National Institute of
Environmental Health Sciences

The U.S. Department of Energy Integrated Safety Management System and Safety Culture Initiatives

A DISCUSSION PAPER

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Executive Summary

The U.S. Department of Energy (DOE) is a large federal agency with a diverse mission, including weapons activities, energy research, environmental cleanup, and waste management. The DOE is currently made up of approximately 15,000 federal employees and 90,000 contractors working in the headquarters (HQ) office in Washington, D.C. / Germantown, Maryland, and in 85 facilities around the country. The organization is made up of programs under three principal offices: 1) Nuclear Energy (which includes the National Nuclear Security Administration (NNSA)); 2) Science and Energy (includes the national labs); and 3) Management and Performance (includes the Office of Environmental Management (EM) and the Office of Health, Safety and Security (HSS)). The Office of Enterprise Assessments is another smaller program that plays an important role with regard to worker safety.[1] The broad scope and complexity of the work performed throughout the complex, the mixture of new technologies along with the ageing assets, the unique management structure of the department as "regulator" and operator, the frequent changes in leadership, and the potential loss of institutional memory are all factors that make the safe conduct of operations an ongoing challenge.

With all these challenges ahead it is essential that the DOE as a whole, along with all the sites and contractors, become learning organizations that aren't reacting to the next crisis but rather questioning and attempting to strengthen areas of vulnerability before something bad happens. To this end, the very committed workforce throughout the complex should not be considered as the problem to be fixed but rather an essential source of expertise.[2]

Recent independent safety culture assessments of five DOE sites and two DOE HQ offices (EM and HSS) indicate signs of a work environment where questioning attitudes are not encouraged and where the perception is that the desire to "get the job done" is prioritized and incentivized over safety. It is also apparent that the atmosphere at several sites appears to be far less than ideal for listening to safety concerns or being responsive to safety issues. Some suggest that leadership "talk the talk but don't walk the walk" and that although multiple mechanisms exist for reporting safety concerns and even for stopping work, the workforce is reluctant to use these mechanisms for fear of retaliation or out of frustration with the time it takes for problem resolution.

The DOE, partially in response to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2011-1, has begun efforts to assess the safety culture of sites around the complex, take actions to introduce and instill the concept of a safety conscious work environment (SCWE) at HQ and at the sites (in part by conducting SCWE training throughout the complex and with workers at all levels), and to provide assistance to the sites in improving safety culture (through the efforts of the Safety Culture Improvement Panel (SCIP)). As these efforts continue, the following comments/recommendations should be considered:

1. All work related to safety culture should come from the top down as well as the bottom up. While many express the attribute of "worker engagement" or "worker involvement," this does not seem very apparent at any level in attempting to understand the problems or in defining the best way to improve.
2. SCWE training, while covering some very important information, seems to be treating a symptom rather than attempting to cure the "disease," as it is narrowly focused on the issue of reporting without fear of retaliation. It should be noted that SCWE is only one attribute of safety culture. Simply informing workers of their rights and

1 U.S. Department of Energy. 2016. Fiscal Year 2015 Annual Performance Report. DOE/CF-0145. Available: *http://energy.gov/cfo/downloads/fy-2015-annual-performance-report* [accessed 4 October 2016].

2 Sidney Dekker suggests, "We need to transition from seeing people as a problem to control, to seeing people as a solution to harness," to make his point that management needed to listen to the workforce in making safety improvements. Dekker S. 2015. Safety Differently: Human Factors for a New Era. 2nd ed. Boca Raton, FL: CRC Press. p. vi.

responsibilities (right to report problem, right to stop work) does not seem to be having much of an effect on changing behaviors – workers seem to remain very reluctant to report problems and/or are frustrated that problems reported are not corrected. Broader training in line with the expressed needs of the workers, at all levels of DOE and contractor organizations, which covers all the elements considered in various safety culture models (Nuclear Regulatory Commission (NRC), Institute of Nuclear Power Operations (INPO), DOE) along with safety systems training may be something to consider. Several National Institute of Environmental Health Sciences (NIEHS) grantee programs have training programs that may provide appropriate starting points for this type of training.[3] The training must include modules that cover other safety culture attributes and should be incorporated into safety management systems training.

3. Declarations about a commitment to an open and trusting workplace do not make it so. DOE safety culture assessments showed that an unwillingness to report safety issues and concern regarding fear of retaliation remain as issues despite efforts by the DOE to establish an open reporting environment. A July 2016 U.S. Government Accountability Office (GAO) report also noted that some of the safety culture self-assessments reported low participation rates in surveys due to concerns of anonymity.[4] The DOE may want to consider reporting models established in other industrial sectors that allow for anonymous reporting.[5]
4. The SCIP has a very broad mission. As the SCIP continues its work, a few questions should be considered: Is it possible to include other stakeholders in the panel's work (labor, contractors, etc.)?[6] How does the SCIP interface with the site Safety Culture Monitoring Panels and should there be some representatives from Safety Culture Monitoring Panels on the SCIP? How is the SCIP going to evaluate the effectiveness of the SCWE training? How is the SCIP going to evaluate its other efforts?

3 The Center for Construction Research and Training Foundations of Safety Leadership (FSL) course, the International Association of Fire Fighters Frontline Safety training course, and the United Steel Workers Systems of Safety and Looking For Trouble training programs may provide useful models for a more holistic training regarding safety management and associated human and organizational factors.

4 U.S. Government Accountability Office. 2016. Department of Energy: Whistleblower Protections Need Strengthening. GAO-16-618. Washington, DC: U.S. Government Accountability Office. p. 23.

5 For example, the Federal Aviation Administration (FAA) has an anonymous reporting program that goes through a third party, the National Aeronautics and Space Administration (NASA), for the reporting *(http://asrs.arc.nasa.gov).* The state of California has a final draft process safety regulation that is requiring anonymous reporting, but not involving a third party.

6 A review of the approach used for the Department Standards Committee that involved stakeholders in associated Standards Process Action Teams may yield some ways in which this could be done.

1.0 Introduction

The objective of this discussion paper is to review recent safety initiatives in place at the U.S. Department of Energy (DOE) and to discuss options the agency should consider to improve safety and safety culture. The review will focus on the Integrated Safety Management System, the Worker Safety and Health Program rule (10 CFR 851), and safety culture initiatives. The review will discuss the approach of each initiative, the effectiveness of each, and possible improvements.

This review included the analysis of the aforementioned safety program documentation; the review of available information on the effectiveness of these programs (DOE internal reports, Defense Nuclear Facilities Safety Board (DNFSB) reports), the review of training materials related to safety conscious work environment (SCWE) training (TLP 200[7] and draft TLP 100); review of approaches in other industrial sectors regarding safety culture; and conversations with DOE workers, trainers, and current and former DOE employees.

2.0 The Evolution of Safety at the DOE

The DOE is a large federal agency with a diverse mission, including weapons activities, energy research, environmental cleanup, and waste management. The DOE enterprise is made up of approximately 15,000 federal employees and 90,000 contractors working in the headquarters (HQ) office in Washington, D.C./Germantown, Maryland, and in 85 facilities around the country. The organization is made up of programs under three principal offices: 1) Nuclear Energy (which includes the National Nuclear Security Administration (NNSA)); 2) Science and Energy (includes the national labs); and 3) Management and Performance (includes the Office of Environmental Management and the Office of Health, Safety and Security). The Office of Enterprise Assessments is another smaller program that plays in important role with regard to worker safety.[8] The broad scope and complexity of the work performed throughout the complex, the mixture of new technologies along with the ageing assets, the unique management structure of the department as "regulator" and operator, the frequent changes in leadership, and the potential loss of institutional memory are all factors that make the safe conduct of operations an ongoing challenge.

The management and regulatory approach to safety at the DOE complex has changed over the years from an expert-based model to a standards-based approach. Several factors likely influenced this evolution, including the change in mission over time, the change in the nature and complexity of the hazards, ageing facilities, complex waste legacy challenges, and the need for changed prompted by major catastrophic events (Three Mile Island and Chernobyl). Another aspect of safety at the DOE sites that has been long studied and debated is the unique situation of the government-owned, contractor-operated (GOCO) sites that are essentially self-regulated with regard to safety. In the early 1980s and into the 1990s, safety reform of the DOE was the focus of several investigations and congressional hearings.[9] Many of these investigations pointed out the inherent conflict of the DOE as the owner and operator responsible for production while at the same time having environmental health and safety (EHS) regulatory oversight responsibilities – pointing out that programmatic objectives (production) were often prioritized over safety considerations. There was great interest in independent, external regulation

7 TLP stands for Technical Leadership Program in the DOE National Training Center's course catalog.

8 DOE, Fiscal Year 2015 Annual Performance Report.

9 Library of Congress Federal Research Division. 2009. Defense Nuclear Facilities Safety Board: The First Twenty Years. Washington, DC: Library of Congress.

of the DOE. In 1995, DOE's Advisory Committee on External Regulation (the Ahearne Committee) recommended that DOE continue to move toward external regulation.[10] The secretary of energy supported the advisory board's recommendations and established a DOE working group to provide guidance for implementation of the recommendations. The rationale supporting external regulation was summarized in a DOE Working Group on External Regulation issue paper on the "Benefits of External Regulation," as follows:

> "The most compelling benefit of external regulation of DOE is that it will enable and lead to a safety culture comparable to that of the commercial nuclear industry…. External regulation is an essential element to completing the move of the Department from its historical self-regulatory status, which has been variable, costly and inconsistent, to a stable, efficient, and predictable safety environment.
>
> External regulation can provide the focus required to remove some of the greatest obstacles the Department now faces in trying to do its job as effectively as possible: the lack of stability in safety policy and management and the confusing, complex, and evolving internal and external regulation and oversight that now consume so much of DOE's resources without ensuring that safety is effectively and efficiently achieved."[11]

Despite the recommendations of the external review commission, the DOE remains self-regulated; however, the safety standards and regulations in place today were certainly influenced by advances in other industrial sectors (the commercial nuclear sector) and by other regulatory agencies' best practices (Nuclear Regulatory Commission (NRC) and Occupational Safety and Health Administration (OSHA)).

2.1 The Early Years of Safety Oversight at the Defense Nuclear Complex

The Atomic Energy Commission (AEC) was initially set up with a small HQ organization and very large government field sites (e.g., Oak Ridge, Savannah River). Technical aspects of operating the sites were handled by the contractors (which in the early years included large chemical companies such as DuPont, Union Carbide, and Monsanto with extensive expertise in industrial and process safety) and HQ mainly handled administrative and budgetary matters.[12,13]

The 1954 Atomic Energy Act allowed the AEC to establish standards for health and safety; however, it did make a clear distinction between commercial nuclear facilities and defense facilities. Commercial nuclear facilities were required to go through a licensing process (with AEC and, as of 1977, through NRC) in order to operate whereas no such requirement was made for the government owned contractor operated (GOCO) defense facilities. Other aspects of safety during this time period were quite similar in that the approach used to maintain safe operations were based on expert review and often on case-by-case consideration.[14] During the 1960s and 1970s, the AEC defense facilities were gradually moving to a standards-based approach to safety through the development and implementation of a manual of safety requirements (DOE directive system). These orders and directives while similar in content had key differences from the regulations being established at the time for commercial nuclear reactors. One key difference was that the AEC orders and directives (and later, in 1977, DOE[15]) could be changed without public comment. Another key difference was the

10 U.S. Department of Energy Advisory Committee on External Regulation of Department of Energy Nuclear Safety. 1995. Improving Regulation of Safety at DOE Nuclear Facilities. Germantown, MD: U.S. Department of Energy.

11 U.S. Department of Energy Working Group on External Regulation. 1996. Report of Department of Energy Working Group on External Regulation. DOE/US-0001. Appendices, p. 1-5.

12 DiNunno J. 2001. Ideas for Improving the Department of Energy's Safety Management of Nuclear Facilities: A Discussion Paper. Available: *http://www.dnfsb.gov/sites/default/files/Board%20Activities/Board%20Members/Joseph%20J.%20DiNunno/Speeches/2001/sp_2001101_2857.pdf* [accessed 5 October 2016].

13 Defense Nuclear Facilities Safety Board. 1996. An Assessment Concerning Safety at the Defense Nuclear Facilities: The DOE Technical Personnel Problem. DNFSB/TECH-10. Available: *https://ehss.energy.gov/deprep/1996-2/tech-10.pdf* [accessed 5 October 2016].

14 Library of Congress Federal Research Division, DNFSB: The First Twenty Years.

15 DiNunno, Ideas for Improving the Department of Energy's Safety Management of Nuclear Facilities: A Discussion Paper, p. 2-6. "The Re-organization Act of 1974 abolished the AEC and established the Energy Research and Development Administration (ERDA) and the independent Nuclear Regulatory Commission (NRC). ERDA assumed responsibility for the weapons program, including the legacy wastes of the early weapons production era….In 1977, ERDA was replaced by DOE."

need to keep certain information classified that limited public awareness and therefore criticism. Aside from the legal differences, compliance with the orders and directives was less than ideal perhaps in part due to the fact that the AEC was under-resourced, lacked sufficient technical expertise, and was reliant on the contractors to achieve the mission. This dual responsibility for production and safety oversight presented very difficult challenges.[16]

2.2 Three Mile Island

The 1979 accident at the Three Mile Island Nuclear Generating Station was a transformative for nuclear safety. This event would trigger major changes in safety and management practices at nuclear facilities. President Carter established a presidential commission (the Kemeny Commission) to investigate the incident. One of the most important conclusions of the Kemeny Commission was that the Three Mile Island accident was caused by "people-related problems and not equipment problems."[17] The commission report went on to say that "fundamental changes were necessary in the organization, procedures, and practices – and above all – in the attitudes of the Nuclear Regulatory Commission, and to the extent that the institutions we investigated are typical, of the nuclear industry."[18]

While this incident had a direct effect on transforming the way commercial nuclear reactors dealt with safety (both industry and regulatory changes) it also lead to greater interest in and attention to DOE nuclear safety – particularly related to nuclear reactor safety. After Three Mile Island, DOE conducted a self-assessment of reactor safety. One of the key recommendations of this assessment (the 1981 Crawford Commission report) was for "internal organizational changes in DOE that would elevate the status of ESH functions."[19] In 1985, DOE established a separate Office of Environment, Safety and Health (EH) within HQ under a new assistant secretary. While this was considered a significant change to separate the safety oversight function from the production mission, overall, the changes in the DOE post-Three Mile Island were not nearly as profound as the changes in the commercial nuclear industry.

2.3 Post-Chernobyl – More Reforms

The 1986 accident at the Chernobyl Nuclear Power Plant was yet another transformative incident in the nuclear industry. Shortly after the incident, the International Atomic Energy Agency (IAEA) formed the International Nuclear Safety Group (INSAG) to investigate the accident. The first official report on the incident, INSAG-1,[20] determined operator error was the primary cause of the incident but also introduced the need for a 'nuclear safety culture' in all nuclear power plants. INSAG-4, published in 1991, clarified the concept of safety culture as it relates to organizations and individuals and provided guidance for assessing safety culture. INSAG-7, published in 1992, refuted the original conclusion that operator error was the primary cause of the accident, instead determining that, "The accident can be said to have flowed from a deficient safety culture, not only at the Chernobyl plant, but throughout the Soviet design, operating and regulatory organizations for nuclear power that existed at that time."[21]

The Chernobyl accident once again put a spotlight on the need for safety improvements at commercial nuclear power plants as well as the DOE. Chernobyl resulted in increased focus on reactor safety at DOE sites and the need for independent oversight at the DOE complex. After various studies, advisory committee recommendations, and congressional hearings on the topic,[22] the DOE responded by establishing the Advisory Committee on Nuclear Facility Safety, which was intended to provide "independent" oversight on nuclear safety. Additionally, in 1989, Congress established the Defense Nuclear Facility Safety Board

16 Library of Congress Federal Research Division, DNFSB: The First Twenty Years, p. 24.
17 President's Commission on the Accident at Three Mile Island. 1979. Report of the President's Commission on the Accident at Three Mile Island – The Need for Change: The Legacy of TMI. Washington, DC: U.S. Government Printing Office. p. 8.
18 Ibid, p. 7.
19 Library of Congress Federal Research Division, DNFSB: The First Twenty Years, p. 33.
20 International Atomic Energy Agency. 1986. Summary Report on the Post-accident Review Meeting on the Chernobyl Accident. INSAG Series No. 1. Vienna, Austria: International Atomic Energy Agency.
21 International Atomic Energy Agency. 1992. The Chernobyl Accident: Updating of INSAG-1. INSAG Series No. 7. Vienna, Austria: International Atomic Energy Agency.
22 Library of Congress Federal Research Division, DNFSB: The First Twenty Years.

(DNFSB) – an independent board reporting to Congress – with safety oversight responsibilities over the DOE facilities.[23]

2.4 Changes after the End of the Cold War

Further changes occurred after the end of the Cold War and the resulting shift in mission from weapons production toward weapons dismantlement and environmental restoration. Starting in 1989, Admiral Watkins, a leader of the nuclear Navy programs, brought the nuclear Navy's approach to DOE. Watkins reorganization resulted in greater "independent" safety oversight authority at HQ with the formation of the Office of Nuclear Safety. The Office of Nuclear Safety, like EH, reported through an assistant secretary directly to the secretary. This resulted in four key programs at DOE HQ: two offices responsible for *safety oversight* (EH and Office of Nuclear Safety) and two programs responsible for *doing the work safely* (Defense Programs (DP) and the newly-established Environmental Management (EM)).[24,25,26]

Watkins also established a site resident EHS program and formed "Tiger Teams" to audit all nuclear facilities.[27] This period was a drastic transition from an "expert-based" model to a "standards-based" approach. Defending the change, DNFSB board member Joseph DiNunno put it as follows: "I am left with the feeling that I'm relying on your judgment as an expert. And I am not diminishing that in any way, but it isn't quite as regularized and criteria-based as we are stressing in an order compliance review."[28] This major shift in approach to oversight created a more centralized, compliance based approach at DOE, resulted in an increased number of "inspectors" at HQ and the field (EHS site representatives) but also seemed to have resulted in the unintended consequence of drastically slowing mission progress.[29]

After the shift to a more standards-based culture came a gradual transition to Integrated Safety Management (ISM). The DOE established a Department Standards Committee (DSC) along with Standards Process Action Teams to consider the site, facility, or project-specific work and the necessary safety standards to protect workers, the public, and the environment. The work of the DSC catalyzed a shift in the department's prior primary attention on better written requirements to an understanding that what was needed was a systematic approach to applying the appropriate set of requirements for the work and hazards. This shift in perspective was foundational to the development and acceptance of what became Integrated Safety Management (ISM).[30,31] One very important aspect of this effort was that the DOE engaged the contractors, labor unions, and other stakeholders in the action teams in the development of these standards-based integrated safety management plans.[32]

Around this time period, DNFSB held a series of hearings on how to achieve more timely and comprehensive safety improvement throughout DOE.[33] This included the discussion of a standards-based integrated safety management approach.

In 1995, the DNFSB issued Recommendation 95-2, "Safety Management."[34] The concept and the rationale are described in detail in a DNFSB technical report authored by board member Joseph DiNunno, "Integrated Safety Management."[35] ISM was established as a means of treating environmental, health, and safety programs in an integrated fashion and to develop a safety management program that provided a formal method to make *safety planning* part of all *work planning* – at the site, facility, and project/job/task level.

23 Ibid, p. 44. Specifically, the report notes, "S. 1085, the Nuclear Protections and Safety Act of 1987, a bill sponsored by Senator John Glenn (D–Ohio) that ultimately proved precursory to the 1988 enabling legislation for the Defense Nuclear Facilities Safety Board (DNFSB or the Board)."
24 Library of Congress Federal Research Division, DNFSB: The First Twenty Years.
25 DNFSB, An Assessment Concerning Safety at the Defense Nuclear Facilities: The DOE Technical Personnel Problem.
26 Conversation with former DOE employee, August 2016.
27 Conversation with former DOE employee, July 2016.
28 Library of Congress Federal Research Division, DNFSB: The First Twenty Years, p. 131.
29 Conversation with former DOE employee, July 2016.
30 Conversation with former DOE employee, September 2016.
31 U.S. Department of Energy. 1996. The DOE Closure Process for Necessary and Sufficient Sets of Standards. DOE M 450.3-1. Available: *https://www.directives.doe.gov/directives-documents/400-series/0450.3-DManual-1* [accessed 5 October 2016].
32 Conversation with former DOE official, August 2016.
33 Federal Register Notice announcing a public hearing to be held on July 18, 1995, at the DNFSB Public Hearing Room in Washington, DC. The Matters to be Considered stated, "The Board will reconvene and continue the open meeting conducted on May 31, 1995, regarding DOE's standards-based safety management program."
34 Defense Nuclear Facilities Safety Board. 1995. Recommendation 95-2. Safety Management. Available: *http://www.dnfsb.gov/board-activities/recommendations/safety-management* [accessed 5 October 2016].
35 Defense Nuclear Facilities Safety Board. 1997. Integrated Safety Management. DNSFB/TECH-16. Available: *http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Technical%20Reports/TECH-16.pdf* [accessed 5 October 2016].

The basics of the Integrated Safety Management System (ISMS) – define the scope of work, analyze the hazards, develop controls, perform work safely, and provide feedback for continuous improvement – appear to be a common sense approach to any hazardous work activities; however, the challenge was really in the implementation over a wide range of complex processes and projects in the DOE complex.

A key provision in the ISMS program was establishing a process for the DOE to review and approve the programs.[36] The ISMS is integrated with the contractor's business processes for work planning, budgeting, and performance.[37]

In 2004, in part in response to the near miss event at the Davis Besse Nuclear Power Plant and the Columbia Space Shuttle disaster, the DNFSB held a series of eight public hearings regarding safety management at the DOE. The key question the board sought to address in the hearings was: "Will modifications proposed by DOE/NNSA to organizational structure and practices, as well as increased emphasis on productivity, improve or reduce safety, and increase or decrease the possibility of a high-consequence, low-probability nuclear accident?"[38] These hearings, along with DNFSB Recommendation 2004-1, resulted in a "re-invigoration" of the ISM program[39] and greater attention to the importance of considering human and organizational factors in safety planning.

Heightened attention to the issue of safety culture at DOE came in 2010 when the DNFSB investigated allegations of a failed safety culture at the Hanford Waste Treatment and Immobilization Plant (WTP). Subsequent to the investigation, DNFSB issued Recommendation 2011-1. This recommendation report concluded as follows:

> The Defense Nuclear Facilities Safety Board (Board) has determined that the prevailing safety culture at the Waste Treatment and Immobilization Plant (WTP) is flawed….The Board's investigative record demonstrates that both DOE and contractor project management behaviors reinforce a subculture at WTP that deters the timely reporting, acknowledgement, and ultimate resolution of technical safety concerns.[40]

DOE's safety management system and safety culture initiatives, including the DOE's actions in response to DNFSB Recommendation 2011-1, are further discussed in Sections 3 and 4 of this report.

3.0 DOE Safety Management Programs

3.1 Integrated Safety Management System

In 1995, the DOE established the ISM policy to assure that all work could be done in a manner that protected workers, the public, and the environment by integrating safety planning into work planning at all levels (site, facility, and job or task). As stated in the "Integrated Safety Management System Manual" (DOE 450.4-1), the purpose of the program is as follows:

> The Department and Contractors must systematically integrate safety into management and work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment. This is to be accomplished through effective integration of safety management into all facets of work planning and execution. In other words, the overall management of safety functions and activities becomes an integral part of mission accomplishment.[41]

36 Department of Energy Acquisition Regulation (DEAR) 48 CFR 970.5223-1(e) and the DOE M 411.1-1, Manual of Safety Management Functions, Responsibilities and Authorities (FRAM).

37 DOE personnel must review and approve ISMSs according to DEAR 48 CFR 970.5223-1(e) and the DOE M 411.1-1. The process for implementing review and approval is discussed in the Integrated Safety Management System Guide (DOE G 450.4-1C).

38 Defense Nuclear Facilities Safety Board. 2004. Recommendation 2004-1. Oversight of Complex, High-Hazard Nuclear Operations. p.1. Available: *http://www.dnfsb.gov/sites/default/files/Board%20Activities/Recommendations/rec_2004-1_230.pdf* [accessed 5 October 2016].

39 Conversation with former DOE official, August 23, 2016.

40 Defense Nuclear Facilities Safety Board. 2011. Recommendation 2011-1. Safety Culture at the Waste Treatment and Immobilization Plant. p 2. Available: *http://www.dnfsb.gov/sites/default/files/Board%20Activities/Recommendations/rec_2011-1_11826.pdf* [accessed 5 October 2016].

41 U.S. Department of Energy. 2006. Integrated Safety Management System Manual. DOE 450.4-1. p. I-1. Available: *https://www.directives.doe.gov/directives-documents/400-series/0450.4-DManual-1* [accessed 5 October 2016].

The ISM process includes five core functions and seven guiding principles. The core functions describe the work cycle (at all levels – site, facility, job), from defining the scope to providing feedback from lessons learned to allow for continuous improvement. The five core functions are:

1. Define the Scope of Work
2. Analyze the Hazards
3. Develop and Implement Hazard Controls
4. Perform Work within Controls
5. Provide Feedback and Continuous Improvement

Figure 1[42] shows the interaction of the five core functions at the site, facility, and activity level.

The seven guiding principles are intended to describe the work environment. Each of the guiding principles applies to every core function. The guiding principles and associated attributes should be considered as organizations strive for continual improvement.

The seven guiding principles described in the "Integrated Safety Management System Guide" are:

- **Line management responsibility for safety.** Line management is directly responsible for the protection of the public, the workers, and the environment.
- **Clear roles and responsibilities.** Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the department and its contractors.

42 U.S. Department of Energy. 2011. Integrated Safety Management System Guide. DOE G 450.4-1C. Attachment 2, p. 1. Available: *https://www.directives.doe.gov/directives-documents/400-series/0450.4-EGuide-1c* [accessed 17 October 2016].

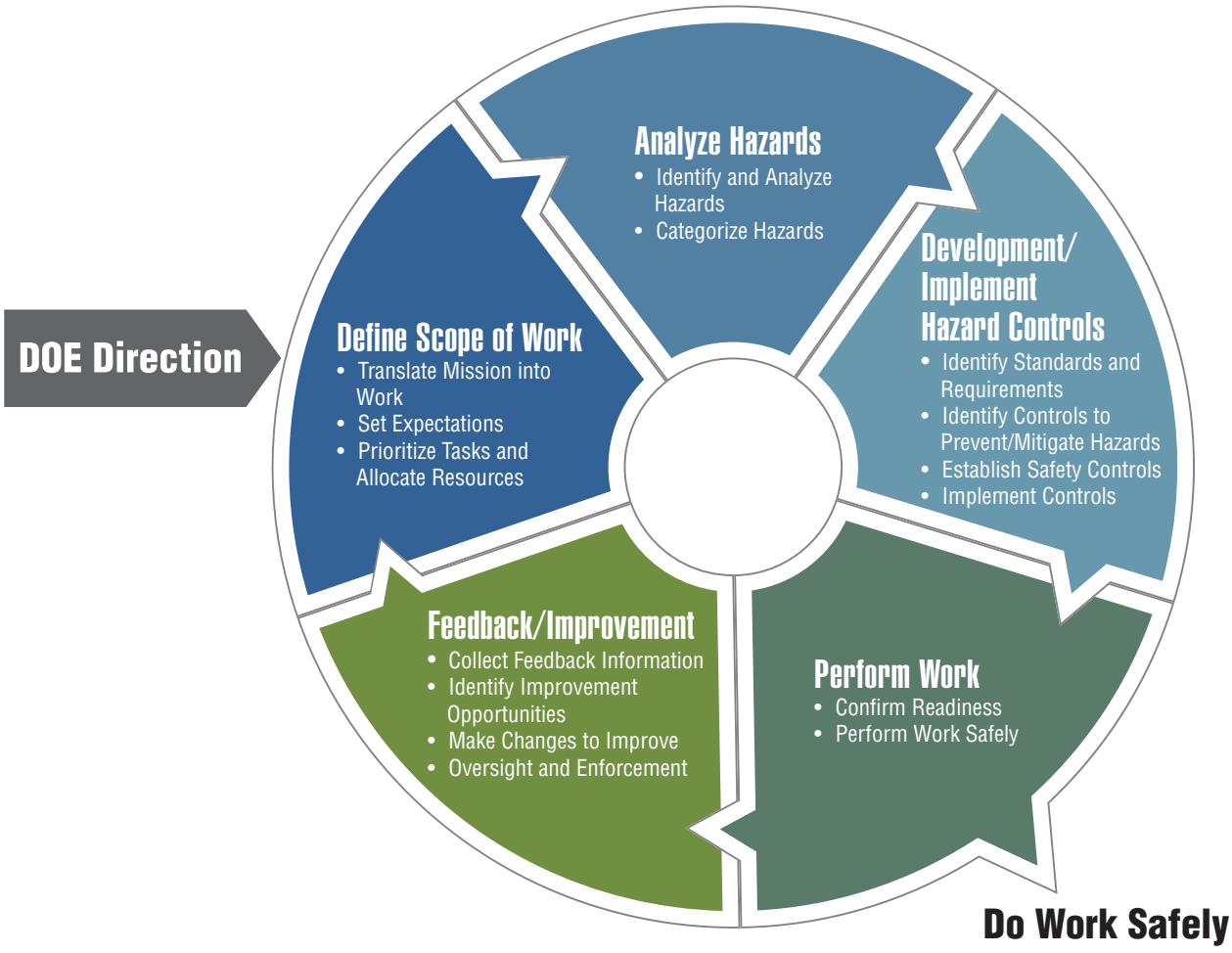

Figure 1. ISM Process – Interaction of the Five Core Functions

- **Competence commensurate with responsibilities.** Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.
- **Balanced priorities.** Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.
- **Identification of safety standards and requirements.** Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established which, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.
- **Hazard controls tailored to work being performed.** Administrative and engineering controls to prevent and mitigate hazards shall be tailored to the work being performed and associated hazards.
- **Operations authorization.** The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed upon.[43]

DOE's commitment to a positive safety culture is expressed in DOE policy document DOE P 450.4A. The DOE "expects all organizations to embrace a strong safety culture where safe performance of work and involvement of workers in all aspects of work performance are core values that are deeply, strongly, and consistently held by managers and workers. The Department encourages a questioning attitude by all employees and a work environment that fosters such attitude."[44]

3.1.1 Effectiveness of the ISM Program

Most believe that the move to the ISMS at DOE was a positive direction for improving safety within the complex – including site safety, facility safety, and personal safety.

According to a 2005 DNFSB technical report, the approach had a positive impact on the way work was done throughout the complex and there was some clear evidence of improvements, including:

- Work planning was formalized.
- Pre-job briefings became more commonplace.
- Identification of job hazards was formalized and was done on a regular basis.
- Working to standards and using engineered controls to mitigate hazards at the facility and job or task levels became routine.
- Formal authorization mechanisms for hazardous work were adopted.
- Occurrence reports and incident critiques were focused on providing feedback and continuous improvement for prevention of similar occurrences. [45]

However, the 2005 DNFSB technical report did raise questions about the effect that ISM was having on overall safety performance. The report found that "the potential for this practical safety system to achieve operational excellence and instill a sustainable safety culture has not been realized. In the broadest sense, system expectations and mechanisms to implement ISM are established, but execution of effective safety systems varies from site to site."46

The report concluded that "to be more effective, ISM needs to start with the hazards and the work and should be owned, developed, and executed by line management and the individuals who do the hazardous work with the support of subject matter experts as necessary."47

This report looks further at the specific metrics in making the conclusion that the ISM programs may not have had a great effect on overall safety performance. The report found that "the numbers of Type A and B Accident investigations, Price Anderson Enforcement Actions, and Operational Emergency

43 DOE, Integrated Safety Management System Guide, Attachment 1, p. 1-8.
44 U.S. Department of Energy. 2011. Integrated Safety Management Policy. DOE P 450.4A. p. 2. Available: *https://www.directives.doe.gov/directives-documents/400-series/0450.4-APolicy-a* [accessed 5 October 2016].
45 Defense Nuclear Facilities Safety Board. 2005. Integrated Safety Management: The Foundation for a Successful Safety Culture. DNFSB/TECH-36. p. iii. Available: *http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Technical%20Reports/TECH-36.pdf* [accessed 5 October 2016].
46 Ibid, p. iii.
47 Ibid, p. iii.

Occurrences have not declined, suggesting that the frequency of serious accidents and near misses has not been reduced by the introduction of ISM."[48]

One other important factor this report raises is the question of the most appropriate metrics for evaluating overall safety performance. Some metrics such as injury and illness data can be misleading when considering the likelihood of a low probability, high consequence event occurring at a facility. This was one of the key findings of the U.S. Chemical Safety Board (CSB) investigation of the 2005 BP Texas City refinery incident, in which 15 workers were killed and 180 were injured. The investigation found the following:

> One underlying cause was that BP used inadequate methods to measure safety conditions at Texas City. For instance, a very low personal injury rate at Texas City gave BP a misleading indicator of process safety performance. In addition, while most attention was focused on the injury rate, the overall safety culture and process safety management (PSM) program had serious deficiencies.[49]

The Energy Facility Contractors Group (EFCOG)/DOE ISMS Task Group, in a 2010 report, concluded that based on "the industrial safety rates, there is a positive correlation between ISMS and DOE complex-wide industrial safety performance since it was introduced in the mid 1990s." The report does, however, go on to say, "At the present time, DOE indicators focus on industrial safety and health. We do not yet have measures of overall system safety; however, this is an objective of the current DOE safety goals."[50,51]

A more recent 2013 review of the ISM program conducted by the DOE Office of Health, Safety and Security (HSS) looked specifically at the activity-level work planning and control deficiencies identified by the DNFSB to determine trends, causal factors, or systemic weaknesses. The report made the following conclusion:

> We identified a common set of activity-level WP&C [work planning and control] deficiencies at DOE Defense Nuclear Facility operations. These fall into five main categories: Hazard Identification and Hazard Control, Procedures and Documents, Supervision and Management, Communication, and Feedback and Lessons Learned.[52]

The report had the following specific findings:

- Inadequacies in work scoping and planning are often associated with lack of involvement from subject matter experts or workers.
- Poor communication and/or broad work instructions resulted in work performed outside the scope of the work control documents.
- Failure to incorporate lessons learned from previous operating experience in work planning.
- Lack of willingness to question decisions or stop work.[53]

Two recommendations from the report were to incorporate a team approach with greater worker and subject matter expert involvement in the work planning process and to consider modifying performance expectations to promote the identification of deficiencies, reporting of safety issues, and completion of corrective actions.[54]

In evaluating performance it is important to note that an organization that is improving will often have a *greater* number of safety issues reported as trust in the reporting process and the responsiveness of management improves. Ideally, over time, the significance of what gets reported should shift – seeing more minor things (perhaps the "weak signals" of greater problems) being reported over time that represent improvement opportunities, versus early on reporting that represent violations or higher risk factors.[55]

48 Ibid, p. 2-4.
49 U.S. Chemical Safety and Hazard Investigation Board. 2007. Final Investigation Report: BP Texas City Refinery Explosion and Fire. Report No. 2005-04-I-TX. p. 19. Available: *http://www.csb.gov/bp-america-refinery-explosion/* [accessed 5 October 2016].
50 Energy Facility Contractors Group/U.S. Department of Energy. 2010. EFCOG/DOE ISMS Safety Culture Task Team Final Report. p. 12.
51 **Industrial safety rates** referenced here are: the DART – "Days Away, Restricted and Transfers" – and TRC – "Total Recordable Cases." "Cases" are incidents or exposures resulting in injury or illness.
52 U.S. Department of Energy Office of Health, Safety and Security. 2013. Analysis of Integrated Safety Management at the Activity Level: Work Planning and Control. pp. 1-4. Available: *http://energy.gov/sites/prod/files/2014/04/f15/HSS_WPC_Analysis_Final_Report_080113.pdf* [accessed 5 October 2016].
53 Ibid, pp. 16-17.
54 Ibid, p. 20.
55 Conversation with former INPO employee reflecting on experience at INPO, September 2016.

3.2 10 CFR 851 Worker Safety and Health Program Rule

The DOE published 10 CFR 851, "Worker Safety and Health Program," in 2006.[56] 10 CFR 851 covers non-radiological worker safety and health programs for DOE contract workers. It includes some very important provisions, including a general clause similar to the OSHA "General Duty Clause."[57] 10 CFR 851.10 (a) (1) states:

> (a) With respect to a covered workplace for which a contractor is responsible, the contractor must: (1) Provide a place of employment that is free from recognized hazards that are causing or have the potential to cause death or serious physical harm to workers.

10 CFR 851.10 (a) (2) goes on to require contractors to ensure that work is performed in accordance with "all applicable requirements of this part" and "with the worker safety and health program for that workplace."

The worker safety and health program (WSHP) is a central part of the regulation. The WSHP must meet all the requirements of Subpart C of the standard that are relevant to the hazards associated with the contractor's scope of work. Some very important provisions related to the WSHP are as follows:

- 851.11 (a) (3) (ii) requires that the WSHP be integrated with the broader ISMS at the site.
- 851.11 (b) requires review and approval of the WSHP by the DOE, stating that, "The Head of DOE Field Element must complete a review and provide written approval of the contractor's worker safety and health program …"
- 851.20 (a) (4) requires that management, "Provide mechanisms to involve workers and their elected representatives in the development of the worker safety and health program goals, objectives, and performance measures and in the identification and control of hazards in the workplace."

The standard details worker's rights and responsibilities (851.20), including the right, *without reprisal*, to: participate in activities related to the standard on company time, access certain health and safety related documents and records, refuse unsafe work and stop unsafe work, and the responsibility to "comply with the requirements of this part, including the worker safety and health program, which are applicable to their own actions and conduct."[58] The standard also requires that the contractor establish a training and information program to ensure that "all workers exposed or potentially exposed to hazards are provided with the training and information on that hazard in order to perform their duties in a safe and healthful manner."[59]

3.2.1 Effectiveness of 10 CFR 851

In 2009, the United Steelworkers (USW) conducted a study to look at the completeness of WSHPs, the effectiveness of training on the standard, and the level of worker involvement in the program.[60] The USW 10 CFR 851 gap analysis study involved two parts. Part one involved site-based worker teams reviewing site WSHPs for completeness and specificity according to the specific requirements of Subpart C of 10 CFR 851. Part two of the study involved conducting a survey of all workers by site-contractor group regarding issues related to 10 CFR 851. For part 1, reviewers looked at 52 specific elements of Subpart C of 10 CFR 851 for completeness and specificity. A summary of the reported results of the plan reviews are shown in Table 1.

56 U.S. Department of Energy. 2006. 10 CFR Part 851. Worker Safety and Health Program. Final rule. Fed Reg 71: 6931-6948.

57 29 U.S.C. § 654, 5(a)1 states that each employer "shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

58 DOE, 10 CFR 851.20(b).

59 DOE, 10 CFR 851.25(a).

60 USW-Tony Mazzochi Center and New Perspectives. 2009. 10 CFR 851 Gap Analysis and Training Needs Assessment Program (GATNAP). Unpublished study.

Table 1. WSHP Completeness Based on USW 2009 Study

851 Section	Not Covered	Less than Completely Covered and Completely Specific	Completely Covered and Completely Specific
851.20 Management Responsibilities and Worker Rights and Responsibilities (19 elements)	7%	39%	54%
851.21 Hazard Identification and Assessment (10 elements)	7%	47%	46%
851.22 Hazard Prevention and Abatement (5 elements)	6%	41%	53%
851.23 Safety and Health Standards (5 elements)	26%	15%	60%
851.24 Functional Areas (2 elements)	7%	57%	35%
851.25 Training and Information (5 elements)	9%	46%	46%
851.26 Recordkeeping and Reporting (5 elements)	0%	33%	68%
851 Subpart C (all 52 elements)	10%	33%	57%

% - Percentage of elements in seven contractor plans reviewed.

In addition to the review of WSHPs, the USW study team also conducted a survey of workers to assess concerns regarding awareness and training related to 10 CFR 851.[61] The USW representatives met with multiple sites and found that in addition to workers, some leaders were unfamiliar with the 851 rule. Some overall findings of the plan reviews and survey included:

- Contractors WSHPs ranged from 11 to 80 percent in completeness and specificity.
- The study suggests that DOE's review and approval process may be inadequate since despite deficiencies all of the plans were approved by the DOE.
- At two sites, among four contractors, 56 percent did not understand worker rights and responsibilities under 851; 64 percent did not understand management's responsibilities under 851.
- Of the workers surveyed at two sites, among four contractors, only 40 percent always reported incidents in their work areas. Primary reasons for not reporting included fear of discipline or problems go uncorrected.
- Only 12 to 18 percent of the workers surveyed reported meaningful involvement in identifying and assessing hazards and meaningful involvement in lessons learned programs respectively.

The USW study suggests that a great deal of improvement is needed in order to realize the benefits of this regulation, including the training of workers at all levels so they have a better understanding of the rights and responsibilities and the inclusion of workers in the development of the WSHP. Training should also give workers an understanding of how the required program under 10 CFR 851 (WSHP) is integrated into the ISMS.

3.3 DOE Voluntary Protection Program

The DOE Voluntary Protection Program (VPP) is a voluntary program that recognizes DOE contractors and subcontractors that have adopted a comprehensive worker safety and health management system, with employees actively involved in assessing, preventing, and controlling the potential health

61 Ibid.

and safety hazards[62]. This program closely parallels OSHA's VPP. The DOE VPP is a voluntary program; hence not all sites have companies working under such programs. Nonetheless, many contractors are participants of the "Star" program, which is awarded to those contractors who have outstanding worker safety and health program. The DOE VPP has similar elements to ISMS and 10 CFR 851, such as management leadership; employee involvement, worksite analysis; hazard prevention and control; and health and safety training. Sites with VPP status undergo a re-evaluation process to assess their continued qualification for the program.

3.4 Safety Programs – Conclusion and Recommendations

One deficiency with both the ISMS and the Worker Safety Standard (10 CFR 851) that stands out as an ongoing problem is the lack of worker involvement in the programs. The findings of the USW study,[63] the DNFSB review,[64] and the HSS report[65] summarized in Sections 3.1 and 3.2 of this report suggest that worker involvement in the safety programs is deficient. While both of these programs include several provisions detailing specific areas for worker involvement and stress the importance of workers being involved throughout the process (planning, hazard analysis, reporting safety concerns, incident investigation and safety audits), the reviews of the programs along with conversations with workers from the DOE sites indicates that worker involvement in the programs is not adequate. As has been previously reported, one key to improving in this area is to ensure workers are receiving adequate training.[66] In addition to training related to technical issues such as hazard identification and control, risk assessment, and accident investigation, workers should be trained in safety systems and human and organizational factors (aspects of safety culture). Recent and not-so-recent major incident investigation reports (including Three Mile Island, Chernobyl, BP Texas City refinery, and the BP Macondo off-shore drilling accident) highlight the need for more attention to human and organizational factors as critical in addressing management activities related to high hazard work. At a recent international conference on safety culture, it was reported that the field of human and organizational factors is well established and has regulatory legitimacy.[67] It seems greater attention to this area in DOE training for workers at all levels is lacking and overdue.

It also seems that without considering/addressing issues identified in the DOE HSS independent safety culture assessment reports (see Section 4.2 of this report), such as the reluctance to report safety concerns due to fear of retaliation, workers will continue to be reluctant to engage even though they have specific rights, including those detailed in 10 CFR 851. Perhaps DOE needs to ask the question: Why? Why are the workers reluctant to report safety concerns?

Another concern expressed regarding these safety programs is that they just become paperwork exercises.[68] This concern is reinforced by the USW study that concluded that incomplete WSHPs had been approved by the DOE. Encouraging workers' involvement throughout the process (planning, hazard identification and selection and assessment of controls, incident or near miss investigation, lessons learned) would provide a good "check" to assure that these programs are living documents and not just a plan that sits on the shelf.

According to the 2009 NIEHS report, meaningful worker involvement must include the following elements:

- Workers must have the proper training to be able to perform job hazard analyses, incident investigations, near miss reporting, and actively participate in labor-management safety and health committees.
- They must have enough training so they know

62 US Department of Energy Voluntary Protection Program (October 1994).
63 USW-Tony Mazzochi Center and New Perspectives. 2009. 10 CFR 851 Gap Analysis and Training Needs Assessment Program (GATNAP). Unpublished study.
64 DNFSB, Integrated Safety Management: The Foundation for a Successful Safety Culture.
65 DOE Office of Health, Safety and Security, Analysis of Integrated Safety Management at the Activity Level: Work Planning and Control.
66 National Institute of Environmental Health Sciences. 2009. Training and Safety and Health in the DOE Complex: NIEHS/DOE HAZMAT Training Program – 2000 through 2008 and the Path Forward for the NIEHS DOE Training Program. Available: *https://tools.niehs.nih.gov/wetp/public/hasl_get_blob.cfm?ID=9095* [accessed 17 October 2016].
67 Carnes E. 2016. Reflection, Interrogatory, Provocation. Presented at the IAEA International Conference on Human and Organizational Aspects of Assuring Nuclear Safety – Exploring 30 Years of Safety Culture, 22 – 26 February 2016, Vienna, Austria.
68 Interview with former DOE employee, August 2016.

what questions to ask when involved in each of these activities.

- Workers must be able to choose among themselves who participates in the safety and health activities, such as walk-arounds and safety and health committees, not the employer.
- Workers should be equal partners with management when it comes to health and safety activities.
- A variety of methods are available for personnel to raise safety issues, without fear of retribution.[69]

Meaningful worker involvement cannot happen unless the following occurs:

- Line managers encourage and appreciate the reporting of safety issues and errors and they do not discipline employees for reporting errors.
- Line managers encourage a vigorous questioning attitude toward safety, and constructive dialogues and discussions on safety matters.
- Performance improvement processes encourage workers to offer innovative ideas to improve performance and to solve problems.
- The bias is set on proving work activities are safe before proceeding, rather than proving them unsafe before halting. Personnel do not proceed and do not allow others to proceed when safety is uncertain.[70]

Training and access to information is critical to meaningful worker involvement. The importance of providing appropriate training and information to all workers (including employers and employees) is outlined in all DOE policies, programs, and regulations. For instance, 10 CFR 851.25 requires that contractors must establish and implement a worker health and safety training program. This provision further requires that contractors provide training and information for workers who may be exposed to hazards prior or at the time of job initiation; periodic training to ensure that workers are adequately trained and informed; and additional training when information regarding hazard or workplace condition changes.[71] ISMS also strongly encourages continuous learning and training in order to understand, recognize, and respond to problems and anomalies. Section II (E)(5) of the DOE VPP also provides that health and safety training must ensure that all workers responsibilities, policies, rules, and procedures are understood.

Another important component is the role of DOE oversight. DOE should of course thoroughly review the plans but they also must verify effective implementation in the field. Understanding the work as it is done in the field rather than just as it is planned on paper is an important aspect of the overall safety management system.

4.0 Safety Culture and Safety Conscious Work Environment

The concept of safety culture has been defined in many ways over the last 30 years and there is still disagreement on how to best define it.[72,73] The IAEA, which first used the term in the investigation report of the 1986 Chernobyl incident, defines safety culture as "that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance."[74]

The Institute of Nuclear Power Operations (INPO) has defined safety culture as, "An organization's values and behaviors – modeled by its leaders and internalized by its members – that serve to make nuclear safety the overriding concern."[75]

Finally, DOE defines safety culture as, "An organization's

69 NIEHS, Training and Safety and Health in the DOE Complex: NIEHS/DOE HAZMAT Training Program – 2000 through 2008 and the Path Forward for the NIEHS DOE Training Program, p. 155.
70 Ibid, p. 155.
71 DOE, 10 CFR 851.25.
72 Hale AR. 2000. Culture's confusions. Safety Sci 34(1-3):1-14.
73 Guldenmund F. 2000. The nature of safety culture: a review of theory and research. Safety Sci 34(1-3):215-257.
74 International Atomic Energy Agency. 1991. Safety Culture. INSAG Series No. 4. Vienna, Austria: International Atomic Energy Agency. p.1.
75 Institute of Nuclear Power Operations. 2004. Principles for a Strong Nuclear Safety Culture. p. iv. Available: *https://www.emcbc.doe.gov/Content/Office/inpo_principles_for_a_strong_nuclear_safety_culture.pdf* [accessed 5 October 2016].

values and behaviors modeled by its leaders and internalized by its members, which serve to make safe performance of work the overriding priority to protect the workers, the public, and the environment."[76]

Safety culture is often simply described as "the way we do things around here."[77,78] However, it is critical to keep in mind that organizations usually include more than a single culture. It is common to have cultural differences between departments, management levels, or occupations. The objective in ultimately improving safety performance is not to "fix" the culture – to make one group do it like another. As Edgar Schein said, the objective is to "honor that each culture has its own values that must be maintained, but they must be aligned."[79]

Many believe that rather than focus on changing the values and behaviors of individuals, the focus should be on improving the systems, structures, and practices within the organization.[80,81] Andrew Hopkins states, "This focuses on what people do, not on what they think, and what people do is something company leadership can indeed control, while what people think is neither here nor there."[82] As James Reason puts it, "acting and doing, shaped by organizational controls, can lead to thinking and believing."[83]

Professor Mats Alvesson warns that what may appear to be a "good" "unified" culture can lead to "blindness" or "tunnel vision." Alvesson hypothesizes that "if a 'good' safety culture is simply agreement on superficial platitudes you can end up with a situation of hyper-culture."[84] Alvesson defines hyper-culture as "a carved-out set of positive sounding statements about values, often decoupled from everyday-life thinking and practices."[85] In fact, even to make a pronouncement such as "we have a good safety culture" or "a poor safety culture caused the incident" may suggest attempts to avoid addressing the underlying organizational or system failures.

4.1 Safety Culture Attributes

Since cultural assumptions are difficult to observe, models have been developed to help understand how the concept can be assessed. Edgar Schein's model of culture defines a central level of basic assumptions and two concentric outer layers of espoused values and artifacts.[86]

The basic assumptions – the beliefs and attitudes of individuals in an organization – are much more difficult to measure than espoused values. (e.g., safety mottos) or artifacts (e.g., written policy statements). Safety culture assessments evaluate the basic assumptions, artifacts, and values to identify the presence or absence of the safety culture attributes that are considered to be important for a positive safety culture.[87,88]

The NRC final Safety Culture Policy Statement includes a list of nine traits that are considered to be essential for a positive safety culture.[89] These are shown in Table 2.

76 U.S. Department of Energy. 2011. Integrated Safety Management System Guide. DOE G 450.4-1C, page 6. Available: *https://www.directives.doe.gov/directives-documents/400-series/0450.4-EGuide-1c* [accessed 5 October 2016].
77 Hopkins A. 2014. Why 'safety cultures' don't work. Distributed by DecomWorld at the 3rd Annual Offshore Safety Conference 2014, 29 September – 1 October 2014, Houston, TX. Available: *http://www.decomworld.com/offshore-safety/pdf/AndrewHopkins.pdf* [accessed 5 October 2016].
78 Guldenmund, The nature of safety culture: a review of theory and research, p. 225.
79 Schein E. 2003. Keeping the Edge: Enhancing Performance through Managing Culture. Presented at the 2003 INPO CEO Conference, 7 November 2003. Available: *http://energy.gov/sites/prod/files/2014/04/f14/11-07-03_Schein-onCulture.pdf* [accessed 5 October 2016].
80 Hopkins, Why 'safety cultures' don't work.
81 Reason J. 1998. Achieving a safety culture: theory and practice. Work Stress 12:293-306.
82 Hopkins, Why 'safety cultures' don't work.
83 Reason, Achieving a safety culture: theory and practice, p. 295.
84 Alvesson M. 2016. The Risk of Hyper-Culture – How to Avoid It and Work with Real Organizational Culture. Presented at the IAEA International Conference on Human and Organizational Aspects of Assuring Nuclear Safety – Exploring 30 Years of Safety Culture, 22 – 26 February 2016, Vienna, Austria.
85 Alvesson M, Sveningsson S. 2007. Changing Organizational Culture: Cultural Change Work in Progress. New York:Routledge. p. 119.
86 Schein E. 2010. Organizational Culture and Leadership. 4th ed. San Francisco, CA: Jossey-Bass.
87 International Atomic Energy Agency. 2002. Key Practical Issues in Strengthening Safety Culture. INSAG Series No. 15. Vienna, Austria: International Atomic Energy Agency.
88 INPO, Principles for a Strong Nuclear Safety Culture.
89 U.S. Nuclear Regulatory Commission. 2011. Final Safety Culture Policy Statement. Fed Reg 76: 34773-34778.

Table 2. NRC: Safety Culture Traits

Leadership Safety Values and Actions Leaders demonstrate a commitment to safety in their decisions and behaviors.	**Problem Identification and Resolution** Issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance.	**Personal Accountability** All individuals take personal responsibility for safety.
Work Processes The process of planning and controlling work activities is implemented so that safety is maintained.	**Continuous Learning** Opportunities to learn about ways to ensure safety are sought out and implemented.	**Environment for Raising Concerns** A safety conscious work environment is maintained where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination.
Effective Safety Communications Communications maintain a focus on safety.	**Respectful Work Environment** Trust and respect permeate the organization.	**Questioning Attitude** Individuals avoid complacency and continually challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action.

Other research has resulted in similar lists of attributes or traits to consider when assessing safety culture.

Hale concludes that key elements of a good safety culture include:

- The importance that is given by all employees to safety as goal.
- Which aspects of safety are included in that safety goal.
- The perceived involvement by all parties in the process of defining, prioritizing, and controlling risk.
- The sense of shared purpose in safety.
- The creative mistrust that people have in safety systems.
- The caring trust which all parties have in each other.
- The openness in communication that can lead to a learning culture.
- The belief that causes for incidents involve the interaction of many causal factors;
- The integration of safety into all aspects of work.[90]

A 2002 United Kingdom Health and Safety Executive report acknowledges four categories of critical health and safety behaviors: frontline behaviors, risk control behaviors, management behaviors, and leadership and direction; but it notes that most programs focus efforts only on the first – frontline behaviors.[91]

The DOE has defined the attributes associated with improving safety culture through a process with a joint DOE/EFCOG ISMS Safety Culture Task Team.[92,93] These attributes, included in Attachment 10 of the "Integrated Safety Management System Guide,"[94] are shown in Table 3.

90 Hale, Culture's confusions, pp. 12-13.
91 Fleming M, Lardner R. 2002. Strategies to promote safe behavior as part of a health and safety management system. Prepared by the Keil Centre for the United Kingdom Health and Safety Executive. Contract Research Report 430/2002. Available at: *http://www.hse.gov.uk/research/crr_pdf/2002/crr02430.pdf* [accessed 17 October 2016].
92 EFCOG/DOE, EFCOG/DOE ISMS Safety Culture Task Team Final Report.
93 McDonald J. 2010. EFCOG/DOE Safety Culture Task Status. Presented at the EFCOG ISMS/QA Working Group Meeting, 30 November 2010, Las Vegas, NV.
94 DOE, Integrated Safety Management System Guide.

Table 3. ISMS Safety Culture Focus Areas and Associated Attributes

ISMS Guide, Attachment 10
Leadership • Demonstrated safety leadership • Risk-informed, conservative decision-making • Management engagement and time in field • Staff recruitment, selection, retention, and development • Open communication and fostering an environment free from retribution • Clear expectations and accountability
Employee/Worker Engagement • Personal commitment to everyone's safety • Teamwork and mutual respect • Participation in work planning and improvement • Mindful of hazards and controls
Organizational Learning • Credibility, trust, and reporting errors and problems • Effective resolution of reported problems • Performance monitoring through multiple means • Use of operational experience • Questioning attitude

Although there is not complete agreement on safety culture attributes, there is a lot of overlap in the various models, and the themes in the DOE model are consistent with other commonly-referenced models, including that of the NRC.

Independent safety culture assessments performed at five DOE sites and two DOE HQ organizations (see Section 4.2) in response to DNFSB Recommendation 2011-1 were conducted using the same methodology that aligns with the current NRC procedures for independent safety culture assessment based on the NRC's nine safety culture traits (listed in Table 2, above). The SCWE self-assessments appear to have been done with different methodologies, although EFCOG has since developed an updated guide for conducting safety culture self-assessments which is based around the DOE safety culture attributes listed in Table 3.[95]

95 Energy Facility Contractors Group Integrated Safety Management Working Group. 2015. A Guide to Safety Culture Evaluation. Available: *https://www.orau.org/safetystudies/white-paper-guide-to-safety-culture-evaluation.pdf* [accessed 5 October 2016]. It should be noted that EFCOG had a 2008 version of this guide which was also based on the DOE safety culture attributes discussed in this report; however, it appears that the self-assessments done in partial response to the DNFSB recommendation were not done with a consistent methodology.

While there is a great deal of literature regarding assessing safety culture, there are far fewer studies that examine the relationship between safety culture and safety performance[96,97,98] or on how to improve safety culture. Does "improving safety culture" drive improved safety performance? Does an improvement in safety performance result in an improved safety culture? One caution that has been raised regarding attempts to improve safety culture, and really safety performance, is that the focus should not be solely on the workers on the shop floor—those with the greatest safety risks and the least authority to make changes. As many have warned, too often the focus of these programs has been on the "frontline behaviors."[99]

4.2 Safety Culture at DOE sites

4.2.1 Review of Independent Safety Culture Reports

The DOE, in partial response to DNFSB Recommendation 2011-1, conducted several independent safety culture assessments. The independent assessments were conducted by the DOE Office of Enforcement and Oversight (Independent Oversight), within HSS. Specifically, in the "DOE Implementation Plan for DNFSB Recommendation 2011-1," the secretary of energy directed HSS to perform safety culture assessments of five major ongoing nuclear design/construction projects to determine the extent of condition of safety culture concerns identified at the Hanford Waste Treatment and Immobilization Plant. DOE's actions outlined in the DOE implementation plan included an extent of condition review (through independent safety culture assessments and self-assessments), a consolidated report, and a plan for sustaining safety culture.[100]

96 Clarke, Sharon, "The relationship Between Safety Climate and Safety Performance: A Meta-Analytic Review, Journal of Occupational Health Psychology, 2006, Volume 11, No. 4, 315-327.

97 Zohar, D., "A group-level model of safety climate: Testing the effect of group climate on microaccidents in manufacturing jobs," Journal of Applied Psychology, 2000, Volume 85, No. 4, 587-596.

98 Morrow, Stephanie, Koves, Kenneth, and Barnes, Valerie, "Exploring the relationship between safety culture and safety performance in U.S. nuclear power operations," Safety Science, 2014, Volume 69, 37-47.

99 Fleming and Lardner, Strategies to promote safe behavior as part of a health and safety management system.

100 U.S. Department of Energy. 2011. DOE Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2011-1: Safety Culture at the Waste Treatment and Immobilization Plant. Available: *http://www.dnfsb.gov/sites/default/files/Board%20Activities/Recommendations/Implementation%20Plans/ip_rec-id_11826_0.pdf* [accessed 5 October 2016].

From 2011-2013, the DOE Office of Enforcement and Oversight conducted safety culture assessments at five facilities, along with two assessments of DOE HQ offices. The projects included the following organizations:

- Los Alamos National Laboratory: Chemistry and Metallurgy Research Replacement Project[101]
- Idaho Cleanup Project: Sodium Bearing Waste Treatment Project[102]
- Hanford Site Waste Treatment and Immobilization Plant[103]
- Y-12 National Security Complex: Uranium Processing Facility Project[104]
- Pantex Plant – full site review[105]
- DOE Office of Environmental Management Headquarters (EM HQ)[106]
- DOE Office of Health, Safety and Security (HSS HQ)[107]

A review of the assessment reports reveals some common themes regarding safety culture across the five DOE sites and at DOE HQ – some positive attributes along with some areas where improvement is needed. These summary findings are consistent with comments made by workers during this review project.[108]

First, some positive elements that appeared to be common in all reports:

- Commitment of the workforce – strongly held belief in the mission.
- Commitment to improve health and safety – organizations appear to be positively engaged in efforts to improve worker safety and health.
- Safety management systems – initiatives from DOE HQ and local efforts across the sites are being conducted to formalize policies and procedures which should improve safety.

The following concerns and challenges appear to be common in all reports:

- Many of those interviewed reported communication problems between multiple management layers and the workers.
- Employee concerns programs, of various types, are available; however, there is a lack of consistency and effectiveness in the programs.
- Some fear of retaliation for raising concerns was reported.
- A significant percentage of those surveyed do not perceive that they can approach management with their concerns.
- A significant percentage of those surveyed do not perceive that their management encourages constructive criticism.
- A significant percentage of those surveyed did not feel they could openly challenge decisions made by management.
- There are concerns from federal staff that there is insufficient federal oversight of contractor organizations.
- Although a high percentage of those surveyed indicated

101 U.S. Department of Energy. 2012. Independent Oversight Assessment of Nuclear Safety Culture at the Los Alamos National Laboratory Chemistry and Metallurgy Research Replacement Project. Available: *http://energy.gov/ea/downloads/independent-oversight-assessment-los-alamos-national-laboratory-april-2012* [accessed 5 October 2016].

102 U.S. Department of Energy. 2012. Independent Oversight Assessment of Nuclear Safety Culture at the Idaho Cleanup Project Sodium Bearing Waste Treatment Project. Available: *http://energy.gov/ea/downloads/independent-oversight-assessment-idaho-cleanup-project-sodium-bearing-waste-treatment* [accessed 5 October 2016].

103 U.S. Department of Energy. 2012. Independent Oversight Assessment of Nuclear Safety Culture and Management of Nuclear Safety Concerns at the Hanford Site Waste Treatment and Immobilization Plant. Available: *http://energy.gov/ea/downloads/independent-oversight-assessment-waste-treatment-and-immobilization-plant-january-2012* [accessed 5 October 2016].

104 U.S. Department of Energy. 2012. Independent Oversight Assessment of Nuclear Safety Culture at the Y-12 National Security Complex Uranium Processing Facility Project. Available: *http://energy.gov/ea/downloads/independent-oversight-assessment-y-12-national-security-complex-june-2012* [accessed 5 October 2016].

105 U.S. Department of Energy. 2012. Independent Oversight Assessment of Nuclear Safety Culture at the Pantex Plant. Available: *http://energy.gov/ea/downloads/independent-oversight-assessment-pantex-plant-november-2012* [accessed 5 October 2016].

106 U.S. Department of Energy. 2012. Independent Oversight Assessment of Safety Culture at the U.S. Department of Energy Office of Environmental Management Headquarters. Available: *http://energy.gov/ea/downloads/independent-oversight-assessment-doe-office-environmental-management-headquarters* [accessed 5 October 2016].

107 Haber SB, Holm DA, Shurberg DA, Stein ME. 2013. An Independent Evaluation of Safety Culture at the U.S. Department of Energy Office of Health Safety and Security – Headquarters (HSS). Available: *http://energy.gov/ea/downloads/independent-evaluation-safety-culture-us-department-energy-office-health-safety-and* [accessed 5 October 2016].

108 Conversations with approximately 25 workers from sites around the complex and conversations with some current and former DOE staff.

that safety was not compromised for production, evidence during the assessments found numerous cases that appeared to contradict the survey results.

- A high percentage of those interviewed indicated there is a problem with the resolution of identified issues.

4.2.2 Study of Safety Systems and Safety Conditions at the DOE

A 2012 study of the worker's perspective on the effectiveness of safety programs found similar reactions as were noted in the independent safety culture assessment reports from workers at DOE sites. The study found that "at every one of the sites, workers in decommissioning and demolition operations (D&D), as well as in some other operations, expressed fear of management retaliation for reporting safety hazards and injuries and seemingly random punitive behavior." The researchers noted that "rather than a culture of safety based on trust, we saw what appears to be a culture of fear and intimidation." Table 4 shows some of the concerns expressed during the study.[109]

Table 4. Workers' Comments Regarding DOE Site Safety Programs

"Contractors get paid by how much waste goes into the hole, so that's all they care about, how much we put in the hole."
When speaking about the company investigating an incident, a worker said, "They're not finding the root cause; it's a way to blame or find fault with the worker."
Some incentive programs "according to the majority of our interviewees, including some safety managers, discourages people from reporting injuries."
"Workers who raised issues were considered to be 'whiners'."
At one site a safety representative said, "the biggest problem is the company gets mad at me for bringing up concerns …. We just want them to stop getting mad when we bring stuff up!"
One employee involved in the company safety program said, "We have a trust problem with mid-level management. The shift operations managers are the #1 biggest flaw in our whole system … Upper level management is trying to encourage a questioning attitude but then people get penalized for questioning."
In response to the approach to health and safety, one person commented that they had a "just get 'er done" approach.
When asked about stop work authority, one worker said: "You ask yourself, 'Is this worth the price I might have to pay?' Retaliation is always a concern."
When asked about the regulator one individual commented, "talking to DOE is like talking to a wall."
Another individual commented, "DOE is AWOL."

109 Levenstein and Rosenberg, DOE site visit reports to USW, 2006-2012, unpublished.

4.2.3 GAO Report: DOE Whistleblower Protections Need Strengthening

A 2016 U.S. Government Accountability Office (GAO) study regarding protections at DOE found, consistent with our review, that the DOE's independent safety culture assessment reports "revealed problems with the environment for raising concerns."[110] The report went on to say, "In contrast, many self-assessments… may have overstated the openness of the environment."[111] The report also found that DOE "infrequently used its enforcement authority to hold contractors accountable for unlawful retaliation"[112] and that "DOE has taken little or no action against contractors that create a chilled work environment and has not developed effective policies for doing so."[113] Regarding the mechanisms available to report safety concerns, the GAO report stated that, "The practice of transferring or referring concerns back to the contractor, without additional restrictions or guidance, may compromise the perceived independence of DOE's ECP and inhibit contractor employees from reporting concerns."[114]

4.3 Safety Culture Activities at the DOE

In May 2014, in partial response to DNFSB Recommendation 2011-1, DOE issued a consolidated report[115] which summarized findings of the recent safety culture assessments (independent studies and self-assessments) and identified three department improvement actions:

- Formation of a DOE Safety Culture Improvement Panel (SCIP).
- Incorporation of safety culture and SCWE concepts and practices into DOE training.
- Evaluation of contract language to incorporate clear reference to safety culture.

110 GAO, Department of Energy: Whistleblower Protections Need Strengthening, p. 17.
111 Ibid, p. 18.
112 Ibid, p. 38.
113 Ibid, p. 38.
114 Ibid, p. 28.
115 U.S. Department of Energy. 2014. Consolidated Report for Defense Nuclear Facilities Safety Board Recommendation 2011-1 Actions 2-8 and 2-9: Safety Culture at the Waste Treatment and Immobilization Plant. Available: *www.dnfsb.gov/sites/default/files/Board%20Activities/Letters/2014/ltr_2014529_24496.pdf* [accessed 17 October 2016]

4.3.1 Safety Culture Improvement Panel

In May 2015 the deputy secretary of the DOE approved and signed the SCIP charter. The charter includes the following objectives and activities:[116]

Objectives

1. Strengthen the implementation of safety culture and SCWE throughout DOE.
2. Share and, as necessary, develop improvement and sustainment tools for positive safety culture.
3. Provide high-level, line management attention to evaluating safety culture issues and strengths.
4. Provide a forum for evaluating DOE safety culture status, progress, and challenges, and communicate the results to the workforce.
5. Work to continuously improve DOE safety culture with representatives from across the complex.
6. Stay current in advances in organizational safety culture and how best practices can be applied to DOE.
7. Identify opportunities to incorporate safety culture and the concepts/practices of a SCWE into leadership and employee training, in coordination with DOE's National Training Center, the Federal Technical Capability Panel, and DOE's chief learning officer.

Activities

1. As requested, evaluate major departmental policy and programmatic changes for their potential to impact DOE's safety culture.
2. Provide recommendations on DOE's directives to incorporate safety culture, SCWE concepts, and associated best practices, as appropriate.
3. Develop a means to monitor DOE's safety culture.
4. Monitor and evaluate changes in trends that have the potential to impact safety culture within the DOE.
5. Benchmark departmental safety culture activities with those of similar industries.
6. Develop and assist with implementing improvement actions as assigned by the department's senior leaders.
7. Evaluate contract language, as appropriate, for potential safety culture and SCWE impacts.

116 Email communication from Pat Worthington, DOE HQ, August 31, 2016.

It is important to note that the SCIP serves in an advisory role and the sites will not be required to follow its recommendations. The panel has been in place a little over one year and has established six workgroups: Contract Language workgroup, Training workgroup, Safety Culture Monitoring Means workgroup, Soliciting Worker's Input workgroup, Strategic Planning workgroup and Communications workgroup.

In addition to the SCIP, several of the sites have established Safety Culture Monitoring Panels. It does not appear that there is any direct coordination between the site level panels and the SCIP.

4.3.2 SCWE Training

Following a whistleblower retaliation incident at the Millstone Nuclear Power Station, the NRC issued a policy statement,[117] that defined SCWE as "a work environment where employees are encouraged to raise safety concerns and where concerns are promptly reviewed, given the proper priority based on their potential safety significance, and appropriately resolved with timely feedback to the originator of the concerns and to other employees."[118] In 2011, the NRC published a final Safety Culture Policy Statement that identified SCWE as one important trait associated with a strong safety culture.[119]

The DOE has not formally defined SCWE, however it seems as though a definition similar to the NRC definition has been used in practice. This "informal" definition of SCWE is "a work environment in which employees feel free to raise safety concerns to management (or a regulator) without fear of retaliation."[120] In 2012 the DOE initiated the development and delivery of SCWE training which was designed to be conducted in three separate courses tailored to different employees throughout the DOE. The TLP 200 level course is designed for senior leadership and as of August 2016 this eight-hour course has been delivered to approximately 2,200 employees. The TLP 150 is designed for front line supervisors. The TLP 100 is designed for workers and is planned to be piloted in December 2016.[121]

4.4 Effectiveness of SCWE Training

The SCWE training is designed to cover very important topics regarding the willingness and rights of employees to raise concerns without fear of retaliation and the idea of a work environment where reporting of safety concerns is encouraged and issues are addressed in a timely manner. A few important notes about the training:

1. SCWE is one of many attributes that are considered part of a strong safety culture and the training does not seem to address any of the other aspects of safety culture or how safety culture is related to safety management systems.
2. The training appears to only be addressing a symptom – concerns about ability to raise safety concerns without fear of retaliation – and does not address or discuss root problems.
3. An effort should be made to determine the effect that SCWE is having on safety performance at DOE.
4. Workers seem quite skeptical about the training and the sustainability of efforts associated with SCWE and safety culture. DOE should consider what needs to be done to assure safety management and/or safety culture initiatives result in sustainable change.

During the preparation of this report, comments similar to those noted in 4.3 in this report were madeat training meetings (in 2016). These comments are summarized in Table 5.

117 Cole KS, Stevens-Adams SM, Wenner CA. 2013. A Literature Review of Safety Culture. SAND2013-2754. Albuquerque, NM: Sandia National Laboratories.
118 U.S. Nuclear Regulatory Commission. 1996. Freedom of Employees in the Nuclear Industry To Raise Safety Concerns Without Fear of Retaliation; Policy Statement. Fed Reg 61:24336.
119 NRC, Final Safety Culture Policy Statement, Fed Reg 76:34778.
120 Goeckner/DOE Office of Environmental Management, Safety Culture.
121 Goeckner J. Training Workgroup Report. Presented at SCIP Meeting, 3 August 2016.

Table 5. Workers' Comments Regarding SCWE Training

Workers expressed concern that SCWE training for leaders and supervisors was separate from the workers. They said that if we are all in this together why don't we have the training together.
Several workers suggested that the SCWE training will likely be nothing more than a "check the box" activity at their site.
Comment about the 200 "SCWE Leaders" training was that workers who had seen copies of the training were concerned about the scenario which involved firing a worker – thought that was a bad place to start the conversation.
Comment related to SCWE training was that this type of training needs to be specific to the site.
Comment that SCWE training should incorporate elements of 10 CFR 851 since the standard includes workers' rights.
Question about how the SCWE training will speak to contractual challenges (award fees).
How does SCWE relate or integrate with other programs, procedures, or training?
Question about how SCWE or broader safety culture programs/efforts would speak to or assure sustainability of the long term effort.
Workers expressed concern about using stop work authority. "You use the stop work authority at your own peril."
One person said that reporting safety issues was not the problem; getting them resolved was the problem.
One person said that the result of these programs is to look at the worker's behavior when something goes wrong.
After presentation at training meeting, workers from a few sites mentioned that they feel like what they have at their sites is nothing more than "hyper-culture." (see 4.0 for definition)
One person said that in many situations when union safety representatives bring up an issue they are asked to "discuss" it with a group of management's technical experts. This one against many situation is intimidating and does not encourage workers to give input.

5.0 Conclusions and Recommendations

5.1 Conclusions

The broad scope and complexity of the work performed throughout the DOE complex, the mixture of new technologies along with ageing assets, the unique management structure of the department as "regulator" and operator, the frequent changes in leadership, and the potential loss of institutional memory are all factors which make the safe conduct of operations an ongoing challenge at DOE. With all these challenges ahead it is essential that the DOE as a whole, along with all the sites and contractors, become learning organizations which aren't reacting to the next crisis but rather questioning and attempting to strengthen areas of vulnerability before something bad happens. To this end, the very committed workforce throughout the complex should not be considered the problem to be fixed but rather an essential source of expertise.[122]

Recent independent safety culture assessments of five DOE sites along with two DOE HQ offices (EM and HSS) indicate signs of a work environment where questioning attitudes are not encouraged and where the perception is that the desire to "get the job done" is prioritized and incentivized over safety. It is also apparent that the atmosphere at several sites appears to be far less than ideal for listening to safety concerns or of responding to safety issues. Some suggest that leadership "talk the talk but don't walk the walk" and that although multiple mechanisms exist for reporting safety concerns and even for stopping work, the workforce is reluctant to use these mechanisms for fear of retaliation or out of frustration with the time it takes to resolve the problems.

122 Sidney Dekker suggests, "We need to transition from seeing people as a problem to control, to seeing people as a solution to harness," to make his point that management needed to listen to the workforce in making safety improvements. Dekker, Safety Differently: Human Factors for a New Era, p. vi.

DOE, partially in response to DNFSB Recommendation 2011-1, has begun efforts to assess the safety culture of sites around the complex, take actions to introduce and instill the concept of a SCWE at HQ and at the sites (in part by conducting SCWE training throughout the complex and with workers at all levels), and to provide assistance to the sites in improving safety culture (through the efforts of the SCIP). The following recommendations are offered for consideration in improving efforts associated with improving safety culture and safety performance at the DOE.

5.2 Recommendations

1. All work related to safety culture should come from the top down as well as the bottom up. While the DOE's safety and health programs (ISMS, 10 CFR 851, and VPP) and safety culture models express the attribute of worker involvement there is little evidence that workers are involved in safety systems or in the department's safety culture improvement efforts in any significant way. If the DOE and its contractors hope to improve safety culture across the complex, this must change. Workers must have more input into the efforts being made in the name of keeping them safe. Effective safety programs are ones in which employers and employees are actively participating and working closely together in order to develop and implement a safety and health program that includes appropriate and adequate training, and meaningful worker involvement. The "Implementation Guide for Use with 10 CFR Part 851" provides measures for worker involvement:

   Active and meaningful employee involvement in the worker safety and health program means the workforce is trained to recognize hazards and is involved in correcting them. An indicator of effective employee involvement is enthusiastic employees who understand their role in the program and who are interested in its success.[123]

   Indicators such as these must be used across the complex to measure meaningful worker involvement in safety activities.

2. SCWE training, while covering some very important information, is treating a symptom rather than attempting to cure the "disease," as it is narrowly focused on the issue of reporting without fear of retaliation. As mentioned above, SCWE is only one attribute of safety culture. Simply informing workers of their rights and responsibilities (right to report problem, right to stop work) does not have much of an effect on changing behaviors – workers remain reluctant to report problems and/or are frustrated that problems reported are not corrected. Broader training in line with the expressed needs of the workers which would cover all the elements considered in various safety culture models (NRC, INPO, DOE) along with safety systems training should be considered. Several National Institute of Environmental Health Sciences (NIEHS) grantee programs have training that can provide appropriate starting points for this type of training.[124] The training must include modules that cover all safety culture attributes and should be incorporated into safety management systems training.

3. Declarations about a commitment to an open and trusting workplace do not make it so. DOE safety culture assessments showed that an unwillingness to report safety issues and concern regarding fear of retaliation remain as issues despite efforts by the DOE to establish an open reporting environment. A July 2016 GAO report also noted that some of the safety culture self-assessments reported low participation rates in surveys due to concerns of anonymity.[125] DOE should consider adopting reporting models established in other industrial sectors that allow for anonymous reporting.[126]

4. The SCIP has a very broad and important mission. Transparency of the SCIP's activities should be a priority. To date, basic items such as the charter, structure, meeting minutes, and presentations made at SCIP meetings are not readily available to the public. As the SCIP continues

123 U.S. Department of Energy. 2006. Implementation Guide for Use with 10 CFR Part 851, Worker Safety and Health Programs. DOE G 440.1-8. p. 28. Available: *https://www.directives.doe.gov/directives-documents/400-series/0440.1-EGuide-8* [accessed 5 October 2016].

124 The Center for Construction Research and Training Foundations of Safety Leadership (FSL) course, the International Association of Fire Fighters Frontline Safety training course, and the United Steel Workers Systems of Safety and Looking For Trouble training programs may provide useful models for a more holistic training regarding safety management and associated human and organizational factors.

125 GAO, Department of Energy: Whistleblower Protections Need Strengthening, p. 23.

126 For example, the FAA has an anonymous reporting program that goes through a third party, NASA, for the reporting *(http://asrs.arc.nasa.gov).* The FAA reporting model also establishes a reporting analysis team who review, analyze, and trend the reported issues. The team includes qualified labor representatives. The state of California has a final draft process safety regulation that is requiring anonymous reporting, but not involving a third party.

its work, a few questions should be considered: Is it possible to include other stakeholders in the panel's work (labor, contractors, etc.)?[127] How does the SCIP interface with the site Safety Culture Monitoring Panels and should there be some representatives from Safety Culture Monitoring Panels on the SCIP? How is the SCIP going to evaluate the effectiveness of the SCWE training? How is the SCIP going to evaluate its overall effectiveness?

127 A review of the approach used for the Department Standards Committee, which involved stakeholders in associated Standards Process Action Teams, may yield some ways in which this could be done.