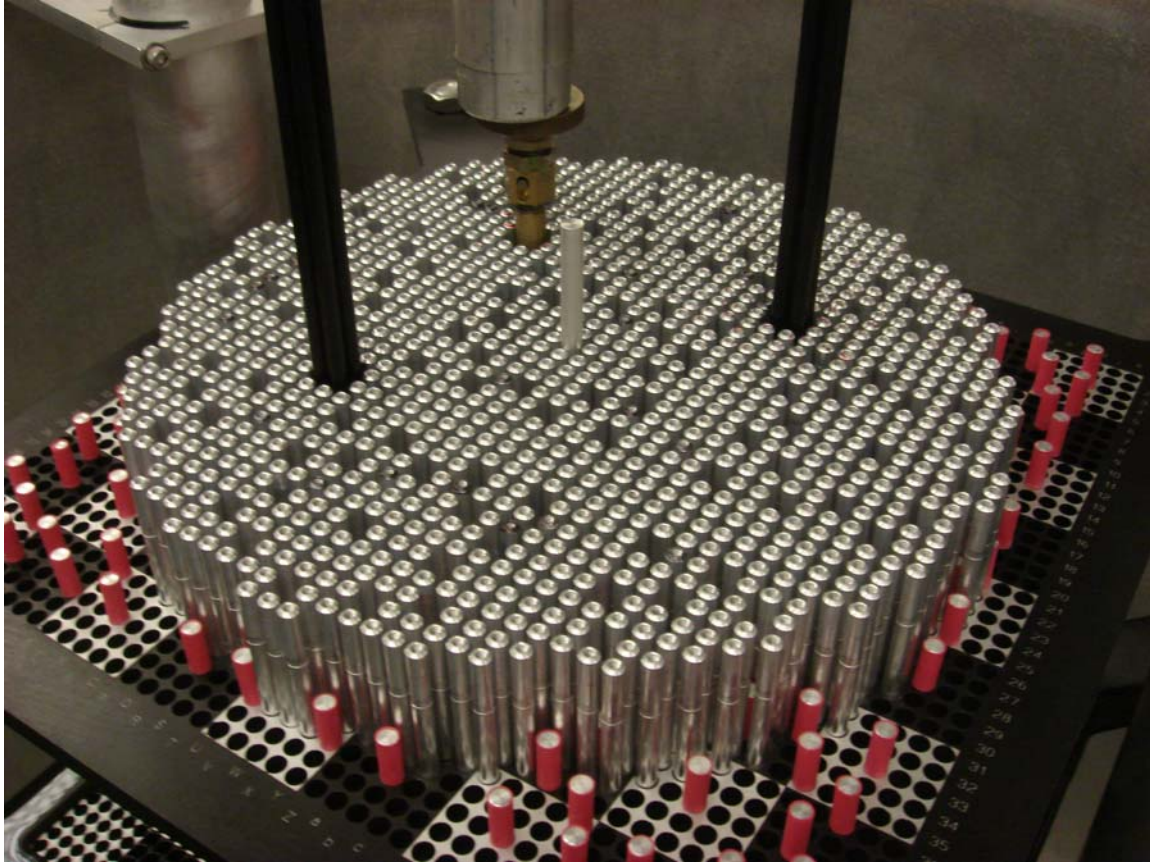
The DOE/NNSA Sandia Site Office (DOE/NNSA/SSO) is the management office providing oversight of the Sandia National Laboratories (SNL). Sandia Corporation (Sandia), a wholly-owned subsidiary of Lockheed Martin Corporation, manages and operates SNL for DOE/NNSA. Sandia designs all non-nuclear components for the nation's nuclear weapons, performs a wide variety of energy research and development projects, and works on assignments that respond to national security threats. The following sections summarize the status of nuclear facilities, assessment of specific administrative controls, the removal of material from SNL, interactions with the Board and staff during 2009, and remaining costs.

#### 1. Sandia Nuclear Facility Status

**Annular Core Research Reactor:** Operational. The Annular Core Research Reactor supported a moderate testing schedule of customers in 2009. Eighty Steady State and 106 Pulse Operations were safely conducted for a wide range of experiments. The DSA 2009 Annual Update was submitted in 2009 and is pending approval by DOE/NNSA/SSO. The Annual Update incorporated the most current International Commission on Radiological Protection (ICRP) Dose Conversion Factors (DCFs) contained in Federal Guidance Report No. 13 (FGR13).

**Sandia Pulsed Reactor (SPR) Facility:** Though the SPR-III and SPR-II reactor fuel has been shipped off site, the remainder of the reactor components and facility remain at Sandia Technical Area V. The DSA 2009 Annual Update was submitted in 2009 and is pending approval by DOE/NNSA/SSO. The Annual Update included the safety basis for both the Sandia Pulsed Reactor Facility and Sandia Pulsed Reactor Facility/Critical Experiments. The Annual Update incorporated the most current ICRP DCFs contained in FGR13.

**Sandia Pulsed Reactor Facility/Critical Experiments (SPRF/CX):** Operational. Following successful completion of the Operational Readiness Reviews, SSO authorized Sandia to conduct their Restart Operations Plan on May 5, 2009. During the week of May 11, 2009, the first 7% Critical Experiment was successfully completed, achieving a delayed critical condition with 1148 fuel elements (see photograph). Following completion of a comprehensive SSO Facility Operations Restart Oversight Plan, Sandia was authorized to conduct full-scale SPRF/CX operations on June 25, 2009.



**SPRF/CX 7% Critical Experiment with 1148 fuel elements installed. This configuration simulates a commercial nuclear fuel bundle.**

**Gamma Irradiation Facility:** Operational. The Gamma Irradiation Facility maintained a modest testing schedule for 2009. The DSA 2009 Annual Update was submitted in 2009 and is pending approval by DOE/NNSA/SSO.

**Auxiliary Hot Cell Facility:** A Basis for Interim Operation was submitted and approved by DOE/NNSA/SSO in 2009. A DOE operational readiness review is scheduled for January 2010 with startup activities scheduled for February/March 2010.

**Manzano Nuclear Facilities:** Operational. The DSA 2009 Annual Update was submitted and approved by DOE/NNSA/SSO in 2009.

**Onsite Transportation of Hazard Category 3 Radioactive Materials:** The Sandia operational readiness review was completed in 2009. The DOE operational readiness is scheduled to be performed in November 2009, with startup activities scheduled for January/February 2010.

## 2. Specific Administrative Controls

SSO and Sandia performed an assessment in support of DNFSB Recommendation 2003-2 to verify implementation of DOE-STD-1186-2004, Specific Administrative Controls. Field work was completed in 2009, and the final report is scheduled to be completed in November 2009.

3. Removal of Material from Sandia National Laboratories

Sandia, in close coordination with DOE/NNSA/SSO and with significant support from other DOE sites (Y-12, Nevada Test Site, Idaho, and Los Alamos), completed the offsite shipment of 638 items of No Defined Use material. These included sealed sources, fission foils and 1.7 metric tons of depleted uranium. Sandia continues to pursue disposition of No Defined Use material.

4. Significant Interface Activities with the Board and Staff

The Board visited DOE/NNSA/SSO and SNL in January 2009. No significant actions resulted from this visit.

5. Visits by DNFSB Staff

DOE/NNSA/SSO and Sandia hosted staff members in January and August. The topics of interest for the visits included the status of the Auxiliary Hot Cell Facility, the nuclear material de-inventory status, nuclear material packaging, the status of the Safety Basis Documents, Nuclear Weapon Safety, and SNL support to Pantex. Dr. Thomas Spatz, the cognizant engineer for the DOE/NNSA/SSA and SNL, participates via video teleconference in the weekly DOE/NNSA/SSO Operations Meetings. This has proved very beneficial by allowing both DOE/NNSA/SSO and Dr. Spatz to fully understand the status of areas of interest to the Board.

6. Document Requests

DOE/NNSA/SSO and Sandia responded to four document requests from the DNFSB concerning SNL nuclear facilities and support of Pantex.

7. Cost Estimates

<b>Projected Costs for Open Recommendations for FY 2010 for SSO/SNL</b>	
Recommendation	Estimated Cost
2008-1, Fire Protection Systems	\$0
2005-1, Nuclear Material Packaging	\$200K
2004-2, Active Confinement Ventilation	\$100K
2004-1, High Hazard Nuclear Operations	\$100K
2002-3, Administrative Controls	\$100K
2002-1, Software Quality Assurance	\$300K

**K. Savannah River Operations Office**

The Savannah River Site (SRS) performs activities for the DOE Office of Environmental Management (EM) and the National Nuclear Security Administration (NNSA). Activities performed by the site contractors – Savannah River Nuclear Solutions, LLC (SRNS), Savannah River Remediation, LLC (SRR), and Parsons Infrastructure and Technology Group, Inc. (Parsons) – in support of EM are overseen by the DOE Savannah River Operations Office (DOE-SR) and include nuclear materials stewardship and environmental stewardship. Major activities and accomplishments in 2009 for the EM specific facilities/projects at SRS are summarized below.

## 1. Safety

SRS continues to implement many initiatives to improve performance in ensuring public health and safety. The following are key highlights:

- In FY 2009, SRS (including DOE-SR and all contractors and subcontractors) achieved a Total Recordable Case (TRC) rate of 0.90 versus the DOE average of 1.28.
- SRS Construction forces continue a world record for hours worked without a Days Away, Restricted or Transferred (DART) injury. They are now in excess of 23,000,000 hours, exceeding 11 years in June.
- At the Voluntary Protection Program (VPP) Participants Association annual conference held in August 2009, SRS received the Star of Excellence. This is the 8th Star of Excellence award and the 7th consecutive year for this recognition at SRS. This is the highest VPP honor awarded by DOE.
- As the site integrator for Integrated Safety Management, SRNS worked with DOE-SR and other contractors and agencies on site to prepare an FY 2009 SRS Integrated Safety Management System and Quality Assurance Declaration by integrating seven individual declarations. The integrated site Declaration was sent to DOE Headquarters on October 30, 2009.
- SRR began operations on July 1, 2009, and has experienced no injuries requiring lost or restricted time. SRR continues a legacy of safe work within Liquid Waste Operations, an organization that has not recorded a lost time injury since March 2006 (over 11,000,000 safe hours).

## 2. American Recovery and Reinvestment Act (ARRA)

SRS recognizes that the successful execution of the ARRA Project requires a systematic approach to safety. Under ARRA, SRS has an opportunity to safely accelerate cleanup activities and to reduce the SRS footprint, risk, and future costs, while generating meaningful jobs for hundreds of workers. To properly and safely execute this work within the defined timeframe, the ARRA Project required a rapidly expanded workforce. This expanded workforce is comprised primarily of subcontracted/staff augmentation staff. To ensure that these new workers, as well as our current workers, are kept safe and that the safety basis of existing operations is not adversely impacted, SRS employs a rigorous Integrated Safety Management System. Implementation of this process ensures consistent understanding and execution of SRS safety and health policies, programs, and procedures by integrating safety and health activities into ARRA project planning, identifying and managing ARRA risk, communicating with customers and stakeholders to facilitate transparency and trust, and advocating appropriate ARRA implementation and emerging safety and health policies.

Although SRS has a well established Environmental, Safety, Health and Quality Assurance (ESHQA) program, this program has been expanded to support the increased work scope of the ARRA Project. A number of actions have been implemented to ensure the safety of ARRA workers.

Additional mandatory safety training was prepared and delivered to all ARRA staff. This training included an introduction to and re-enforcement of the SRS Safety Culture and a team oriented review of hazards recognition and prevention, as well as job-specific safety.

The oversight of field operations has been expanded for the ARRA Project. This has included increased management field presence and conduct of operations support, such as a mentor program for new hires, daily hot wash/end of week housekeeping, and Subcontract Technical Representatives oversight. Additionally, ARRA has enhanced the independent oversight of its operations by staffing a dedicated ARRA Facility Evaluation Board composed of technical experts who observe and assist in operational reviews and assessments.

An ARRA “timeout” was initiated August 28, 2009, for all field work activities. This timeout involved: multi-disciplinary reviews of all ARRA work packages, job-specific hazards identification and mitigation, and job-site walk downs.

Through the positive results of these actions, the ARRA Project has successfully accumulated 1,558,542 hours during FY 2009. Although safety performance remains a concern and high priority of management, our safety rates continue to improve due to these recent actions, and SRS rates remain consistently lower than the DOE national averages.

In FY 2009, ARRAI – including operations and all subcontractors – achieved a TRC rate of 0.86 and a DART rate of 0.51.

SRS has made substantial progress in meeting the objectives of the SRS ARRA project. The end point objectives of this project are to achieve a greater than 50% footprint reduction of EM site liabilities and reduce or eliminate the remaining transuranic (TRU) waste inventories, while creating jobs and spurring economic recovery in the Central Savannah River Area. More specifically, this work scope includes the deactivation and decommissioning of three Cold War reactors, the disposition of over 5000 cubic meters of TRU waste and over 15,000 drums of uranium oxides, demolition of 25 excess facilities, and the characterization and/or cleanup of over 100 waste sites across the SRS site. As of October 30, 2009, SRNS had saved or created 2155 jobs, expended in excess of \$280 M, and exceeded small business subcontracting goals while issuing over \$100 M in local subcontracting – all while making significant progress in the accomplishment of project work execution objectives. Work accomplishments to date include:

- On-boarding and training over 1357 workers in support of the ARRA project
- Completing the deactivation of R Reactor in preparation for decommissioning
- Making substantial progress on necessary rail improvements to support increased materials movements required to implement the ARRA project scope
- Palletizing over 1500 drums of depleted uranium oxides and loading over 35 rail cars in support of the shipment of these materials off the SRS site
- Initiating glove box operations with newly trained ARRA workers for the remediation of TRU waste-bearing drums for shipment to the Waste Isolation Pilot Plant (WIPP)

- Initiating drum removal from the earthen covered Pad 1 burial ground of TRU waste
- Completing over 15 shipments of TRU waste to WIPP.

### 3. Area Completion Project

The Area Completion Project (ACP) includes work scope for soils, groundwater, and surface water remediation and deactivation and decommissioning (D&D) of inactive, excess SRS facilities to support the SRS Area Completion Strategy. This work scope is conducted by contractor employees in the ACP. Currently, 360 of the 515 waste units have been completed under the oversight and approval of the South Carolina Department of Health and Environmental Control (SCDHEC) and the United States Environmental Protection Agency – Region 4 (EPA). Additionally, 248 of 973 facilities have been decommissioned.

In 2008, the ACP completed closure of the General Separations Area Consolidation Unit by constructing a 76-acre engineered cover over the Old Radioactive Waste Burial Ground, the highest risk waste unit in the ACP. Integrating soil and groundwater cleanup with D&D resulted in successful closure of the first industrial area (T) in 2007. As a follow-up to this successful closure, ACP currently is working to close four additional industrial areas: M, D, P and R Areas. ACP has worked closely with the EPA and SCDHEC, as well as the public and the SRS Citizens Advisory Board, to determine whether leaving the reactor facilities in P and R Areas in situ provides both short- and long-term protection of human health and the public. Additionally, ACP continued operating groundwater remediation systems, with 27 active, enhanced, and passive systems in place. One of the more successful groundwater remediation systems includes the Dynamic Underground Stripping System in M Area, which has removed approximately 425,000 pounds of solvents from the subsurface to date.

### 4. Solid Waste

In FY 2009, SRS maintained its accelerated Transuranic Waste Program, dispositioning 492 cubic meters of legacy TRU waste and successfully completing 115 shipments to WIPP, comprising 1,871 drums and 55 Standard Waste Boxes. The 1,000th shipment to WIPP was made on June 3, 2009. Over 30,000 drums have been disposed of since the beginning of the TRU Waste Program in 2001. SRS submitted the closure certification report for TRU Storage Pads 7-13 to SCDHEC and started the soil cover removal and culvert retrieval from the last covered pad (TRU Pad 1). Additionally, the first Remote Handled TRU waste shipment from SRS to WIPP was made. SRS worked closely with DOE Headquarters and WIPP to complete the certification of the Large Container Nondestructive Assay equipment (LCNDA) and Real Time Radiography equipment (RTR-4). As a result of LCNDA and RTR-4 availability for characterizing TRU box containers, the first shipment of direct loaded TRU waste in Standard Waste Box from SRS was shipped to WIPP in FY 2009. All legacy Plutonium-Uranium Extraction (PUREX) solvent mixed waste has been shipped to NTS for disposal, meeting the Site Treatment Plan goal 3 months early. Also, during FY 2009 SRS began preparing the remaining depleted uranium oxide drums for offsite disposal. With ARRA funding, the SRS Solid Waste Management has increased staffing and will accelerate disposition of various legacy wastes in the next two years.

### 5. Savannah River National Laboratory (SRNL)

As a DOE multi-program applied science laboratory, the mission of SRNL is to provide technology-based solutions for the nation's challenges of cleaning up the environmental legacy of the weapons program



and meeting our country's national and energy security objectives. To support these missions, SRNL provides applied technology through multidisciplinary programs of scientific research and applied engineering. Some of SRNL's most significant accomplishments during the last year include the following:

- SRNL retained its position as the safest national laboratory, based on DOE safety metrics.
- SRNL created a reversible route process to regenerate aluminum hydride, a high capacity hydrogen storage material. This will accelerate development of hydrogen storage materials and has applications in areas spanning energy technology and synthetic chemistry.
- SRNL completed destructive examination (DE) analyses on 19 plutonium-containing 3013 packages ahead of schedule, modified and expanded the HB Line flow sheet for dissolving 3013 DE materials, and designed and built a digital radiography system for the LANL 3013 program.
- SRNL demonstrated and delivered a robotic rad sampler and demonstrated an unmanned aerial vehicle system for the Department of Defense, Defense Threat Reduction Agency, to aid in homeland security efforts.
- SRNL completed longevity testing and post-test analyses for the Hybrid Sulfur Process that met a key milestone for the DOE-NE Nuclear Hydrogen Initiative.
- SRNL successfully completed a T-Area treatability study using vegetable oil deployment in the vadose zone and groundwater plume, leading to shutdown of an air stripper and annual cost savings of \$1 million.
- SRNL provided key technical support for the Defense Waste Processing Facility (DWPF), including critical path sample analyses, flow sheet development, frit development and acceptance testing, development and delivery of a tool to remotely remove a DWPF Nitrogen Sparger, non-destructive evaluation equipment measurements, and remote video examinations.
- Patents were issued on Surfactant Biocatalyst for Remediation of Recalcitrant Organics and Heavy Metals (BioTiger™), Microbial Based Chlorinated Ethene Destruction, Sol-gel/Metal Hydride Composite & Process, Modified Monosodium Titanates with Improved Sorption, Expanding Hollow Metal Rings, Biological Enhancement of Hydrocarbon Extraction, and Magnetic Coupling Device.
- SRNL continued to provide ongoing training and support for various homeland security and law enforcement agencies, including the Federal Bureau of Investigation (FBI), Customs and Border Patrol, and Immigration and Customs Enforcement. SRNL also provided Weapons of Mass Destruction (WMD) Commodity Identification training for Poland, Greece, Argentina, and Czechoslovakia.
- SRNL developed and delivered a high-level waste (HLW) tank wall sampler and a wall crawler for examinations for SRR to support waste removal and closure efforts.
- SRNL achieved substantial completion of the FBI Radiological Evidence Examination Facility, including replacement of the Air Handling Units, and west side and east side modifications.

Work was done safely, ahead of schedule, under budget, and with very high FBI customer satisfaction.

- SRNL provided key technical support for the Saltstone Performance Assessment, resulting in successful reviews by the DOE Low-Level Waste (LLW) Disposal Federal Review Group; developed a Saltstone vault camera to improve performance and reduce maintenance and personnel exposure; and provided Saltstone formulation development to assist in Saltstone Production Facility startup.

## 6. F Area Transuranic Waste Operations

In April 2009, SRS started working on bringing the TRU drum remediation facility in the Warm Crane area of 221-F Canyon back on line. This operation will be funded by the ARRA. Specific startup tasks conducted in FY 2009 included hiring workers, conducting necessary training courses, converting all temporary modifications in the facility implemented during the previous operation to permanent modifications, and completing necessary facility improvements. The TRU drum remediation operation is scheduled to start in the first quarter of FY 2010.

### a) F Area

F-Canyon, FB-Line, and 235-F remained in the shutdown and de-inventoried state. A portion of F-Canyon that provided TRU waste remediation capability from CY 2006 through CY 2008 was prepared to support resumption of remediation activities in early FY 2010. To further reduce F-Canyon surveillance and maintenance costs, deactivation of F-Canyon systems that were not required for TRU waste remediation began in FY 2009 and will continue in FY 2010. Additionally, banding and palletizing of depleted uranium oxide in preparation for shipments to Energy Solutions in Clive, Utah, resumed in FY 2009. Shipment of depleted uranium oxide drums will resume in FY 2010. Plans are also being developed to reduce risk at the 235-F facility, including reduction in the stack height for an abandoned stack adjacent to the 235-F facility and development of a Basis for Interim Operation to support removal of Pu-238 holdup. The F/H Lab remains in operation supporting customers across SRS. The laboratory received or renewed many certifications during the year and replaced/upgraded the high activity drain tank system.

### b) H Area Projects

In FY 2009, H-Canyon had the lowest Conduct of Operations event rate in the last 6 years. The rate shows a 15% improvement from FY 2007 to FY 2008, and reflects an additional 27% improvement from FY 2008 to FY 2009. Other key accomplishments included:

- H Canyon dissolved the remainder of the 324 containers of Y-12 Facilities' Super Kukla uranium metals four weeks ahead of schedule.
- H Canyon dissolved the remainder of the 30 containers of Livermore National Laboratory (LLNL) metals plus two additional containers.
- HB Line repackaged Y-12 Facilities' U-235/U-233 material into both metal and oxide containers and transferred to K Area for interim storage.

- H Canyon successfully completed charging 115 of 115 high enriched uranium-molybdenum (HEU-Mo) drums. This campaign was completed two weeks ahead of schedule.
- HB Line completed processing 30 kg of DE-3013 material approximately 2 months ahead of schedule.
- The modified Interagency Agreement for blend-down of additional highly enriched uranium (HEU) to low enriched uranium (LEU) and subsequent offsite shipment was approved by DOE and Tennessee Valley Authority (TVA). The scope of this modification includes 5.6 metric tons of HEU to be processed in H-Canyon through FY 2011. Eleven LEU trailers were shipped to TVA.
- Dry runs for unloading, unpackaging, and storage of the Hanford Low Assay Plutonium containers were successfully performed. Integration of personnel from three DOE sites (Hanford, Idaho, and SRS) was necessary to complete the cold runs.
- HB Line completed flushing Phase II and transferred neptunium flush from HB Line into H Canyon tank 8.8. H Canyon processed the material through the high-activity waste stream.
- HB Line shipped the final can of the Neptunium Oxide Part II campaign to K-Area. The shipment concluded activities for the HB Line Neptunium Part II processing mission.
- H Canyon and HB Line completed a facility acid outage.
- HB Line Engineering finalized the flow sheet and campaign documentation for disposition of off-spec neptunium oxide in Phase I.
- Integrated flow sheet development for blending 11.1/12.2, LLNL metals and HEU-Mo material in the Enriched Uranium Solution tank was completed.
- Initial strong acid flushing of the Neptunium process vessels downstream of the anion exchange columns was completed in HB-Line Phase II.
- A major facility outage was completed in Spring 2009.

c) Nuclear Materials Disposition Plans and Studies

- H Canyon submitted the H Canyon Documented Safety Analysis (DSA) 3009 upgrade.
- The HB Line Phase 2 Lay-Up Plan was developed.
- Five H Canyon Integrated Facility Aging Management assessments were completed:
  - Ventilation System
  - Facility Cranes
  - Nuclear Incident Monitor System
  - Railroad Tunnel & Airlock System
  - Buildings – General.

d) Infrastructure Upgrades completions

- H-12 outfall modifications were completed and the system was turned over to SRNS from the subcontractor. A comprehensive test program was executed and all issues were resolved. SCDHEC inspected the system and issued the Industrial Wastewater Treatment permit. A facility readiness review was completed and the system placed in service in June 2009.
- The replacement Penjerdel Chiller in HB Line was procured and installed.
- The Mock-Up on the H Canyon evaporator was performed.
- The 8x8 H Canyon cell tank was procured.

e) Waste Handling

- H Canyon was challenged to transfer less than 200K gallons of liquid waste to Tank 39 during FY 2009. Approximately 57K gallons of liquid waste were transferred to the Tank Farm.

7. Nuclear Materials Management

a) K-Area Complex

Keeping safety in the forefront, the K-Area Complex continues to effectively execute mission elements as SRS's only Category I facility. It has been more than 12 ½ years since the last lost workday case and over 9 years since the last personal contamination in the K-Area Complex. Key accomplishments for 2009 included:

- Declared the K Area Material Storage (KAMS) Neutron Multiplicity Counter (NMC) Fire Suppression System operable ahead of schedule and with a cost under run. This project satisfied an open commitment by the Secretary of Energy to Congress to address this DNFSB concern. This system is also part of an enhanced fire protection strategy, which was required to fully satisfy an action identified during a 2007 EM-62 audit.
- Safely completed receipts of over 1000 containers in FY 2009 to deinventory Hanford and LLNL of surplus EM, non-pit plutonium (Pu), including 3013/9975s and Fast Flux Test Fuel (FFTF). With these receipts, more than 96% of the Pu identified for complex-wide deinventory has been received at SRS.
- Received and provided lag storage of HEU materials. Receipts began in December 2007 and over 88% of the containers have been received to date, including final receipt of Y-12 Super Kukla and HEU-Mo material.
- Completed all 3013 Surveillance activities ahead of schedule to complete 45 non-destructive and 19 destructive examinations in FY 2009. Early initiation of the FY 2010 campaign began in September 2009, and program results continue to provide valuable supporting data on the long-term storage capabilities of 3013 containers.

- Supported studies to ensure safe disposition options, including the Combined Pit Disassembly & Conversion Facility/Pu Preparation Study and the 5MT Pu Disposition Study.
- Submitted the Purification Area Vault CD-0 in support of storage for future Pu receipts.
- Successfully consolidated an additional ~450 containers of Pu under International Atomic Energy Agency safeguards ahead of schedule. Execution included over 1600 error-free MC&A transactions.
- Successfully supported the annual Russian inspection for the Plutonium Production Reactor Agreement.
- Shipped the last container of neptunium oxide to Oak Ridge National Laboratory.
- Expanded storage capacity through the construction of the FFTF Vault Type Room (VTR) and the K Uranium storage VTR. Additionally, the K Area Material Storage capacity was increased to ~5300 positions in support of the deinventory of LLNL and Los Alamos National Laboratory (LANL) through additional safety basis analysis.

b) L-Area Complex

Spent nuclear fuel is received and stored on site in the L-Area Basin awaiting disposition. The L-Area Complex safely performed work with no lost workdays in 2009, extending their record to over 17 years without a lost workday case and approximately 6 years since the last personal contamination. Other risk reduction activities have included:

- Successful receipt and processing of 8 casks from foreign research reactors, containing 323 spent fuel assemblies, into the L-Area spent nuclear fuel inventory during FY 2009.
- Successful receipt and processing of 15 casks from domestic research reactors, containing 36 spent fuel assemblies, into the L Area spent nuclear fuel inventory during FY 2009.
- Received and processed 3 casks, containing 252 National Institute of Standards and Technology fuel assembly parts from the Department of Commerce, to initiate the FY 2010 domestic research reactor campaign.
- Successfully supported the annual Russian inspection for the Plutonium Production Reactor Agreement in P, L, and C-Areas.
- Initiated the L Area Rack Installation Project. This infrastructure improvement is designed to provide additional spent nuclear fuel storage capacity in L Basin.
- Initiated planning for the refurbishment of 70-ton casks, which will be used for future onsite transfers of spent nuclear fuel from L-Area to H-Area for disposition.
- Reviewed technical specifications of spent nuclear fuel from two Chilean reactors in preparation for future receipts of this Gap material.

- Supported Departmental planning for heavy water utilization and disposition. Conducted experimental venting and sampling of drum head space in an effort to determine if He-3 could be retrieved from heavy water and provided assistance in a trial program for detritiation of drums at a commercial facility.

## 8. Liquid Waste Operations

The liquid waste disposition program activities were performed by Washington Savannah River Company (WSRC) until June 30, 2009, after which SRR began operations in the liquid waste program. WSRC and subsequently SRR demonstrated significant progress in 2009 in safely treating and dispositioning high-level wastes and reducing risk.

### a) Saltstone

- Processed approximately 1.5 million gallons of salt waste from Tank 50 over the past 12 months.
- Successfully processed Low Isopar salt waste from the Modular Caustic Side Solvent Extraction (CSSX) Unit (MCU) under an Interim DSA for Low Organic Material.
- Two new disposal cells under construction, with site preparations in progress to begin constructing an additional four cells.

### b) Defense Waste Processing Facility (DWPF)

- Experienced benchmark performance in FY 2009.
- Produced 196 canisters of vitrified HLW glass.
- Poured glass at a maximum feed rate of 0.73 gallons per minute during the year with an average feed rate of 0.60 gallons per minute.
- Achieved its highest average monthly waste throughput of 54.2 lb/hr during the month of October 2008.
- Produced a fiscal year maximum of 23 canisters during December 2008.
- Transitioned to Sludge Batch 5 (high-aluminum sludge) in December 2008.
- Adjusted Sludge Batch 5 waste loading to protect a repository maximum concentration limit of 897 gms fissile per cubic meter.

### c) H-Tank Farm Operations

- A total of 3,120 kgal (a 33% increase over FY 2008) was recovered in FY 2009 through three evaporator systems, thereby allowing H-Canyon to meet its objectives, tank closure activities to remain on schedule, DWPF to maintain canister production, and sludge batch preparations to proceed as scheduled.

- Continuing to demonstrate the viability of the MCU/Actinide Removal Process (ARP) process in H-Tank Farm and DWPF since beginning radiological operations in April 2008. A total of ~764,000 gallons of salt solution have been processed to date. The process achieved monthly highs (~132,000 gallons) and weekly highs (~40,000) during FY 2009.
- Continuing process optimization with subsequent salt batches, based upon experience and lessons learned from salt batch processing. Increasing overall attainment as modifications and changes are incorporated. Implementing Performance Improvement Plan to reduce batch preparation and qualification cycle time.
- Continuing to share operating experience and lessons learned with the Salt Waste Processing Facility (SWPF).

d) F-Tank Farm

- F-Tank Farm closure made significant progress toward completion of Federal Facilities Agreement milestones for waste removal and tank closure.
- Removed 50,000 kg and 210,000 kg of sludge solids from Tanks 4 and 12, respectively, to support the next batch of feed (Sludge Batch #6) to DWPF. This completed the first of two Bulk Waste Removal (BWR) phases in each tank. Preparations to start Phase II BWR on each tank to support Sludge Batch #7 are in progress.
- Chemical cleaning was completed in Tanks 5 and 6 in December 2008. The residual volume of sludge solids was determined, and in-process samples were obtained and analyzed. It was then determined that additional solids removal is required. A path forward was developed and approved. A third mixer pump will be added to each tank to suspend and remove solids in previously unmixed areas of each tank. Design is in progress.
- Project work was initiated on Tank 13. The sludge in Tank 13 will become part of Sludge Batches #8-12. Preparations to remove obsolete equipment from tank risers were in progress prior to mixer pump installation.
- Mechanical cleaning of Tanks 18 and 19 was completed in March 2009. The residual volume of sludge solids was determined and in-process samples taken and analyzed. It was determined that further execution of waste removal activities was not practical. A "cessation of cleaning" case was presented to DOE, EPA, and SCDHEC. The three parties concurred with the case. This is a major milestone for SRS. Preparations are in progress to obtain final samples and to isolate the two tanks from the balance of the operational tank farm in preparation for closure.
- Development of the F Tank Farm Performance Assessment continued throughout the year. The document is in the final comment response phase.
- Development of the F Tank Farm General Closure Plan also continued throughout the year. This document is also in the final comment phase with DOE, EPA, and SCDHEC.

## 9. Salt Waste Processing Facility (SWPF)

The SWPF is managed by Parsons Infrastructure and Technology Group, Inc., under a separate contract with DOE. The project received Critical Decision 3 approval in January 2009, which authorized all construction for SWPF. Subsequently, the DNFSB issued a letter on February 10, 2009, which stated that "the overall safety strategy for SWPF appears sound and the Board has identified no significant safety issues that would preclude construction." During this year the SWPF completed the entire 8 foot thick basemat (which placed over 10,160 cubic yards), and the project began facility wall placements late in the year. In addition, fabrication of key equipment, including ASME large tanks and the CSSX Contactor skids, is well underway.

Parsons completed the Summary Structural Report (SSR), which documented the project's technical process using structural analysis models and dynamic analysis approach. The draft SSR was provided in January 2009, and SSR Revision 0 was issued in April 2009. The SSR concluded that the Finite Element Model and the Soils Structure Interaction calculations were adequate and therefore provide a confirmation of the adequacy of the final design. Feedback from the DNFSB staff stated that "the report was well written and clearly describes the design and analysis processes followed by the project. It is a good example of a Summary Structural Report." This issue is closed, but DOE and Parsons will incorporate resolution of any comments received in subsequent revisions to the SSR.

Reviews continued with the Board staff on safety basis, tank mixing, fire protection, commercial grade dedication, instrumentation and control, and control of flammable gases. The Board identified the contribution of thermolysis to flammable gas generation as a concern. DOE commissioned SRNL and Idaho National Laboratory to irradiate solvent to test for thermolysis. Testing and evaluation of the results were received, and the final reports documented that there was no measurable difference in hydrogen generation rates over the range tested. These reports closed this issue. In addition, SWPF met with the DNFSB staff periodically to discuss implementation of DOE-STD-1066. Several design changes resulted from that interaction. The project intends to document these actions in a revised Facility Hazards Analysis.

## **L. Savannah River Site Office**

The Savannah River Site Office (SRSO), in coordination with DOE-SR, oversees Tritium Programs-related NNSA activities at SRS. These activities include nuclear weapons stockpile stewardship and operation of the Tritium Facilities. NNSA activities at SRS are performed by the site contractor (SRNS), which also supports activities that are overseen by DOE-SR. In addition to the site-wide accomplishments, the activities and safety-related accomplishments in 2009 associated with the NNSA Tritium Programs are described below.

Extraction of tritium gas from Tritium Producing Burnable Absorber Rods (TPBARs) continued in the Tritium Extraction Facility (TEF); the extraction of the Cycle 8 TPBARs was completed one month early.

Resolution of two significant technical issues associated with TEF was obtained. The migration of zinc-65 in the process piping was mitigated by the installation of appropriate in-line filters; modifications to the TPBAR breaching tool to preclude metal fines from affecting its operation were successfully implemented.



SRNS Tritium Programs continued a series of coaching tours and operational pauses to enhance the Conduct of Operations posture of the Tritium Facilities. During the coaching tours, teams of senior Tritium Programs managers monitor plant operations and maintenance activities, discuss expectations with plant personnel, and provide mentoring support to the plant personnel. Operational pauses allow the Tritium Programs management team the opportunity to discuss facility, site-wide, and complex issues with operations, maintenance, and support personnel assigned to the facilities.

An outage was successfully completed in the H-Area New Manufacturing (HANM) Facility to replace three zeolite beds and the associated piping in the second of three glovebox atmosphere stripping systems. The task required the fabrication and installation of a large temporary radiological containment structure, the breaching of primary and secondary confinement systems, and the hoisting and rigging of replacement components, which weigh approximately 1000 pounds each.

A facility outage was successfully completed in May 2009 to replace the HANM liquid nitrogen storage tanks. The new tanks provide approximately 1-½ times the capacity of the old tanks.

The FY 2009 annual update to the Tritium Facilities' Documented Safety Analysis (DSA) was approved by SRSO on June 22, 2009.

The SRS Tritium Facilities continued supporting the Stockpile Stewardship Program by successfully completing function testing of several gas transfer systems in accordance with Design Agency direction, and providing the resulting data via formal reports to the Design Agencies for their analyses.

The Tritium Facilities continued providing excellent support of on-time delivery for gas transfer systems to the Department of Defense.

"Responsive Operations," a cost-effective workforce mobility practice, was successfully demonstrated. During the periods when extraction and processing of gas is not occurring in TEF, many of the TEF operators are assigned support functions in other Tritium Facilities. These operators have been trained and qualified in these additional support functions.

Safe performance of work was again demonstrated this year in the Tritium Facilities; the Total Recordable Case rate for Operations was 0.31, and for construction was 0.0. Additionally, there were no TSR violations associated with the Tritium Facilities this year.

The Office of Independent Oversight review of the Tritium Facilities was completed in August 2009. There were no findings associated with SRSO. In addition, several positive attributes were identified in key areas, including conduct of operations, configuration management, and maintenance.

## **M. Y-12 Site Office**

### **1. Project Management, Infrastructure and Construction**

In FY 2009, Project Management's primary focus was to upgrade existing facilities to prepare for ongoing or future missions, remove facilities that are no longer needed, and build new facilities for future missions, including security upgrades/additions. The Projects Division is managing \$3.3B – including American Recovery and Reinvestment Act (ARRA) – worth of line item projects; \$121M in GPP/GPE projects; and \$131.7M worth of expense projects. In FY 2009, forecast total project cost is

\$369M, which includes ARRA projects. The Projects Division is also managing 49 capital projects supporting programmatic need dates. Significant accomplishments include: Construction Direct Hire craft, staff, and escorts worked over 2.8 million hours without a lost-time injury. The last lost workday was April 13, 2004. A 245% reduction in the Total Recordable Injury and Illness Case Rate for CY 2008 over the CY 2007 levels was achieved.

Projects Division provided execution resources and expertise for ARRA projects. The projects to be funded include Alpha-5 Legacy Material Disposition, Beta-4 Legacy Material Disposition, West End Mercury Area Remediation, Environmental Management Salvage Yard Cleanup, Biology Complex Demolition, Building 9735 Demolition, and Building 9206 Filter House Demolition. Funding was received in May 2009. The June 1 submittal to EM was completed, and supporting materials were provided to EM's subcontractor. A June 12 submittal was also completed on schedule, and supporting materials were provided to EM's subcontractor. The integrated project review (IPR) was very favorable and complimentary of the Y-12 project plans and ability to execute the ARRA Program. ARRA milestones were completed on or ahead of schedule. Project work has commenced.

The Infrared Debonding (IRD) project completed installation and readiness on an accelerated schedule to support challenging production mission work in FY 2009, which is now underway. The IRD system vendor completed design and began fabrication in early FY 2009. The unit was factory acceptance tested on January 15, 2009, and received at Y-12 on January 26, 2009. Installation and Readiness were completed on an accelerated schedule to support challenging production mission work in FY 2009, which is now underway. The project was completed ahead of schedule and \$1M under budget.

The Beryllium Capability Project completed construction on the glovebox, and the final release-for-testing form was signed off by Construction. Punch-list items to support engineering testing were completed. Preparation of facility safety documentation continues. Construction, testing, and check-out activities will be complete by October 2009.

The project team completed Quality Evaluations (QE) glovebox installation activities on September 29, 2008. The Readiness Assessment was completed on December 22, 2008, to support First Use by February 20, 2009. The QE project team achieved both milestones ahead of schedule, and the project was completed approximately \$3.8M under budget. This project was a first of its kind for Y-12, as the site relocated critical process equipment between facilities with significant industrial hygiene issues without an exposure, contamination, or a lost workday case.

The Steam Plant Life Extension project is 87% complete overall. Construction activities continue on the boiler house site, oil storage facility, and utility tie-ins. All four boilers have been installed on their foundations. Foundations were poured for the oil storage facility and transformer pads, and the duct bank was installed. Management of both subcontractor and direct-hire forces will continue throughout the construction phase of the project.

The Potable Water System Upgrades project completed the east tower's pedestal and tank and began installation of the pump room. On the west tower, the pedestal and ground erection activities were completed.

The Nuclear Facility Risk Reduction project reduces the risk of failure of key infrastructure structures, systems, and components in existing Y-12 nuclear facilities by implementing practical utility modifications that will ensure continued safe operations of those facilities during construction of the

Uranium Processing Facility (UPF). The 9212 Nuclear Facility Risk Reduction project CD-1 package was reviewed by an IPR on July 23, 2009, which recommended approval of CD-1. Energy Systems Acquisition Advisory Board review of this project approved CD-1 on October 20, 2009.

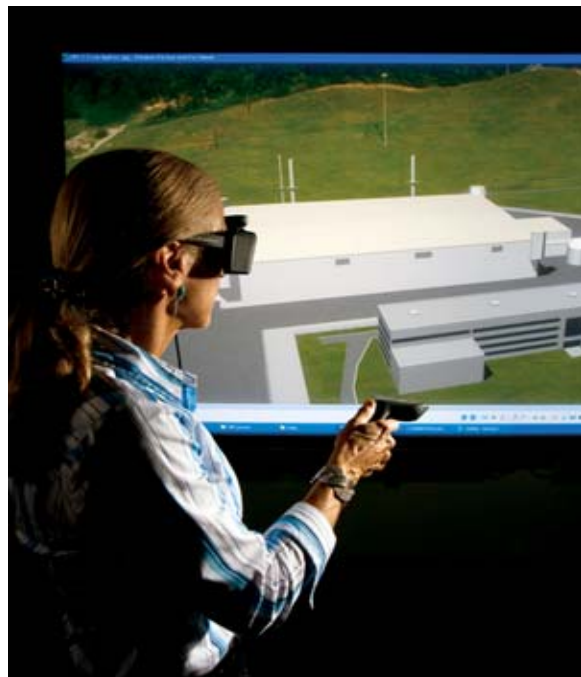
## 2. Transforming the Site

At the beginning of FY2009, the Uranium Processing Facility (UPF) project had completed approximately 14% of the total design and put into place full staffing for in-house and basic ordering agreement (BOA) subcontract resources to support design staffing requirements. At the end of September 2009, the project's design was almost 40% complete, and UPF staffing is approaching 400 full-time equivalents (FTEs). Engineering has approximately 300 FTEs, with 150 of those supplied under the BOAs. Staffing for FY 2010 will peak at over 600 FTEs.

In December 2008, a process optimization and reduction study and a facility layout/security strategy study indicated that several major changes to UPF's preliminary design would result in more cost-effective building and process layouts. By January 2009, a basic outline of the new layout was established, focusing on entry/exit philosophy, access to utility floor, life safety, and operational arrangements. The security posture was bolstered while improving spatial flexibility. The process area space was optimized, and overall facility footprint and building volume were reduced by 11% and 21%, respectively. Significant resources were reprioritized to support efforts to optimize the process design, reduce floor space, and determine cost savings. Although the final impact from these changes is still evolving, there have been several areas where cost savings or avoidances amounting to more than \$100M have been identified. These savings/avoidances include reduced civil commodities; simplified heating, ventilating, and air conditioning (HVAC) systems; and improved constructability. Further, the operational improvements will have a favorable impact on the life-cycle costs within the facility.

There were eight major projects reviews in the second half of FY 2009, and all supported the mission, size, and schedule for building UPF at Y-12. One of the most thorough reviews was conducted in June 2009 by TechSource Science and Engineering Consultants, which was chaired by Dr. Everet Becker, former NNSA Deputy Administrator. The review included a week-long visit to Y-12 with a formal briefing, documentation review, and tours of Building 9212 and other aging facilities. Extensive question and answer sessions were held over a 6-week period following the Y-12 briefing. The review concluded the footprint and size are reasonable for the current Program Requirements Document (PRD). The fragility of 9212 requires pressing forward with the planned final design and construction of the UPF as soon as possible.

The UPF project's design criteria were revised and issued in October 2008 to incorporate, in part, DNFSB comments. Revision 2 of the System Requirements Document (SRD) was issued in December 2008. This revision aligns the SRD with



**The new 3-D Design Visualization Center creates a virtual factory for walkthroughs and ensures that all the pieces fit together.**

the currently approved PRD. Revisions to the PRD are being reviewed by the Y-12 Site Office (YSO) and NNSA Headquarters and will require additional updates to the SRD.

A new 3-D Design Visualization Center at the project office building will help the project's team interactively evaluate and modify the new facility's design in real time. The new large-format, high-resolution, interactive digital visualization room includes a 14-ft wide by 6-ft tall screen that allows 3-D stereo and interactive viewing of computer-aided design (CAD) models of the facility and process equipment. The ability to see and manipulate CAD images in 3-D reduces the need to invest in physical prototypes, a true cost savings to the project.

The Title I structural design was initiated using the results of the preliminary seismic soil-structure interaction (SSI) analyses. Structural design and acceptance criteria and a seismic analysis and design plan were issued for use in the Title I and Title II structural design. Based on the January 2009 preliminary design changes, additional geotechnical exploration was performed, and final SSI analyses will be performed to provide input into the Title II structural design, which will begin in FY 2010. Several meetings were held with the B&W Y-12 independent peer review panel, the NNSA peer reviewer, and the DNFSB staff, and all comments and concerns are being resolved.

The preliminary safety basis documents for UPF continued to implement the criteria in DOE-STD-1189, Integration of Safety into Design. In September 2009, the UPF project shifted its Critical Decision strategy to focus on long-lead procurement items. This shift refocused the safety analysis effort in late FY 2009 and early FY 2010 from a full-facility Preliminary Safety Design Report to a tailored Preliminary Documented Safety Analysis (PDSA) in support of a CD-2/3 package submittal for these procurements. The tailored PDSA will address hazards analysis, accident analysis, and control selection for the 20 equipment items that have been identified as requiring long lead times for acquisition. This PDSA is being written and is based upon a long-lead Hazard Evaluation Study (HES) and a long-lead Accident Analysis. Upon conclusion of the long-lead PDSA preparation, the UPF safety analysis team will return focus to completing development of the HESs and accident analyses associated with all 14 UPF process areas.

### 3. Infrastructure Projects

The FY 2009 project goals for 9201-5 and 9204-4 Facility Deactivation are being achieved in a major step forward by removing the safety basis for these buildings. The safety basis for 9201-5 was revised and the facility placed into service as an alternative warehouse for some of the material that needed to be removed from 9204-4 and 9201-5. The removal of hazardous materials from the 9204-4 facility reduced the maximum anticipated quantity values to a level below Nuclear Hazard Category 3 in February 2009. Consequently, the safety basis documents for Beta 4 were removed from the Safety Basis List effective March 30, 2009.

Material removal from 9201-5, in support of reducing the facility hazard category to below level 3, was completed, and a letter transmitting the 10 CFR 830, Part B, exemption request for the Alpha 5 Complex and requesting cancellation of the Safety Basis documents was sent to YSO. This task, which included both 9201-5 and 9204-4, was started late in 2007 and is significant step forward in support of decommissioning the facilities. The project was challenged to accelerate the removal of items from 9201-5 and complete that task by September 2009. This required the removal of 2069 items. The project was funded from production efficiencies in several areas and from several different sources with diverse

objectives. This work supports the Integrated Facility Disposition Project and the Y-12 Transformation and Modernization initiatives.

#### 4. The High Enriched Uranium Material Facility (HEUMF) Project

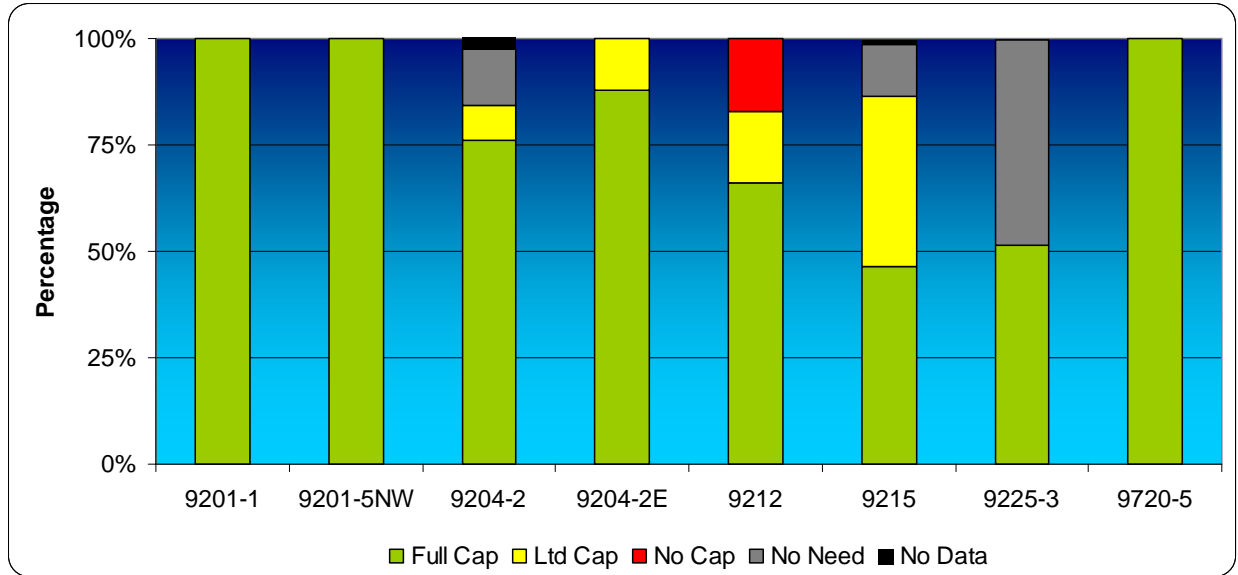
Significant milestones were achieved on the HEUMF project during FY 2009. Work continued on the HEUMF project, which was 94% complete at the end of FY 2009.

All system level testing was completed and all facility systems transferred to system owners. The final DSA/TSR and supporting documents were submitted to YSO for approval. Subsequent approval of the DSA/TSR was received via the Safety Evaluation Report. The project completed the Implementation Validation Review that assesses the implementation of the safety basis on the project. The Criticality Safety Evaluations (CSEs) were revised to be compliant with standard DOE-STD-3007. Good progress was made in closing construction punch list items, dispositioning non-conformance reports, and completing as-built design documentation. As part of the readiness effort, the project used Readiness Assist Team specialists to assess and identify issues prior to the more formal readiness reviews. The project also implemented the Readiness Certification Assurance process, which added more rigor and structure to the readiness effort. The project successfully completed the Contractor Operational Readiness Review in November 2009 and is on schedule to complete the NNSA readiness review and transition to operations by the end of March 2010.

Throughout the fiscal year, the project continued to proactively manage risks, Six Sigma initiatives, lessons learned (LLs), contractor assurance system (CAS) related activities, tours, and DNFSB questions. The risk-related activities are summarized in the Risk Analysis Report, which was revised to support the FY 2009 Annual Estimate. Six Sigma tools and processes were used to optimize and improve key processes. Six Sigma process improvement projects were formed, resulting in a significant reduction in schedule durations for preparation of the DSA/TSR and CSEs. The project continued to gather, evaluate, and document LLs from Y-12 and other DOE sites, and to document HEUMF project-related LLs in a comprehensive report. The project team continued to respond to DNFSB questions and concerns including those related to the safety systems Engineering Quality Requirements Documents.

#### 5. Operational Capability

Improvements in maintenance work control and coordination have led to improved equipment and facility availability. Production process and facility availability remains at a high level of 95% or better, and, as availability has improved, production down time has been substantially reduced. Despite operational issues in 9212 reduction operations, secondary extraction, and fluid-bed operations, overall availability has been high, as indicated below.



**Process and facility availability**

An electrical panel Preventive Maintenance (PM) Program was finalized for 130 panels. After a fire in an electrical panel in 2003, an extensive effort was put into developing a database of all the lighting panels at the site. In the 2004–2005 timeframe, 130 panels were intrusively inspected in the Production facilities. At the end of those inspections, an effort began to categorize and prepare a PM schedule in the SAP enterprise software system to track and perform a PM on those panels deemed necessary. This evolved into a standing PM for electrical panels on a 5-year schedule that extended to panels in the Production facilities beyond those that were intrusively inspected. As a result, 95% of the facilities have now completed the development of these PMs and been entered into SAP. Some production facilities have every electrical panel in the system, while others concentrated on only the panels on the troubled list from the 2005 initial inspection. All panels in the SAP program have thermal scanning, and most have the additional internal visual inspections. The 9212 complex led the way, entering a total of 278 electrical panels included in the 5-year PM and 24 panels from the troubled list in an annual PM.

In addition to the PM effort, replacement of electrical panels continued. Five more panels from the 9212 troubled list were replaced, and six panels in 9215 were replaced.

A particular effort was placed on the purchase of critical spares as a method to improve availability. For example, the current detectors for the Criticality Accident and Alarm System were first produced in 1981 and are no longer in production. As a result, there has been a continual loss of suppliers for parts for the detectors, especially the photomultiplier tubes. In FY 2009, 41 photomultiplier tubes were located and purchased as part of the critical spares strategy for the Facility Risk Reduction project. Approximately six to nine tubes are needed on an annual basis, so this provides a multi-year supply of parts. To improve responsiveness in repairing credited fire protection systems, approximately \$40K in critical spares for fire systems was purchased.

**6. Cleanup Expansion**

After the cleanup initiative in 9212 at the end of FY 2008, Production implemented a rotational schedule for similar cleanup efforts in the remaining production facilities throughout FY 2009. The magnitude of this investment exceeded expectations, as illustrated by the fact that nearly 771 tons of material were

removed in this fiscal year from the cleanup events at 9215, 9201-1, and 9204-2E. Added to the totals for 9212 completed in August, Production has removed 2.24 million pounds of waste and excess materials with no injuries.

The types of material removed included:

- Sealand containers full of contaminated materials
- B-25 boxes of low-level radioactive waste
- Classified paper and materials for burning
- Resource Conservation and Recovery Act (RCRA) chemicals
- Excess office equipment, computers, and safes
- Excess facility equipment, such as forklifts, floor scrubbers, and sweepers
- Excess production equipment no longer in service.

#### 7. Management of Workforce

Working in conjunction with the Atomic Trades and Labor Council and the Tennessee Department of Labor and Workforce Development, Facilities Infrastructure & Services re-instituted the Apprentice Program at Y-12. The program is designed to help bring valuable skills training for the building trades and other skill-related jobs in high-growth industries that face critical skilled-worker shortages where demand exceeds the supply.

To date, 48 apprentices have been granted a Q security clearance, and in the last 8 months, the apprentices have shown increasing productivity ratings versus on-the-job and classroom training. The productivity metrics for the business months from December 2008 to August 2009 show a large increase of productive time.

#### 8. Accomplishment of Work

The Enriched Uranium Operations (EUO) Maintenance crews completed a number of jobs for Wet Chemistry and Fluid Bed Operations, allowing total system availability for the first time in 20 years. This is a significant milestone for EUO and the Y-12 Complex. The EUO Maintenance crew helped to achieve a significant milestone for the Y-12 Complex in the cleanout of the 540 and 570 tanks. This is the first time in 15 years these tanks have been cleaned out and residual inventory reconciled.

#### 9. Program Focus

With the direction to support mission deliverables, Assembly and Quality Evaluation production was on or ahead of schedule, with respect to Dismantlement, Quality Evaluations, Disassemblies, Joint Test Assembly, deuterium-tritium, and ES-3100 container work. The W76 War Reserve production continued to meet delivery requirements while continuing the challenging work to support required design changes.

#### 10. Operational Performance Improvement

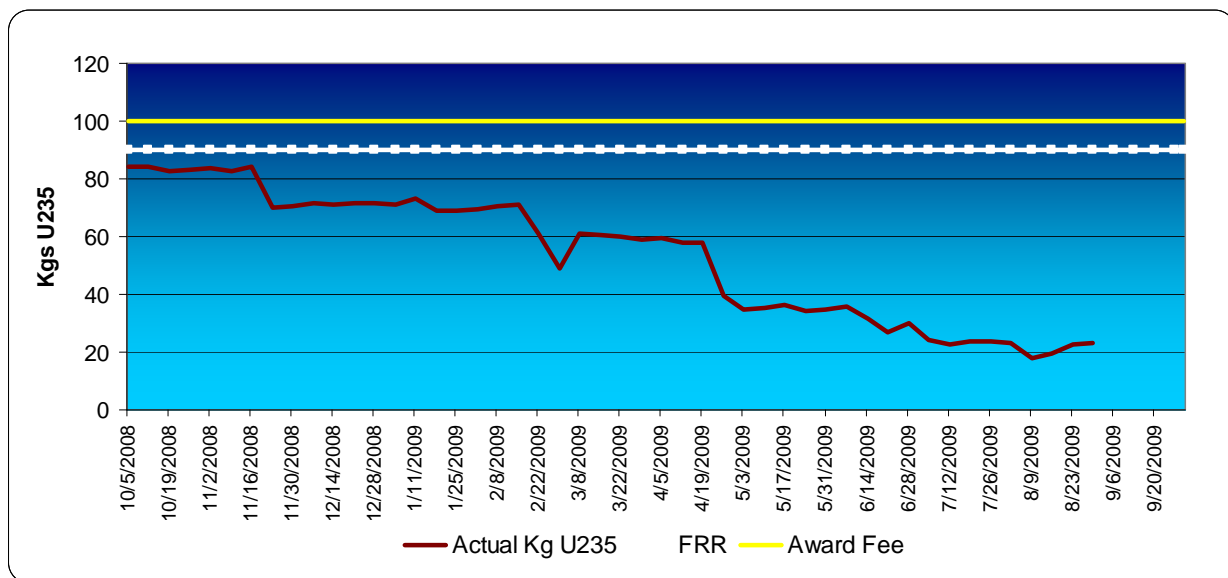
The DNFSB conducted a staff visit to Y-12 January 12-15. The five visitors and two site representatives observed several operations in the field. Approximately 24 man-days of observation were conducted

across all of the nuclear facilities in this short span of time. Overall, the comments from the staff were positive. This review provides a formal field validation of the success of conduct-of-operations improvements over the past year.

A new procedure review process was implemented to increase the evaluation rigor and improve the final product quality of procedures used in Production. The new review process streamlines procedures by removing extraneous, redundant, and non-value-added requirements. It includes all members affected by the procedure and draws in all peripheral documents associated with the process in the review. It also requires a physical walkdown of the process referenced in the procedure. Using this new comprehensive format, the division reviewed 359 procedures (against a goal of 299). Nineteen procedures were eliminated as duplicate process requirements were worked out of each review.

The Chemical Recovery Area is also making considerable progress. The focus for the year has been reducing the backlog of solution in safebottles that has accumulated over the last ~15 years. This progress has been steady and predictable and has contributed to a favorable position with the DNFSB. The amount of HEU on the floor has been reduced to just over 23 kg.

The safebottle graph below shows the amount of HEU contained in safebottles in the Enriched Uranium Production (EUP) storage areas. An analysis of the trend in this data shows a reduction of over 73% from the beginning of the fiscal year. This accelerated pace of reduction of material contained in safebottles continues well ahead of the material-at-risk goal for FY 2009. The reduction in the number of safebottles on the floor contributes to effective contractor assurance in three ways. First, the overall safety of the facility is improved by reducing the amount of hazardous material that would be directly exposed to release in an emergency event. Second, the probability of a liquid spill is significantly reduced, providing an increased margin of safety from a possible nuclear criticality event. Third, a large amount of additional space is created for increased flexibility in operations, as well as immediately available storage space for liquids as needed should an unanticipated event occur.



**HEU in safebottles.**

Continued progress in the chemical recovery area enabled the salvage function to continue. Most notable is the receipt of safebottles from the M-wing area. For years this area was almost completely



full, which impacted production activities from time to time. The progress this year reduced the number of safebottles stored in M-wing and enabled production in this area to continue in a more reliable manner.

Historically, the quantity of oxide generated in E-wing operations exceeded the ability of the salvage processing area to process the material. With a change in focus, the backlog of oxide from E-wing is being handled more efficiently, and the material is being processed on an as-generated basis. This improvement has had a positive impact on the nuclear materials control and accountability inventory posture.

#### 11. Readiness Assurance Program

B&W Y-12 held the ninth annual Readiness Workshop in July 2009, with record levels of attendance from DOE Headquarters, DNFSB, and most sites and contractors. The participants indicated in the evaluation forms that the workshop was well done and of value.

#### 12. Safety Basis Program

Beginning in November 2008, an expert-based unreviewed safety question determination (USQD) process was piloted in 9204-2E. Initial results indicated a potential reduction of about 50% in the number of USQDs. Following the data analysis phase, if results continue to be positive, Safety Analysis Engineering will seek appropriate approval to implement the process site-wide. An estimated savings of almost \$1.2M/year can be realized if these results are extended site-wide. The results were discussed with YSO, DNFSB, and the NNSA Chief of Defense Nuclear Safety (CDNS), with positive feedback. As a result of the data and feedback, a draft revision of the Y-12 unreviewed safety question (USQ) process procedure was developed to include an expert-based USQD as an option to the existing USQ process. The draft is in site-wide review. Following B&W approvals, the procedure will be submitted to YSO for approval. Per previous discussions with the CDNS, YSO expects to submit the procedure to the Central Technical Authority for a rule compliance opinion.

Independent reviews continue to be performed on safety basis documents in accordance with Y74-48-014. An annual schedule was developed to integrate the Independent Technical Reviews with the annual schedule for the update of DSAs/TSRs. This schedule will be coordinated with YSO to help level their review workload.

Following the removal of material from Beta-4, a categorization document was developed and approved by YSO downgrading the facility to less than nuclear category 3. It was originally planned to do the same for the Alpha-5/5E portion of the Alpha 5 complex, but a strategy was developed and approved by NNSA for an exemption from 10 CFR 830 Subpart B to downgrade the entire complex to less than category 3.

#### 13. Environment, Safety and Health

Radiological control (RADCON) efforts are generally the third-leading contributor to compliance activities and associated cost in the production facilities, and the Production Facilities Department (PFD) continued to work on reducing radiological areas throughout the facilities. In 9204-2, the removal of material and two radioactive material storage areas eliminated 3,632 square feet of contaminated space. In addition, PFD completed a Six Sigma Yellow Belt project in 9204-4 (which no longer has an active production mission) to reduce the number of surveys performed by RADCON personnel. As a

result, contamination surveys were reduced 26%, and radiation surveys were reduced by 92%, with an overall cost savings of over \$171K annually. Finally, Y-12 Waste Management concurred with the designation of Building 9225-3 as a Nonradioactive Material Management Area (NRMMA) effective December 18, 2008. This NRMMA status allows waste/recycle streams to be handled as nonradioactive waste. Beta 2 has reclassified the radiological areas of the Mold Loading Area as a NRMMA effective July 9, 2009.

A significant measure of compliance is maintaining exposure as low as reasonably achievable (ALARA). The final doses for CY 2008 indicate that no individual received an exposure greater than the Administrative Control Level of 1.0 rem. A small percentage of the monitored workforce (~4%) received exposures greater than the regulatory monitoring threshold of 100 millirem. This is indicative of thorough hazard analyses and the application of effective controls to maintain exposures ALARA. Since the majority of dose is associated with production activities involving HEU, applicable organizational doses are tracked and compared against their production to determine the effectiveness of exposure control. The weighted collective dose/production trend continues to be down.

Another major indicator of effective radiological control is the number of personnel contamination events. There were no reportable occurrence events, and there has not been such an event since August 2007. RADCON tracks the number of contamination events below the reporting threshold, and this decreased from 24 in FY 2008 to 14 in FY 2009 for the same reporting period.

The new electronic version of the Radiological Work Permit (RWP) writing application was placed into production. Benefits gained from this system over the old include:

- Centralization of approximately 18 RWP independent databases into 1 networked database
- Minimal generation of hard-copy records
- Allowance of Field Operations Management, Radiological Engineers, Work Group Supervisors, and RADCON Writers/Approvers access to review and approve RWPs electronically
- Development of searchable specified criteria such as training, dosimetry requirements, etc., which will facilitate audits.

RADCON is an integral part of all of the ARRA projects. In fact, in most cases RADCON serves as the “point-of-the-spear” based on the need to characterize the areas. The interaction continues throughout the project with waste characterization, shipping, and job coverage. To meet this need, RADCON has had to grow 30% in head count from 160 to 215. A huge ramp-up in the use of subcontractors, as well as the innovative use of a Reservoir Operation Study with B&W Clinch River, has placed, and will place, a tremendous strain on RADCON’s Training program, instrumentation requirements (\$650K new instruments in FY 2009, \$150K new instruments in FY 2010) and general management. By December 2009, RADCON will have deployed 7 exempt staff, 66 radiological control technicians, and 2 clerical staff in support of ARRA projects.

#### 14. Emergency Management

The Emergency Management Program Organization (EMPO) maintained a compliant, comprehensive Emergency Management Program. This included providing a comprehensive technical basis, maintaining

up-to-date plans and procedures, maintaining a trained and qualified Emergency Response Organization, and maintaining systems, components, and other infrastructure assets necessary to ensure effective response to the full range of operational emergencies.

EMPO completed the closure of all action items resulting from the DOE Headquarters Office of Independent Oversight inspection of the Emergency Management Program. The inspection was performed by the Office of Emergency Management Oversight (HS-63).

Key components of the success of the Y-12 Emergency Management Program are the Self-Assessment and Exercise programs. No significant deficiencies were identified in the Self-Assessment Program or in the six evaluated exercises conducted. All emergency responses to events and all simulated events during exercises demonstrated the required state of readiness for the Y-12 Emergency Management Program. All exercises were critiqued and evaluated, with no significant deficiencies identified.

One significant contributor to the success of the Y-12 Emergency Management Program is the Drill and Exercise Committee. Y-12's Drill and Exercise Coordinator conducts monthly meetings of this committee, which includes representatives from all onsite organizations. This committee ensures that exercise planning activities are conducted appropriately.

Y-12's expertise in emergency management is recognized within the Nuclear Weapons Complex. Y-12 EMPO staff performed an evaluation of the Savannah River Site annual exercise April 26-30, 2009. EMPO staff also participated in the DOE Emergency Management Issues (EMI) Special Interest Group (SIG) Conference held in San Francisco. Y-12 is represented on the EMI SIG Drill and Exercise Subcommittee, the Hazards Assessment Subcommittee, the Subcommittee on Consequence Assessment and Protective Actions, and the Training Working Group.

#### 15. Regulatory Compliance

A strong commitment to worker safety was reflected by health and safety case rates that were significantly below the Bureau of Labor Statistics national average (4.2) and the NNSA average (1.7) per 200,000 hours of work. The total recordable case rate through August 31, 2009, was 1.47.

An independent corporate assessment of the ISM system evaluating the execution of the ISM process with emphasis on line management, subject matter expert, and worker performance was performed. The assessment resulted in 4 findings, 7 observations, and 24 noteworthy practices.

The 2009 DOE Integrated Safety Management Conference was held on August 24–27, 2009, at the Knoxville Convention Center. A total of 963 attended from 28 states, the United Kingdom, and Canada. Of the 184 abstracts submitted for technical papers in 10 topical areas, 97 papers were presented during breakout sessions and 11 additional papers were presented through poster presentations. The theme of the conference was “Reaching New Heights” and focused on the implementation of ISM across the DOE Complex. Featured speakers included University of Tennessee Lady Vols Coach Pat Summitt and William Redmond, Deputy Chief of Safety for the United States Air Force.

#### 16. Industrial Hygiene (IH)

B&W Y-12 performance relative to personal breathing zone air sampling results for beryllium declined due to a number of elevated sampling results associated with the Building 9202 Foundry

decontamination project. However, it should be noted that elevated levels were anticipated and that in each instance of an elevated sample, personnel were equipped with the appropriate respiratory protection for the job. In FY 2009, no samples exceeded the DOE Action Level or Permissible Exposure Limit without the proper respiratory protection. This validates the effectiveness of the beryllium hazard recognition, evaluation, and control process in place.

B&W Y-12 implemented the new automated fluorescence analytical method for IH beryllium samples. This technology provides a major improvement in productivity over the previously used method. Throughput is more than doubled using the automated fluorescence method versus the previously used inductively coupled plasma method.

The IH department established a program to formally document monthly beryllium-associated area posting validations. Approximately 240 posted areas are walked-down each month to ensure they are posted in compliance with Y73-201, Chronic Beryllium Disease Prevention Program Manual.

#### 17. Environmental Management

Y-12 was awarded a Green flag and achieved Performer status in the Tennessee Pollution Prevention Partnership. Y-12 is the second government facility in Tennessee to achieve this award. The Y-12 Environmental Management System scored >99% during the Partnership review.

Environmental Compliance supported a number of endeavors that resulted in the following recognition for the Y-12 Complex:

- Y-12 was one of three sites in the NSE recognized by DOE for exemplary environmental sustainability practices and was honored with the agency's E-Star award. The award acknowledged the site's leadership in environmental sustainability practices and NNSA's commitment to promoting best practices throughout the Nuclear Security Enterprise (NSE). DOE cited Y-12 as an example of successful new energy projects designed to facilitate a more "green" agency.
- Y-12 was recognized for initiating pollution prevention programs that included elimination of freon for chip cleaning, development of a tackless residue cleaning cloth, and reuse of surplus materials. More than 275,600 kg of waste were eliminated, resulting in a cost avoidance of \$542K.

#### 18. Waste Management

The Y-12 Sustainability and Stewardship section is continuing efforts to disposition Unneeded Materials and Chemicals, with more than 5,000 items being dispositioned to date. Priorities included Stores Chemicals, Completion of 9720-16 Drum Yard, Legacy Boxes, and 9720-58 Yard Planning. Completion of these activities is scheduled in the most cost-efficient manner while minimizing waste, maximizing reuse of materials, improving safety and stormwater compliance, and reducing radiological exposure.

In support of the Site Treatment Plan (STP) milestones established with the Tennessee Department of Environment and Conservation, approximately 728 drums of RCRA residues were packaged and shipped for disposal at Energy Solutions in Utah. Also, 2 drums of STP-listed organic materials, accounting for 8 items, were shipped to Diversified Scientific Services, Inc. for incineration. These shipments account for

approximately 215 of the STP listed items. Through September 30, 2009, the cumulative total of items removed from the baseline inventory is approximately 1,715 of 2,139 items (80.1%). This exceeds the established milestone for shipment of a cumulative 65% of the baseline inventory by 9/30/09 and also exceeds the FY 2010 milestone for shipment of a cumulative 80% of the baseline inventory by 9/30/2010.

#### 19. Community Involvement

In direct funding, the company completed its five-year commitment to the Oak Ridge High School renovation project, with funding totaling \$1.1 million. In Knoxville, B&W Y-12 is furthering educational resources and fostering improvement in student academic performance in 14 inner-city schools. A five year pledge includes \$60,000 for Project GRAD Knoxville in 2008.

As part of the company's focus on business memberships, support continued for chambers of commerce in Anderson, Blount, Knox, and Roane counties, Oak Ridge, and Tennessee. Other memberships include the East Tennessee Economic Council, Oak Ridge Millennium Partnership, and the Tennessee Business Roundtable. To promote economic growth, the company has supported the Jobs Now! initiative since its inception in 2003.