Consolidated Nuclear Security, LLC
Y-12 National Security Complex
Oak Ridge, Tennessee

Report from the Department of Energy
Voluntary Protection Program
Onsite Review
March 14-23, 2017

U.S. Department of Energy
Office of Environment, Health, Safety and Security
Office of Health and Safety
Office of Worker Safety and Health Assistance
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Foreword

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's (OSHA) VPP. Since its creation by OSHA in 1982 and implementation by DOE in 1994, VPP has demonstrated that cooperative action among Government, industry, and labor can achieve excellence in worker safety and health.

DOE-VPP outlines areas where DOE contractors and subcontractors can surpass compliance with DOE Orders and OSHA standards. The program encourages a *stretch for excellence* through systematic approaches that emphasize creative solutions through cooperative efforts by managers and employees. Requirements for the DOE-VPP participation are based on comprehensive management systems with employees actively involved in assessing, preventing, and controlling potential health and safety hazards at their sites. All contractors in the DOE complex, including production facilities, laboratories, and various subcontractors and support organizations may participate in DOE-VPP.

Participation in DOE-VPP is strictly voluntary. Any participant may withdraw from the program at any time. 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 outstanding protectors of employee safety and health. The Merit program is a steppingstone for participants that have good safety and health programs, but need time and DOE guidance to achieve Star status. The Demonstration program, which is expected to rarely be used, allows DOE to recognize achievements in unusual situations about which DOE needs to learn more before determining approval requirements for the Merit or 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 employees at the site. The symbols of this recognition 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.

This report summarizes the results from the evaluation of Consolidated Nuclear Security, LLC (CNS) at the Y-12 National Security Complex (Y-12) conducted March 14-23, 2017; and it provides the Acting Associate Under Secretary for Environment, Health, Safety and Security with the necessary information to make the final decision regarding CNS Y-12's participation as a DOE-VPP Star site.

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS

ATLC	Atomic Trades and Labor Council
AU	Office of Environment, Health, Safety and Security
AU-12	Office of Worker Safety and Health Assistance
B&W Y-12	Babcock & Wilcox Technical Services Y-12, LLC
BBS	Behavior-Based Safety
BEST	Build Everyone Safe Tomorrows
BLS	Bureau of Labor Statistics
CBT	Computer-Based Training
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
CNS	Consolidated Nuclear Security (Corporate)
CNS Y-12	Consolidated Nuclear Security, LLC at Y-12
CTM	Compliance-Training Matrix
DART	Days Away, Restricted or Transferred
DML	Decision Making Leave
DOE	Department of Energy
DSA	Documented Safety Analysis
DU	Depleted Uranium
EA	Office of Enterprise Assessments
EPA	Environmental Protection Agency
FY	Fiscal Year
GET	General Employee Training
HIW	Hazard Identification Worksheet
HRP	Human Reliability Program
IGUA	International Guards Union of America
IH	Industrial Hygiene
IRB	Injury Review Board
ISMS	Integrated Safety Management System
JCI	Johnson Controls, Inc.
JHA	Job Hazard Analysis
KBCTC	Knoxville Building and Construction Trades Council
MCL	Maintenance Center Leader
NAICS	North American Industry Classification System
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
NPO	NNSA Production Office
OHS	Occupational Health Services
OJT	On-the-Job Training
OSHA	Occupational Safety and Health Administration
PDC	Performance Documentation Checklist
PPE	Personal Protective Equipment
PST	Proactive Safety Team
SAP	System Application and Data Products
SME	Subject Matter Expert
Team	Office of Environment, Health, Safety and Security DOE-VPP Team
TRC	Total Recordable Case

TWG	Training Work Group
UCOR	URS/CH2M Oak Ridge LLC
U.S.	United States
USW	United Steel Workers
VPP	Voluntary Protection Program
VSET	Value Stream Element Team
Y-12	Y-12 National Security Complex

EXECUTIVE SUMMARY

The Department of Energy's (DOE) Voluntary Protection Program (VPP) team from the Office of Environment, Health, Safety and Security (AU) (Team) recommends that Consolidated Nuclear Security, LLC (CNS) at the Y-12 National Security Complex (Y-12) continue participating in DOE-VPP as a Star site. This report documents the Team's observations, and conclusions, and identifies several opportunities for improvement that CNS Y-12 can consider in its pursuit of excellence in worker safety and health.

On July 1, 2014, CNS, assumed responsibility for the combined management and operation of the Y-12 National Security Complex in Oak Ridge, Tennessee, and the Pantex National Security Complex, in Amarillo, Texas. CNS Y-12 replaced Babcock & Wilcox Technical Services Y-12, LLC (B&W Y-12), which operated Y-12 since 2000, and B&W Pantex, LLC, which operated the Pantex Plant since 2000. The contract includes a total annual operating budget of $1.5 billion and a combined employment of about 8,000 in Tennessee and Texas. The National Nuclear Security Administration (NNSA) expected CNS to combine management of both sites into a unified system.

CNS formally requested that CNS Y-12 continue in DOE-VPP as a "Transitional Star" status on December 4, 2014, which AU approved on February 23, 2016. CNS Y-12 submitted a VPP application to the AU Office of Worker Safety and Health Assistance (AU-12) through the NNSA Production Office (NPO) in April 2016. As a Transitional Star participant, CNS Y-12 continued to fly the DOE-VPP Star flag as it made changes to the worker safety and health program. Continued participation in DOE-VPP beyond the approved transition period requires an onsite review by AU to ensure the new contractor is meeting the DOE-VPP expectations in each of the five tenets.

CNS Y-12 injury rates increased in 2015, but remained well below the Bureau of Labor Statistics (BLS) comparison industry average from 2014-2016. The subcontractor injury rate increased in 2015, but trended downward the following year. CNS Y-12 actions resulted in lower injury rates in 2016. CNS Y-12 encourages workers to report all injuries, no matter how minor, and the Team did not find any incentives that discourage the reporting of injuries, illnesses, or safety concerns. Injury/illness recordkeeping/case management is mature with accurate recordkeeping, decisionmaking, and appropriate case management.

After initially alienating a large segment of the CNS Y-12 workforce, CNS Y-12 has adjusted its leadership approach and is regaining workers' trust and support. It is investing heavily in intense training classes for all employees to foster its performance excellence model and engage employees in achieving program cost reductions and production improvements. It is working closely with leaders within the four bargaining units to ensure CNS Y-12 identifies, resolves, or elevates workers' concerns. Managers understand the challenges posed by the contract production goals, but will not compromise safety to achieve those goals.

CNS Y-12 employees have numerous means to raise safety issues and concerns. Management continues working closely with the union safety representatives to maintain communication with site employees. CNS Y-12 has increased the number of union representatives as a means of providing additional communication pathways for employees. CNS Y-12 is working to improve employee trust and engagement, provide necessary training to managers and supervisors, and identify resources for safety improvements. It should continue its efforts to encourage and solicit

employee involvement in all changes and improvements.

CNS Y-12 uses written procedures and work practices that involve planners, craft, engineers, and subject matter experts (SME) to identify and analyze hazards and recommend controls. Maintenance continues to find ways to improve work packages with preapproved dispatch work, improved maintenance hazards identification checklists, and work package quality reviews. Job Hazard Analyses (JHA) in work packages identify the hazards and controls, but do not include the analysis that determined the control, or links to the analysis so it can be located. The beryllium program is robust with industrial hygiene (IH) monitoring and medical surveillance. Accident investigations are detailed and the reports produce lessons learned to apply to the rest of the site. CNS Y-12 uses a graded approach to facility inspections and believes other inspections meet the intent of VPP, but should confirm this belief.

CNS Y-12 uses the hierarchy of hazard controls with an emphasis on engineered controls for new and renovated equipment. CNS Y-12 continues to improve engineered controls with capital investments, such as contamination enclosures to control worker exposures and reduce physical stresses from personal protective equipment (PPE).

CNS Y-12 maintains a mature training program that satisfies a variety of training objectives. Managers and employees receive training commensurate with their level of responsibility. The safety and health training derives from programmatic requirements, such as title 10, Code of Federal Regulations, part 851 (10 CFR 851), *Worker Safety and Health*, requirements, DOE Orders, and corporate initiatives. In addition to the routine safety and health training, CNS is making large investments in training managers, supervisors, and employees as part of the strategic plan implementation.

Rapid changes to several business processes that changed worker benefits without gaining worker confidence, support, or trust initially alienated a large segment of the Y-12 workforce. The result was a rift between workers and managers. In January 2016, CNS recognized that without the trust and support of the workforce, they would never achieve the cost and performance goals established in the contract. The president/chief executive officer is determined to focus the organization on performance excellence. Since then, CNS has worked to unify the organization, gain worker commitment to the strategic plan, earn workers' trust, and use the organizational strengths to work toward the necessary performance goals. The workforce has responded to these efforts, and the trust gap is narrowing. CNS has many opportunities to continue fostering employee engagement and is committed to acting on those opportunities.

TABLE 1
OPPORTUNITIES FOR IMPROVEMENT

Opportunity for Improvement	Page
CNS Y-12 should consider enrolling the new recordkeeping/case manager in an OSHA recordkeeping training class to ensure continued accuracy in recordkeeping and proper case management.	**4**
CNS Y-12 should consider implementing the action officer approach used by the operations organization in other organizations to stimulate continuous improvement.	**7**
CNS Y-12 should review its existing internal Webpages for ideas that it should resurrect (e.g., posting safety council meeting minutes, VPP information), or pages it should remove because information is no longer relevant.	**8**
CNS Y-12 should consider providing a monthly or quarterly summary of safety and health concerns, including the status of those concerns, through an internal newsletter, safety share, or other company communications to employees.	**11**
CNS Y-12 should consider using the Top Gun program as an opportunity to revitalize the employees' awareness of VPP.	**13**
CNS Y-12 should continue working to solicit workers' input to identify opportunities of implementing improvements to all its processes.	**14**
CNS should find ways to share costs with DOE and NNSA and budget those costs to allow employees to participate in professional conferences or regional and national safety conferences.	**14**
CNS Y-12 should ensure the JHAs document all analysis and assumptions regarding the hazards, and ensure the analysis justifies the controls selected for all maintenance and production work.	**18**
CNS Y-12 should analyze the inspections it is performing to ensure it inspects all occupied and operating facilities quarterly per DOE-VPP expectations.	**19**
CNS Y-12 should review calibration and inspection practices in the development laboratory to ensure personnel tag out-of-calibration equipment per procedure to prevent use and ensure regular workplace inspections include verification that equipment is either calibrated or tagged out-of-service.	**22**
CNS Y-12 should increase its efforts to conduct arc flash hazard analysis and label electrical equipment in accordance with NFPA 70E.	**22**
CNS Y-12 should consider resurrecting and updating ergonomics awareness training for engineers designing or modifying processes and equipment.	**24**

I. INTRODUCTION

On July 1, 2014, CNS assumed the responsibility for the combined management and operation of Y-12 in Oak Ridge, Tennessee, and the Pantex National Security Complex, in Amarillo, Texas. CNS Y-12 replaced B&W Y-12, which operated the Y-12 site since 2000, and B&W Pantex, which operated Pantex since 2000. The contract includes a total annual operating budget of $1.5 billion and a combined employment of about 8,000 in Tennessee and Texas.

Located in the Bear Creek Valley of East Tennessee, the site is adjacent to Oak Ridge, Tennessee. Initially built as part of the World War II Manhattan Project, construction began in February 1943 and operations began in November of that year. The first site mission was the separation of Uranium-235 from natural uranium by the electromagnetic separation process. In the years following World War II, the Y-12 site evolved into a high-precision manufacturing assembly and inspection facility while maintaining the Nation's uranium and lithium technology base. Missions have expanded since the end of the Cold War and the ensuing easing of international tensions. Y-12's national defense missions focus on weapon components, production of nuclear weapon secondaries, and prevention of the spread of weapons of mass destruction.

Y-12 is one of four production facilities in NNSA's Nuclear Security Enterprise and includes 314 buildings, encompassing 5 million square feet on 811 acres. At its peak in 1945, Y-12 employed over 22,000 workers. The current mission of Y-12 is to:

- produce/rework/dismantle complex nuclear weapon components and secondaries;
- receive, store, and protect special nuclear materials;
- perform quality evaluation/enhanced surveillance of the Nation's nuclear weapons stockpile;
- maintain the safety, security, and effectiveness of the United States' (U.S.) nuclear weapons stockpile;
- help reduce the global threat posed by nuclear proliferation and terrorism;
- provide safe and effective nuclear propulsion systems for the U.S. Navy;
- process and store uranium and develop technologies associated with those activities;
- prevent the spread of weapons of mass destruction; and
- support DOE, other Federal Agencies, and other national priorities.

In the 1990s, the Environmental Protection Agency (EPA) listed Y-12 as an EPA Superfund site for groundwater and soil contamination. Today, Y-12 is on the DOE's Cleanup Criteria/Decision Document database (or C2D2 database). An influx of funding from the American Recovery and Reinvestment Act benefited cleanup efforts by funding demolition and decontamination of aging facilities. These efforts were in furtherance of work to reduce the long-term footprint of Y-12.

CNS Y-12 currently employs approximately 4,700 people. About 1,500 additional personnel work onsite as employees of organizations that include UT-Battelle, Science Applications International Corporation, Johnson Controls, Inc. (JCI), and URS/CH2M Oak Ridge, LLC (UCOR). Four labor unions represent personnel at Y-12: (1) Atomic Trades and Labor Council (ATLC), (2) Knoxville Building and Construction Trades Council (KBCTC), (3) International

Guards Union of America (IGUA), and (4) United Steel Workers (USW) Local Union 9-288. All four unions have endorsed the CNS Y-12 pursuit of continued VPP participation.

In 2012, the previous contractor had a strong safety and health program. Between 2000 and 2012, it implemented a series of program improvements that resulted in excellent safety performance and strong support and trust of the workforce. The strength of the management team and commitment to safety and health excellence, in some cases, masked more active worker involvement. However, workers interviewed by the Team were equally committed. Improvements in work planning and control and hazard analysis, particularly in the research and development processes, addressed weaknesses commonly seen elsewhere in the DOE complex and provided excellent examples for others. Y-12 was a strong community member that reached out to the surrounding areas to expand safety awareness and safe work practices for work and home. The commitment to reinvest cost savings from process improvements produced additional savings and improvements in worker health and morale. As a result, Y-12 entered DOE-VPP as a Star participant.

On December 4, 2014, when CNS began managing and operating Y-12, CNS requested that AU grant CNS Y-12 "Transitional Star" status. AU approved that request on February 23, 2015. CNS Y-12 submitted a VPP application to AU-12 through NPO in April 2016. As a Transitional Star participant, CNS Y-12 continued to fly the DOE-VPP Star flag as it made changes to the worker safety and health program. Continued participation in DOE-VPP beyond the approved transition period requires an onsite review by AU to ensure the new contractor is meeting the DOE-VPP expectations in each of the five tenets.

II. INJURY INCIDENCE/LOST WORKDAYS CASE RATE

Injury Incidence/Lost Workdays Case Rate (CNS Y-12)					
Calendar Year	Hours Worked	Total Recordable Cases (TRC)	TRC Incidence Rate	DART* Cases	DART* Case Rate
2014	4,896,237	13	0.53	11	0.45
2015	9,652,110	45	0.93	17	0.35
2016	11,366,067	34	0.60	12	0.21
3-Year Total	25,914,414	92	0.71	40	0.31
Bureau of Labor Statistics (BLS-2015) composite for NAICS** Code 332999, all other miscellaneous fabricated metal product manufacturing			5.0		2.6
Injury Incidence/Lost Workdays Case Rate (CNS Y-12 Subcontractors)					
Calendar Year	Hours Worked	TRC	TRC Incidence Rate	DART* Cases	DART* Case Rate
2014	679,600	0	0	0	0
2015	1,189,374	4	0.67	1	0.17
2016	2,828,031	4	0.28	2	0.14
3-Year Total	4,697,005	8	0.34	3	0.13
Bureau of Labor Statistics (BLS-2015) composite for NAICS** Code 23, construction			3.5		2.0

* Days Away, Restricted or Transferred
** North American Industry Classification System

3-year TRC Incidence Rate, including subcontractors: 0.65
3-year DART Case Rate, including subcontractors: 0.28

Conclusion

CNS took over Y-12 operations in July 2014 and injury/illness data collection for the new contract began at that time. CNS Y-12 injury rates increased in 2015, but remained well below the BLS comparison industry average during this 3-year reporting period. The subcontractor injury rate increased in 2015, but trended downward the following year. CNS actions, including the *9 in 90 Campaign* (see Management Leadership), lowered injury rates in 2016. Since the last assessment, CNS Y-12 changed the subcontractor comparison industry to construction, which has a lower injury rate than the miscellaneous fabricated metal product manufacturing industry, and more accurately reflects the majority of subcontractor work.

CNS encourages workers to report all injuries, no matter how minor, and the Team did not find any incentive's that discouraged the reporting of injuries, illnesses, or safety concerns. Injury/illness recordkeeping/case management is mature with accurate recordkeeping, decisionmaking, and appropriate case management. The Team reviewed 15 first-aid cases from the past 2 years and found no discrepancies in the cases. CNS recently appointed a new recordkeeping/case manager that is inexperienced in OSHA recordkeeping. CNS Y-12 should consider enrolling the new recordkeeping/case manager in an OSHA recordkeeping training class to ensure continued accuracy in recordkeeping and proper case management.

Opportunity for Improvement: CNS Y-12 should consider enrolling the new recordkeeping/case manager in an OSHA recordkeeping training class to ensure continued accuracy in recordkeeping and proper case management.

The CNS Y-12 injury/illness and rates meet the expectations for continued participation in 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 exceeding occupational safety and health requirements and meeting the expectations of DOE-VPP. Management systems for comprehensive planning must address health and safety requirements and initiatives. Elements of the management system include: (1) clearly communicated policies and goals; (2) clear definition and appropriate assignment of responsibility and authority; (3) adequate resources; (4) accountability for both managers and workers; and (5) managers must be visible, accessible, and credible to employees. 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.

In 2012, under the previous contractor, Y-12 had a strong management team that understood and demonstrated the necessary leadership qualities to advance a strong safety and health program. They recognized VPP as an investment to foster excellence and continuous improvement. They consistently acted in concert with that commitment and had formed a trusting partnership with the workforce.

When CNS took over operating Y-12, it retained most of the senior managers from the previous contractor. CNS formed an Enterprise Level management structure to coordinate and combine Y-12 and Pantex per the contract. The result was a Senior Management Team at Y-12 that understood the workforce, as well as the issues and concerns the workers raised. Unfortunately, the contract transition was not as smooth as many had hoped. In the year prior to CNS taking the contract, there were challenges to the contract, many distracting issues, and a growing uncertainty among the workforce about the future. Once the contract was in place, CNS immediately began making changes to reduce costs. One change that CNS put in place quickly affected employees' benefits. This change, made without including workers, caused workers to distrust managers' motives. In January 2016, the CNS president left, and the then chief operating officer moved into the president/chief executive officer (CEO) position. The new president/CEO immediately began working to regain workers trust by restoring part of the reduced benefits, working closely with the unions to improve communications, and finding ways to restore worker engagement. The result has been a restoration of most workers' trust in the CNS Y-12 management team and the president/CEO, but many workers remain wary of the CNS Enterprise Leadership Team.

One effort championed by the president/CEO was the *9 in 90 Campaign*. He intended this effort to help define "a collective definition of what success looks like" and help everyone in CNS understand their contribution to that success. The Executive Leadership Team then defined nine goals that CNS would attempt to achieve within 90 days. The first goal was to "significantly reduce injuries and improve security performance through dissemination of corrective actions to the workforce." Other goals included contract performance, manning levels, and self-assessment. Although CNS did not meet all nine goals, the president/CEO did credit the entire organization with meeting most of the goals and "significantly" moving "the needle on all others." The program helped build organizational momentum and helped more people focus on the successes.

Managers continue struggling to match CNS' contractual goals for increased production rates at reduced costs with Y-12 needs related to aging infrastructure and improving safety. CNS is approaching a "gateway" determination in its contract at which point NPO will make a determination if CNS is eligible for an extension beyond the initial 5-year contract. NPO will make that determination based on several goals established in the contract, including product delivery and cost reductions. Managers are concerned that the efforts to restore worker trust, address aging infrastructure problems, maintain a qualified workforce, and meet production goals make it difficult for CNS to meet the necessary performance ratings. In the meantime, CNS Y-12 managers recognize the risk that cost reduction targets might stress workers into taking shortcuts and are working to identify and prevent such behaviors.

Despite these concerns, CNS Y-12 managers continue pursuing process and infrastructure improvements and are open to ideas from anyone that can help them realize their cost reduction targets. They recognize safety as an "imperative" that will help CNS Y-12 succeed. Managers expressed a willingness to push back if they believed expectations became unrealistic. Under the leadership of the president/CEO, CNS is implementing a performance excellence paradigm. These efforts involve a multi-pronged approach to establishing a unified strategic vision and plan, connecting with people throughout the organization to build buy-in; training workers to recognize their contributions to the enterprise success; and training managers to value, respect, and support workers. The president/CEO is drawing on his experience with the Naval Reactors program to educate managers and workers and inspire them to "do their best every day, for the mission and the organization." His belief is that by investing in the people and the systems, CNS will be able to achieve the performance improvements and cost reductions NPO desires.

A primary training course that CNS identified approximately a year ago is "Relational Based Leadership." Two retired Air Force personnel developed his week-long course that places managers and supervisors in an environment where they can reflect on their experiences; identify their individual communication and leadership styles; learn the strengths and weaknesses of their style; and improve their relationships up, down, and across the organizational structure. To date, 540 managers and supervisors have completed the course. CNS is committed to having all managers and supervisors complete it by the end of fiscal year (FY) 2017. Most attendees report some degree of transformation during the course and believe it is helping to change the culture at CNS Y-12.

A second internally developed training course CNS is using to help shift the culture is "Foundations of Performance Excellence." Classes of about 25 people, representing all levels of the organization, spend a full week in the classroom learning about the CNS Strategic Plan. Attendees identify their individual roles in achieving the strategic vision, and identify specific actions they can take to implement the desired state. CNS makes this course available to all personnel, although class size restrictions and the personal participation by senior managers make it unlikely that all CNS personnel will get to take the course. CNS is counting on the people completing the course to help take the lessons back to the workplace. The course includes a 2-3 hour segment at the beginning taught by the president/CEO who also leads the final hour of the class. The president/CEO uses this time to convince course participants of his personal commitment to the principles espoused in the strategic plan and inspire attendees.

As part of its Performance Excellence model, CNS is implementing a Performance Enterprise System that uses a variety of techniques and ideas from industry, mostly stemming from the Toyota Manufacturing System. For example, CNS Y-12 is using Value Stream Element Teams

(VSET) to review some processes. These teams identify a process stream (or portion thereof) to optimize, remove barriers and risks, and identify cost saving opportunities. Other techniques include applying "Lean" methods to the "workface," ensuring workers have the proper materials and tools at the proper time, minimizing time and movements necessary to achieve the objective of the process, and minimizing idle time and work delays due to poor coordination and integration. The Performance Enterprise System gives workers the power and responsibility to improve the work process they are performing. Improvements may focus on work area improvements, process improvements, or tool/equipment upgrades essentially encompassing safety, performance, and efficiency with the goal of improving overall productivity. In a similar exercise, workers at the Y-12 medical facility formed a VSET and evaluated the process for patient examinations. Prior to this VSET, workers would wait to see a doctor for a variety of examinations, particularly for evaluations related to the human reliability program (HRP). The VSET reviewed the process for medical evaluations and was able to reduce the waiting time for patients and improve the overall throughput of the medical facility without compromising the quality of medical services (see Hazard Prevention and Control).

The CNS Y-12 Production Support organization implemented a good practice using a team of five people (action officers) that proactively review and assess operations focusing on conduct of operations, performance improvement, and safety. The action officers have a wide variety of backgrounds, including organizational psychology and industrial engineering. Action officers cover a particular part of the production organization giving them an opportunity to interact with that segment of the workforce on a regular basis. The production support manager expects each action officer to spend 32 hours each month in production areas, interacting with workers, identifying improvements, and helping workers address issues and concerns. These action officers are a strength of the program. Other organizations, such as the Mission Engineering organization, in particular the Development group, might benefit from a similar function embedded within the organizations CNS Y-12 should consider implementing the action officer approach used by the operations organization in other organizations to stimulate continuous improvement

Opportunity for Improvement: CNS Y-12 should consider implementing the action officer approach used by the operations organization in other organizations to stimulate continuous improvement.

The production organization also stations frequent senior supervisory watches. Managers within the production organizations perform these watches to focus on specific topics of interest or just provide general management presence and support for workers. Action officers also perform senior supervisory watches as part of their normal duties. Watches may include specific checklists or just general worksite observations. The goals of these senior supervisory watches are to encourage communication with workers, identify necessary resources to succeed, and address any identified issues in an efficient manner.

Recognizing the value of frequent and visible manager presence in work areas, the CNS Y-12 infrastructure manager has designated the third Wednesday of every month as "Field Day." On that day, all managers in the Infrastructure Organization clear their calendars and spend the day performing management observations of work, communicating with workers in the field, and identifying potential issues and improvements. He further expects that managers spend other time performing observations on their own. For example, the infrastructure managers perform

Maintenance Management Watches, which are similar to Senior Supervisory Watches in the production organization. The Team observed many examples of open communication among infrastructure managers and workers, due in part to the manager's emphasis on frequent workplace presence.

In another effort to build trust and help workers understand their personal mission contribution, the CNS Y-12 site manager has provided workers with cross-functional tours of production areas. These tours help workers understand both upstream and downstream processes and understand how their work (or errors) affect the production stream. Workers were grateful for the opportunity and said it gave them better understandings of what they had previously thought were unproductive activities or requirements.

The CNS Y-12 site manager holds a monthly Site Manager's Safety Council meeting. This meeting includes managers and union safety representatives from each of the four unions. This council is the primary group for identifying and implementing safety initiatives to drive safety excellence. This council is championing the Top Gun approach recommended by ATLC, monitoring the 90-day safety challenge, promoting the site managers "caught in the act" initiative, and giving input to the manager for selecting the "Organization Award" (see Employee Involvement). The safety representatives are included on the agenda with an opportunity to raise or elevate safety issues.

Although the Site Manager's Safety Council is active, CNS Y-12 is not publishing minutes or notes from the meetings. The previous contractor posted minutes from this council on the company's internal Website. Similarly, CNS Y-12 has not maintained current Website information on several other efforts that were active prior to the transition. Website information related to VPP, behavior-based safety (BBS), employee teams, and other employee involvement opportunities that were strong prior to contract transition is out of date, inaccurate, and does not have relevant information for current employees, even though these Websites remain accessible to employees. These Websites may serve as reminders to workers of activities they participated in, and may contribute, in part, to workers' belief that CNS is not as committed to safety as the previous contractor. To help gain workers' trust, CNS Y-12 should review its existing internal Webpages for ideas that it should resurrect (e.g., posting safety council meeting minutes, VPP information), or pages it should remove because information is no longer relevant.

Opportunity for Improvement: CNS Y-12 should review its existing internal Webpages for ideas that it should resurrect (e.g., posting safety council meeting minutes, VPP information), or pages it should remove because information is no longer relevant.

CNS balances rewards and discipline. It has a positive reinforcement system that includes a performance appraisal system, leadership incentive awards, and a special recognitions program. Supervisors and workers consider the CNS Y-12 discipline process to be fair, consistent, and equitable. The discipline process, documented in Y11-415, *Employee Discipline*, uses a common, graded, and progressive approach to nonegregious offenses or repeated unsatisfactory misconduct. The progression is a verbal reminder (with an active duration of 6 months). The next level, if necessary, is a written reminder (9 months) that can progress to decision making leave (DML) (1 day off without pay). The next step progresses to DML, plus 5 days off without pay (administered similarly to the DML) with an active duration of 12 months. Egregious offenses or repeated unsatisfactory misconduct can also result in immediate termination.

Immediate termination bypasses the stepped process described above. The written discipline procedure (Y11-415) also includes guidelines for discipline in 15 safety-health, conduct of operations, and security categories.

Conclusion

After initially alienating a large segment of the CNS Y-12 workforce, CNS has adjusted its leadership approach and is regaining worker trust and support. It is investing heavily in intense training classes for all employees to foster its performance excellence model, and engage employees in achieving program cost reductions and production improvements. It is working closely with leaders within the four bargaining units to ensure CNS Y-12 identifies, resolves, or elevates workers' concerns. Managers understand the challenges posed by the contract goals, but will not compromise safety to achieve those goals. CNS Y-12 demonstrates the Management Leadership expected of a DOE-VPP participant.

IV. EMPLOYEE INVOLVEMENT

Employees at all levels must continue to be involved in structuring and operating the safety and health program and in decisionmaking that affects employee health and safety. Employee involvement is a major pillar of a strong safety culture. Employee participation is in addition to the right to notify managers of hazardous conditions and practices. Managers and employees must work together to establish an environment of trust where employees understand that their participation adds value, is crucial, and welcome. Managers must be proactive in recognizing and rewarding workers for their participation and contributions. Employees and managers must communicate and collaborate in open forums to discuss continuing improvements, to recognize and resolve issues, and to learn from their experiences.

In 2012, Y-12 employees were fully aware of their safety responsibilities and looked out for their coworkers' safety. They were fully empowered to pause or stop work without fear of reprisals. The employee teams provided employees with an avenue to express their safety concerns and ensure timely resolution. They had multiple avenues for meaningful involvement in the safety and health program. While some employee teams functioned well, most could improve by emulating the more successful teams. Managers needed to emphasize employee ownership as employee teams mature.

CNS Y-12 employees have multiple means to raise safety issues and concerns. CNS prefers that workers raise the issue or question to their immediate supervisor. If the issue cannot be resolved at that level, employees are encouraged to elevate the issue through the chain of command or discuss it with one of the union safety representatives. If one of the 15 union safety representatives is not locally available, the union safety representatives continue to staff and maintain the VPP Safety Hotline, which CNS Y-12 advertises on posters across the site. Interviewed employees felt comfortable pausing or stopping work, understood the hazards and applicable controls, and knew whom to contact to resolve issues.

Employees are also involved with problem resolution through the "Q&A Connection," a communication tool available to anyone with access to Y-12's Intranet. It provides an avenue to submit questions or raise concerns through the employee concerns program or the employee suggestion program. These tools give employees the opportunity to suggest solutions to problems that managers may not know about. CNS Y-12 also provides a VPP Issues line that allows employees to identify safety issues.

CNS Y-12 has an active employee concerns program. Issues raised through the employee concerns program include many other aspects other than health and safety. Based on Team review, the safety-related concerns currently in the system did not include any indication of concern for retaliation or retribution. CNS Y-12 directs safety and health concerns to an individual within the Environment, Safety, and Health organization for investigation and resolution. That individual investigates the concern and documents the resolution in a database. If the concerned individual has provided contact information, the investigator contacts the individual with the proposed resolution and gives them an opportunity to provide feedback. The investigator could not provide the Team with any evidence from the files or the database of a concerned individual either accepting or rejecting the resolution. When employees submit a concern, they do receive an issue number, and they can use that number to log into the concerns system to determine the status of their concern. As a means of improving communications about

concerns and demonstrate that it is addressing concerns, CNS Y-12 should consider providing a monthly or quarterly summary of safety and health concerns, including the status of those concerns, through an internal newsletter, safety share, or other company communications to employees.

Opportunity for Improvement: CNS Y-12 should consider providing a monthly or quarterly summary of safety and health concerns, including the status of those concerns, through an internal newsletter, safety share, or other company communications to employees.

CNS Y-12 relies on the union safety representatives as a primary means to communicate with the site employees. It increased the number of union safety representatives from 13 to 15 members. Interviews with the ATLC union safety representatives (the primary union representatives) demonstrated that they believe their role is to represent all employees at Y-12 and not limit their attention to union personnel only. Team interviews with ATLC safety representatives identified their active involvement with multiple safety committees, including the Culture Monitoring Team, Tool Committee, As Low As Reasonably Achievable Committee, Pro-Active Safety Teams, Electrical Safety Committee, the Beryllium Steering Committee, and the Beryllium Support Group, as efforts it currently supports.

ATLC developed a Health and Safety Committee charter. The charter created a framework for the operation of the Health and Safety Committee. The charter established the committee's mission as "to the greatest degree possible, this committee will provide employees a voice to management to ensure all mechanical and physical facilities required for personal health and safety are controlled and maintained in keeping with the highest standards." The charter also defines ATLC's efforts and responsibility related to the Occupational Health and Safety Program and the Safety Committee. The ATLC leaders maintain an active tracking log for all issues raised by CNS Y-12 employees. ATLC members routinely meet with CNS Y-12 managers to keep the managers aware of developing issues that may require management attention. The ATLC member's daily interaction with the workforce also gives CNS Y-12 managers a unique insight and helps them understand program successes, and where improvements or greater communication may be required to clarify managers' intentions.

The ATLC safety representatives continue to operate the VPP safety issues hotline created by the VPP Champions Committee for all CNS Y-12 employees to use. The safety representatives meet on a regular basis with their respective managers, the deputy general manager, and the general manager to discuss safety issues and potential improvements. They also solicit input from all site employees, then record and track those safety issues to closure.

CNS Y-12 has struggled to encourage workers to participate in a BBS observation program. CNS Y-12 still maintains the "BEST" (Build Everyone Safe Tomorrows) BBS process introduced by the previous contractor, but the participation rate by employees is below 6 percent, in part due to the lack of union support for the process. CNS Y-12 continues to use the program because the CNS Y-12 safety group has determined the "BEST" software is a useful tool for developing evaluation checklists for site/facility inspections. Since the "BEST" software is licensed and funded, CNS Y-12 felt it prudent to continue to use the program.

In November 2015, the Infrastructure organization initiated the CNS Y-12 Infrastructure Proactive Safety Team (PST). The purpose of the PST is to use a proactive approach to predict and mitigate accidents/incidents before occurrence. In addition, the PST will review a select number of first aid and all recordable and lost workday injuries to determine actions required to mitigate reoccurrence. The Infrastructure PST charter requires review of three elements at each monthly meeting. The three elements are: (1) multi-discipline infrastructure review of injuries (as required by the established Injury Review Board (IRB)); (2) "Voice from the floor," which includes discussion of issues from floor level representatives and union leadership; and (3) proactive assessments/briefings to identify and eliminate potential safety issues.

The Infrastructure PST has established a multi-discipline IRB tasked with conducting post-injury event investigations using the established post-event investigation form. The goal of the investigation is to identify precursors to the incident that can help prevent recurrence. The Infrastructure PST has conducted 13 IRBs since November 2015. The security organization has also established a Proforce PST. The Proforce PST focuses on establishing strong communication between the PST and the workers, soliciting safety concerns and resolving those concerns as funding allows. Both PSTs maintain an active issues tracking log, update those tracking logs monthly, and inform workers who have identified an issue of the status of any resolution.

As a means of encouraging safe behaviors, the CNS Y-12 site manager created a safety recognition program entitled "Caught in the Act." This program provides managers and supervisors with a supply of reward certificates, labeled as a $5 award with no real cash value. People receiving these awards can use them to purchase food or drinks in the cafeteria, but do not receive cash back for purchases less than $5. The site manager's Safety Council tracks the number and value of awards given and redeemed.

Another award intended to help instill organizational pride and stimulate employee engagement is the site manager's Organization Award. CNS discovered an award plaque provided to the Y-12 site in the 1950s recognizing the site for an outstanding safety record. The site manager had the plaque cleaned up, and now awards it to a group or team that is worthy of recognition. The group retains the plaque and can display it in their work area until the site manager awards it to another group or team. The site manager uses the site manager's Safety Council to discuss and recommend potential winners.

Recognizing a need to improve employee involvement and engagement, CNS Y-12 is in the process of introducing a new program called "Top Gun." The proven success of the Top Gun program at UCOR was the basis for ATLC recommendation for adoption and use at Y-12. The full complement of Y-12 union safety representatives (ATLC, KBCTC, IGUA, and USW) was actively involved in the selection and endorsement of the Top Gun program. The Top Gun program is a people-based program and recognition process. The program's aim is enhancing the CNS Y-12 safety culture and preventing occupational injury and illness incidents by raising safety awareness and reducing workers' at-risk behaviors.

The Top Gun program works by tasking employees to complete any seven items from a checklist. The items reinforce and promote safety, safe behaviors, the five core functions of Integrated Safety Management and the complimenting Guiding Principles. The checklist contains various activities an employee can accomplish independently or as a part of their

employee team. Employees typically perform most of the activities during their usual job tasks. The employee's supervisor verifies the checklist activities to validate the employee's participation. The Top Gun Implementation Team will review the checklist every quarter to incorporate feedback from employees and then update to expand the elements listed on the checklist. The Implementation Team hopes to build a database of more than 100 activities that it can select from for the checklist each quarter. CNS Y-12 will recognize employees who complete the checklist for their first quarter with a lanyard, along with a company-sponsored quarterly lunch. Upon completion of four consecutive quarters, they will receive a participation award. Based on the program's success at UCOR and the support of the Y-12 bargaining units' leadership, the Implementation Team expects this program to improve employee involvement, but since the program had not launched prior to this assessment, the program will need time to reach its full potential.

In its efforts to demonstrate rapid cost savings at contract transition, CNS Y-12 stopped supporting several activities that previously promoted and branded the Y-12 VPP. During this assessment, CNS Y-12 managers believed they had integrated VPP into its company policies and procedures. An unintended consequence of this approach is that workers may not recognize the company's dedication to continuing VPP participation. To help workers recognize the integration of the VPP tenets into CNS' performance excellence model, CNS Y-12 should consider using the Top Gun program as an opportunity to revitalize the employees' awareness of VPP (similar to the roadmap initiative used in 2012). CNS Y-12 could periodically provide activities targeting VPP awareness as part of the Top Gun program. The revitalization of VPP would help CNS Y-12 demonstrate to the workforce the various opportunities available through VPP to assist employees to become more involved and participate in their ownership of the safety and health program.

Opportunity for Improvement: CNS Y-12 should consider using the Top Gun program as an opportunity to revitalize the employees' awareness of VPP.

CNS Y-12 has recognized how worker involvement can lead to process improvements through the VSET process (see Hazard Prevention and Control) and is trying to stimulate further worker involvement as a key step in improvements across all organizations. The Team saw several cases of workers taking the initiative to implement improvements affecting their safety in the workplace. For example, in one building used for maintenance shop activities, a worker took the initiative to organize an oil storage area. The area included organization of oil drums by type, storage of the drums on pallets that could catch leaks, and segregation of waste oils for recycling. Employees have also contributed to the design of workspaces and installation of new tools. In one case, workers were directly involved in identifying and implementing material-handling methods and controls for a new water jet-cutting machine. Employees have also identified improvements for handling and controlling many of the special materials they work with.

In one shop, beryllium contamination began to increase around equipment from a specific work process, requiring periodic cleaning and expensive sampling. SMEs, along with the operators, analyzed the possible reasons for the contamination spread. SMEs suggested walls and hard surfaces to limit the contamination and make cleaning easier. Workers recommended reducing the height of a wall to prevent interference with the process while maintaining the additional

contamination control. The resulting changes helped reduce beryllium contamination spread and demonstrated the value of the workers cooperating with SMEs and engineers to achieve process improvement and cost reductions. CNS Y-12 should continue working to solicit workers' input to identify opportunities of implementing improvements to all its processes.

Opportunity for Improvement: CNS Y-12 should continue working to solicit workers' input to identify opportunities of implementing improvements to all its processes.

In 2012, the previous contractor was using a unique approach to the employee's safety committees by intentionally establishing 176 employee teams across the site. It established the teams to involve every employee in improving the overall performance of Y-12 in all areas, not exclusively to safety. The program purposefully identified them as employee teams instead of safety teams, so the scope would not be limited to safety issues. The employee teams had the authority to address any barriers or concerns identified by an employee. If issues precluded quick resolution, employee teams had an established hierarchy to elevate those issues to the president's employee team (replaced by the current Site Managers Safety Council). The president's employee team was comprised of senior managers, most of which sponsored multiple employee teams. Team membership could be as few as two members, a management co-lead and an employee co-lead, or had upwards of 25 members. The contractor expected employee teams to meet quarterly, but some teams met more frequently based on issue resolution concerns.

After contract transition, CNS Y-12 did not maintain the employee teams' infrastructure that communicated issues to the former president's safety council, although some employee teams continued to meet. In 2016, CNS Y-12 recognized this breakdown and identified an opportunity to revitalize the employee teams. CNS Y-12 continues to progress towards that goal. It has identified 26 senior management sponsors who are in the process of designating their management co-leads and employee co-leads, points of contact, and coordinators for the individual teams. CNS Y-12 plans to roll out the revitalized employee teams in conjunction with the Top Gun initiative in July 2017. Some employee teams continue to meet, usually in conjunction with their organizational status meetings. Although the protective force previously did not have a separate employee team, interviews identified that the protective force collectively is a robust team that involves workers in safety and overall workspace improvements while awaiting formal employee team implementation.

Since taking over Y-12 operations, CNS' contractual focus on cost reductions has restricted employees' opportunities to participate in outside activities that could benefit CNS Y-12. Employees have limited participation in the Energy Facility Contractors Group and the Voluntary Protection Programs Participants' Association conferences. Participation opportunities have been primarily limited to activities that do not involve travel. In order to help stimulate additional employee engagement, CNS should find ways to share costs with DOE and NNSA and budget those costs to allow employees to participate in professional conferences or regional and national safety conferences.

Opportunity for Improvement: CNS should find ways to share costs with DOE and NNSA and budget those costs to allow employees to participate in professional conferences or regional and national safety conferences.

Conclusion

CNS Y-12 employees continue to have numerous means to raise safety issues and concerns. Management continues working closely with the union safety representatives to communicate with site employees. CNS Y-12 has increased the number of union representatives to increase that communication since 2012. CNS is working to improve employee trust and engagement, provide necessary training to managers and supervisors, and identify resources for safety improvements. It should continue its efforts to encourage and solicit employee involvement in all changes and improvements. CNS Y-12 meets the employee involvement expectations for a DOE-VPP participant.

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. Implementation of the first two core functions of the Integrated Safety Management System (ISMS), defining the scope of work and identifying and analyzing hazards, form the basis for a systematic approach to identifying and analyzing all hazards encountered during the course of work. 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 mitigating measures during work planning to anticipate and minimize the impact of such hazards.

In 2012, Y-12 had a documented system to evaluate the hazards encountered by workers at the site. Workers exhibited knowledge about the hazards in the workplace and were able to demonstrate adherence to controls that mitigated those hazards. Y-12 was working on corrective actions and improvements on work control and hazard analysis issues identified by the Defense Nuclear Facilities Safety Board in 2011. Those process improvements had not fully matured, but improvements were ongoing.

Maintenance work uses Y18-012, *Integrated Work Control Manual*, to guide the development of the dispatch, minor, and complex work packages. Work packages follow a graded approach so that less hazardous work, once analyzed, requires less hazard evaluation documentation as compared to more complex work. Detailed workflow diagrams found in Y18-012 help planners select appropriate work packages and the documents needed to complete the package.

Dispatch maintenance work, which are simple tasks, takes advantage of existing craft skills or qualifications and does not include specific work instructions. CNS Y-12 developed Y/IA-422, *List of Preapproved Dispatch Work*, which identifies over 250 preapproved dispatch scopes of work. A Dispatch Committee reviews proposed dispatch work for inclusion into Y/IA-422. Additionally, the craft must analyze the work area with a preestablished set of five questions to ensure there are no new hazards or changed conditions since the original work was planned/analyzed. The five questions also ensure the workers are working within the scope of work as approved on the dispatch. Dispatch work relies on the skill of the craft to complete the work. CNS Y-12 developed Y/A-489, *Skill of the Work Force Program*, to inventory the skills of the 14 different crafts in the maintenance department. The inventory of duties, knowledge, and skills allows planners to generate appropriate work packages. CNS Y-12 also uses this procedure to help identify craft workers' proficiency requirements.

CNS Y-12 uses minor and complex work packages depending on the hazards associated with the work and the associated risk. Procedure Y18-012 provides six criteria that restrict certain types of work from "minor work" packages. For example, critical lifts and fire-suppression degradation activities are two limiting criteria that automatically require a "complex" work package due to the potential safety risks associated with those activities. Both may have work instructions or hold points to conduct the work.

The maintenance planners improved the Maintenance Planner checklist used to walk down work. The checklist incorporates the maintenance activities' Hazard Identification Worksheet (HIW), which contains 46 hazard questions, and about half of the questions are shade colored. The shading is a visual signal/indicator to the planner that the shaded hazards have a preanalyzed control identified within the checklist. Since those hazards have been preanalyzed, if an HIW only identifies shaded hazards, that checklist becomes the JHA for that activity, becomes part of the work package's history file, and requires no further analysis. However, if a planner identifies any unshaded hazards, a formal JHA is required. Other checklist improvements include an area to record the participation of SMEs, craft, and engineers; a maintenance section for manager review; and identifying activities that are high-risk with an asterisk. The responsible planner presents work packages with high-risk activities to the Senior Review Board for approval of the hazards identified and controls selected.

Maintenance planners have experienced almost 50 percent turnover in the past 2 years. Twenty-five new planners replaced planners who had moved to higher paying positions within the maintenance organization. Because of the turnover, the maintenance organization implemented monetary retention incentives for planners who complete levels of training and time on the job. A 13-week training program qualifies new planners at the first level. Planners then progress through three more levels as they stay in the job and complete additional training. Planners complete refresher training every 2 years.

The maintenance center leader (MCL) or planning supervisor reviews all maintenance work packages (dispatch, minor, complex) monthly. Maintenance planning initiated this review process to improve the work package documentation and to provide feedback to the planners. They use an MCL checklist to review work scope, the JHA, work package performance, post-work testing, and then rate the package overall. Maintenance Execution managers also perform random work inspections using a checklist. The self-evaluations have successfully improved the quality and consistency of work packages. For example, in February 2017, the MCL completed 407 reviews with two actions identified as unsatisfactory and one action that did not identify the hazard control in the work package. The error rate in February 2017, tracked as a leading indicator for maintenance, was well below the goal of 3 percent.

The Team reviewed dispatch work, machine shops, and minor work. A dispatch work package to repair badge reader/keypads was in scope and contained the five questions to use prior to the start of work. The machine shop JHA lists the hazards and specific controls, like hearing protection with a noise reduction rating of 29 decibels, various eye protective shading for welding, and full-face respirators with P100 cartridges for a specific welding operation. The JHA did not provide or reference the analysis explaining why the control was adequate for the hazards. The JHA for janitorial services describes the control for mixing or transferring chemicals between containers as safety glasses with side-shields and nitrile gloves. The JHA did not document the analysis demonstrating that nitrile gloves protected against all the chemicals they use. By including the analysis, planners and workers will be able to recognize when work conditions have changed (i.e., higher concentration or alternative chemical) and require new analysis to determine if the selected hazard controls are still adequate.

Hazards analysis for production work involves design engineers, process engineers, system engineers, production craft, safety, IH, and radiation control, who collaborate to walkdown the

work. This group uses an HIW to identify hazards and to complete the JHA. The Team reviewed a JHA for machining depleted uranium (DU). The JHA included references to the use of hand protection. The part specification (production procedure) required the use of leather gloves with cut-resistant inserts when handling the part. The Team attended a prejob briefing for DU casting where the supervisor reviewed the JHA for hazards. The JHA identified the use of a ventilation system to control dust during the transfer of DU. The ventilation system designed for the transfer process has been out-of-service for the past 2 years. Workers now use a downdraft ventilation system, but the JHA did not specify which ventilation system to use and it did not include the analysis of the downdraft table. The JHA identified electromagnetic energy as a potential hazard, but did not include measurement or analysis of the electromagnetic hazard. In addition, workers used a welder's protective glass to view the molten metal, but the JHA did not contain the analysis that identified the correct darkness of the glass. Similar to the maintenance JHAs, the production JHAs lacked the analysis justifying that the identified controls provided adequate protection for workers. To ensure hazard analysis matches the identified scope of work, eliminates repetitive analysis, and provides a reference for future planners and SMEs, CNS Y-12 should ensure the JHAs document all analysis and assumptions regarding the hazards and ensure the analysis justifies the controls selected for all maintenance and production work.

Opportunity for Improvement: CNS Y-12 should ensure the JHAs document all analysis and assumptions regarding the hazards and ensure the analysis justifies the controls selected for all maintenance and production work.

Analysis of construction hazards begins with an engineer or subcontract technical representative documenting the project according to Y17-64-301, *Construction Work Planning*. The initial scoping walkdown occurs with various line personnel who develop a JHA with craft, construction representatives, and applicable SMEs, such as safety, IH, and fire protection. Y17-64-324, *Construction JHA Implementation*, contains instructions to complete construction JHAs. The final construction work package includes the technical drawings, specifications, and the JHA. The Team attended a prejob briefing for sprinkler head replacement. The construction supervisor thoroughly briefed the work and reviewed hazards and controls on the JHA for the applicable work that day. The prejob also included the Safety Task Analysis and Risk Reduction Talk (STARRT) cards, a standard Bechtel construction prejob briefing tool. The supervisor also took the opportunity to share experiences working around radiological hazards with the construction crew. Because of these efforts, construction personnel were aware of the hazards in their work environment.

CNS Y-12 maintains a comprehensive baseline of exposure assessments. IH data includes noise measurements, heat stress monitoring, electromagnetic surveys, and chemical exposure monitoring. The IH database contains the information and is readily available for review.

CNS Y-12 IH maintains an extensive beryllium program. CNS implemented a new Chronic Beryllium Disease Prevention Program consolidating both Pantex and Y-12. As part of its contract, CNS is still working to better integrate the program between the sites. From the 2016 Beryllium Performance Feedback/Exposure Reduction and Minimization Program Report (FY 2015) for Y-12 (the 2017 report is not yet released), there are no new cases of beryllium sensitivity or chronic beryllium disease. The IH program conducted 3,500 breathing zone samples at Y-12. An increase in decommissioning and decontamination projects at Y-12 is

further increasing the sampling requirements. The Analytical Chemistry Operations laboratory analyzed a total of 34,700 air, smears, and bulk samples for both Y-12 and Pantex. CNS Y-12 reduced the beryllium-associated areas in 2015 by 11,200 square feet in an effort to eliminate beryllium areas no longer necessary for operations.

CNS Y-12 has an effective accident investigation program in Y73-170, *Safety and Health Incident and Near-Miss Investigation and Reportin*g. CNS Y-12 is in the process of revising this document with the new title of *Incident Investigation and Reporting*. The Team reviewed the most recent accident investigation titled *Fall in Utility Pit, Old Salvage Yard, June 30, 2016,* where a worker broke his leg. The report contains detailed description of the event and pictures of the rescue performed by the fire department. The effort to document the accident with pictures soon after the event, including during the event response, gives the reader a good visual understanding of the work area. The report analyzes many factors and focuses on improvement across multiple areas. This accident was also the subject of a review by DOE's Office of Enterprise Assessments (EA). Although the action is not final, EA is limiting action to a consent order due to CNS' excellent response and investigation after the accident.

The CNS Y-12 safety and IH department conducts the facility inspection program. The department developed a prioritization system based on the activity performed within the facility. Category 1 facilities are active production/maintenance areas (annual inspection); Category 2 facilities are occasional/periodic production/maintenance areas (biannual inspection); and Category 3 facilities are administrative areas (triannual inspection). CNS Y-12 uses a detailed facility inspection checklist to complete the inspections and tracks and trends any issues. CNS Y-12 uses a variety of other inspections, such as the Senior Supervisory Watch to inspect production work; the Maintenance Management Watch to inspect work in maintenance, production, or administrative facilities; fire protection inspections; radiological surveys of areas; IH surveys; industrial safety walkdowns; and nuclear criticality inspections. CNS Y-12 conducts twice a year safety pauses to have personnel inspect its facilities and uses the union safety representatives to conduct an informal walkthrough of facilities as they interact with workers and management. Through these inspection efforts, CNS Y-12 believes it meets the DOE-VPP expectation to inspect all continuously occupied areas quarterly, but has not performed a collective analysis to validate that belief. CNS Y-12 should analyze the inspections it is performing to ensure it inspects all occupied and operating facilities quarterly per DOE-VPP expectations.

Opportunity for Improvement: CNS Y-12 should analyze the inspections it is performing to ensure it inspects all occupied and operating facilities quarterly per DOE-VPP expectations.

CNS Y-12 trends many activities and results. Some activities include facility inspections, MCL work package reviews, subcontractor construction inspections, electrical mishaps, completed JHA reviews, personnel contamination events, and many more. CNS Y-12 uses these indicators to track compliance with the Contractor Assurance System. For instance, the Radiological Manager tracks the amount of square feet decontaminated and down posted. In FY16, CNS Y-12 down posted 14,744 square feet of contaminated flooring. By reducing the number and size of contaminated areas, CNS Y-12 is hoping to reduce collective internal dose, and save on PPE and monitoring requirements.

CNS Y-12 self-identified workers were experiencing injuries from slips, trips, and falls. In response, CNS Y-12 developed slip, trip, and fall prevention training classes, including the use of a new slip simulator. The Team participated in the *Fall Prevention Training Through Kinetic Learning* offered by CNS Y-12. Union safety representatives, the instructors for these classes, gave positive motivation to engage the students. To simulate walking on a slick surface, the slip simulator has students don special overshoes and a fall protection harness to prevent an actual fall. As the student walks on the slick surface, the instructors train the student on proper walking techniques, including keeping the body weight and load balanced, adjusting the stride, and walking flatfooted rather than the normal heel-to-toe walking motion. All CNS Y-12 personnel are required to attend the training and have the option to try the slip simulator. Approximately 50 percent of CNS Y-12 personnel have completed training. Because janitors and snow removal workers are at the highest risk of slipping during winter weather, CNS Y-12 prioritized them for the slip simulator training following installation of the equipment.

Conclusion

CNS Y-12 involves planners, craft, engineers, and SMEs to identify hazards and recommend controls. Maintenance continues to find ways to improve work packages with preapproved dispatch work, improved maintenance hazards identification checklist, and work package quality reviews. JHAs in work packages identify the hazards and controls, but should include the analysis of the hazard that determined the control, or link the analysis on the JHA so it can be located. The beryllium program is robust with IH monitoring and medical surveillance. Accident investigations are detailed, and the report produces lessons learned to apply to the rest of the site. CNS Y-12 uses a graded approach to facility inspections and believes other inspections meet the intent of VPP, but has not confirmed this belief as accurate. CNS Y-12 meets the overall DOE-VPP expectations for Worksite Analysis.

VI. HAZARD PREVENTION AND CONTROL

The third and fourth core functions of ISMS - identify and implement controls and perform work in accordance with controls - ensure that once hazards have been identified and analyzed they are eliminated or mitigated. Hazards are eliminated through substitution or changing work methods, or mitigated using engineered controls, administrative controls, or PPE. Equipment maintenance 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. These rules and procedures must also be followed by everyone in the workplace to prevent, control the frequency of, and reduce the severity of mishaps.

In 2012, the use of substitution and engineered controls was evident. While the Team identified one issue regarding adherence to its beryllium procedure, the majority of observations indicated an effective hazard control process. Y-12 was addressing aging facility issues through its maintenance program while awaiting construction of newer facilities. Y-12 had implemented an excellent wellness program with measureable results and significant cost savings.

CNS Y-12 has adequate certified professionals who provide the necessary support for operations and are engaged in hazard prevention and control efforts. The safety and health and the radiological control departments have certified safety professionals, certified industrial hygienists, and certified health physicists, respectively. Interviews with workers confirmed that professionals are involved with job walkdowns and regularly visit work areas.

The nature of the work at Y-12 presents many challenges and hazards. Despite the aging infrastructure, CNS Y-12 has mitigated hazards using the hierarchy of controls. The Team found extensive examples of the use of engineered controls, substitution, administrative controls, and PPE. CNS Y-12 has been applying engineered controls on equipment it repairs or upgrades legacy equipment deficiencies (within budget constraints). For instance, recent improvements to machine shop equipment included relocating the power disconnect switch from an overhead location that required a ladder to install a lock for energy control to a convenient location at ground level adjacent to the equipment. In another example, CNS Y-12 modified a material handling process enclosure (similar to a glovebox). Regular maintenance of this equipment required disassembly of the enclosure, including removing a large metal plate. The modification installed a swingout arm for the plate that eliminated the hazard of manually removing and handling the plate. CNS Y-12 is installing smaller, modern crane control pendants that address worker concerns with the heavy and bulky crane pendants currently in use. During breakroom renovations, CNS Y-12 began using Quiet Batt™ acoustical insulation behind sheetrock walls. This insulation consists of cotton instead of more hazardous manmade fibers or mineral fibers. CNS Y-12 used worker involvement to improve processes and establish engineered controls to reduce the spread of beryllium contamination (see Employee Involvement). Finally, CNS Y-12 is replacing pallets with newer pallets that have smaller openings to remove or reduce the risk of foot and ankle injuries.

Over many years, workers in the ironworkers and riggers' machine shop noticed damage to the support surfaces on some machines from improper operation. To prevent further damage, potential injury, and unauthorized operation of the machines, CNS Y-12 installed separate key

locks on each electric powered machine. The keys, under exclusive control of the machine shop, provide positive control of the machines to prevent unauthorized use. Since the installation of the key controls, they have not found any more damage to their machines. CNS Y-12 plans to implement key control in other machines shops.

CNS Y-12 uses extensive administrative controls throughout the plant. Typical controls included signs for radiation, safety, health, and security. Hazardous areas were marked with rope boundaries and signs for hazards, such as beryllium and electricity. Other administrative controls involve equipment tags.

In one case, workers may not have been properly applying administrative controls required by CNS Y-12 procedures. CNS Y-12 has a "Do Not Use" tagging program for out-of-service/out-of-calibration equipment. The Team observed many laboratory hoods in the development building that were several months past their inspection date, but appeared to be in use because items were stored inside of the hoods. The hoods were not tagged as out-of-service although laboratory personnel stated they would have the hoods checked before use. CNS Y-12 should have identified the failure to either maintain inspections on the hoods or tag them out-of-service during regular workplace inspections, and may be an indicator of complacency in those areas. CNS Y-12 should review calibration and inspection practices in the development laboratory to ensure personnel tag out-of-calibration equipment per procedure to prevent use and ensure regular workplace inspections include verification that equipment is either calibrated or tagged out of service.

Opportunity for Improvement: CNS Y-12 should review calibration and inspection practices in the development laboratory to ensure personnel tag out-of-calibration equipment per procedure to prevent use and ensure regular workplace inspections include verification that equipment is either calibrated or tagged out of service.

CNS Y-12 uses the 2015 version of the National Fire Protection Association's (NFPA) National Electric Code Section 70E, *Standard for Electrical Safety in the Workplace.* The 2015 version (and several previous versions) of NFPA 70E requires labeling electrical equipment with an arc flash warning. Because much of the equipment predates modern arc flash labeling requirements, Y-12 legacy equipment does not have the labels. While a concerted effort to analyze and label electrical equipment is not currently underway or planned, new, renovated, and remodeled equipment does conform to this NFPA 70E practice. To offset the lack of labeling, work packages involving electrical work include arc flash analysis and prescribe the necessary NFPA 70E level of PPE. However, NPO has allowed a second prime contractor, JCI, to use its own energy control program for work at Y-12. Without the labels, JCI workers may not have sufficient knowledge of the arc flash hazards when implementing the JCI energy controls. CNS Y-12 should increase its efforts to conduct arc flash hazard analysis and label electrical equipment in accordance with NFPA 70E.

Opportunity for Improvement: CNS Y-12 should increase its efforts to conduct arc flash hazard analysis and label electrical equipment in accordance with NFPA 70E.

CNS Y-12 has a strong occupational medical program. Occupational Health Services (OHS) is continually making improvements. OHS used a VSET to streamline the physical process (including HRP) and reduced the average time to complete a physical from 4.4 to 3.3 hours. OHS employees made several suggestions to refine the process. One suggestion included the use of colored signs to allow schedulers/expeditors to determine from a distance if a clinician is available or with a patient. To reduce time away from work, OHS provides physical therapy for occupational and nonoccupational injuries to all employees. It has placed white noise generators throughout the halls for patient privacy. The facility presents a professional appearance and housekeeping is excellent.

OHS also manages a wellness program. The Health and Wellness Supervisor speaks to newly hired employees during their orientation. This effort has increased employee interest in the program. A key element of the wellness program is *Live Wise*. Under this program, CNS Y-12 maintains three workout facilities, offers classes, such as yoga and Zumba®, and a lunch and learn program. CNS Y-12 compensates employees for registration fees when participating in races or other fitness events. Typical Y-12 employee participation in most local 5K races averages 40 or more. Fitness facilities are clean, orderly, and have a trainer available. Over the life of the wellness program, about 30 percent of the population has participated in a wellness activity. In January 2017, there were 4,639 fitness center visits (a record high). CNS Y-12 offered a nutrition boot camp, meeting once a week for 5 weeks in March 2017, which filled up quickly and had a waitlist. The 5 p.m. yoga and Zumba classes normally draw 20-30 people. Recognizing the wellness program adds value and best practice, CNS is implementing a similar program at Pantex, with Y-12 personnel assisting.

The Y-12 site's location presents some unique emergency preparedness challenges. Exit routes from the plant are limited because the plant sits in a relatively narrow valley. Two main roads, one from the northeast and one from the southwest, provide access to the plant. CNS Y-12 conducts regular drills, but deems an annual site-wide evacuation drill as impractical due to the limited site access. Further, the emergency planning hazard analysis did not identify any accident scenarios that would require simultaneous evacuation from all areas of the plant. Analyzed scenarios would result in defined area evacuations, with the remainder of the plant sheltered-in-place. CNS Y-12 evaluates evacuations from various parts of the plant by conducting multiple, smaller evacuation drills. Experience from evacuations performed due to weather-related events found that geographically phased worker releases prevent traffic gridlock. CNS Y-12 coordinates with local law enforcement in these events, and regular exercises and drills have demonstrated the ability to conduct an orderly site evacuation in these cases. Interviewed employees were knowledgeable of evacuation routes and rally points for assembly in the event of an emergency and the routes are clearly marked and maintained. The fire department responds to about 150 calls per year across the facility, and they are proud of their average response time of 2-3 minutes.

The Y-12 site contains extensive ergonomic hazards. These hazards arise from the nature of the work, and the age of equipment, and are more likely to affect workers as the workforce ages. A trained member of the safety staff conducts ergonomic evaluations as part of his/her regular responsibilities and averages about 100 office ergonomic evaluations and about 20 industrial evaluations that are performed with several engineers every year. Under the previous contractor, Y-12 was using a multi-faceted approach to reduce or eliminate ergonomic hazards. Y-12 was

using a commercial software package to evaluate new equipment design before installation to identify potential ergonomic improvements. To supplement that approach, the previous contractor also developed an "Ergonomics for Engineers" training class. Although the previous contractor did not implement that training class prior to transition, CNS Y-12 could resurrect it to help engineers incorporate human factors into new or modified designs. CNS Y-12 should consider resurrecting and updating ergonomics awareness training for engineers designing or modifying processes and equipment.

Opportunity for Improvement: CNS Y-12 should consider resurrecting and updating ergonomics awareness training for engineers designing or modifying processes and equipment.

One VSET in the production organization has been successful. The VSET participants were initially skeptical about this effort, concerned that it might be another "flavor of the month." However, after participating in the effort, participants now believe in this process. Working on project locations, logical flow to minimize back tracking, and trying to decongest work areas has been a priority for them. They reduced one procedure from approximately 60 pages to 15 by eliminating steps and notes not directly applicable to their group. The modified procedure is awaiting final approval. This VSET also eliminated five steps in an inspection process that saves about 2 hours per item. The team also cleaned out and organized storage cages, and used inventory charts to show when they should order new items or remove expired items. By organizing a small storage cage shared by three workgroups, workers can find and retrieve items immediately that previously took from 5 to 30 minutes. Organizing the cage created a safer work environment by clearing walking paths and improved the process. Because of the improvements, workers replicated this initiative in another nearby cage.

This VSET identified other improvements they would like to see, including videotaping processes and better collaboration between workers and engineers on infrequent processes. Workers were encouraged by recent improvements, but want additional involvement in improving work methods and equipment upgrades.

Conclusion

CNS Y-12 uses the hierarchy of controls on hazards at CNS Y-12 with an emphasis on engineered controls for new and renovated equipment. CNS Y-12 continues to improve engineered controls with capital investments, such as contamination enclosures to control worker exposures and reduce PPE stresses. CNS Y-12 meets the Hazard Prevention and Control expectations for participation in DOE-VPP.

VII. SAFETY AND HEALTH TRAINING

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

The 2012 VPP review determined that the previous contractor had an effective training and qualification program. Personnel understood the hazards they faced on a daily basis and were capable of implementing appropriate controls. In addition, senior managers provided direction for the Y-12 training and qualification program. Managers were accountable for implementing training commensurate with the hazard levels associated with a respective employee's job assignment.

Safety and health training derives from programmatic requirements, such as 10 CFR 851 requirements, DOE Orders, and corporate initiatives. New employees receive initial General Employee Training (GET) that includes general safety and health training topics, such as ISMS and Hazard Communication.

CNS Y-12 continues to utilize the System Application and Data Products (SAP) system as its learning management software. This system has processes primarily used to manage training requirements, training courses, training schedules, bookings for training events, notifications on requirements and bookings, and qualification status for individual or groups of qualification areas (as well as by person and organization). Training scheduling and much of the reporting functionality is also readily available to anyone with a valid Y-12 computer user identification through a Web-based interface. Integration with other systems, such as badge readers, medical system, and qualification checks in key areas ensures workers are qualified to work safely before gaining access to an area.

The CNS Y-12 training program continues to represent a mature program that satisfies a variety of training objectives. The program delivers training through several different methods, including formal classroom instruction, computer-based training (CBT), and Web-based training through the SAP Database Learning Management System. Personnel may also receive on-the-job training (OJT), as well as training through informal means (i.e., employee team meetings, newsletters), including required and suggested videos and safety meetings. CNS Y-12 continues to use the compliance-training matrix (CTM). The CTM lists the primary safety-related courses required for specific jobs/functions. Supervisors working with training officers develop new employee training requirements using the CTM. Additionally, CNS Y-12 uses a job task analysis to determine training requirements beyond GET. A checklist is available for supervisors to use to evaluate additional training requirements if necessary. If qualification to work with specific hazards (e.g., beryllium or asbestos) requires a medical evaluation, the system automatically adds links to those medical screening/evaluation requirements in the worker's medical screening history. This system provides managers and supervisors the tools they need to ensure they assign only trained and qualified workers.

Managers and employees receive training commensurate with their level of responsibility. The SAP training system identifies the training requirements for each individual job or position, and

documents course completion. This is done both manually by designated training officers who administer the training database and automatically when personnel logon to online CBT.

OJT uses an established performance documentation checklist (PDC) developed directly from the associated procedure for an activity. After OJT training/mentoring, the supervisor evaluates the employee using the PDC checklist. Upon successful completion, the supervisor and employee sign the checklist and submit it to the SAP system. This approach ensures the training program demonstrates, documents, and retains OJT training proficiency.

The training working group (TWG) ensures safety and health training requirements are maintained and current. The TWG evaluates all training every 3 years to ensure training is up-to-date. The TWG reviews the applicability of training based on regulatory and process changes. The TWG uses the Training Impact form to evaluate training completeness to ensure appropriate training competency related to regulatory or procedural changes. CNS Y-12 uses a Training Impact Assessment form when it updates Y-12 procedures to establish the appropriate level of training and identify the employees that will require training based on the updates. The resulting training decision can range from no training required, supervisor/SME briefing, classroom, Web-based, or flexible continuing training.

The Team observed the CNS Y-12 training organization conduct a pilot training course for 25 CNS Y-12 employees sponsored and developed by the National Training Center and the DOE Training Institute titled, "TLP150 Safety Culture Training for Front Line Leaders." The class focused on providing tools and demonstrating how to use those tools to improve first line and mid-level managers' abilities to actively listen and communicate information in everyday discussions with the workforce. The training included multiple small group activities involving case studies designed to reinforce the tools presented throughout the training. While the training was a pilot lesson and CNS Y-12 may make additional refinements based on feedback from the class, CNS Y-12 is taking a proactive approach to improve first line managers' ability to communicate with employees.

Conclusion

CNS Y-12 continues to have an effective training and qualification program. The CNS Y-12 training program is a mature program that satisfies a variety of training objectives. Managers and employees receive training commensurate with their level of responsibility. The safety and health training derives from programmatic requirements, such as 10 CFR 851 requirements, DOE Orders, and corporate initiatives. In addition to the routine safety and health training, CNS is making investments in training managers, supervisors, and employees as part of the strategic plan implementation. CNS Y-12 continues to meet the expectations for continued DOE-VPP participation.

VIII. CONCLUSIONS

Immediately after assuming the contract in 2014, CNS began making rapid changes to several business processes that changed worker benefits without gaining worker confidence, support, or trust. This created a rift between workers and managers. In January 2016, CNS Y-12 recognized that without the trust and support of the workforce, they would never achieve the cost and performance goals established in the contract. The elevation of the chief operating officer to president/CEO marked a shift in CNS' management approach. The president/CEO is determined to focus the organization on performance excellence. Since then, CNS Y-12 has worked to unify the organization, gain worker commitment to the strategic plan, earn workers trust, and use the organizational strengths to work toward the necessary performance goals. The workforce has responded to these efforts, and the trust gap is narrowing. CNS Y-12 has many opportunities to continue fostering employee engagement and is committed to acting on those opportunities. The result of the past 12 months' efforts are tangible although the transition could have been smoother. The Team recommends that CNS Y-12 continue participating in DOE-VPP as a Star site.

Appendix A: Onsite VPP Assessment Team Roster

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