National Security Technologies/ Livermore Operations

Report from the Department of Energy
Voluntary Protection Program
Onsite Review
December 1-5, 2008

U.S. Department of Energy
Office of Health, Safety and Security
Office of Health and Safety
Office of Worker Safety and Health Assistance
Washington, DC 20585

Foreword

The Department of Energy (DOE) recognizes that true excellence can be encouraged and guided but not standardized. For this reason, on January 26, 1994, the Department initiated the DOE Voluntary Protection Program (VPP) to encourage and recognize excellence in occupational safety and health protection. This program closely parallels the Occupational Safety and Health Administration (OSHA) VPP. Since its creation by OSHA in 1982 and DOE in 1994, VPP has demonstrated that cooperative action among Government, industry, and labor can achieve excellence in worker safety and health. The Office of Health, Safety and Security (HSS) assumed responsibility for DOE-VPP in October 2006. Assessments are now more performance based and are enhancing the viability of the program. Furthermore, HSS is expanding complex-wide contractor participation and coordinating DOE-VPP efforts with other Department functions and initiatives, such as Enforcement, Oversight, and the Integrated Safety Management System.

DOE-VPP outlines areas where DOE contractors and subcontractors can surpass mere compliance with DOE orders and OSHA standards. The program encourages a "stretch for excellence" through systematic approaches, which emphasize creative solutions through cooperative efforts by managers, associates, and DOE.

Requirements for DOE-VPP participation are based on comprehensive management systems with associates actively involved in assessing, preventing, and controlling the potential health and safety hazards at their sites. DOE-VPP is designed to apply to all contractors in the DOE complex and encompasses production facilities, research and development operations, and various subcontractors and support organizations.

DOE contractors are not required to apply for participation in DOE-VPP. In keeping with OSHA and DOE VPP philosophy, *participation is strictly voluntary*. Additionally, any participant may withdraw from the program at anytime. DOE-VPP consists of three programs with names and functions similar to those in OSHA's VPP: Star, Merit, and Demonstration. The Star program is the core of DOE-VPP. This program is aimed at truly outstanding protectors of employee safety and health. The Merit program is a steppingstone for contractors and subcontractors that have good safety and health programs, but need time and DOE guidance to achieve true Star status. The Demonstration program, expected to be used rarely, allows DOE to recognize achievements in unusual situations about which DOE needs to learn more before determining approval requirements for the Star program.

By approving an applicant for participation in DOE-VPP, DOE recognizes that the applicant exceeds the basic elements of ongoing, systematic protection of associates at the site. The symbols of this recognition provided by DOE are certificates of approval and the right to use flags showing the program in which the site is participating. The participant may also choose to use the DOE-VPP logo on letterhead or on award items for employee incentive programs. DOE will provide the opportunity for contractors to work cooperatively with the agency to resolve health and safety problems. Each approved site will have a designated DOE staff person to handle information and assistance requests from DOE contractors.

This report summarizes the results from the evaluation of National Security Technologies, LLC/Livermore Operations during the period of December 1-5, 2008, and provides the Chief Health, Safety and Security Officer with the necessary information to make the final decision regarding its application for participation in DOE-VPP as a Star site.

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ABBREVIATIONS AND ACRONYMS

AED	Automated External Defibrillator
AHJ	Authority Having Jurisdiction
BLS	Bureau of Labor Statistics
CCD	Core Company Directive
CD	Company Directive
CPR	Cardiopulmonary Resuscitation
CSP	Certified Safety Professional
DART	Days Away, Restricted or Transferred
DI	Desktop Instruction
DOE	U.S. Department of Energy
EAT	Emergency Action Team
ES&H	Environment, Safety, and Health
FEP	Facility Execution Plan
FR	Field Representative
HA	Hazard Analysis
HEDP	High Energy Density Physics
HHA	Health Hazard Assessment
HHE	Health and Hazard Evaluation
HHI	Health Hazard Inventory
HS&E	Health, Safety and Environmental
HSS	Office of Health, Safety and Security
IIPP	Injury and Illness Prevention Program
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
LLNL	Lawrence Livermore National Laboratory
LO	Livermore Operations
LOSC	Livermore Operations Safety Committee
MA	Management Assessment
MSDS	Material Safety Data Sheet
NAICS	North American Industry Classification System
NIF	National Ignition Facility
NNSA	National Nuclear Security Administration
NRTL	Nationally Recognized Testing Laboratory
NSTec	National Security Technologies, LLC
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
PEP	Project Execution Plan
PM	Preventive Maintenance
PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
SEP	Support Execution Plan
SWAT	Safety Walkaround Action Team
Team	Office of Health, Safety and Security Team
TRC	Total Recordable Case
VPP	Voluntary Protection Program

EXECUTIVE SUMMARY

National Security Technologies, LLC (NSTec) was formed in 2005 as a joint venture between Northrop Grumman Corporation (managing partner), AECOM, CH2M HILL, and Nuclear Fuel Services. Headquartered in Las Vegas, Nevada, NSTec manages operations at the Nevada Test Site (NTS) and has satellite operations across the country, which includes NSTec/Livermore Operations (LO). NSTec/LO operates a leased facility at Livermore, California. Comprising 35,000 square feet of laboratory and office space, the facility is an applied science and engineering operation engaged in engineering, testing, and field operations for Lawrence Livermore National Laboratory (LLNL), NTS, and other National Laboratories. The facility has 17 laboratories, which includes clean rooms. The workforce at NSTec/LO consists of 75 scientists, engineers, designers, electro-optic/mechanical technicians and administrative staff. NSTec/LO personnel provide design, fabrication, and implementation of sophisticated diagnostics systems, including ultra fast, electro-optic and recording systems for capturing fast transient signals. NSTec/LO also supports the National Ignition Facility (NIF) located at LLNL, operating NIF Target Area systems, as well as providing diagnostics, vacuum, and alignment services. In a Memorandum of Understanding with the U.S. Department of Energy (DOE)/ National Nuclear Security Administration (NNSA) Nevada Site Office, the DOE/NNSA Livermore Site Office provides oversight of, and direction to, NSTec/LO.

Efforts by NSTec/LO to pursue the DOE Voluntary Protection Program (VPP) began in April 2006, and its application was received by the DOE Office of Health, Safety and Security (HSS) in late June 2008. Approval for an applicant's participation in DOE-VPP requires an onsite review by the HSS DOE-VPP team (Team). The Team conducted its review during December 1-5, 2008, to determine whether NSTec/LO is performing at a level deserving DOE-VPP Star recognition. The purpose of this report is to document the results of the Team's review and provide the Chief Health, Safety and Security Officer with the necessary information to make the final decision regarding NSTec/LO participation in DOE-VPP.

Based upon discussions and interviews with more than 60 workers, supervisors, and managers, as well as extensive observation of work activities in the laboratories and at NIF, the Team determined that NSTec/LO has established a culture of safety excellence, is committed to continuous improvement, and has the safety and health programs in place, which are sufficiently mature and fully meet the tenets of DOE-VPP. Accordingly, the Team recommends that NSTec/LO be approved for entry into DOE-VPP at the Star Level.

The standard for Star status is not perfection, but rather, in addition to an excellent safety record, managers and workers are dedicated to and effectively pursuing continuous improvement and excellence in safety performance. Consistent with that goal, the Team identified a number of opportunities for improvement. These opportunities reflect those areas where NSTec/LO can further improve its performance (see table 1). While no formal action plan is required to address those opportunities, NSTec/LO is expected to consider and specifically address them in its annual status reports.

TABLE 1
OPPORTUNITIES FOR IMPROVEMENT

Opportunity for Improvement	**Page**
NSTec/LO should establish a formal mechanism for sharing examples of continuous improvement between sections of the organization with corporate and across the DOE complex.	**4**
NSTec/LO should validate the analysis, which determined that spot welding of alloys containing small percentages of chromium did not present a hexavalent chromium exposure hazard, and implement engineered controls if this validation determines that an exposure hazard exists.	**13**
NSTec/LO should review its policy for warning signs and postings, and consider requiring specific postings at the equipment/machinery regarding required procedures and safety equipment.	**16**

I. INTRODUCTION

The U.S. Department of Energy (DOE) Voluntary Protection Program (VPP) onsite review of National Security Technologies, LLC (NSTec)/Livermore Operations (LO) was conducted from December 1-5, 2008. This was the initial certification review conducted at NSTec/LO.

The NSTec/LO Facility is a leased facility, approximately 40 percent offices and 60 percent laboratories, located in Livermore, California. NSTec/LO is an applied science and engineering facility engaged in engineering, testing, and field operations for the Lawrence Livermore National Laboratory (LLNL), Nevada Test Site (NTS), and other National Laboratories. NSTec/LO provides design, fabrication, and implementation of sophisticated diagnostic systems, including ultra fast, electro-optic and recording systems for capturing fast transient signals. NSTec/LO provides synergistic support, supporting NTS field experiments while engaging in similar work at the laboratories. NSTec/LO also supports the National Ignition Facility (NIF) located at LLNL, operating NIF Target Area systems, and providing diagnostics, vacuum and alignment services.

The Electro-Optics Laboratories test, characterize, evaluate, and assemble electronic and electro-optic diagnostic systems that include electronic imaging cameras, optical x-ray streak cameras, and related equipment. The Phototube Process Laboratory main process area is used to produce phototubes and detectors. In addition to the main process area, the facility includes a research and development laboratory, a scanning electron microscope, a characterization laboratory, a cleaning room, and an image test room. Calibration Laboratories characterize, calibrate, and repair high-speed diagnostics for the High Energy Density Physics (HEDP) experiments. These facilities include an X-Ray Laboratory with Henke and Manson sources and multiwavelength Short Pulse and Long Pulse Laboratories.

NSTec/LO is organized into four major laboratory sections. These are the Advanced Sensor Development section, the Electro-optics Engineering section, the HEDP section, and the NIF Target Area Operations section. The Site and Administration, Production Engineering, and Facilities sections provide support across the facility and to NIF. The NSTec/LO workforce consists of 75 scientists, engineers, electro-optic/mechanical technicians, designers, and administrators. In a Memorandum of Understanding with the DOE/National Nuclear Security Administration (NNSA) Nevada Site Office, the DOE/NNSA Livermore Site Office provides oversight of, and direction to, NSTec/LO.

Certification in DOE-VPP requires an onsite review by the DOE Office of Health, Safety and Security (HSS) team (Team) to determine whether the contractor is performing at a level deserving DOE-VPP recognition. The Team evaluated NSTec/LO safety programs against the provisions of DOE-VPP. During the site visit, the Team observed work activities, attended management meetings, section work planning meetings and safety committee meetings, evaluated relevant safety documents and procedures, and conducted interviews to assess the strength and effectiveness of NSTec/LO health and safety programs.

The Team had contact with more than 60 employees, managers, and supervisors, either formally or during observation of laboratory activities. In addition to the hazards common in any facility, such as fire and ergonomic, the principal hazards that exist at NSTec/LO are prevalent in many laboratory environments and include hazardous chemicals and waste, high voltage, high energy x-ray, cryogenics, high temperature and pressure, lasers, magnetic field, stored energy and rotating machinery.

II. INJURY INCIDENCE/LOST WORKDAYS CASE RATE

Injury Incidence/Lost Workdays Case Rate (NSTec/LO)					
Calendar Year	Hours Worked	Total Recordable Cases	Total Recordable Case Incidence Rate	DART* Cases	DART* Case Rate
2005	159,750	0	0.0	0	0.0
2006	155,893	0	0.0	0	0.0
2007	161,538	1	1.2	1	1.2
3-Year Total	477,181	1	0.4	1	0.4
Bureau of Labor Statistics (BLS-2007) average for NAICS** Code # 5417			1.8		0.5
Injury Incidence/Lost Workdays Case Rate (NSTec/LO Subcontractors)					
Calendar Year	Hours Worked	Total Recordable Cases	Total Recordable Case Incidence Rate	DART* Cases	DART* Case Rate
2005	2242	0	0.0	0	0.0
2006	4174	0	0.0	0	0.0
2007	766	0	0.0	0	0.0
3-Year Total	7182	0	0.0	0	0.0
Bureau of Labor Statistics (BLS-2007) average for NAICS** Code # 5417			1.8		0.5

* Days Away, Restricted or Transferred

** North American Industry Classification System

Total Recordable Case Incidence Rate, including subcontractors: 0.4

Lost or Restricted Workday Case Incidence Rate, including subcontractor: 0.4

A review of the accident and injury statistics at NSTec/LO over the past 3 years revealed that the 3-year average rates are below the comparative industry average and meet the expectations of DOE-VPP.

III. MANAGEMENT LEADERSHIP

Management leadership is a key element of obtaining and sustaining an effective safety culture. The contractor must demonstrate senior-level management commitment to occupational safety and health in general, and to meeting the requirements of DOE-VPP. Management systems for comprehensive planning must address health and safety requirements and initiatives. As with any other management system, authority and responsibility for employee health and safety must be integrated with the management system of the organization and must involve employees at all levels of the organization. Elements of that management system must include clearly communicated policies and goals, clear definition and appropriate assignment of responsibility and authority, adequate resources, and accountability for both managers and workers. Finally, managers must be visible, accessible, and credible to employees.

The safety culture at NSTec/LO is exceptionally strong, driven by a personal awareness of safety as a value across the organization. It is NSTec/LO philosophy that all managers and employees are ultimately responsible for the health and safety of the work environment. This core value is institutionalized in the corporate NSTec policy statement "NSTec is committed to effective integration of Environment, Safety, and Health (ES&H) requirements into all facets of work planning and execution." Further, "It is NSTec's policy to prevent occupational injuries and unplanned exposures to chemical, radiological, or biological hazards." This policy is inculcated into the work ethic at NSTec/LO and serves as the foundation for a highly effective ES&H program. Managers have empowered workers to jointly own the safety program. The NSTec/LO Injury and Illness Prevention Program (IIPP) clarifies that safety and health is the responsibility of all employees at NSTec/LO, and that zero accidents and injuries is the goal. All managers are responsible for implementing and maintaining IIPP in their work areas and for answering employees' questions with regard to IIPP.

Managers lead by example and have committed to establishing an environment that promotes active involvement by every member of the workforce. Managers demand high standards of cleanliness and housekeeping. Efforts to improve what is a noticeably clean and well organized worksite were ongoing and evident to the Team. Managers have instilled a sense of pride in the job and the Team noted the obvious pride the workers take in their contribution to a critical mission in support of DOE/NNSA and the Department of Homeland Security. The workforce at NSTec/LO is experienced and mature. Managers have not let this fact substitute for process and procedures. As discussed in the following sections, a series of Desktop Instructions (DI), accompanying Job Hazards Analyses (JHA), Health and Hazard Evaluations (HHE), training requirements, etc., have been implemented to ensure that all work is performed in accordance with the Integrated Safety Management System (ISMS) and Quality Assurance requirements as outlined in NSTec Core Company Directive (CCD), CCD-QA05.001, *NSTec Integrated Work Control Process*.

Managers' support of safety initiatives, willingness to purchase better safety equipment, and allowing time for workers to participate in new initiatives is unequivocal. This was confirmed by everyone the Team interviewed. Each section manager at NSTec/LO holds regular safety meetings to maintain proactive involvement and commitment to project-related safety. Managers have taken positive steps to increase employee awareness of workplace hazards by sending e-mail notifications, posting management assessment results on the site intranet, and conducting internal open house forums. Improvements suggested by employees are put in place without bureaucratic red tape or barriers. When improvements are incorporated, managers not

only encourage but expect their employees to pursue further improvements. Examples of employee driven improvements are included in the Employee Involvement and Hazard Prevention and Control sections of this report. While these examples of continuous improvement are noteworthy, NSTec/LO has not yet shared the success stories between the sections in the organization with corporate or across the DOE complex.

Opportunity for Improvement: NSTec/LO should establish a formal mechanism for sharing examples of continuous improvement between sections of the organization with corporate, and across the DOE complex.

NSTec/LO is led by the Operations Manager, who reports to NSTec corporate at Las Vegas, Nevada. NSTec/LO has funded one full-time ES&H representative. A Certified Safety Professional (CSP), the ES&H representative provides daily health and safety support services at the site and is responsible for providing guidance on ES&H matters to the various managers, employees, and contractors at NSTec/LO. He reports directly to the Operations Manager at NSTec/LO and also has reporting responsibilities to the ES&H Field Operations Manager at NSTec corporate office. This position acts as a liaison between NSTec corporate ES&H and local ES&H needs. The site has ready access to additional certified professionals for support of operations as needed at the corporate level. These include CSPs, Certified Industrial Hygienists, and a Certified Health Physicist. The ES&H representative is also responsible for leading ES&H-related training, approving purchase requests related to safety and environmental, Emergency Response Team training, and assisting managers and employees in generating hazard analyses, mitigation plans, and safety meeting reports. He also supports accident investigations.

The Team had the opportunity to attend several section meetings, as well as the Operations Manager's managers meeting. In each case, the respective manager led the meeting in such a way that all attending employees were active participants in discussions and decisions. Especially noteworthy was the manner in which managers engaged their employees in meaningful review of recent safety incidents that had occurred elsewhere in the DOE complex. These manager-led reviews included root cause analysis of the incident and identification of ways to preclude similar occurrences at NSTec/LO.

NSTec/LO spends approximately 3.1 percent of its operating budget on health and safety resources. To support ongoing ES&H training, NSTec/LO budgets approximately $350,000 to sustain the first aid, cardiopulmonary resuscitation (CPR), Electrical Safety, Laser Safety, Driver Safety, General Employee Training, and other safety and health training. In addition, programmatic funding is used to address project-related ES&H issues. Corporate resources are available to the local (ES&H) representative on a short turnaround basis.

The five section managers at NSTec/LO each develop a Support Execution Plan (SEP) for their respective sections. The guiding document for developing, revising, approving, and maintaining a SEP is Company Directive (CD), CD-2000.002, *Support Execution Plans*. The SEP defines the scope of support activities and serves as the implementing tool for continuing these activities established under baseline conditions to support projects, facilities, and other work scope activities. The primary purpose of SEP is to serve as a planning tool to define how the section manager performs work scope activities and to address integration of quality assurance and risk management into work execution. Within the SEP CD is the direction to complete a Hazard Analysis (HA) per CD-0400.004, *Hazard Analysis for Project and Support Execution*. This

directive establishes the hazard analysis process, which identifies safety, health, and environment hazards and their associated work controls at the planning stage. The hazard analysis identifies mitigation and controls to be implemented when work is executed. Another level of management planning is found in the Project Execution Plans (PEP). Like SEP, PEP describes the work to be performed, the location, and resources for performing the tasks within the project. PEP also develops an associated HA for the work to be performed. To support the management planning for facility-related needs, the NSTec/LO Facility Manager generates a Facility Execution Plan (FEP). FEP details the upgrades, floor spacing, power, life safety systems, heating, ventilation, and air conditioning (HVAC), and other utilities needed to operate NSTec/LO. Guidelines for creating FEP are captured in CD-2000.001, *Facility Execution Plan*.

The HA is used as a tool to develop future Management Assessments (MA), which are conducted throughout the year by Section Managers following CD-3200.010, *Management Assessment*. Completed MAs provide managers with a measurement of compliance with requirements governing their functions, identification of opportunities for improvement that can have a positive impact on their organizations, and the environment of continuous improvement to maintain a safe and effective workplace. After completing an MA, noncompliant issues are entered into the NSTec Issue Tracking System/CAWeb for tracking and resolution. The company-wide issue tracking system tracks issues that may have an adverse effect on the environment, safety, health, operations, or quality. Issues are identified from a number of sources, including nonconformance reports, independent assessments (external and internal), management self-assessments, workplace activities (formal workplace inspections, walkthroughs, etc.), surveillances, identified conditions, deficiency reports, and lessons learned requiring a response. All issues are documented, entered into the company-wide issue tracking system, and processed according to CD-3200.017, *Issue Tracking*.

Annually, the NSTec Corporate ES&H staff reviews NSTec/LO site for health risks. This health and hazard evaluation (HHE) and assessment reviews the NSTec/LO Hazard Communication Program, Laser Safety Program, Toxic Metals, and Hazardous Materials Control. HHE is documented in a report to the Operations Manager using NSTec Form 1692. Other program evaluations are conducted as required. For example, in advance of NSTec/LO submitting its application for entry into DOE-VPP, a review of NSTec/LO program by an independent resource that had achieved DOE-VPP Star status was conducted.

The NSTec/LO annual performance review process, defined within the NSTec Human Resources Manual, holds all managers and employees accountable for safety and health. The annual review guidelines form is used to account for the employee's past performance with regards to safety and health. In addition, it requires the manager and employee to jointly set individual employee safety goals for the next 12 months. The individual's safety performance is reviewed and graded. The individual's performance is weighted and used as a factor in determining the employee's merit increase.

Although the Team review concluded that the process had not been used to date, NSTec/LO has a comprehensive, progressive disciplinary policy that includes provisions for formal verbal counseling, written warnings, suspension, and termination as appropriate. Disciplinary actions may be used with employees who fail to meet established performance standards, engage in misconduct, or violate company policies or procedures. NSTec corporate disciplinary process guidelines are posted on the NSTec/LO Human Resources homepage.

NSTec/LO participates in a positive reinforcement system through the Great Catch Program. This program allows anyone at the company to give positive reinforcement to another employee when they observed a positive safety behavior. The Great Catch Program is highlighted through a Web site link on the NSTec/LO homepage. During the annual performance appraisal of the employee, the manager is able to provide both positive and negative reinforcement to the employee. The employee's appraisal would depend upon ES&H accomplishments throughout the year.

New employees are provided with a site orientation and an explanation of the various hazards at NSTec/LO during their initial new hire training. Visitors to NSTec/LO must register at the main entrance security checkpoint and are provided a site orientation, as outlined in NSTec/LO Visitor Orientation Guide, at the security checkpoint or by their escort. The orientation consists of familiarization with NSTec/LO Zero Incident Goal, Stop Work Authorization, and Emergency Procedures. The visitor's point of contact is responsible for informing their guest of emergency management protocol. NSTec/LO emergency response procedures are defined in ERP-1003, which provides guidance for either evacuation or shelter in-place depending on the type of emergency. To aid in site orientation, NSTec/LO has multiple evacuation posters located throughout the facility. Either an audible fire alarm or an intercom system will be activated during an emergency evacuation.

NSTec/LO subcontractors are required to work in a safe manner while performing their duties. NSTec/LO selection process of a subcontractor begins with the responsible NSTec/LO individual defining a scope of work for the project. Depending on the type of work conducted and the scope of the work to be performed, a bid package is generated, which includes a definition of the ES&H clauses to be contractually applied to the subcontractor. During the bidding process, the subcontractor is required to complete and submit a Form H-1, *Safety and Health History,* which details the bidder's past safety performance and includes past years' Occupational Safety and Health Administration (OSHA) Logs, as well as inspection procedures. The bidder may also be required to submit a safety manual, lockout/tagout program, and/or fall protection program depending on the scope of the work. These submittals by the bidders are reviewed by the NSTec/LO ES&H representative to determine if the bidder is qualified to perform work at NSTec/LO. Once the contract is awarded, the scope of work is used to create a work package for the project. The NSTec/LO work package process is defined in CD-4000.002, *Work Package*. Subcontractors working at NSTec/LO are assigned a responsible individual who ensures that the subcontractors comply with NSTec/LO ES&H and security rules. The NSTec/LO responsible individual instructs the subcontractor on NSTec/LO emergency response procedures using NSTec/LO Visitor Orientation Guide and reviews the work package and potential hazards with the subcontractor.

The work package is the NSTec/LO controlling document that allows subcontractors to perform contract work. The work package consists of Work Package Cover Sheet, a Pre-Task Hazard Review, relevant JHAs, a Pre-Job Briefing and a Post-Job Debriefing. Within ES&H clauses provided in the contract is the requirement for contractors to complete the *Subcontractor Safety & Personnel Report*. Information collected on this form includes hours worked, mileage driven, injuries, vehicle incidents, first aid cases, and near-misses.

Conclusion

NSTec/LO is characterized by a culture of safety excellence led by managers who are totally committed to providing their employees the safest possible environment in which to work. The strong safety culture that exists at NSTec/LO preceded the company's decision to pursue VPP. VPP is well understood by managers and employees not as another set of requirements, but as recognition for an existing culture of excellence which demands continuous improvement. NSTec/LO fully meets the requirements of the Management Leadership tenet.

IV. EMPLOYEE INVOLVEMENT

Employees at all levels must continue to be involved in the structure and operation of the safety and health program and in decisions that affect employee health and safety. Employee participation is in addition to the individual right to notify appropriate managers of hazardous conditions and practices. Field observations and interviews indicate that NSTec/LO workers are committed to their personal safety, as well as the safety of their coworkers and facility visitors.

NSTec/LO offers its employees several means of actively participating in its safety and health program. One such avenue is through the participation in monthly safety meetings. Sections conduct monthly safety meetings that discuss issues related to safety and health, such as safety items found during the monthly Safety Walkaround Action Team (SWAT) inspections (see Work Site Analysis) and safety events at other DOE sites. To encourage employee involvement with safety meetings, managers rotate the responsibility of developing and presenting the monthly safety topic among all of their employees. The employee presents a safety topic at the monthly meeting that he or she feels is pertinent. Several employees provided examples of topics that they either presented or were given by fellow coworkers. These topics may draw upon the individual's personal experience, or the NSTec Corporate safety topic that is posted monthly on the NSTec/LO EH&S Website. Most employees believed this has been an excellent opportunity for them to share information that not only may be pertinent to the workplace, but also, in many cases, information they can use at home and share with family members, neighbors, and friends.

Work packages are a key tool at NSTec/LO to ensure that employees understand the hazards of their work. This process requires employee involvement through the reading and comprehension of the hazards of the work that they perform. Depending on the level of hazard associated with the work package, each section's work package is required to be reviewed at least annually. During this review, the hazards are identified and addressed. As part of NSTec/LO work package process, employees participate in an annual review during the pre-job briefing prior to starting work. This process is defined in the Pre-Job Briefing and Post-Job Debriefing. At the end of the job or the close of the work package, employees participate in a post-job debriefing to determine how to improve on the tasks performed or any valuable lessons learned. Managers have the option to document the pre-job and post-job debriefings using one of the following three forms: FRM-0062, *In-House Training;* FRM 0185, *Pre-Task Hazard Review;* and FRM-1063, *Pre-Job Briefing and Post Job De-Briefing*. Interviews confirmed that employees do, in fact, participate in this process and have had the opportunity to affect changes as a result.

Another program that allows employee involvement is the Emergency Action Team (EAT). There are 16 employees that volunteer to participate on the NSTec/LO EAT. The EAT participates in biannual drills, one shelter-in-place and one fire evacuation drill, and live fire extinguisher training classes. Yellow triangle shaped signs are strategically placed on the outside of each EAT member's office or cubicle identifying them as an EAT member.

To empower employee involvement, each employee is authorized to stop any work that they believe to be an unsafe act. NSTec CCD-3200.006, *Stop Work,* applies to work performed by the employee, work performed by other employees, and work performed by subcontractors. In all interviews, employees indicated that they not only had the right, but also the responsibility to stop work if they felt a potential hazard or unsafe condition was present. Moreover, none felt that they would be subject to retribution or punished if work was stopped. NSTec/LO has also

developed an informal process called "Time-Out." A Time-Out allows employees to step back, take a fresh look at the situation, and resolve the concern. Employees are given several badge-sized cards that are attached to their badge holders that serve as reminders of pertinent safety information. On one two-sided card Time-Out is explained and when it can be used. The reverse side of the same card explains “Stop Work” rights and responsibilities.

Employees can become involved through participation in the new NSTec Corporate Safety Suggestion Program. Employees may submit their suggestion through a local suggestion box, submitting a suggestion electronically through the ES&H Web page, or by calling the safety suggestion coordinator. Any safety suggestion receives a voucher towards the corporate store where employees can purchase items, such as NSTec and NTS T-shirts, hats, and mugs. Furthermore, suggestions are reviewed and monthly, quarterly, and annually a monetary award is given to outstanding suggestions. Throughout the course of the review, the Team observed several examples of employee suggestions and engineered safety solutions that helped improve safety in many laboratory spaces. Several solutions were key contributions to reducing chemical usage, high voltage exposures, and unauthorized access. NSTec/LO employees repeatedly provided examples of solutions that were developed solely by them and specific to their work. In many cases, where a purchase was made to improve safety, employees continued to look for better tools and solutions. Examples included employee-made poly vinyl chloride (PVC) high voltage shielding on equipment that prevented workers from potential electrical shock, modifications to a laser cabinet that allowed the operator to access equipment with minimal stress to the body by avoiding awkward posture/position, and installing overhead equipment racks on workbenches with electrical outlets to prevent tripping hazards caused by electrical cords laying across the floor. More examples are provided in the Hazard Prevention and Control section of this report.

Two safety and health committees are used by NSTec/LO. The first is the corporate employee safety committee, WECARE. The WECARE safety committee was chartered in February 1999. An employee who wishes to be an employee representative can submit a nomination form to participate in the committee and the committee votes and approves the nomination. To ensure that NSTec/LO keeps abreast of corporate safety initiatives and to share local initiatives with corporate, a local NSTec/LO employee representative has a seat on the WECARE committee. The WECARE committee sponsors various safety awareness activities, such as the safety calendar, Children's Holiday Event, and the Online Quiz. The employer representatives are selected by senior managers to support the committee and its members. The WECARE committee meets monthly and the majority of the members must be available to vote on issues or the issues will be tabled for vote/discussion at a later date. The committee’s secretary is responsible for taking and distributing meeting minutes to all members. The quorum rules for the WECARE committee require that more than 50 percent of members be present in order to vote on any issue.

The WECARE committee maintains a Web site, which promotes safety at home and at work by the following activities:

- Restroom Rhetoric;
- Caption Contest;
- Safety Calendar;
- Video Tape Library of Safety Topics;
- Online quizzes, which have included:
    - Electrical Safety;
    - Extreme Driving Quiz;
    - Indoor Air Quality;
    - Workplace Eye Safety;
    - Holiday Safety;
    - Cooking Turkey Safely;
    - Lightning Safety;
    - General Safety - How Safe Are YOU?;
    - Close Calls Are Wake-Up Calls;
    - Road Trip Safety;
    - Bees, Ticks, and Snakes;
    - Summer Skin Care, Fire Safety, etc., and
- Safety Posters for Display at all locations, including NSTec/LO.

In addition, the committee receives safety information from the corporate environment, safety, health, and quality advisor, which is included in a weekly "Safety Stuff" Newsletter that is sent to all committee members.

To complement the WECARE committee, NSTec/LO founded a site-specific safety committee. The Livermore Operations Safety Committee (LOSC) had its inaugural meeting in November 2007. All NSTec/LO sections have at least one representative on the LOSC. The goal of the committee is to eliminate workplace injuries and illnesses by proactively involving all employees in identifying hazards, suggesting how to control the hazards, and sharing the results with the various sections. During this review, all members had been on the LOSC for more than 5 months, with the Chairperson being on the NSTec WECARE committee for 7 years. Members are volunteered through their section managers.

The LOSC committee meets at least monthly. Discussions and decisions for each meeting are documented through meeting minutes. During the meeting, employees discuss relevant safety issues that were identified during their respective section's safety inspection. The purpose of this discussion is to foster a cross communication between the various sections to increase the awareness of safety issues that are occurring throughout NSTec/LO.

Conclusion

Keeping employees fully engaged in the safety program is a top priority at NSTec/LO. Employees and managers demonstrate a mutual respect for each other indicating effective communications. Issues, concerns, suggestions, and recommendations are given the appropriate level of attention, and problems are resolved in a timely manner. Managers have empowered employees to proactively administer the safety and health program at this site. NSTec/LO meets all DOE-VPP criteria for the Employee Involvement tenet.

V. WORKSITE ANALYSIS

Management of health and safety programs must begin with a thorough understanding of all hazards that might be encountered during the course of work, and the ability to recognize and correct new hazards. There must be a systematic approach to identifying and analyzing all hazards encountered during the course of work, and the results of the analysis must be used in subsequent work planning efforts. Effective safety programs also integrate feedback from workers regarding additional hazards that are encountered and include a system to ensure that new or newly recognized hazards are properly addressed. Successful worksite analysis also involves implementing preventive and/or mitigative measures during work planning to anticipate and minimize the impact of such hazards.

Baseline health and safety surveys and analyses are required to be conducted by qualified medical personnel, industrial hygienists, and safety specialists to identify hazards, determine risks, and ensure awareness and control of those risks. Baseline surveys have been performed and are well documented for the hazards at NSTec/LO. Comprehensive analysis starts with completion of a Health Hazard Inventory (HHI). The HHI contains an itemization of potential health hazards in the workplace, an inventory of chemical, physical, and biological stressors, the number of employees involved, engineered and administrative controls in place, and required personal protective equipment (PPE). The Health Hazard Assessment (HHA) details the qualitative analysis of the hazards. The HHA is conducted by corporate ES&H personnel. The HHA includes an exposure assessment of the stressors identified in the HHI, the specifics of exposure monitoring, and a synopsis of risk ranking and assessment. The HHE documents the final report of the analysis and includes a list of deficiencies, recommendations, and corrective actions. The Team reviewed these baseline documents for assessments conducted in 2007 and 2008, and determined that overall the process is highly effective at capturing all of the details with respect to baseline hazard exposure analysis. There was one opportunity for improvement, however, that is discussed later in this section.

NSTec/LO performs analysis of all planned, new, or newly acquired equipment, materials, and processes before use to identify hazards, assess risks, and plan for prevention and control. The hazard analysis that is performed within the NSTec/LO process is comprehensive and detailed with input from affected workers, users, managers, and the customer. The facility has adopted a multitiered approach to identifying and controlling hazards in the workplace. This approach starts with divisional work packages that encompass several laboratories. These work packages generically define scope, identify hazards, and document controls over a broad range of activities. For higher hazard laser laboratories, individual work packages for specific activities have been documented. Within each laboratory, specific work activities are controlled by procedures that are developed along with the associated JHAs. Each section has approximately 40 of these activity specific procedures referred to as DIs. The Team conducted a detailed review of the DIs for each of the three laboratory sections, as well as three work packages: a general work package for the HEDP laboratories, HEDP Work Package, *Livermore Operations*, AA25-HEDP-2008; a specific work package for the High Energy X-ray Laboratory; and a specific work package for the Gated Imager Laboratory. Additionally, the Team reviewed work packages for the other two laboratory sections, but in less detail. Overall the Team determined that the work control documents at NSTec/LO are comprehensive with good documentation of the respective hazards analyses and controls.

Additionally, NSTec/LO has a comprehensive program for the acceptance and testing of electrical equipment at the site. This is especially important due to both the volume and highly specialized nature of the work that is performed in the laboratories. Nationally Recognized Testing Laboratory (NRTL)-listed equipment is purchased and used as much as possible. However, as much as 30 percent of equipment is site-specific or fabricated to meet a special purpose or need, and not NRTL-listed. NSTec-LO has a very rigorous and robust process to analyze and assure electrical safeness before this non-NRTL equipment is approved for use. Five NSTec/LO employees have been trained and certified as Authority Having Jurisdiction (AHJ)-Field Representatives (FR). Each AHJ-FR actively participates in the non-NRTL process, ensuring that non-NRTL equipment is electrically safe before it is deployed for use. Certification stickers are signed by the respective AHJ-FR and affixed to the affected equipment. The Team had the opportunity to interview three AHJ-FRs and witness the inspection/ certification process and determined it to be highly effective. Not only is this process used for non-NRTL equipment brought into the laboratory, but also for those cases where safety enhancements are made to NRTL-labeled equipment. If an employee was to modify NRTL-labeled equipment, then the process under CD-2100.004, *Acceptance of Non-Nationally Recognized Testing Laboratory Equipment*, is followed, which includes an examination of the equipment, preparation of a written report, correction of any deficiency, and labeling the equipment as non-NRTL.

With respect to engineering and research and development work performed by the laboratory sections, typically the worker is provided a scope of work to be performed. The process ensures that the worker has the documented training and expertise to perform the scope of work desired by the customer. The worker develops a procedure or process to meet the customer's expectations. The procedure or process is reviewed, hazards identified, potential controls suggested, and a JHA developed with inputs from the subject matter experts, users, managers, and ES&H personnel. After this review, a dry run is conducted with ES&H personnel and managers in attendance to validate procedural steps, hazard identification, and control sets. After completion of the dry run validation, the procedure is approved with appropriate signatures and forwarded to the customer for final approval.

SWAT is a team-based review used for routine hazard control and compliance verifications that are conducted at intervals appropriate for the risks of the workplace operations. The SWAT team systematically evaluates laboratories and documents issues identified by the team members. These issues are tracked until corrective actions are validated. SWAT was institutionalized before the VPP application and continues to grow and become more useful with more employees involved. The system risk ranks deficiencies such that the more serious items have a short timeframe for corrective action compared to less serious items that do not require immediate correction. The Team reviewed several recent SWAT reports, and observed active discussion of items identified during SWAT inspections during section staff meetings. SWAT reviews, coupled with safety assessments from corporate personnel, provide an excellent set of outside eyes to identify and correct deficiencies.

Employee reports of hazards at the facility are not only expected, but also strongly encouraged. Interviews with personnel indicated that all personnel were comfortable with the ability and the expectation to identify and report hazards. There was no indication that they had any fear of reprisal. The facility instituted the Great Catch Program to identify hazards either via electronic or written media to management for corrective actions. Additionally personnel felt very comfortable talking directly to managers about issues with no fear of reprisal. The system has a

mechanism to track responses and corrective actions. Employees indicated that managers openly solicit input from employees in this area during team or safety meetings.

NSTec/LO has a system in place that evaluates upsets and identified abnormal conditions, investigates to determine root causes, and applies corrective actions. The NSTec/LO accident/incident investigation system includes written guidance, written reports of findings and hazard correction tracking, identification of causes, and provisions for preventive or corrective actions. The system also provides for a narrative report suitable for dissemination to all employees containing root causes, analysis, and lessons learned. The team reviewed the documentation relating to operation of the Sacher laser without a functioning interlock or external warning light system. The documentation appeared complete with recommended corrective actions that had been implemented.

A comprehensive trend analysis system for issues relating to the health and safety program (including injury and illness experience, inspections, and employee reports of hazards) is in place at NSTec/LO. A review of documentation and employee interviews confirms that this process is effective. Trend analysis occurs for TRC and DART statistics and as identified in the site application. Additionally tracking and trending is conducted regarding issues identified in safety inspections. For example, based upon corporate standards, which have been set to less than OSHA compliance levels, lead contamination was identified in five or nine areas sampled in 2007. Action was taken to increase diligence in housekeeping and worker attention to detail. Results of sampling conducted in 2008 revealed an improving trend with just 2 of 17 samples indicating lead above the levels established by corporate. Efforts to eliminate lead contamination are ongoing and tracking and trending continues.

NSTec/LO performs Tungsten Inert Gas welding activities with stainless steel in the shop area and on an alloy containing chromium in one of the laboratories (chromium content 30-55 percent by weight and 0.2 percent by weight, respectively). Air samples have been taken in the shop area and the facility has installed an engineered control to remove fumes through a snorkel apparatus. Samples from the shop area revealed hexavalent chromium levels well below action levels. In the laboratory the process involves spot welding of the alloy, which contains the small amount of chromium. The facility used the comparison of the chromium content of the material in the two areas to analyze the exposure potential to the worker in the laboratory. Since the stainless steel welding had significantly higher levels of chromium than the alloy spot welded in the laboratory, coupled with the fact that the process duration was short (approximately 20 seconds), the facility concluded that worker exposure in the laboratory was zero. While this was a reasonable assumption, there were no air samples taken to validate that the assumption was, in fact, accurate. Hexavalent chromium is a carcinogen and DOE recommends avoiding any exposure to it, warranting a more conclusive analysis.

Opportunity for Improvement: NSTec/LO should validate the analysis, which determined that spot welding of alloys containing small percentages of chromium did not present a hexavalent chromium exposure hazard, and implement engineered controls if this validation determines that an exposure hazard exists.

Conclusion

Worksite analysis is comprehensive and robust. Processes are in place to identify and analyze hazards throughout the laboratory, and employees subscribe to and utilize these processes in performance of their daily work activities. The multitiered approach in place is highly effective in providing for a safe working environment. NSTec/LO fully meets the requirements of the Worksite Analysis tenet.

VI. HAZARD PREVENTION AND CONTROL

Once hazards have been identified and analyzed, they must be eliminated (by substitution or changing work methods) or addressed by the implementation of effective controls (engineered controls, administrative controls, and/or PPE. Equipment maintenance, PPE, processes to ensure compliance with requirements, and emergency preparedness must also be implemented where necessary. Safety rules and work procedures must be developed, communicated, and understood by supervisors and employees, and followed by everyone in the workplace, to prevent mishaps or control their frequency and/or severity.

The Team observed many examples of good controls that had been implemented throughout the laboratory spaces at NSTec/LO. The preferred approach was to eliminate hazards through substitution where possible. For example, the Electro-optics Systems Engineering section had incorporated the use of a fabrication machine for circuit boards using milling instead of chemical etching, thus eliminating the use of iron chloride hexahydrate and associated solvents. Five other hazardous chemicals (dichloroethane, chlorobenzine, xanthene, dicarbocyanine, and methyl alcohol) were eliminated by replacing two Class IV Dye lasers with solid state lasers. Some chemical film and developers (heavy metals, acids, alkalis, and fixers) have been eliminated by switching from film photography to solid state imaging. For a plating process involving scanning electronic microscopes' slides, gold was chosen over the hazardous chemical osmium tetroxide. In another example, isocyanates were eliminated from the laboratory when a foam packing system was replaced with a sealed air pillow system. NSTec/LO also used outsourcing to eliminate hazardous processes from the laboratory, such as glass fritting.

When substitution to eliminate hazards was not practical, engineered controls were put in place. The Team noted numerous engineered controls throughout the laboratory. Many of these controls were a result of improvements suggested by employees as discussed in the Employee Involvement section. Examples of these controls include oxygen-monitoring systems at liquid nitrogen sources, dewar platform to facilitate pouring of liquid nitrogen, plastic guards over circuit boards being tested, utilization of fixed "metal box" high voltage test sets, hard wired, high voltage probe holders, both PVC and plexiglass high voltage shielding, magnetic field exposure minimization using a PVC tool, fume absorber for table saw, reorganized welding area with background coating to minimize light reflection, and lifting devices for heavy cameras. In another example of employee innovation, a go/no-go gauge was developed to measure chain elongation and hook wear for lifting hoists. Examples of engineered controls implemented by the Facilities section include installation of fall protection systems at the roof hatch and roof edge, on the mezzanine, and at the cryo-room rollup door. Facilities also installed a hydraulic lift on the General Services Administration (GSA) pickup truck to facilitate lifting.

Efforts to implement engineered controls throughout the laboratory so as to minimize potential hazard exposures are credible. However, as discussed in the Worksite Analysis section, a potential for exposure to hexavalent chromium exists in the laboratory. Depending upon further analysis, engineered controls may be necessary.

Administrative controls are used to supplement substitution efforts and engineered controls. These include access control to laser areas using fingerprint reader, access lists for space entry, hazard analyses, work packages, desktop instructions, required certifications, permits, signs and postings. All hazardous material requisitions are reviewed by the ES&H representative before

procurement. Requisitions are reviewed for appropriateness, adequate work practices and controls, and quantity.

While warning signs were in place at the entrance to laboratory spaces, postings at individual work stations were not consistent. For example, there were no postings at milling machines and lathes, such as for requiring safety glasses. When questioned by the Team, employees indicated that by virtue of being on the space access list, employees had been trained in these requirements. Although not required, postings of spaces requiring eye and hearing protection were commonplace in DOE and industry and can help remind workers to wear PPE when in those spaces.

Opportunity for Improvement: NSTec/LO should review its policy for warning signs and postings and consider requiring specific postings at the equipment/machinery regarding required procedures and safety equipment.

There is a comprehensive PPE program in place at NSTec/LO. This includes a variety of safety eyewear due to the nature of potential hazards at the facility. The laser laboratories use wavelength specific laser safety eyewear. The laser eyewear is determined and documented in each Laser Safe Operating Procedure. Laser safety eyewear is based on an analysis using the American National Standards Institute (ANSI) Z136.1-2000, *Safe Use of Lasers*. Each laser laboratory has its own unique laser safety eyewear that is stored within the individual laser laboratory. Laser safety glasses are inspected prior to use by the employee wearing the laser safety eyewear. Laser safety eyewear is also inspected annually by the ES&H representative, who serves as the Local Laser Safety Officer. When the long pulse laser operates in the ultraviolet wavelength, the employees use a face shield and laboratory coat to protect them from potential dermal hazards of the ultraviolet wavelength. NSTec/LO provides a subsidy to employees for their prescription safety glasses and safety shoes. Vouchers for the safety shoes or prescription safety glasses can be obtained from the local ES&H representative. Managers confirm that employee-purchased safety equipment meets the appropriate standards. Safety glasses are required when operating machines in the Model Shop and in the laboratories when employees are exposed to hazards, such as flying debris or chemical splashes. Nonprescription safety glasses are issued directly to the employee or a container of safety glasses is located near the laboratories that require safety glasses. All workers were observed by the Team wearing the appropriate PPE.

NSTec/LO uses liquid nitrogen and has a large capacity tank that stores the liquid nitrogen. When filling portable containers and adding liquid nitrogen to the machines, employees are required to use face shield, apron, and gloves that provide thermal protection to the employee. The PPE for this operation is outlined in the Handling of Liquid Nitrogen policy and procedure. In support of the phototube fabrication process, a tungsten inert gas (TIG) welder is used. During that process, the employee is required to wear a welding hood for eye protection and gloves for thermal protection. A welding curtain is also used to protect other employees in the area from the light hazard.

When energized electrical work needs to be performed at specified energy levels, employees are provided with the appropriate level of flash-rated PPE, such as gloves, coat, and face shield. NSTec/LO protocol is to achieve a work environment where zero or minimal electrical hazards are present or the lowest risk to employees. Flash-rated electrical safety PPE is controlled and

distributed by the Facilities Manager. A detailed NSTec/LO Facilities Arc Flash Analysis was completed by NSTec/LO Engineering Department in October 2006 that details the potential arc flash hazards throughout the facility. The Team verified the postings in the laboratory against the report of this analysis and found no discrepancies.

NSTec/LO has a strong set of safety and health rules in the hierarchy of policies, procedures, and work packages. NSTec/LO site safety and health rules are found in the Safety & Industrial Hygiene Manual. Potential hazards are addressed and controlled using engineering and administrative controls, JHAs, work permits, checklists, and PPE. Site safety rules, work practices, and usage of PPE were found to meet all requirements. A local Web site delivers a comprehensive set of requirements and processes that provide staff with the standards, procedures, guidelines, and safety information needed to perform work safely. Hardcopies of Material Safety Data Sheets (MSDS) are maintained in the appropriate areas. Additionally, MSDS' are being made available online, one organization at a time, with several units already available. The plan is to complete access for all employees in the near future.

Overall, the Team found that safety and health rules are followed by all employees. Interviews with employees indicated they know and understand the disciplinary process and consequences of failing to adhere to the rules. Those interviewed felt this process was both fair and consistent and gave examples of positive reinforcement received from supervisors and managers for good work practices.

NSTec/LO has implemented a comprehensive Preventive Maintenance (PM) program for the entire organization. PM is used to mitigate the chances and effects of unplanned equipment failure. PM schedules are based on manufacturer's recommendations and operating experience. The program consists of individual departments performing equipment maintenance for both performance and safety reasons as required. Department level PM is discussed in the organizational instruction Maintenance Plans. These plans describe the daily, weekly, monthly, quarterly, and annual maintenance performed by the organization. The maintenance schedules are reviewed periodically by the laboratory supervisors. Equipment is maintained pursuant to the equipment manufacturers' recommended service intervals and scope. In addition, select safety and/or security systems are maintained and tested at levels that exceed manufacturers' recommendations due to NSTec corporate policies and requirements. NSTec/LO procurement develops and implements maintenance contracts with manufacturer-recommended and approved service providers based upon equipment maintenance requirements as defined by the manufacturer, site level technical needs as defined by the equipment owner, and technical input from the equipment user/group. Team review of maintenance documentation, coupled with observations of equipment condition, indicates the PM program enhances safe and effective operations at NSTec/LO.

Based upon Team review of documents, including records of drills conducted, NSTec/LO has an extensive emergency preparedness plan in full compliance with DOE Order 151.1C. The *Emergency Response Organization* description and the *Emergency Management Plan* are the primary documents that provide the framework for the comprehensive plan. The documents identify the roles and responsibilities of staff and how all EAT personnel respond, in both actual emergencies, as well as during drills and exercises. Response actions include initial response and implementation of the protective actions of evacuation and/or shelter-in-place. Emergency fire suppression and ambulance services for the facility are provided by the Livermore

Pleasanton Fire Department from a nearby station. Emergency response time was reported to be less than 6 minutes.

With respect to radiation protection program requirements, NSTec/LO does not have or use sealed radioactive sources that exceed title 10, Code of Federal Regulations, part 835 (10 CFR 835) exempt quantity activities at its operations. However, there are three radiation generating devices (HEX, Henke, and Manson units), which produce ionizing radiation. These three devices operate independently and two are contained within the same laboratory. Operators of these units must complete training in General Employee Radiological Training, Radiation Generating Devices Training, and Radiological Worker I training. The Team reviewed the manufacturers' manuals for these units. Design features that minimize the potential for occupational exposure to x-rays include redundant interlocks and microswitches, enclosure wall thickness, and a fully sealed enclosure. The enclosure wall thickness was designed to absorb x-rays at maximum energies and fluxes present, to keep exposure outside of the enclosure to as low as reasonably achievable. The x-ray filament and anode are enclosed within a metal housing that can only operate within a vacuum. Beam output is highly collimated that further reduces occupational exposure. To record any occupational exposure, personnel are provided thermoluminescent dosimeters, which are exchanged quarterly. To verify that x-rays are not emitted from either the Henke or Manson units, multiple studies were conducted using facility area monitors placed throughout the x-ray laboratory to detect x-ray generation. The Team reviewed two studies conducted over a 6-month period in 2008, both of which recorded a result of zero exposure.

Three laser laboratories (nonionizing radiation) utilize class 3B and 4 lasers. NSTec/LO has three Pritchard Photometers that are light measuring meters and have a sealed carbon-14 source. The carbon-14 is mixed with a phosphor material and sealed in a container within the instrument. This 50 microcurie source is not used as a radiation source. Team review of the operating procedures revealed them to be well documented and following the guidelines established in NSTec corporate policies. Each laser laboratory has a written Laser Safety Operating Procedure that describes the parameters of the laser, the nominal hazard zone, required PPE, and the safe operation of the laser. Each laser laboratory has conducted an analysis that determines the specific wavelength of laser safety eyewear to be used. Also, all employees who use either class 3B or 4 lasers are required to have a laser eye examination prior to beginning work.

Time constraints precluded actually visiting the medical provider during the onsite review. The Team did review the program with NSTec/LO ES&H personnel. NSTec/LO occupational medical services for nonemergency incidents are provided under contract by Pleasanton Urgent Care Occupational Medicine located in nearby Pleasanton, California, where there are three licensed physicians and four clinical nurses on staff. The Human Resources representative or the ES&H representative provides coordination for the services, including prehire, duty status, return-to-work, and termination physicals. The NSTec corporate Occupational Medical Department assists with the review of the criteria for and results of prehire physicals. The medical provider assists with case management to limit the severity of injuries. Offsite medical services for emergency incidents and nonemergency incidents outside of normal office hours are provided by Valley Medical Center in Pleasanton, California. Onsite emergency services include employees who are trained to administer basic first aid, CPR, and use of an automated external defibrillator (AED). Refresher training is provided to keep certifications current. An AED is available at the facility for emergency use and 80 percent of the NSTec/LO staff is currently

CPR/AED trained. The goal is to have 100 percent of the personnel at NSTec/LO certified in CPR/AED in the near future.

A number of wellness activities are provided for NSTec/LO employees. These include smoking cessation, weight reduction, stress management, blood pressure monitoring, body mechanics, and a number of focused health awareness presentations and pamphlets. Employee interviews indicated that these programs are well received by the workforce.

Team review determined that NSTec/LO policies and procedures are based on appropriate DOE and NNSA contract clauses, orders, Contract Requirement Documents, and industry standards. Procedures are written and maintained by the organization to address worker health and safety requirements. Organizational Work Packages reference applicable procedures and other documents to provide a clear and integrated communication of occupational safety and health programs for managers and staff members. The hazards and hazard mitigation for specific activities are addressed by JHAs or other documents, such as Health and Safety Plans. The procedures, JHAs, and other documents appropriately translate requirements and best practices into working level guidance. Lessons learned are incorporated into program documentation as appropriate. Ergonomics services are provided on an as-needed basis throughout the organization.

Conclusion

NSTec/LO employees use safety and health rules to assure that a safe work environment exists and to reduce hazards and potential exposures. The site ES&H representative provides ES&H training to local personnel and directly provides a number of support services. NSTec/LO is served by experienced and certified safety professionals to provide continuous proactive services and programs. NSTec/LO meets all DOE-VPP criteria for the Hazard Prevention and Control tenet.

VII. SAFETY AND HEALTH TRAINING

Managers, supervisors, and employees must know and understand the policies, rules, and procedures established to prevent exposure to hazards. Training for health and safety must ensure that responsibilities are understood, that personnel recognize hazards they may encounter, and that they are capable of acting in accordance with management expectations and approved procedures.

Team interviews included employees with as little as 1 year to those with 30 plus years of experience at NSTec/LO. All felt that their ES&H training adequately prepared them for hazard identification for their respective work environments and conditions and gives them the tools to keep themselves and their coworkers safe. While the Team did not have the opportunity to observe any training as none was scheduled during the review, the Team did review training records, course curricula, and reports. The Team also observed several employees gain access to their training plans and training histories online. Additionally, the status of required training was an agenda item during the Operations Manager's manager meeting, as well as during the Section Managers' staff meetings, both of which the Team had the opportunity to attend.

NSTec/LO section managers play a key role in all aspects of the safety and health program. In part, this includes analyzing and resolving job hazards, instilling in employees the behavioral safety that all work can be accomplished with a "Zero Accidents" philosophy. A newly hired manager completes a comprehensive New Hire Orientation Process. During this time, the manager is introduced to the five core functions and seven guiding principles of ISMS, as well as receiving indoctrination to their roles and responsibilities in the program. A further introduction is accomplished via a course entitled "Roles and Responsibilities of the Supervisor," which includes a Supervisor Safety module. The course is designed as preliminary training to complement subsequent supervisory courses specific to each manager's job duties and those of their direct reports, including outlining progressive disciplinary guidelines to follow if employees fail to follow policies and procedures. Formal training for managers includes hazard communication training that provides the manager with tools required to provide their employees with task-specific hazard communication awareness.

The parameters of each manager's Training Plan is developed based upon the type of work in which the manager is engaged and that of their direct reports. It is developed from the Training Questionnaire that their manager completes. The NSTec/LO Operations Manager is updated periodically as to the Training Plan status for each member of his team. An integral part of Work Performance training at the supervisory level includes Work Control and Work Planning Processes, which are required for all managers that have direct reports performing contact work. This training explains the work control process, department-level planning processes, work package development, JHAs, Pre-Task Hazard Review, Facility Work Control, and the Plan of the Day. This comprehensive planning process raises hazard awareness and deconflicts hazards from one work area to another where changing work practices or conditions may affect work being accomplished in multiple contact work locations. A majority of ES&H and supervisory courses are supplemented with informal senior manager-to-manager, or manager-to-manager training. The informal venues are staff meetings conducted in-person, via video or teleconference, e-mail notices, written memoranda, and the like. Along with informal training, managers receive direction from and interact with ES&H, Occupational Medicine, and staff members. The local ES&H representative actively participates in the weekly managers' staff meetings. The Team had the opportunity to attend these meetings during the review. During this

time, participants discuss new or changing work to be performed, then evaluate and plan the work based upon the Work Control standards. This ensures that all employees are educated as to the hazards and Work Package requirements that will facilitate the work being completed safely.

During their first days of employment, new employees also complete a series of formal training that starts with a comprehensive New Hire Orientation Process. The employee is given General Employee Training that provides an overview to NSTec; operations at NTS and outlying locations; ISMS; contact work versus noncontact work; ES&H policy, including NSTec "Zero Accidents" philosophy, emergency procedures, and stop work authority. The employee's formal job training continues with a series of ES&H training classes. The training is a combination of instructor-led and web-based classes. The parameters of each employee's Training Plan is determined by the type of work in which they will be engaged. The Plan is developed from the Training Questionnaire that managers complete for each employee. The renewal period of the classes is dictated by the NSTec Training Department and subject matter experts.

Informal training takes place in the various laboratories throughout NSTec/LO. An example of this informal training was demonstrated to the Team concerning the use of lasers. The purchase of a new laser system includes operation and safety training on the new laser system. Additional informal training is conducted by the laser laboratory supervisor, who provides direct supervision of the new laser operator and gradually increases the new operator's responsibilities until the time when the new operator has achieved a level of competence to operate the laser independently. The authorization to operate the laser independently is reviewed and approved by the section manager.

In addition to informal training, a method for evaluating and updating formal courses occurs when a company directive is changed. Such changes are frequently driven by changes in corresponding DOE contract, Code of Federal Regulations, OSHA Regulations, as well as internal requirements. A majority of NSTec/LO ES&H courses include a final examination to verify each employee's level of understanding and retention. A passing score of 80 percent or better is required. The instructor acknowledges the employee’s attendance and successful completion by signing an attendance sheet at the end of each instructor-led course.

All formal training is tracked within the NSTec Plateau software. Plateau is a learning management system that keeps track of students (employees), their training histories and training requirements, courses, and scheduled course sessions. Plateau is web based and runs through the Internet Explorer 7.x browser via the NSTec intranet. After an employee completes a class, the instructor submits a class roster to the NSTec Training Department for entry into Plateau. Course completion of Web-based training is recorded by Plateau. ES&H Web-based training courses provide the option to complete a course evaluation form at the end of each course. The course evaluation assists the NSTec Training Department in fine-tuning web-based training to better meet the needs of employees and the organization as a whole.

Whether or not employees developed their skills from employment outside of NSTec and DOE, NSTec/LO saw a need to capture, document, and track skill of the craft tasks. Each NSTec/LO operation that relies on skill of the craft maintains a “Skill of Craft” binder that records all training a section employee has taken. Each binder contains the *Master Contact Skill of the Craft List*. This list identifies each task and the qualification method used by the employee. Qualification method categories include *Past Experience*, *Current Demonstration*, *Certificate/License*, and “*Other*” for each identified task. The Team reviewed these binders for

each of the laboratory sections and identified the collection of this data as a unique means of verifying an employee is adequately qualified to perform certain tasks. The Team considers the implementation and use of the Skill of Craft binder as a best practice that could be shared throughout the DOE-complex where skill of the craft may be relied upon for work activities.

Conclusion

Formal and informal training programs at NSTec/Lo are comprehensive and adequately address the training needs for the accomplishment of the NSTec/LO mission. NSTec/LO meets the requirements of the Safety and Health Training tenet.

VIII. CONCLUSIONS

NSTec/LO has a culture of safety excellence that had been ingrained throughout the organization long before efforts to pursue DOE-VPP began. The principles of VPP are well understood by all hands. Managers and employees are equally committed to maintaining the safest possible working environment and employees are empowered to affect safety improvements in real time. Hazard analysis is comprehensive, thorough, and well documented. Credible efforts to substitute materials and processes, and then mitigate hazards that cannot be eliminated through the hierarchy of controls, were evident across the laboratory. The workforce at NSTec/LO is experienced, mature, and well trained. The degree of teamwork achieved by managers and employees is exemplary. Safety has been clearly put ahead of production. The Team observed firsthand that the desire for continuous improvement is real at NSTec/LO. Efforts to improve safety performance are ongoing and effective. While a few opportunities for improvement were identified, the overall climate at NSTec/LO is one of safety excellence and total ownership by managers and employees alike. Accordingly, the Team recommends that NSTec/LO be approved for entry into DOE-VPP at the Star level.

Appendix A

Onsite VPP Audit Team Roster

Management

Glenn S. Podonsky
Chief Health, Safety and Security Officer
Office of Health, Safety and Security

Michael A. Kilpatrick
Deputy Director for Operations
Office of Health, Safety and Security

Patricia R.Worthington, PhD
Director
Office of Health and Safety
Office of Health, Safety and Security

Bradley K. Davy
Director
Office of Worker Safety and Health Assistance
Office of Health and Safety

Quality Review Board

Michael Kilpatrick	Patricia Worthington
Dean Hickman	Robert Nelson

Review Team

Name	Affiliation/Phone	Project/Review Element
Frank Greco	DOE/HSS (301) 903-5522	Team Lead Management Leadership
Carlos Coffman	DOE/HSS	Employee Involvement Safety and Health Training
John Locklair	DOE/HSS	Worksite Analysis Hazard Prevention and Control
Robert Kapolka	ORISE	Worksite Analysis Hazard Prevention and Control