Assessment of Safety Culture Sustainment Processes at U.S. Department of Energy Sites

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Office of Enterprise Assessments
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Table of Contents

Acronyms

CNS	Consolidated Nuclear Security, LLC
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
ECP	Employee Concerns Program
EFCOG	Energy Facility Contractors Group
EZAC	Employee Zero Accident Council
GAO	U.S. Government Accountability Office
HPI	Human Performance Improvement
IAEA	International Atomic Energy Agency
INPO	Institute for Nuclear Power Operations
ISM	Integrated Safety Management
LANL	Los Alamos National Laboratory
LSIT	Local Safety Improvement Team
MSA	Mission Support Alliance
Navarro	Navarro Research and Engineering, Inc.
NNSS	Nevada National Security Site
NWP	Nuclear Waste Partnership, LLC
OLOI	Objectives and Lines of Inquiry
OREM	Oak Ridge Office of Environmental Management
ORP	Office of River Protection
PZAC	President's Zero Accident Council
RL	Richland Operations Office
SCWE	Safety Conscious Work Environment
SOC	SOC, LLC
SRR	Savannah River Remediation
SRS	Savannah River Site
TLP	Technical Leadership Program
Triad	Triad National Security, LLC
UCOR	URS | CH2M Oak Ridge, LLC
VPP	Voluntary Protection Program
VSET	Value Stream Element Team
WRPS	Washington River Protection Solutions
Y-12	Y-12 National Security Complex

Assessment of Safety Culture Sustainment Processes at U.S. Department of Energy Sites August 2018 – November 2019

Summary

Scope

This assessment evaluated eight U.S. Department of Energy (DOE) Federal field offices and associated site contractors to obtain insights into the maturity of safety culture sustainment processes. The assessment focused on the maturity of line management processes for assessing and improving safety culture at DOE sites, as well as the maturity and reliability of processes for accurately monitoring how the work environments promote safety culture.

Significant Results for Key Areas of Interest

Cultural Awareness

Emphasizing the concept of safety culture in the DOE complex has served to heighten awareness of safety, promote ongoing conversations about culture as a set of organizational competencies that influence long term success in mission accomplishment, and stimulate renewed attention to positive working relationships as the foundation for the safe performance of work. Management initiates communications so that attention to organizational factors that promote safe work performance is a vital, visible topic of discussion throughout the organization. Multiple employee-led committees and teams champion active employee identification of concerns, improvements, and effective practices. A variety of communication channels and media help shape and sustain mutually respectful relationships and collaborative engagement. The use of formal, joint management and employee groups for analyzing and resolving safety issues promotes shared decision-making and responsibility for safe mission accomplishment.

Relative Maturity of Safety Culture

DOE's ability to use culture as a management concept for continuous improvement of safe work performance is in the early stages of maturity. Two factors illustrate the bases for this conclusion:

- All assessed organizations used surveys as the primary method for quantifying safety culture improvements. In three cases, the organizations could demonstrate that their surveys had proven validity and reliability, but the remaining organizations could not. Thus, at those organizations, the validity of measurements can be uncertain and the credibility of the data not understood, reducing the reliability of decisions based on the surveys.
- When asked the question, "What does safety culture mean to you?" the great majority of responses related to worker safety. It is not evident that the term safety culture is understood to apply to the principles of nuclear safety, radiological safety, industrial safety, and environmental safety. This difference in focus limits the factors that are monitored and attended to as aids for decision making.

Federal Oversight

Safety culture is a topic of ongoing discussion between the DOE Federal field offices and contractor management. Despite familiarity with the concepts of safety culture, Federal oversight that focuses specifically on contractor safety culture with defined processes, performance objectives, and criteria, is not evident. The team found through interviews that there is a widely shared perception among DOE and contractor officials that safety culture is not an overarching contractual requirement, and that formal oversight is limited to contract requirements. Over the course of this assessment, there has been some progress toward incorporating safety culture into contract requirements.

Best Practices

The report summarizes ten best practices in safety culture sustainment. These best practices are:

- A "shared governance" model to encourage strong relationships between leadership and the workforce (such as demonstrated by URS | CH2M Oak Ridge, LLC).
- A documented description of a reliable and repeatable safety culture monitoring, analysis, and continuous improvement program (such as demonstrated by Washington River Protection Solutions).
- A formal change management model that uses evidence-based decisions to shape the direction of change and social-science based models to design the processes for sustained change over time (such as implemented by Consolidated Nuclear Security, LLC).
- An initiative that combines the principles of Technical Conscience with the human performance improvement tools described in DOE Handbook 1028 to support integrity in developing and maintaining engineering products (such as implemented by Savannah River Remediation)
- Weekly Safety/Security Shares published on an easily accessed web page, targeted toward specific hazards, with a referenced link to the applicable Mission Success Model principle, that are timely, thought-provoking, and designed to encourage dialogue among employees (such as implemented by Consolidated Nuclear Security, LLC).
- A dedicated organizational improvement department to support employee development, performance improvement, and performance assurance (such as established by Consolidated Nuclear Security, LLC, and Washington River Protection Solutions).
- A knowledge preservation management program that captures key knowledge from retiring personnel through interviews (such as implemented by Consolidated Nuclear Security, LLC).
- Adoption of elements of the 2017 EFCOG *Guide to Monitoring and Improving Safety Culture* (as used by Consolidated Nuclear Security, LLC and Washington River Protection Solutions).
- Use of Integrated Safety Management Surveillance Team results to improve management's awareness of field status, potential safety issues, and worker attitudes toward the work environment (such as those used by Mission Support Alliance).
- Inclusion of safety culture expectations into recent requests for proposals, contract clauses, and contractor performance evaluation factors (as used by the Richland Operations Office).

Findings and Recommendations

This assessment resulted in no findings. However, to enhance continuous improvement and sustainability, five recommendations are provided to support furthering the maturity of the understanding and application of the safety culture concept. Recommendations, with the responsible organizations, are:

- Use a standard framework for culture monitoring and reporting to promote consistency, comparability and credibility. (DOE Program Offices)
- Designate safety culture oversight monitors to provide an ongoing picture of cultural factors that warrant management attention and develop culture competencies among Federal staff. (DOE Program and Field Offices)
- Develop safety culture competencies throughout the organizations. (Site Contractors)
- Enhance culture assessment and learning with peer reviews. (Site Contractors)
- Implement survey techniques that will produce credible safety culture assessment results. (Site Contractors)

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at U.S. Department of Energy Sites

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health, within the independent Office of Enterprise Assessments (EA), conducted a targeted assessment of safety culture sustainment processes at multiple DOE sites. The purpose was to evaluate DOE's progress in improving and monitoring safety culture and to determine whether the maturity of the site processes is consistent with DOE expectations for continuous improvement. Also, this assessment was conducted within the context of a prior U.S. Government Accountability Office (GAO) audit recommendation for DOE to examine the maturity of assessment processes for evaluating and monitoring the work environment to continuously improve safety culture and promote employee willingness to raise safety concerns.[1]

This assessment evaluated eight DOE Federal offices and associated contractors as a sample of DOE work sites to obtain insights about the maturity of safety culture sustainment processes. The review focused on two areas:

- The maturity of line management processes for assessing and improving safety culture at DOE work sites.
- The maturity and reliability of processes for accurately monitoring the work environments' promotion of employee willingness to raise safety concerns.

This assessment also sought perspectives on and examples of improvements made in safety culture following the Department's commitments in response to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2011-1.[2]

The following sites/organizations were selected in collaboration with DOE site office and contractor management:

- Hanford Site, Richland Operations Office (RL), Mission Support Alliance (MSA)
- Savannah River Site (SRS), Savannah River Operations Office, Savannah River Remediation (SRR)
- Y-12 National Security Complex (Y-12) and Pantex Plant, NNSA Production Office, Consolidated Nuclear Security, LLC (CNS)
- Waste Isolation Pilot Plant, Carlsbad Field Office, Nuclear Waste Partnership, LLC (NWP)
- Nevada National Security Site (NNSS), Nevada Field Office, Mission Support and Test Services; Navarro Research and Engineering, Inc. (Navarro); and SOC, LLC (SOC)
- Hanford Site, Office of River Protection (ORP), Washington River Protection Solutions (WRPS)
- Oak Ridge Reservation, Oak Ridge Office of Environmental Management (OREM), URS | CH2M Oak Ridge, LLC (UCOR)
- Los Alamos National Laboratory (LANL), Los Alamos Field Office, Triad National Security, LLC (Triad).

DOE has devoted considerable attention to safety culture over the past several years. Based on observations from previous oversight activities and recommendations by the GAO, EA determined that a targeted assessment was warranted to gain insights about progress in safety culture maturity. The

[1] Department of Energy, "Whistleblower Protections Need Strengthening," GAO-16-618 July 2016
[2] DNFSB Recommendation 2011-1, Safety Culture at the Waste Treatment and Immobilization Plant, June 9, 2011

assessment was chartered to examine progress toward the Department's vision of continuous improvement in safety culture as described in DOE Guide 450.4-1C, *Integrated Safety Management System Guide*, dated September 29, 2011. Results are intended to provide conclusions and recommendations to improve management of contractor safety culture, particularly with respect to conducting self-assessments and reporting, analyzing, and acting on employee concerns as drivers of continuous improvement.

It was not the intent of this assessment to examine all programmatic or external factors that might influence a site's safety culture maturity. Maturity is a relative concept not susceptible to definitive measurement. However, used as a management "frame of reference," as illustrated in the DOE *Integrated Safety Management Guide*, Attachment 11, safety culture maturity can serve as a useful concept for examining the future potential of an organization to perform work safely under all circumstances.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms "best practices, deficiencies, findings, opportunities for improvement and recommendations" as defined in DOE Order 227.1A.

The assessment used the objectives and lines of inquiry (OLOI) from EA OLOI 30-03, *Targeted Assessment of Safety Culture Sustainment Processes Objectives and Lines of Inquiry*, and was conducted as described in the "Plan for the Office of Enterprise Assessments Targeted Assessment of Safety Culture Sustainment Processes at Multiple Department of Energy Sites," dated July 9, 2018.

DOE recommends, but does not require, a standard safety culture model and standard approaches to safety culture monitoring, assessment, and sustainment. EA's inquiry was tailored to examine how the assessed contractor organizations deal with intangible organizational and social factors. The data collection method was patterned on Rapid Qualitative Inquiry approaches using key informant interviews, supplemented with review of quantitative methods employed by contractors or DOE, and their use of analysis results to inform decision making and promote continuous improvement.[3] The EA data analysis was interpretive, choosing to "bin" the data collected into the following categories: contractor continuous improvement efforts, encompassing the three DOE safety culture focus areas of leadership, employee engagement, and organizational learning; contractor self-assessments (culture monitoring), analysis, and reporting; and Federal oversight of contractor safety culture sustainment processes. The team interviewed 546 individuals from DOE field offices and contractor organizations through a series of 213 semi-structured individual and group sessions. The team also reviewed a total of 1340 exhibits (e.g., policies, plans, procedures, presentation and training material, performance data, employee communications) provided by the assessed organizations as background information. The members of the assessment team, the Quality Review Board, and management responsible for this assessment are listed in Appendix A.

[3] Beebe, J. (2016). Rapid qualitative inquiry: a field guide to team-based assessment (2nd ed.). Lanham: Rowman & Littlefield.

3.0 RESULTS

3.1 Contractor Continuous Improvement Efforts

3.1.1 Leadership

This section of the report examines management attention to organizational alignment on key cultural factors, such as trust, open communication, and engagement, to improve safety and operations.

Safety Conscious Work Environment Support

Leaders at all sites provided Safety Conscious Work Environment (SCWE) training and asserted sensitivity to the need for a work environment that encourages employees to raise safety concerns without fear of retribution. Workers and managers interviewed across the sites expressed willingness to raise safety issues and a general belief that such issues would be addressed by current management without fear of retribution. In addition, workers, supervisors, and managers expressed that worker safety and continuous safety improvement were important, and that a "stop work" or "pause" called for a safety issue should be honored and take precedence over work schedule. Leadership development courses and new employee orientation at all sites included safety culture attributes, as well as emphasizing the importance of safety and expectations for raising safety concerns.

Several organizations faced barriers in maintaining employees' trust that safety issues would take precedence over work schedule. Two of the eight assessed organizations had experienced a change of contractors due in part to serious negative events. One other organization was still recovering from trust breaches associated with serious operational issues in the past. At two others, both DOE and long-tenured contractor personnel expressed dissatisfaction with previous management/employee relationships. The significance of these observations is that senior management of these five contractor operations were faced with environments of distrust, and they expressed that it was incumbent on them to gain trust as a precondition to improving performance.

Leadership Relationships with Staff

The senior leaders interviewed during this assessment view culture strategically, as a way of understanding the human and organizational factors that form constructive relationships, trust, and teamwork as the essential foundation for ensuring future mission success. Senior executives tended to view safety culture as a subset of organizational culture. Those interviewed devoted considerable time to affirming the strengths of the organizational culture, reinforcing values and behaviors, commending and celebrating success, and engaging organizational members in conversations about challenges and improvements. However, their culture leadership is generally informal, and leadership styles and time commitment to culture factors vary.

A major leadership theme emerged during interviews across the eight assessed sites. There was a direct and positive correlation between the degree to which senior leadership established personal relationships with members of identifiable site subcultures (e.g., craft members, union safety representatives, first line supervisors, leadership team, safety committees, and professional staff) and the level of trust between the workforce and contractor management. Where personal relationships were strong, the level of trust was high and management and the workforce were closely aligned on the importance of continuous safety improvement, fostering an environment where raising safety concerns is expected and rewarded. These positive relationships were seen at MSA, SRR, WRPS, and UCOR.

UCOR, in particular, uses a "shared governance" model to encourage strong relationships between leadership and the workforce. The concept of shared governance has been used in the healthcare field to put the responsibility, authority, and accountability for practice-related decisions into the hands of the people who will operationalize the decision. Organizational structures are established to facilitate communication and collaborative decision making at all levels of the operation, ranging from input on strategic plans to details of task performance. Management engages workforce leaders in discussions of contract requirements and budgetary decision making, in addition to the technical bases for operational decision making. Without compromising need-to-know considerations, efforts are made to help each employee understand the "Why" of their work – that is, how their tasks and products contribute to the collective processes and ultimate mission. (**Best Practice**)

A common theme in the interviews at most sites was the desire for management to spend more time in the field. Workers and supervisors alike wanted senior managers to be aware of the work being accomplished; they also wanted to get to know the senior managers, develop relationships with them, and hear what was on their minds. Seven of the eight organizations implement some form of a program to stimulate management's engagement with workers in the field. One is the CNS "Floor Time" process, which is designed to increase senior directors' interaction with employees in their work environment to improve trust. The primary role of floor time is engagement and communication with the workers, and the amount of time that each senior manager spends on the floor is tracked. Another example is the WRPS management observation program. It provides a process for promoting management presence in the workplace for coaching, mentoring, reinforcing company values, and building trusting relationships.

Leadership Processes to Monitor Safety Culture

With respect to line management processes for assessing and improving safety culture, a few organizations demonstrated significantly greater maturity than the others. For example, WRPS has a formal, well defined, and documented safety culture program in place. Its safety culture sustainment plan effectively describes the key elements of its safety culture monitoring processes, consistent with the three safety culture focus areas developed by the Energy Facility Contractors Group (EFCOG) and examined in this assessment: leadership, employee engagement, and organizational learning. The safety culture improvement team selects improvement opportunities. WRPS has recently focused on two initiatives: proceeding in the face of uncertainty, and workforce civility. The assessment team considers WRPS's documented description of a standards-based, reliable, and repeatable safety culture monitoring, analysis, and continuous improvement program to be a **Best Practice**.

Because CNS and UCOR have conducted multiple, credible safety culture surveys of the workforce, they have a basis for tracking and trending progress in the areas of leadership, employee engagement (including willingness to raise safety concerns), and organizational learning. Some contractors have established key performance measures for safety culture; other contractors have no specific repetitive measures for assessing safety culture but consider it to be inherent in their safety performance, integrated safety management (ISM), and organizational culture.

Contract Transition

The team assessed three sites that were approaching contract transition (SRS, Hanford (RL and ORP), and Oak Ridge Reservation), and two sites that had recently undergone contract transition (LANL, NNSS). At three sites, aspects of the contract transition reduced the workforce's trust due to inadequate communications, perceived (or real) reduction in benefits, or perceived loss of work scope and reduction in force. At the sites approaching contract transition, the interviews showed that these potential impacts are of concern to the workforce. Both at sites approaching transition and sites that had recently undergone transition, leadership was aware that these concerns can cause distraction, potentially

producing negative effects on safety performance and safety culture if the contract transition is not carefully managed.

When questioned about addressing safety culture as part of due diligence during transition to assume management of their existing contract, no current contractors addressed culture sustainment during their transition. Only Triad asserted attention to culture on assumption of contract management; in that case, culture improvement was specified as part of the contract. Of the other sites, only one undergoing imminent contract change was making plans to address safety culture during the transition.

Conclusions

At all sites, leaders expressed the expectation that a "stop work" or "pause" would be honored and take precedence over work schedule. The assessment team noted that a shared governance model encourages strong relationships between leadership and the workforce, increasing trust. Among line management, only one organization (WRPS) excelled in assessing and improving culture through the use of a formal, documented safety culture program.

A common theme in interviews was the desire for management to spend more time in the field in order to strengthen relationships between leaders and workers. The team found examples of contract transition reducing the workforce's trust, and interviews at sites approaching contract transition showed that loss of trust was already of concern to the workforce. Leadership is aware that this concern can negatively affect safety performance and safety culture, but only one site where contract change was imminent was making plans to address safety culture during the transition.

3.1.2 Employee Engagement

DOE Guide 450.4-1C identifies four attributes of employee engagement: personal commitment to everyone's safety, teamwork and mutual respect, participation in work planning and improvement, and mindfulness of hazards and controls. This section of the report identifies efforts that organizations have undertaken to enhance employees' understanding of safety culture and to increase their engagement in improving mission operations. These efforts include opportunities to participate in improvement, formal communications on the topic of safety culture, the employee concerns program, and others.

Employee Commitment to Safety

Most employees express strong personal commitment to ensuring the safety of their fellow workers. There was a widespread assertion that individuals at all levels have no fear of stopping work if they feel unsafe or are unsure due to unexpected conditions. In addition, there is widespread agreement that workers are motivated to actively participate in identifying and controlling hazards so as to perform work correctly and mitigate harm if the unexpected occurs.

When asked the question, "What does safety culture mean to you?", the great majority of responses related to worker safety, and the monitoring data presented by contractors focused on worker safety. These facts indicate that DOE's institutional understanding of safety culture has not yet matured to embrace a broader definition of safety culture that involves not only such fundamental issues as design, operating parameters, and technical knowledge and experience, but also organizational and social pressures for production over safety.

Employee Participation

At all sites, workers take part in safety discussions, and participate on safety committees and teams, such as Voluntary Protection Program (VPP) teams, zone safety committees, and Employee Zero Accident Councils. Programs exist for workers to participate in problem-solving teams that focus on removing hazards, barriers, eliminating frustrating circumstances, and/or improving the quality, safety, and efficiency of their work; these programs include Lean process improvement, Local Safety Improvement Teams (LSITs), and Value Stream Element Teams (VSETs). Discussions of mistakes, failures, close calls, accidents, and incidents focus increasingly on problem solving rather than on blaming individuals. This focus encourages workers to communicate more fully about such incidents and how to better prevent future occurrences. Positive and negative feedback is valued and shared.

The approach to procedure management at WRPS is an example of reinforcing safety culture via work management systems that facilitate employee participation and improvement. WRPS transformed its procedure review and procedure change request process to an electronic approach and reorganized procedure writers into a shared resource pool. These changes allowed the procedure group to respond to procedure change requests within 30 minutes during work hours and within one hour during off hours for the next day's attention. Interviews showed that these improvements have helped shift the attitude of procedure users, who are now willing to stop and get clarification when needed.

CNS uses formal, social-science based change models and tools to design the processes for change, with multiple inputs to identify change opportunities. Members of workforce sectors most affected by a change develop collaborative improvement teams, supported by management and supplemented with subject matter experts as appropriate, to construct, implement, and sustain change interventions. (**Best Practice**)

The assessment team noted that mechanisms for engaging the professional staff/subject matter experts are not widely visible, nor were such mechanisms often mentioned compared to craft personnel. An exception is the SRR engineering organization's Technical Conscience initiative, which uses the principles of the Institute for Nuclear Power Operations (INPO) guidance document, *Principles for Maintaining an Effective Technical Conscience*. That document discusses the "attributes necessary to ensure ethical and effective technical support during the operation, maintenance, and modification of nuclear power plants." The SRR engineering organization combines these principles with the human performance improvement (HPI) engineering tools described in DOE Handbook 1028, *Human Performance Improvement Handbook*, to support the highest integrity in developing and maintaining engineering products. (**Best Practice**)

The team found that although workers at all assessed sites have multiple avenues to participate in safety improvement, feedback to employees on the status of resolving concerns is not always timely or adequate. Communications (vertically and horizontally) are usually deemed adequate, but miscommunication and failures to relay information still occur. In a few cases, both senior executives and workers stated in interviews that middle managers are not as receptive to and supportive of efforts to involve/engage employees as other levels of management.

Communications with Employees

Contractors use a diverse portfolio of communication media to facilitate information sharing, including traditional print media, electronic media, and social media. Corporate communications address internal and external communication, inclusive of media and community relations. Formal communication processes are used for socializing safety culture principles and translating them into practical application.

Some sites use pocket references on safety culture principles and ISM for work support and culture reinforcement. CNS publishes weekly Safety/Security Shares on the OneSource Home Page targeted toward specific hazards, with a referenced link to the applicable Mission Success Model principle; these are timely, thought-provoking, and designed to encourage dialogue among employees. CNS also makes an effort to publish and discuss Quality Shares in weekly site staff meetings that also reference applicable principles. (**Best Practice**)

Employee Concerns Program

The employee concerns program (ECP) is a vital element of employee engagement. All sites have functional ECPs in place to provide both formal and informal avenues for employees to raise concerns in an open and supportive environment without fear of reprisal. Multiple mechanisms (formal and informal) are available for reporting safety concerns, usually with anonymity if employees prefer. Contractor and Federal ECP managers attempt to resolve issues informally before they become concerns.

The DOE directive setting out the requirements for DOE and contractor ECPs was revised in January 2019. The 2019 revision, DOE Order 442.1B, *Employee Concerns Programs*, Att. 1, *Contractor Requirements Document*, had not yet been incorporated into the contracts at the time of the onsite portion of this assessment. Interviews indicated that some contractors will need to make changes under the new order, because the current use of assessments and self-assessments for ECPs is inconsistent with the new direction.

Conclusions

There is widespread agreement that workers are motivated to actively participate in identifying and controlling hazards. When asked the question, "What does safety culture mean to you?" the great majority of responses related to worker safety, and were not inclusive of nuclear safety, radiological safety, industrial safety, and environmental safety. At all sites, workers are engaged in safety discussions, safety teams, and programs to remove barriers to success and contractor leadership uses a variety of communication media to share information and socialize safety culture principles. However, feedback to workers on the status of concerns is not always timely or adequate. All assessed sites have functional ECPs in place for employees to raise concerns without fear of reprisal. Based on interviews, some contractors will need to make changes to their ECPs once DOE Order 442.1B is incorporated into their contracts.

3.1.3 Organizational Learning

This section of the report identifies future improvements planned and/or under way to sustain positive cultures that promote the safe accomplishment of mission goals, highlighting some approaches to organizational learning observed in practice and citing selected examples. Section 3.2 of this report addresses in detail a major aspect of organizational learning: operating contractor self-assessments (culture monitoring), analysis, and reporting.

Formal Training

All contractors have seen the need for focused leadership development through in-house training or by partnering with local colleges/universities, allowing more in-depth discussions of culture as a topic for leadership focus. First line leader development is increasingly a matter for priority attention. All contractor organizations use some type of "reach back" arrangements with parent companies, often leveraging their parent companies' leadership training modules. All organizations reference the National

Training Center technical leadership program (TLP) series of safety culture courses as baseline awareness training for their organizations.

Enculturation of new employees begins with efforts to recruit individuals who have the knowledge, skills, relevant work experience, and personal characteristics to support them in completing work safely. Safety culture education continues with providing material in new employee training and revisiting it in annual general employee training refresher training.

Performance Improvement

Two sites have shifted from traditional "training" programs to competency development, performance monitoring, and performance support. One example is the CNS Performance Excellence Office, which combines all major aspects of performance monitoring and improvement within a single office. Functions include performance assurance, training, HPI, safety culture support, and organizational change management. Additionally, at WRPS, the Organizational Performance Improvement organization leads, directs, and coordinates activities to ensure that WRPS attains goals, special emphasis actions, and performance-based incentives. This organization is responsible for training, core procedures, Lean management, contractor assurance, the conduct-of-operations program, and HPI. (**Best Practice**) A philosophy common to both sites is a recognition that performance improvement is a function of learning, and that cognitive, behavioral, and social-science techniques for analysis and improvement must be a part of a holistic approach.

All contractor organizations use the DOE HPI program concepts to varying degrees. Recent trends are to customize HPI training for specific disciplines (e.g., operations, engineering, maintenance) and to reinforce concepts and tool use with practical application scenarios and hands-on HPI laboratory simulations.

Knowledge Management

All sites are losing senior, experienced workers to retirement. Management and workers across the assessed sites highlighted as an issue the need to collect and preserve the history, knowledge, and experience these workers possess. To the extent possible, some contractors are attempting to be proactive by hiring, training, and developing personnel based on projections of future needs instead of reacting to vacancies as they occur. Most contractors address this issue via workforce development programs, and also through increased attention to continuous effectiveness review and revision of documented systems and work processes. LSITs and VSETs provide the principal opportunities for employees to influence procedures, in addition to employee reporting and lessons-learned systems.

Y-12 initiated a knowledge preservation management process in 2004 to capture key knowledge through interviews with retiring personnel. This process has proven to be quite efficient and is among the most mature knowledge-capture processes EA has observed. It now includes knowledge capture from subject matter experts from support areas in addition to technical critical skill areas. The underlying safety components and safety culture aspects in place are also being captured and will serve to convey the longstanding safety culture strengths to a new generation of workers. (**Best Practice**)

Benchmarking

Several organizations have benchmarked selected industry processes to proactively identify successful organizations and seek improvement opportunities. All contractors participate in EFCOG, which provides opportunities for benchmarking and sharing of good practices. Two of the contractors assessed (CNS and WRPS) explicitly adopted elements of the 2017 EFCOG *Guide to Monitoring and Improving*

Safety Culture, including a Culture Improvement (Monitoring) Team, performance indicators, work environment improvements, and culture communication. (**Best Practice**)

Conclusions

Several efforts promote organizational learning through ongoing and future improvements in safety culture for the contractors that implement them. All organizations reference the National Training Center TLP series of safety culture courses as baseline awareness training for their organizations. First line leadership development is increasingly a priority within the contracting organizations. Two organizations have shifted from traditional training programs to competency development, performance monitoring, and performance support. In particular, two organizations have a dedicated organizational improvement department to support employee development, performance improvement, and performance assurance.

All sites are losing senior, experienced workers to retirement. The knowledge preservation management process at Y-12 captures key knowledge from these personnel through interviews, and serves as a means of passing down the longstanding safety culture to a new generation of workers. All eight contractors participate in EFCOG, and two of the eight assessed contractors have explicitly adopted elements of the 2017 EFCOG *Guide to Monitoring and Improving Safety Culture*.

3.2 Contractor Self-assessments (Culture Monitoring), Analysis, and Reporting

This section of the report identifies the maturity and reliability of processes for accurately monitoring the work environments' promotion of employee willingness to raise safety concerns. The comparative frames of reference used in this assessment were primarily the criteria and recommendations from reports by EFCOG (2015) and the International Atomic Energy Agency (IAEA) (2016) on how to obtain reliable and credible safety culture assessment findings.[4]

Culture Monitoring and Contractor Assurance Systems

Mature organizational cultures exhibit active and systematic monitoring of performance through multiple means that align with the intent of DOE guidance in DOE Guide 226.1-2a, *Federal Line Management Oversight of Department of Energy Nuclear Facilities* (April 14, 2014), and the 2017 EFCOG *Guide to Monitoring and Improving Safety Culture*.

The DOE contractor assurance system is the primary means of contractor performance monitoring, and an extensive variety of safety-culture related data sources exists among the assessed organizations. However, most of the available data sources are not organized or well-analyzed with regard to safety culture, so their ability to provide leading indications of future success or potential performance decline is limited.

Employee-led Safety Teams

Three contractors (MSA, WRPS, and UCOR) encourage the assignment of employees to designated employee-led safety teams, with the goal of promoting both vertical and horizontal communication that includes the organizations' president/general managers and voluntary worker engagement. Employee-led safety teams can provide senior management with direct insights into workforce cultural norms, changes in safety culture, and positive developments or concerns, as well as workforce input for improvement.

[4] The EFCOG guidance documents incorporate lessons learned from the commercial nuclear utility experience, including IAEA, INPO, and the Nuclear Regulatory Commission, as well as the DOE 2014 independent SCWE self-assessments.

For example, MSA implements 41 Employee Zero Accident Councils (EZACs) and the President's Zero Accident Council (PZAC), which is chaired by the MSA President and includes the executive leadership team and EZAC chairpersons. The PZAC also meets monthly to communicate successes and weaknesses, address issues elevated by the EZAC, and drive performance improvements. In addition to the EZACs, MSA has ISM Surveillance Teams that continually monitor safety culture factors through field information/feedback from ongoing mentoring and analysis activities. A team of subcontracted technical experts and MSA bargaining unit members conducts focused interviews, work performance evaluations, and mentoring of the EZACs and provides feedback to MSA management. The ISM Surveillance Teams address such items as safety culture attributes, value-added work activities, and improvements (both under way and needed). MSA uses ISM Surveillance Team results to improve management's awareness of field status, potential safety issues, and worker attitudes toward the work environment. **(Best Practice)**

Star Level Voluntary Protection Program

"Star" level VPPs are characterized by a documented VPP program description, management champion, VPP core teams to unify a site's multiple VPP organizations, periodic VPP surveys of the workforce (addressing leadership, employee engagement, and organizational learning), behavior-based safety observations involving peer-to-peer feedback with trained volunteer employees, and incentives for desirable behaviors. Five of the contractor organizations covered in this assessment maintained VPP Star status, and all but one of the others were seeking Star status. The VPP allows successful employee engagement with safety issues and was frequently cited as a core component of safety culture within the organizations. The VPP core teams, behavior-based safety observation data, and VPP surveys are sources of data that can be monitored for safety culture.

Employee Issue Reporting Systems

All organizations maintain some type of employee issue reporting systems, but they vary significantly in method of input and transparency. Some reporting-system characteristics that employees identified as effective include ease of use, self-identified or anonymous reporting capability, and communication of management response to all entries indicating disposition or status. Navarro employees proudly exhibited an "EASY BUTTON" on their web home page that provides a quick and effective means of entering any employee comment, suggestion, issue, or concern (self-identified or anonymous). A posted tracking system allows all employees to access all reported entries and disposition status. Additionally, SRR has positioned kiosks throughout work locations within each SRR facility; these provide an electronic issue entry mechanism for all SRR employees to identify issues or concerns, anonymously if desired. Employees who submit non-anonymous entries can check the status of management responses from their computers. SRR reviews and evaluates new entries weekly and tracks kiosk entries and management responses, providing a useful performance indicator for monitoring safety culture.

Analysis and Reporting

All sites in this assessment use dedicated groups of data analysis professionals to analyze collected performance data and communicate results to senior management. For example, the monthly CNS safety metrics showed a growing adverse trend throughout 2018, with a distinct reversal in the October statistics. The Performance Excellence organization was actively analyzing this trend during the assessment period and had hired analytical experts to improve the data analysis capability. Additionally, there is evidence that site contractor management is appropriately acting on reported information. For example, SRR identifies the lowest performing areas on the President's Watch List for increased management attention. SRR's suite of metrics was the most extensive and included a subset of "Nuclear Safety Culture Indicators" consisting of 22 metrics addressing each of the three safety culture focus areas. Federal

oversight personnel reported overall satisfaction with the transparency of contractors' performance measurement data.

Safety Culture/Safety Conscious Work Environment Surveys

All of the assessed sites have performed multiple comprehensive culture surveys of their workforce since 2012. Surveys are one source of data for larger assessments that consider multiple data sources when drawing conclusions about safety culture. Site leadership was supportive of these efforts and used safety culture assessment results to develop changes that have led, or are intended to lead, to improvements. For example, NWP followed up its 2017 survey by implementing strategies to address four areas of weakness identified by the survey: demonstrating management commitment, improving training at all levels, providing accountability, and promoting supervisory leadership. Additionally, UCOR and CNS followed almost all the steps that EFCOG and IAEA recommend for obtaining credible safety culture assessment results. However, the methods the other sites used for their most recent assessments were not as sound.

Almost all sites invited all their employees to complete their culture surveys, resulting in a sufficiently large survey sample. However, in most cases the survey response rate was below the IAEA recommended minimum response rate, so the results may not have been representative of the entire workforce; those who chose not to participate may have substantially different views from those who responded. For its 2017 survey, UCOR and its subcontractors had an overall response rate of 68%, the highest rate the assessment team observed. Although this rate is close to the IAEA recommended minimum response rate of 70%, the response rates for 7 of the 19 subunits were below 50%, so the findings from these 7 subunits cannot be assumed to represent the views of all the employees in those groups. In contrast, CNS had a slightly lower overall response rate to their 2015 survey (65%), but only one of 14 subunits had a response rate significantly below 50%, providing more confidence in the accuracy of the results. The remaining contractors typically had an overall survey response rate of 50-60%. Interviews indicated that several of those responsible for conducting the surveys were not aware of the standards for acceptable response rates and thus had no strategies in place to increase the response rates on future surveys.

For the sites with the higher response rates, the employees were assured that their survey responses would be confidential and that no one in their organization would have access to the raw data. These sites were able to provide this assurance because they used an external survey provider and asked employees to respond by mailing or directly handing the survey back to the external survey provider, or by completing the survey electronically on the survey provider's website. For the contractors with the lowest survey response rates, the surveys were conducted by the contractor itself, reducing assurance that the responses would be confidential.

Three organizations were able to provide statistics demonstrating that their surveys had proven validity and reliability. Reliability is the extent to which survey participants would answer the questions the same way if they took the survey multiple times. Validity is the extent to which an instrument actually measures what it is intended to measure. The other organizations were unable to provide any statistical evidence for judging their survey instruments' validity and reliability.

The 2015 culture survey conducted by CNS was the only one reviewed that provided any evidence concerning the extent of convergence in the results obtained from analyzing multiple sources of information about its culture. CNS found convergence around six themes. Convergence of data from the survey, written survey comments, focus groups, and interviews provides greater confidence in the validity of the findings; when there is divergence, more evaluation may be needed to understand the issue. Three other sites included qualitative data as part of their safety culture assessment. Two of these sites included data from surveys, interviews, and focus groups, and one site included data from surveys and focus

groups. However, these three sites had no documentation describing their analytical methods and did not report whether or not they found convergence between their qualitative and quantitative results.

All but one site included multiple questionnaire items (questions or statements for response) to assess SCWE in their most recent report. Of the sites that included questions about SCWE, all reported that 69% - 95% of their employees felt they could raise a safety concern without fear of retaliation or some type of negative consequence, but only two reported on why some employees might fear retaliation. This fear is a sentinel indicator of an organization's safety culture. The 2015 CNS survey sorted responses by organizational categories (e.g., payroll status, department) to determine where fear of retaliation is more prevalent. In addition, CNS identified themes in employees' statements about their fear of retaliation (either during focus groups or in written survey comments) to help organizational leaders understand the sources of such fears and why they exist. The 2017 survey conducted by UCOR was similarly detailed.

Conclusions

Employee-led safety teams, the VPP, and employee issue reporting systems provide multiple data sources for contractor organization insights into the level of trust, openness, and engagement among employees. The assessment team found that contractor management is acting appropriately on the information they have. However, the data related to safety culture is generally not well organized and is sometimes not well analyzed, limiting the organization's ability to use it to improve safety and operations.

Regarding safety culture surveys, the overall approach for self-assessment of SCWE across most of the sites did not provide for consistent application of assessment methodologies and was not designed to ensure validity and credibility. The wide variation in the quality and balance of methodologies and analysis of results significantly undermines the conclusions of many of the self-assessments, similar to the findings of the 2014 independent oversight assessment report, *Independent Oversight Evaluation of Line Self-Assessments of Safety Conscious Work Environment*.

3.3 Federal Oversight of Contractor Safety Culture Sustainment Processes

This section of the report identifies the assessed DOE organizations' efforts to understand and use cultural insights to improve and sustain mission operations, and to conduct Federal oversight of safety culture consistent with DOE Guide 226.1-2A, *Federal Line Management Oversight of Department of Energy Nuclear Facilities*.

Safety Culture and Federal Oversight

DOE senior executives said that their primary focus on safety culture was to support contractors' mission success by encouraging and monitoring their initiatives for improvement. Federal staff at all assessed sites reported that they work along with contractor management to achieve the mission, and they are generally aware of contractor initiatives to monitor and improve the safety culture of the contractor organization. At several sites, Federal staff stated that safety culture is a part of ISM and that everything has an aspect of safety culture to it, and some Federal oversight staff stated that they are attentive to safety culture while performing their oversight tasks. Facility Representatives at one site commented they seek to be attentive to safety culture during their oversight activities and have mechanisms for sharing observations, even though they do not formally capture observations on safety culture. At RL, DOE management indicated that they were aware that oversight personnel were not "particularly comfortable" in attempting to perform direct oversight of safety culture, and RL has initiated specific safety culture oversight training for staff. However, despite familiarity with the concepts of safety culture and interest

in continuous improvement, Federal oversight focused specifically on contractor safety culture, with defined processes, performance objectives, and criteria, is not evident across the DOE complex.

Safety Culture and Contracts

Federal staff report feeling limited by contract provisions in their oversight of safety culture. When questioned about sustaining progress in safety culture over future contract transitions, DOE senior managers expressed that without specific contract expectations, there is no mechanism for ensuring that improvements in safety culture achieved during past contracts would be sustained. A working group of the DOE Safety Culture Improvement Panel recommended including safety culture clauses in contracts. Several contract re-competitions throughout DOE have established new contract expectations for safety culture (i.e., in Requests for Proposals, contract clauses, and contractor performance evaluation factors), thereby providing the necessary contractual bases for the Federal oversight process to include safety culture. Such a clause was included in the LANL contract awarded in 2018. Furthermore, RL has included innovative language in its final 2019 Hanford Mission Essential Services Contract Request for Proposal regarding "adoption and continuous improvement" of organizational culture. **(Best Practice)** Interviews with RL staff indicated that this approach is intended to preserve the success factors of the existing culture while giving the new contractor time to study the cultural norms before attempting to drive improvements.

Conclusions

Although DOE field offices perform varying levels of informal or indirect oversight of safety culture, none of the field offices have an adequately defined approach to safety culture oversight. Development and implementation of safety culture oversight processes are not evident. The recent inclusion of safety culture expectations in Requests for Proposals, contract clauses, and contractor performance evaluation factors represents a step forward in addressing this issue.

4.0 BEST PRACTICES

A best practice is a safety-related practice, technique, process, or program attribute observed during an appraisal that may merit consideration by other DOE and contractor organizations for implementation because it: (1) has been demonstrated to substantially improve safety or security performance of a DOE operation; (2) represents or contributes to superior performance (beyond compliance); (3) solves a problem or reduces the risk of a condition or practice that affects multiple DOE sites or programs; or (4) provides an innovative approach or method to improve effectiveness or efficiency.

- A "shared governance" model to encourage strong relationships between leadership and the workforce (such as demonstrated by UCOR).
- A documented description of a reliable and repeatable safety culture monitoring, analysis, and continuous improvement program (such as demonstrated by WRPS).
- A formal change management model that uses evidence-based decisions to shape the direction of change and social-science based models to design the processes for sustained change over time (such as implemented by CNS).
- An initiative that combines the principles of Technical Conscience with the human performance improvement tools described in DOE Handbook 1028 to support integrity in developing and maintaining engineering products (such as implemented by SRR)
- Weekly Safety/Security Shares published on an easily accessed web page, targeted toward specific hazards, with a referenced link to the applicable Mission Success Model principle, that are timely,

thought-provoking, and designed to encourage dialogue among employees (such as implemented by CNS).
- A dedicated organizational improvement department to support employee development, performance improvement, and performance assurance (such as established by CNS and WRPS).
- A knowledge preservation management program that captures key knowledge from retiring personnel through interviews (such as implemented by CNS).
- Adoption of elements of the 2017 EFCOG *Guide to Monitoring and Improving Safety Culture* (as used by CNS and WRPS).
- Use of ISM Surveillance Team results to improve management's awareness of field status, potential safety issues, and worker attitudes toward the work environment (such as those used by MSA).
- Inclusion of safety culture expectations into recent Requests for Proposals, contract clauses, and contractor performance evaluation factors (as used by RL).

5.0 RECOMMENDATIONS

The following recommendations are provided to leverage progress in using the concept of safety culture to improve safe work performance. The goal is to promote DOE program-specific sustainment of cultures as strategic assets through formalized learning, combined with culture monitoring and analysis, to support evidence-based decision making. DOE organizations and site contractors should evaluate the applicability of the following recommended actions to their respective facilities and/or organizations and consider their use as appropriate, in accordance with Headquarters and/or site-specific program objectives.

DOE Organizations

- **Use a standard framework for culture monitoring and reporting to promote consistency, comparability, and credibility.**
    - Make decisions about specific safety culture contract language and performance metrics within the purview of program offices.
    - During contract transitions ensure that new management contractors exercise due diligence in assessing and understanding existing organizational cultures in order to sustain and continuously improve, based on the strengths and unique site cultural characteristics that have enabled past mission success.
    - Set expectations for the validity and reliability of survey design, administration and analysis, and qualification of individuals who interpret survey results.
    - Encourage the use of the EFCOG safety culture guidance.
- **Designate safety culture oversight monitors and develop culture competencies among Federal staff.**
    - Each DOE field oversight organization should appoint a safety culture oversight monitor with responsibility for integrating data from assessments into the above referenced framework in order to provide an ongoing picture of cultural factors that warrant management attention.

- DOE Headquarters and field elements should develop culture competencies among federal staff so that they incorporate cultural awareness into their management and oversight responsibilities.

- The Federal Technical Capability Panel should evaluate and develop or update as appropriate knowledge, skills, and abilities for monitoring safety culture in technical qualification standards and supporting training courses.

Site Contractors

- **Develop safety culture competencies throughout the organizations.**

  - DOE contractors should develop safety culture competencies throughout their organizations, commensurate with employee technical and leadership roles. Specific competencies should be defined for monitoring, acquiring, and analyzing qualitative and quantitative culture data; designing, implementing, and evaluating culture-influencing interventions; and managing change.

- **Enhance culture assessment and learning with peer reviews.**

  - DOE contractors should implement a collaborative peer review approach for culture assessment and improvement.

- **Implement survey techniques that will produce credible safety culture assessment results**

  - DOE contractors should use survey questions with proven validity and reliability

  - DOE contractors should conduct focus groups, work observations, or other qualitative data gathering and analyze for convergence with the survey results.

Appendix A
Supplemental Information

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