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ATTRIBUTES OF EFFECTIVE IMPLEMENTATION



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ATTRIBUTES OF EFFECTIVE IMPLEMENTATION

In May 1996, the Department Standards Committee (DSC) chartered a Standards Process Action Team (SPAT 12) to develop a tool that would help guide the implementation of Work Smart Standards (WSS) derived and approved using the DOE Manual 450.3, *Closure Process for Necessary & Sufficient Sets of Standards* (WSS Closure Process). Consistent with the *Criteria for the Department's Standards Program* and the *DOE Guide for Integrated Safety Management Systems*, the team defined implementation as the collection of activities comprising work planning, work performance, performance assessment, and work feedback. As a subsequent step toward developing a tool for improvement, the team defined “effective implementation” as “planning and performing the work in accordance with the agreed-upon standards, confirming that this has been done, and maintaining and improving work planning and performance based on feedback.”

Once the scope had been precisely defined, the team then visited a number of DOE sites to observe diverse implementation practices. From these visits the team validated that the four components of implementation were in evidence at each site, but that the mechanics and mechanisms employed were site- and program specific—inextricably bound to the particular activities, work environments, and corporate operating policies. Creating a tool designed for improving implementation, therefore, demanded respect and appreciation: for the diversity of work and missions, and for the capabilities, expertise, and knowledge of those immediately involved in implementing standards.

Using the field observations as a foundation, the team identified common themes at the sites, and from these derived a set of 21 attributes correlated with effective implementation. This attribute set is intended for use by all organizations involved in implementing standards. The set is equally applicable for implementing standards derived using the WSS Closure Process or any other process, and is intended to accomplish three key goals:

- Promote more effective and informed decision making about how effective implementation is accomplished; there are no “how to” guides or “checklists” provided, but rather information that will allow more effective judgments to be reached about where and to what degree opportunities exist for doing work more safely and efficiently.
- Encourage each of the communities involved in implementing standards to make more valuable contributions toward ensuring work is done safely and efficiently; workers, ES&H professionals, management, and assessors—both contractor and DOE—have opportunity and shared responsibility in enhancing the effectiveness of implementation.
- Promote and foster a logic of implementation predicated on the Work Smart Principles embedded in the *Criteria for the Department's Standards Program* and reflected in the WSS Closure Process:

- a focus on the work, as opposed to beginning with a focus on requirements or hazards;
- teamwork, highlighted by cooperative engagement of affected organizations and individuals;
- fostering of and reliance on sound judgment, experience, and operating knowledge;
- an emphasis on ownership and accountability;
- decision-making at the appropriate operating levels;
- enhanced communication throughout the process and work cycles; and
- a rational balance between safety and efficiency.

The set of attributes is a starting point. Derived exclusively from limited observation of DOE programs, the list is not intended to be definitive. Rather, the team expects that experience with the set will encourage expanding and refining the attribute list, and will serve to increase its usefulness in helping meet the DOE's objectives of establishing itself as a world class, standards-based operation.

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ATTRIBUTES OF EFFECTIVE IMPLEMENTATION

I. INTRODUCTION

When the Department of Energy (DOE) issued the *Criteria for the Department's Standards Program* (DOE/EH/-0416) in August 1994, it established a new direction and vision for the complex: Standards-Based Management. The *Criteria* depicted the image of a fully mature safety-based management system: standards selected based on their appropriateness in safely and efficiently accomplishing the work; the selected standards effectively incorporated into work controls; work conducted in concert with those controls; local and corporate infrastructures reengineered to better support the DOE's mission and work; and feedback and assessment systems in place, aligned with and directly contributing to strengthening work performance and assuring continued adherence to the agreed-upon standards and controls.

Beyond the mechanical changes needed to achieve the vision, the *Criteria* described a new Department-wide approach to Department and contractor management that embraced the following principles:

- a focus on the work, as opposed to beginning with a focus on requirements or hazards;
- teamwork, highlighted by cooperative engagement of affected organizations and individuals;
- fostering of and reliance on sound judgment, experience, and operating knowledge;
- an emphasis on ownership and accountability;
- decision making at the appropriate operating levels;
- enhanced communication throughout the process and work cycles;
- a rational balance between safety and efficiency;
- an appreciation of the distinctive differences among the numerous work activities and work environments evidenced within the DOE Complex.

The first tangible demonstration of how these "Work Smart" principles contribute to achieving the goals established in the *Criteria* was provided in the Department Standards Committee's (DSC's) development of a *Closure Process for Necessary and Sufficient (N&S) Sets of Standards* (WSS Closure Process) for the identification and approval of Work Smart Standards. Using the expectations set forth in the *Criteria*, coupled with the Work Smart principles enumerated above, the DSC engineered a process that calls for establishing knowledgeable teams to conduct a rigorous examination of the work and to determine the associated hazards. Definition of the work and identification of associated hazards is followed by a disciplined, cooperative determination—using expertise, experience, and judgment—of the standards necessary to allow the work to be performed both safely and efficiently.

Successes achieved in pilot applications validated both the WSS Closure Process and the inherent value and benefits resulting from the underlying Work Smart principles. Based on these successes and the clear benefits to the DOE and its work force, the Secretary of Energy issued a policy statement (Policy 450.3) in March 1996 authorizing use of the WSS Closure Process for selecting and approving standards. With issuance of the policy, the first challenge of achieving a mature standards-based management system had been met: with the sanctioning of the WSS Closure Process, the complex had an institutionalized tool for selecting and approving standards' tool predicated on the expectations and principles laid out in the *Criteria*.

With the institutionalization of the WSS Closure Process, new opportunities for doing work more safely and more efficiently became evident throughout the DOE Complex. However, both the DSC and the owners of potential applications of the WSS Closure Process recognized that selecting and approving an appropriate set of standards is only the first step in achieving a functional and mature standards-based management system. Once the standards are approved, they still must be translated into the performance of work.

Here, too, the *Criteria* identified expectations on how the standards should be captured in work planning; how work controls should be developed and work performed; how feedback should be used to contribute to ensuring the continued efficacy of work and work processes; and how assessment strategies should be aligned to reinforce and validate the overall integrity of the system.

As with development of the WSS Closure Process, the issue with implementation was not that no previous method or system existed. As was recognized by the DSC from the outset, implementation is not at all new: for as long as DOE has been doing work, standards and program requirements have generally been captured in and translated into work through the use of policies, plans, and procedures. Policies provide a statement of intent and philosophy; plans establish specific agreements and commitments such as resource allocations and schedules; and procedures prescribe the detailed direction on how to accomplish the tasks that cumulatively represent the agreed-to scope of work.

However, experience in recent years has manifestly demonstrated that capturing requirements and standards in a facility's or program's documentation is not synonymous with, nor an accurate indicator of, implementation effectiveness. The missing ingredient is not availability of a strategy, but, rather, availability of a strategy that embeds the Work Smart principles within the implementation function. In other words, there is a two-fold measure of implementation effectiveness: (1) its success in meeting the mechanical expectations that ensure work proceeds in concert with the agreed-upon standards and (2) its success in using the "Work Smart Principles" to satisfy the expectations (Figure 1) of affected communities: management, workers, assessors, and stakeholders.

Using this “expectation yardstick,” it is evident that while isolated successes in implementation have occurred within DOE, DOE and its contractors have not produced a consistent record of

Management	<ul style="list-style-type: none">• Work is proceeding safely and efficiently• Work is being carried out consistent with standards• All levels of implementation remain within established standards• Technical, management, and performance standards are integrated
Workers	<ul style="list-style-type: none">• Worker safety is a paramount consideration• Systems exist for participation and input• Experience and capability are recognized
Assessors	<ul style="list-style-type: none">• Work is performed consistent with standards
Stakeholders	<ul style="list-style-type: none">• Focus is on getting work done• Work is performed safely and efficiently• Public and environmental safety are paramount considerations

Figure 1. Expectations Associated with Effective Implementation.

effective implementation. Achieving a consistent record requires two conditions: (1) broad appreciation of precisely what is meant by “effective implementation,” and (2) availability of a tool to promote and provide the ability to achieve or enhance effective implementation—both for those work activities transitioning from the process of selecting standards into the implementation phase and for those work activities seeking to make improvements in ongoing implementation initiatives and practices.

Accordingly, the DSC chartered a Standards Process Action Team (SPAT 12) to accomplish precisely these ends:

- develop a definition and understanding of effective implementation that can be used to enhance communication and foster collaboration among DOE, its contractors, and its stakeholders
- establish a framework to guide implementation of sets of standards approved using the WSS Closure Process
- establish a framework to promote improved implementation for those activities that are already in the implementation phase, irrespective of the means by which standards were identified and approved.

This report provides the results of the team’s efforts. The sections of the report correspond with the objectives established for the team by the DSC:

- Section I, Introduction, provides the context and background of this project

- Section II, Implementation, provides an explanation of implementation—its scope and focus
- Section III, Attributes of Effective Implementation, provides an explanation of why attributes were selected as the tool most appropriate for improving implementation, the process used for deriving the attributes, and the use of attributes in supporting Integrated Safety Management Systems.
- Section IV, Attribute Descriptions, provides descriptions of each of the attributes, including descriptions of conditions found when the attribute is in evidence, benefits of the attribute, and field examples as observed during team visits to DOE sites.

II. IMPLEMENTATION

A. IMPLEMENTATION: BASIC DEFINITION

Implementation, in its broadest sense, deals with getting the work done, with the steps that follow the selection and approval of a set of standards for the work and the hazards. In the *Criteria*, implementation deals with the elements described in Criteria 6 through 10:

- Criterion 6: Department line management and contractor management implement necessary and sufficient sets of standards to provide protection during the accomplishment of work, including all requirements imposed by law.
- Criterion 7: Department line management and contractor management incorporate agreed-upon standards through design, operating and administrative controls
- Criterion 8: Work is performed in compliance with design, operating, and administrative controls
- Criterion 9: Implementation of the agreed-upon standards is confirmed
- Criterion 10: Compliance with agreed-upon standards is maintained, and noncompliances are resolved in a timely manner.

Another way to envision the scope of implementation is by using the basic figure depicting the five functions accomplished by a Safety Management System (SMS). Using this communication model, implementation is the cumulative scope of the three shaded elements: establish controls, perform work, assess and feedback (Figure 2).

B. IMPLEMENTATION: EXPANDED DEFINITION

Using this basic representation of implementation, a more specific definition can be derived. Additionally, the more exact definition can be used to introduce the concept of “effectiveness,”

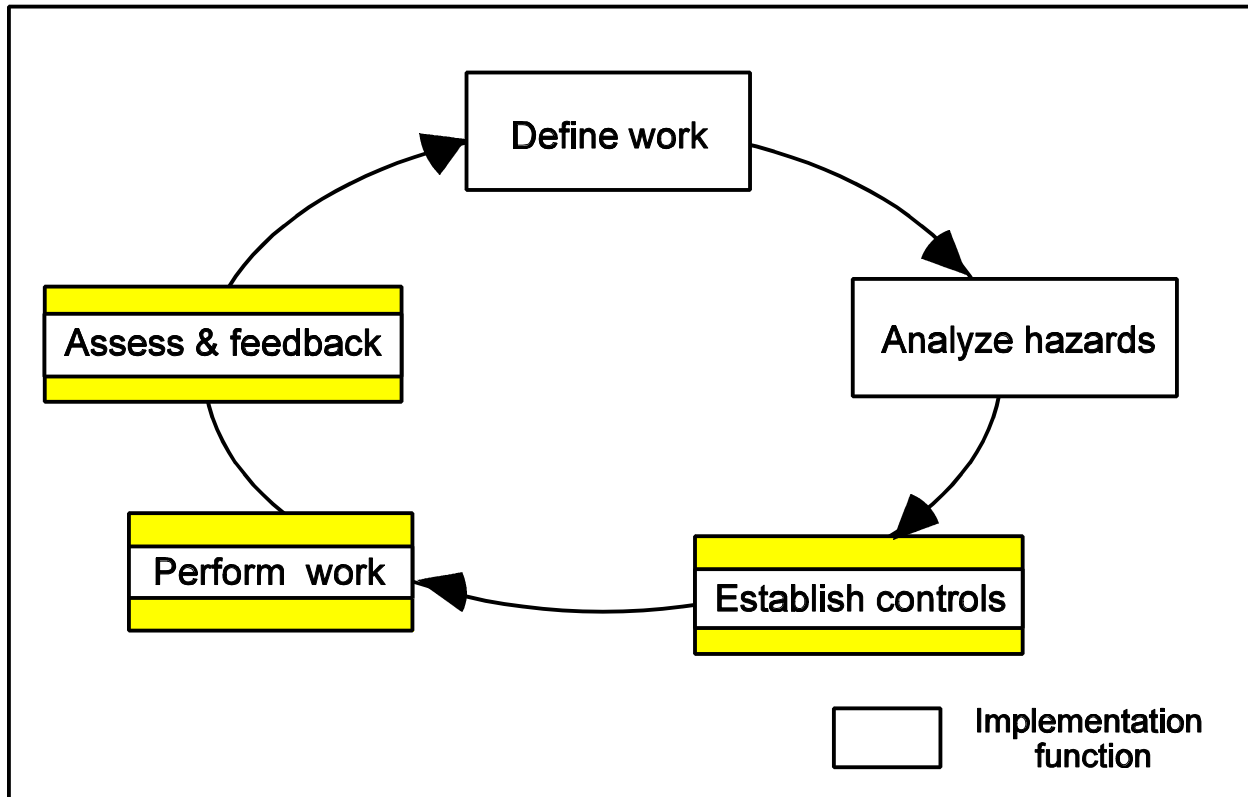


Figure 2. Implementation and Integrated Safety Management.

the recognition of when these functions are done well (in keeping with the expectations of the *Criteria* and the Work Smart Principles).

As a first step in refining the definition, implementation was defined in terms of its scope: Implementation represents the scope of activity encompassed in (1) planning work, (2) performing work, (3) performance assessment, and (4) providing and addressing feedback. This basic definition was then expanded by defining specific starting and ending points for each of the components of implementation (Figure 3), and then by introducing the notion of “effectiveness.”

Combining the preliminary definitions with the statements of starting and ending points produced a clearly articulated framework for understanding and communicating the concept of effective implementation, effective work planning, effective work performance, effective performance assessment, and effective work feedback.

Effective Implementation: Planning and performing the work in accordance with the agreed-upon standards, confirming this has been done, and maintaining and improving work planning and performance based on feedback.

Effective Work Planning: Reaching agreement on standards and expectations for refined definitions of work down to the level of activity at which work is performed, concluding with the

informed acceptance of expectations by those responsible for the performance of work. Informed acceptance means with full knowledge and understanding of all management expectations.

Component	Start Point	End Point
Work Planning	Work, hazards, and N&S standards for the work have been defined	Informed acceptance of expectations for the work by those responsible for the performance of work
Work Performance	Approval to proceed with work	Completion of the approved work
Performance Assessment	Approval to performs work	Completion of the approved work
Work Feedback	No specific starting point; can start anytime in the process	Disposition of feedback

Figure 3. Parameters for Implementation Components.

Effective Work Performance: Performing work safely and in accordance with the work plans and work controls incorporated in the work plans.

Effective Performance Assessment: Providing recognized and credible information on strengths and weaknesses of work planning and performance.

Effective Work Feedback: Appropriately using assessment information for maintaining performance or achieving improvement.

III. ATTRIBUTES OF EFFECTIVE IMPLEMENTATION

A. SELECTION OF ATTRIBUTES AS THE APPROPRIATE TOOL

All of the Department's contractors have developed methods for translating applicable standards (requirements) into work controls and work practices. In addition, most contractor management systems provide for worker feedback. The contractor safety management systems are subject to multiple levels of oversight and assessment. In most cases, the contractors have conducted work over a considerable period with a reasonable to excellent level of safety, as indicated by standard statistical measures of safety (e.g., OSHA standards).

Although there has been a significant degree of commonality in the high level standards that have been applied to the various Department contracts, this has not led to commonality in the work practices and philosophies. The differences in work practices and philosophies have evolved over time as direct consequences of the differences that exist in the work activities throughout the complex. For example, Figure 4 illustrates how work planning at various DOE sites is accomplished; while all sites use a common framework to reach agreement down to the level at

which work is performed, each site has customized the process to best support its work and work environment. The dual need for (1) higher level standards that provide more flexible implementation, and (2) work planning that provides a greater degree of rigor and effectiveness has led to the development of the Work Smart approach to safety management.

Guidance on effective implementation of agreed-upon standards needs to be applicable to diverse work, work environments, and user communities. It needs to provide useful guidance while allowing the flexibility that is necessary for effective and efficient safety management. It should promote and strengthen a common vision among management, workers, and independent assessors with regard to effective implementation. And finally, it should not prescribe how effective implementation is to be accomplished, but rather describe what it is or looks like in order to help managers and workers set appropriate goals and measure accomplishments.

The team determined that the best approach for meeting all of these criteria was to provide a set of attributes that correlate with effective implementation, and to indicate how the user can identify these attributes through observations in the field. The objective is to encourage managers and workers to use their experience, expertise, and professional judgment to make more valuable and productive contributions to safe and efficient performance of work.

Knowing the work and understanding the hazards are essential prerequisites to participating in any effort to improve implementation. The attribute set does not allow for uninformed participation in work planning, work performance, performance assessment, or feedback. Participation in those activities without first attaining a good understanding of the work, work environment and associated hazards will, inevitably, diminish overall effectiveness, and can—though unintentionally—introduce barriers to doing the work safely and efficiently. The

Site	Activity Description	Facility Environment	Activity Environment	Integrated Control
Rocky Flats	Drain tanks	771 Basis for Operation (BFO)	Activity Control Envelope (ACE)	Work procedures
Livermore	Experimental projects	Facility Safety Procedure	Experiment plans	Experimental barriers and procedures
Oak Ridge (HFIR)	Operate reactor	Safety Analysis Report (SAR)	Unreviewed Safety Question (USQ) process	Procedures and readiness reviews
Hanford (Purex)	Deactivate facility	Project Plan	Job safety analysis (JSA); enhanced work planning	Work control and procedures

Figure 4. Examples of DOE Planning Structures.

attribute set is intended to promote and foster a logic of implementation predicated on the work smart principles:

- a focus on the work, as opposed to beginning with a focus on requirements or hazards;
- teamwork, highlighted by cooperative engagement of affected organizations and individuals;
- fostering of and reliance on sound judgment, experience, and operating knowledge;
- an emphasis on ownership and accountability;
- decision-making at the appropriate operating levels;
- enhanced communication throughout the process and work cycles;
- a rational balance between safety and efficiency;
- an appreciation of the distinctive differences among the numerous work activities and work environments evidenced within the DOE Complex.

The relationship of ownership to responsibility and accountability deserves discussion in light of the different perceptions that were encountered during the preparation of this report.

Responsibility for work can be assigned, and individuals can be held accountable for performing the work. Ownership cannot be assigned. It arises within an individual as a result of the informed acceptance of responsibility and accountability for defined work. In some cases, individuals can feel ownership for all of the work of their organization, even work for which they are not directly responsible. This broader sense of ownership can be highly productive when expressed in appropriate ways, through teamwork, for example.

B. DEVELOPING THE ATTRIBUTE SET

Using the refined definitions of effective implementation, the team developed a process for deriving a set of attributes that correlate with effective implementation. This process consisted of observing implementation practices at a select number of DOE sites, and then deriving the attribute set through a disciplined and deliberate process of assessment and evaluation using the combined experience and expertise of the team. Because the observations were limited to DOE sites, the team recognizes that the list of attributes is not definitive, and should be subject to regular re-evaluation, refinement, and expansion. The goal was to develop a preliminary set of attributes, which would allow persons involved in implementation to take broad measure of their efforts, to create a forum for sharing and communicating successful practices, and to encourage practical, pragmatic, and creative thinking about additional opportunities every program has to improve upon current implementation efforts.

To accomplish these goals, the process used to identify and derive attributes was structured in four phases: Phase 1 was to refine the definition and scope of implementation (discussed in Section II, Implementation); Phase 2 was to conduct a series of site visits to gather data about implementation practices; Phase 3 was to analyze the data from the visits and to determine any common themes observed; and Phase 4 was to derive the underlying attributes that correlate with effective implementation.

Data Gathering: The first step in developing the attribute list was to gain an understanding and appreciation of what was being done relative to implementation in the field. To achieve this goal, specific areas of interest and lines of inquiry relative to implementation were developed for use during site visits (Figure 5). These lines of inquiry were used not as formal checklists, but as general discussion topics intended to ensure high confidence in the completeness of the information being gathered by the team.

As an initial test of the team's methodology and lines of inquiry, the entire team, as a group, conducted the initial site visit, which was held at Livermore. This group visit helped refine the questions and topic areas, and ensured that all team members shared a common sense of the lines of inquiry and the scope of implementation about which information was being gathered.

Observing a sufficient sampling of the types of DOE work activities was understood as critical in establishing the validity of the team's conclusions. Therefore, a site list was constructed that offered perspective from large and small sites, of traditional and non-traditional DOE work, of routine and non-routine work activities, of stable work environments and highly dynamic work environments. Teams of 2 to 4 people visited each site for 1 to 2 days. Site visits included tours, presentations, and informal meetings with DOE and contractor personnel, including workers,

Work Planning	Work Performance	Assessment	Feedback
<ul style="list-style-type: none"> • Worker input • Customer input • Documentation • Communication methods • Maintaining information current • Integration of standards (including cost and schedule) 	<ul style="list-style-type: none"> • Safety experience • Safety behavior • Cost and schedule experience • Worker authority versus responsibility • Worker confidence 	<ul style="list-style-type: none"> • Basis for assessment at each level of planning and performance 	<ul style="list-style-type: none"> • Feedback from worker • Feedback to worker • Lessons learned • Performance metrics • Trending

Figure 5. Areas of Specific Focus During Site Visits.

technicians, ES&H professionals, and management. The hosts were informed in advance of the visit that the goal was to gain an understanding of implementation practices. (Figure 6 is a list of the sites visited.)

Synthesis and Analysis: Once all site visits had been completed, individuals prepared reports documenting their observations. Then, the members of each team that had visited a site got together to discuss what they had seen, what items had made strong impressions on them, and why. The next step was putting together the lists from the site teams. Related themes were grouped and then discussed further to ensure a thorough understanding of each item on the list. The lists of common themes were then refined and combined. Using the combined list, discussion focused on determining underlying principles, influences, and causal factors. Finally, this led to an understanding of the attributes themselves. (Figure 7 depicts the steps used in deriving the attributes. Figure 8 is a depiction of the overall process used in the development of the attribute set.)

C. ATTRIBUTES AND INTEGRATED SAFETY MANAGEMENT

The DOE Guiding Principles of Integrated Safety Management are intended to permit different approaches to tailoring a set of implementing mechanisms while ensuring that a set of core values is preserved in any acceptable Integrated Safety Management System (ISMS) design and performance. The DOE mission comprises exceptional diversity in the scope and complexity. It includes both conventional and unconventional work. In some cases, the uncertainties associated with characterization of the work, the work environment, and the hazards require tailored

Work Planning	Focus of Visit
Fermi	Transition to/implementation of an N&S set of standards
Fernald	New approaches to work planning
Hanford	Teamed approach to planning and performance of deactivation activities (PUREX) Laboratory operations [Pacific Northwest National Laboratory (PNNL)]
Livermore	Experimental mission; combined bottoms-up/top-down approach
Nevada	Implementation in construction environment; non-nuclear activities at nuclear site
Oak Ridge	Implementation at a reactor (HFIR)
Pantex	Weapons assembly and disassembly
Rocky Flats	Tank draining operations; conversion of building to radioactive waste storage
Savannah River Site	Vitrification of waste (DWPF); introduction of high-performance work teams

Figure 6. Sites Visited.

management approaches. It is recognized there can be no single right answer to implementation of standards or the achievement of integration.

The attributes of effective implementation represent an effective tool in the operation of an Integrated Safety/Management System as envisioned in the DOE Guide 450.4. Work Smart principles represent a coherent strategy for tailoring the performance of an ISMS. The Work Smart Manual process applied to work design leads to an agreed-upon set of expectations (standards) that are tailored to the work. Application of Work Smart thinking to work performance, using the ISMS basic Safety Management Functions, permits identification of a set of characteristic observables by which the integration of ISMS Mechanisms, Responsibilities, and Implementation (execution methods) can be assessed for effectiveness. The relationship

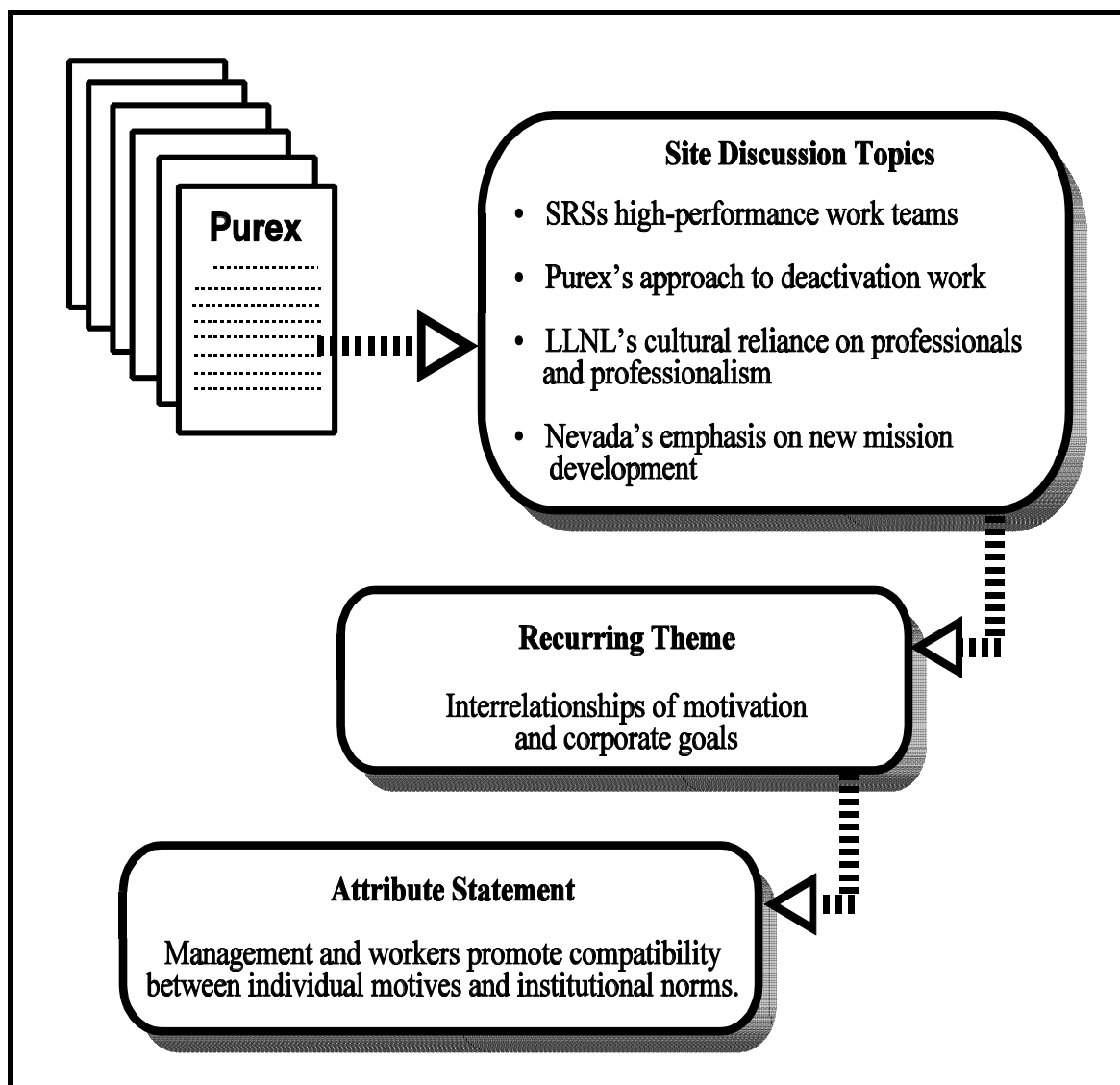


Figure 7. Process for Deriving Attributes.

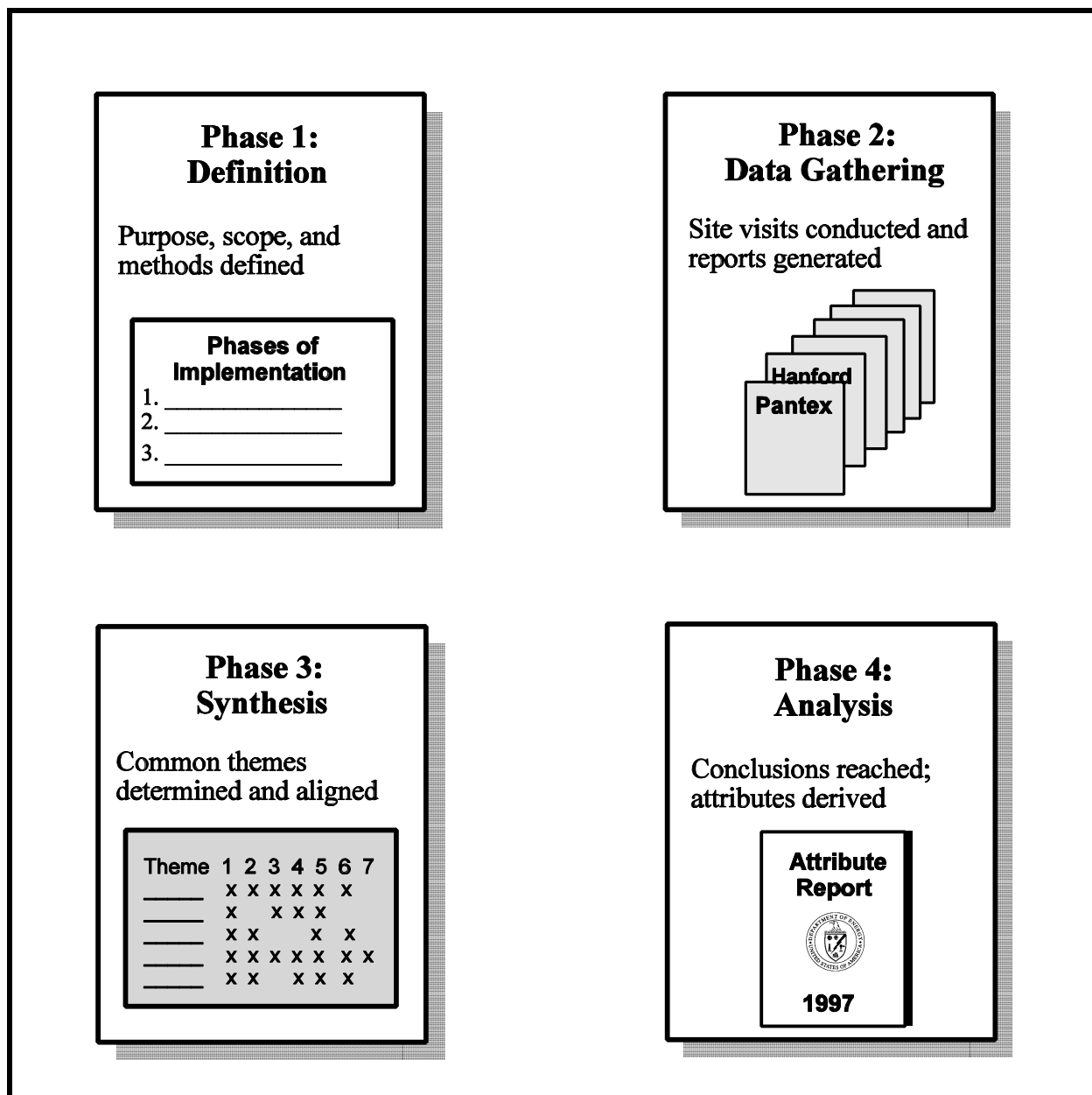


Figure 8. Overview of Team Process.

between the ISMS concepts and Work Smart principles is depicted in Figure 9.

In developing the Safety Management System (SMS) description required by the Environment, Safety, and Health Clause of the contract, the contractor must integrate the need to contain risk, meet mission objectives, and meet applicable requirements. The objective in each case is to perform the core safety functions in a manner that fulfills the Integrated Safety Management Guiding Principles. The mechanisms used to implement the core safety functions are sometimes unique, but more usually are drawn from sets of mechanisms that are common across broad

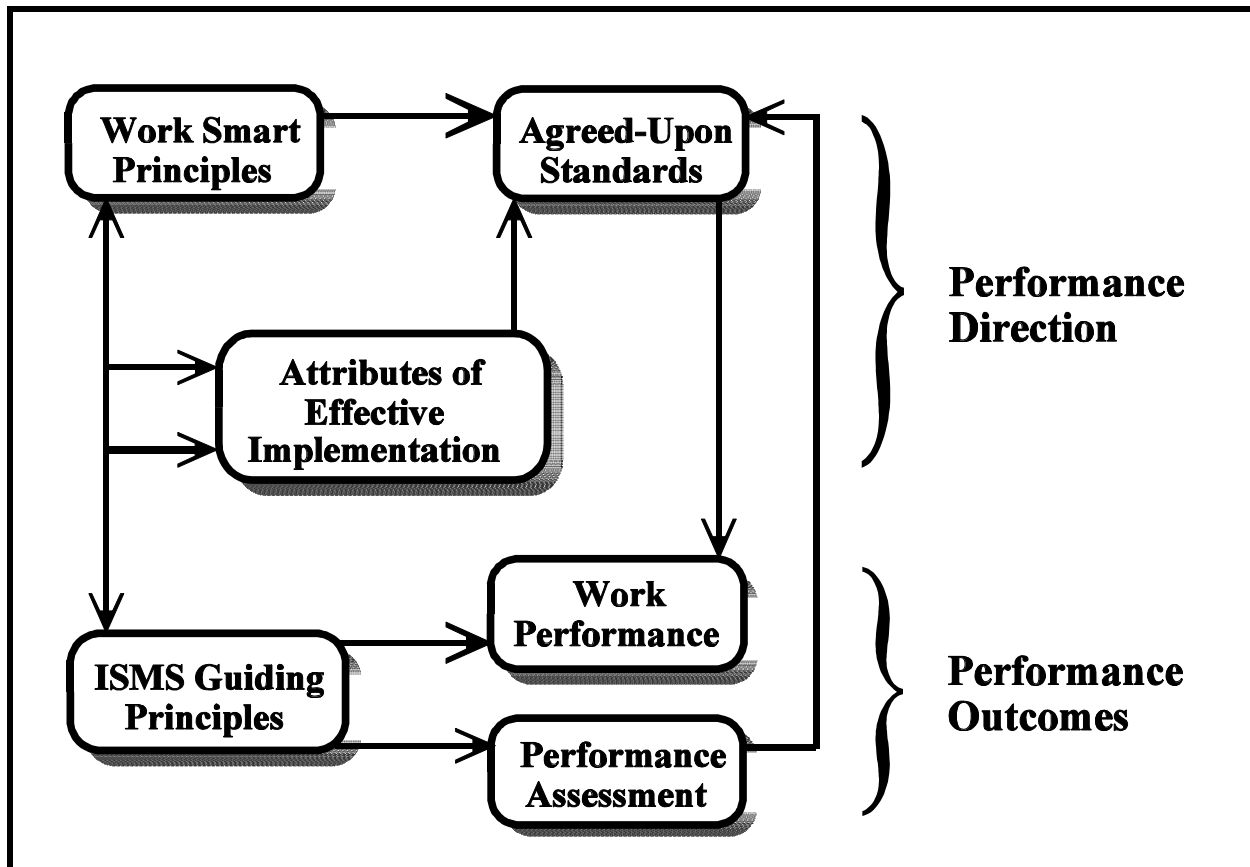


Figure 9. Relationship Between ISMS Concepts and Work Smart Principles.

sectors of the DOE complex. The selection and use of the mechanisms is tailored to the management philosophy and style of a particular contractor and the resulting set of mechanisms may well be unique. Beyond that, the design, operating, and administrative controls are tailored by the contractor to the work, the work environment and the associated hazards. This is why there may be little to distinguish between the basic standards (e.g., laws, regulations, consensus standards) applicable to different contracts, or even the commitments made in different SMSs, while the actual fulfillment of the commitments will need to be different to provide adequate protection efficiently. Coupling the “Work Smart” approach with a set of attributes for effective implementation promotes the tailoring of work controls that are both effective and efficient.

A set of attributes that signify effective implementation provides a universal basis for evaluation and improvement. The set of attributes is equally relevant in all work environments, independent of whether the agreed-upon standards being implemented were derived by the WSS Closure Process or some other means. The attribute set can be used by all groups involved in the implementation of standards to promote more effective, more collaborative, safer, and more efficient ways of planning work, performing work, assessing performance, and using feedback to improve work planning and performance.

IV. ATTRIBUTE DESCRIPTIONS

ATTRIBUTES OF EFFECTIVE IMPLEMENTATION

1. Planning, performance, and assessment are focused on the work.
2. ES&H standards are integrated with other expectations for the work.
3. Line ownership of ES&H is evident.
4. Worker ownership, confidence, and job satisfaction are evident.
5. DOE and contractor line management provide tangible evidence of commitment to implementation of agreed-upon standards.
6. Workers know and understand operational and strategic objectives.
7. Managers and workers promote compatibility between individual motives and institutional norms.
8. Workers have timely participation in work planning.
9. Work planning is carried out with an integrated project approach.
10. Work planning and work controls are based on collective knowledge.
11. Information necessary for work planning and performance is reliable, readily available, and communicated with appropriate tools and methods.
12. Training and qualification of workers support reliance on judgment and expertise.
13. Workers know, understand, and believe in agreed-upon standards.
14. Managers do not allow worker ownership without informed acceptance.
15. Work is conducted in accordance with agreed-upon work controls.
16. Performance of work is based on worker knowledge and ownership.
17. A formal program of self-assessment supports organizational learning.
18. Assessment criteria are developed during work planning.
19. Assessment criteria are based on agreed-upon expectations.
20. Cost effectiveness is one measure of performance.
21. Planning and performance of work are responsive to feedback.

These 21 attributes relate to all four components of effective implementation (planning, performance, confirmation, and feedback). Some attributes, rather than lying exclusively within the boundaries of one of these components, have broad reaching implications that are equally applicable, and equally essential to each of the four components. Others are more specifically focused on a particular component of implementation. The attributes are presented in a single list; the numbers are used simply to discriminate among the attributes and are not intended to suggest relative importance or order of examination.

The set, as noted, does not provide a template, model, or checklist for assessing or achieving effective implementation. Each attribute, and the set as a whole, must be carefully considered in light of the particular circumstances governing its proposed use. In this regard, each attribute is described using a structure designed to allow potential implementers to make judgments regarding the appropriate degree to which the attribute is and should be in evidence in the workplace. With the same goal of fostering thinking rather than promoting prescription, select examples of how each attribute has been observed among the visited sites is provided again, not as models to be replicated, but as examples of the various means by which the attribute has been introduced.

For each attribute, there are three subheadings:

1. Evidence of the attribute: What is seen in the work place when the attribute is in effect.
2. Benefits of the attribute: What advantages accrue from having the attribute in effect.
3. Field examples: Illustrations of how the attribute was manifested at sites visited by the team.

ATTRIBUTE 1: Planning, performance, and assessment are focused on the work.

Evidence of Attribute: At each level of work management, the identification of standards for the work begins with a characterization of the work, the work environment, and the hazards associated with the work. The level of detail for the characterization is necessary and sufficient for the identification of the standards appropriate for the level of work management. (For example, the level of detail will be greater for identifying task level work controls than will be needed for identifying contract requirements or site level standards.) Work performance is focused on completing the work in a manner that meets all applicable standards, including, as appropriate, ES&H, quality, productivity, schedule, and design standards. Assessment is focused on performance to meet objectives and expectations, and on how improvements in performance could be effected by changes to the design of the work or modification of the standards.

Benefits of Attribute: An integrated approach to work planning, performance and assessment requires a global approach that is best achieved by focusing on the central issue: the work. (Focusing on hazards or requirements tends to result in segregation of issues—stovepiping.) The result of focusing on the work is a more substantive and accurate characterization of the work, work environment and hazards, and the identification of standards that are constructively related to (i.e., necessary and sufficient for) safe performance of the work. This improves safety, worker morale, and program efficiency.

Field Examples of Attribute:

PUREX. Deactivation tasks are planned by cross-functional teams including craft workers, ES&H and engineering personnel, and other experts, as appropriate. The planning begins with a walk-down to refine the definition of the task, including a characterization of the work environment and the identification of hazards. This information is entered into a computer-aided analytical tool that supports a disciplined approach to the identification of applicable standards and resources, including technical resources that might be needed during the planning activity. The focus is on the work and what it will take to do the work safely and efficiently. Team members interviewed expressed satisfaction and a sense of ownership for the work and for performing in accordance with the standards that they had collectively identified. Both management and workers noted that work performance was both more efficient and timely as a result of work packages being developed with a focus on the work, rather than on compliance with an arbitrary set of standards.

Fernald. Maintenance work packages are prepared by cross-functional teams including ES&H and maintenance personnel (craft workers are not involved). The work planning begins with a definition of the maintenance task and the identification of hazards. The applicable standards and procedures are identified and incorporated into the work package.

HFIR. Maintenance work packages are prepared by cross-functional teams including ES&H, maintenance, and reactor operations personnel (craft workers are not involved). The work planning begins with a definition of the maintenance task and the identification of hazards. The applicable standards and procedures are identified and incorporated into the work package.

Nevada. A project based structure for doing work is being adopted. Project managers (whose goal is to accomplish the work safely and efficiently) are in charge of the work, and are empowered to cut across organizational lines in order to plan and to perform the work. Project managers set the vision for the work and form multi-disciplinary teams to plan and perform the work. The project manager, in effect, has control of all resources needed to get the work done. The matrix organization supports the project managers in assembling the project teams, and project managers are backed up by a high-level project management department. ES&H functions and self-assessment functions are included as integral elements of the project team. Project managers are being incentivized to ask for external assessment as well. Decisions on procedures (Which ones are needed? In what detail?) are being pushed down, as much as possible, to the level of the project manager or below. Placing resources and responsibilities in the hands of a project manager tasked with doing the work helps assure that the focus is on the work.

SRS (DWPF). Maintenance work packages are developed using multi-disciplinary teams including ES&H, maintenance, operations, and engineering personnel. The planning begins with a walk-down to clearly define the maintenance task and to identify hazards. The maintenance task is analyzed using a graded approach commensurate with the hazards identified. The applicable standards and procedures are identified and incorporated into the work package.

ATTRIBUTE 2: ES&H standards are integrated with other expectations for the work.

Evidence of Attribute: ES&H standards are incorporated into the work planning process and are addressed concurrently with the other management expectations for the performance of the work. Work design takes into account the potential for reducing or eliminating hazards. Multi-disciplinary work planning teams include ES&H professionals along with the workers and the other technical disciplines relevant to the safe, efficient performance of the work. Line managers and workers understand that their responsibility encompasses safety as well as other aspects of work performance. Self-assessments address all aspects of work performance—safety, quality, and efficiency—with a particular focus on conformance with agreed-upon work controls.

Benefits of Attribute: Work plans that integrate all expectations eliminate conflicts and result in a more uniform understanding of performance criteria. Line manager and worker ownership is encouraged when accountability for safety is clearly established. Worker confidence and safety are improved. Efficiency is not threatened by add-on safety requirements after work planning is completed.

Field Examples of Attribute:

NEVADA. As Nevada transitions to a project management form of work organization, ES&H personnel are being deployed (via the matrix organization) out to specific projects. Project managers assemble teams of personnel to perform project work and ES&H personnel are part of the project team. As the ES&H personnel who are deployed to a project become an integral part of that project team, they help ensure that ES&H standards are integrated into project planning and finally into project performance. Integration of the ES&H personnel into the team is encouraged by the project manager becoming responsible for the ES&H team member's performance appraisal (or at least that share of it relating to project work, if the project doesn't require full time ES&H). The project manager's responsibilities include responsibility for ES&H, so both the project manager and the ES&H team members are incentivized to make sure ES&H is properly integrated into performance.

Pantex. ES&H standards are now integrated with other expectations into weapons assembly and disassembly activities. To allow better understanding and integration, work scopes were divided into discrete sets of activities. Thorough analyses of the processes, the technical requirements, and the hazards were then conducted using teams of operations and ES&H personnel. These teams had complete responsibility to ensure work was being done both safely and efficiently—integrating the technical, management, and safety expectations. The outcome was better organizational alignments, restructuring of requirements databases to incorporate all pertinent standards, and revision of the majority of procedures to reflect the broadened perspective.

PUREX. The multi-disciplinary work planning integrates all expectations for the work, including ES&H standards and requirements, into the work.

Fernald. Maintenance task plans incorporate all expectations for the work, including ES&H standards and requirements, into the work plan.

HFIR. Maintenance task plans incorporate all expectations for the work, including ES&H standards and requirements, into the work plan.

ATTRIBUTE 3: Line ownership of ES&H is evident.

Evidence of Attribute: Line managers establish and communicate goals for the integrated ES&H program and objectives for meeting those goals in a manner that conveys full understanding of expectations to all workers. They provide active and visible leadership in implementing the program so that all workers (contractor, subcontractor, and facility users) understand that management commitment is genuine and enthusiastic. Line managers facilitate and encourage employee involvement in the structure and operation of the program, as well as in the decisions that affect their safety and health, and the protection of the environment. Worker commitment to achieve program goals and objectives is fostered and maintained by line managers. Responsibility (and associated accountability) is assigned and communicated for all aspects of the program so that all managers, supervisors, and employees in all parts of the organization know what is expected of them.

Benefits of Attribute: Ownership by line managers and workers, achieved by involvement in the day-to-day incorporation of safety into operations at every level, provides continued reductions in all levels and kinds of injuries and environmental incidents. The establishment of a positive, team-oriented work environment produces continued improvement of efficiency and performance by using managers and workers as a diverse source of technological and operational experience and ideas.

Field Examples of Attribute:

PNNL. Radiological control technicians (RCTs), radiological engineers, and radiological work permit (RWP) writers are directly funded by the projects they support. The staff are matrixed to the line organizations and receive their day-to-day priorities from line management. Funding and FTE levels are renegotiated each year as part of the business planning cycle. For the most part, RCTs, radiological engineers and RWP writers are resident in the facilities. To ensure independence in making correct radiological decisions, these staff remain accountable to the Radiological Control Manager.

Fermi. The Laboratory Director has assigned the responsibility for ES&H performance to the line managers. This assignment includes direction for activities that are required to effect the responsibility and includes the resources (professional ES&H staff) to conduct those activities. The Director has established a system of Laboratory ES&H committees and subcommittees who participate in the development of policy and standards. These employees (technicians, engineers, scientists, clerical people, and all level of managers) bring to the discussions the technical

expertise and perspective of the organizations they represent. The top level committee includes regular meetings of the Director with the top level managers.

SRS. The Enhanced Work Team for the Waste Water Treatment Plant is composed of a team leader and all the employees (which include ES&H technicians). The team establishes the goals for the Plant, including ES&H goals and objectives. A team meeting is held at least once a week to decide what tasks need to be performed and how to accomplish those tasks in the most efficient and safe way. Responsibility is assigned to the team members by the team so all members know what is expected of them. The employees are fully involved in the implementation and day-to-day incorporation of ES&H into operations at every level.

PUREX. Line managers fought for the opportunity to apply the modified enhanced work planning, multi-disciplinary team approach to work planning at the PUREX plant. The result is obvious ownership of work planning and work plans by the plant manager and the workers.

ATTRIBUTE 4: Worker ownership, confidence, and job satisfaction are evident.

Evidence of Attribute: Workers can describe why their jobs are important and can describe what job ownership (informed acceptance) means. Workers express pride in their jobs and are confident in their abilities to perform safely and efficiently. Workers express not merely a sense of ownership in their own jobs, but joint ownership of the organizational goals as well. Management provides opportunities for workers to expand their skills and knowledge. Workers are confident that they are meeting management's expectations. Workers express satisfaction with their jobs and with their organization. Workers believe that communications to and from management are effective and adequate. Management regularly applies, and pays attention to, measures of worker confidence and satisfaction.

Benefits of Attribute: Work ownership by qualified individuals meets individual goals of competency, esteem, and achievement; and meets management goals of accomplishing work safely and effectively. Although research on "job satisfaction" varies widely, individual feelings of self-worth, competency, and satisfaction generally do promote greater productivity and better work performance. Job satisfaction may even enhance safety performance. Job satisfaction also aids integration of individual and institutional needs.

Field Examples of Attributes:

SRS. The Enhanced Work Team for the Waste Water Treatment Plant is made up of all the plant employees. Through analysis of the work and identification of the performance expectations, the team identified job tasks. Specific responsibilities are assigned to team members by the team; team members know what is expected of them and how their assignments contribute to ensuring work is performed safely and effectively. The team also benchmarked commercial operations to gain further perspective. The workers interviewed expressed pride in their jobs and were confident in their abilities to perform safely and efficiently. Through this initiative, the personnel

needed to operate the facility was reduced by 50 percent while the productivity and safety confidence level increased.

Nevada. The workers who had been involved in the N&S process were pleased at the way changes had been occurring. They had a sense of the institutional goals coinciding with their own goals. These workers felt in charge of their jobs, and were happy that their expertise had been enlisted to help develop new standards. They knew how their jobs related to the organizational goals. They expressed confidence that the changes they were undergoing were in the right direction and that, with a little tweaking of the new policies, things would be better in the future. More than one worker spoke to us of the need to become competitive in a commercial world and expressed confidence that they could do it. Workers felt they knew what management expected of them, and that good performance would be rewarded.

PUREX. Interviews with the plant manager and with one of the multi-disciplinary work planning teams indicated a high level of ownership, confidence, and pride. One worker, evidently speaking for the team, said, "We are all here because we want to be here. We want to put this old dinosaur to sleep." The team indicated that the team approach to work planning allowed their individual input to matter and this was a source of job satisfaction.

ATTRIBUTE 5: DOE and contractor line management provide tangible evidence of commitment to implementation of agreed-upon standards.

Evidence of Attribute: Personnel at each organizational level express the belief that higher levels of management are committed to implementation of agreed-upon standards. An active self-assessment program is aimed at improving performance of work to meet and exceed agreed-upon standards. Performance assessments and associated award systems use the agreed-upon standards as measures of performance. Non-conformance with standards results in rapid and effective corrective action by management.

Benefits of Attribute: Workers respond to what they see, not what they are told; management inconsistency results in workforce confusion and demoralization. Tangible evidence of management commitment to implementation of agreed-upon standards provides the workforce with a logical, clear and consistent sense of direction. Experience has shown that this motivates workers to meet and exceed standards, and to identify and initiate correction of non-conformances.

Field Examples of Attribute:

PUREX. Members of the cross-functional teams doing the work planning, including craft workers, ES&H and engineering personnel, noted that the willingness of workers to engage in the work definition, hazards analysis, and standards identification tended to evolve from reluctant to enthusiastic as management consistently demonstrated a commitment to implementation of the identified standards. The team members expressed and exhibited professional pride in their ability to plan and perform the work safely.

HFIR. DOE and HFIR management and workers uniformly expressed personal commitment and the belief that their management and coworkers were committed to meet the standards that had been established for the reactor. A high degree of professionalism and pride in the work was evident at all levels.

Nevada. Both DOE and Bechtel top management are behind a push to change the existing culture and implement agreed-upon standards. Both management and workers stated that they were convinced that most of management was supporting such a change. Workers were particularly impressed that the top DOE manager at Nevada had held all-hands meetings and told DOE personnel that they had to be client driven. The DOE Manager also closed an on-site audit office, demonstrating tangibly that he intended his staff to be part of the new thinking. These steps were seen as a dramatic shift from past practice and as evidence of a commitment to implement new agreed-upon standards. Workers expressed the change by stating “DOE is now expecting us to be the expert, rather than the lackey.”

The Bechtel Nevada top manager also held all-hands meetings to explain the changes. These meetings provided workers with a sense that both DOE and contractor management were committed to implementation of the agreed-upon standards. There was also a perception that communication between the DOE Field Office and the contractor had improved significantly, that the message from the top in both organizations was the same. This unified message was seen as evidence of commitment to an agreed-upon goal. What most impressed the workers, however, was that the cash benefits that result from good performance will be shared with all employees. This incentivization of workers to actively support the new standards was seen as very strong commitment on the part of management to implement the new standards.

ATTRIBUTE 6: Workers know and understand operational and strategic objectives.

Evidence of Attribute: Workers are able to describe how their work fits into the overall work of their site and of the DOE. Workers know what work is to be done, and workers understand how that work will support the announced goals for their site and for DOE. That is, workers also understand why work is being done. DOE and company management communicate objectives and goals to workers, and help to show workers how their work supports the objectives and goals.

Benefits of Attribute: Workers want to feel that their work matters, that their contribution makes a difference. By helping workers know and understand DOE and company goals, management helps workers see that their work has a purpose. A worker who knows his or her work is important in supporting an announced goal will be more involved than a worker who doesn't know how or if his or her work contributes. Fostering a knowledge of goals helps foster a sense of responsibility in the worker, which can lead to improved performance. In addition, a worker who knows what his or her work supports is in a much better position to suggest work enhancements and improvements.

Field Examples of Attributes:

Nevada. DOE Nevada and Bechtel top management are both trying to communicate new operational and strategic objectives to the Nevada workforce. Both top managers have held a series of all-hands meetings to explain the new objectives. They have made a point of describing how the new objectives differ from the traditional ways of doing business. There are regular announcements as to the progress towards the objectives. The success of these communications was evidenced by the fact the workers were able to identify what the objectives were and how the site was progressing towards them. The fact that worker bonuses were tied to success with the new objectives helped focus worker knowledge.

PUREX. PUREX workers find themselves in a very difficult situation: deactivating the facility is, in fact, working themselves out of their jobs—with few, if any, work assignments available on site to which to transfer when this work is done. The management clearly understood the implications of the work, and took an active role in making workers aware of what the work was, why it was important, and what its timely completion meant—to the site and the workers. Working together, the management and workers were able to gain the perspective that has allowed the work to proceed, while increasing worker morale by making them more active participants in all aspects of the work and by creating an atmosphere of open communications.

ATTRIBUTE 7: Managers and workers promote compatibility between individual motives and institutional norms.

Evidence of Attribute: Managers communicate and gain worker acceptance of institutional norms (such as organizational structure, training, advancement policies, benefits, working conditions, and management behavior). Institutional norms reflect consideration of individual motives (such as security, interpersonal relationships, competence, esteem, and achievement). Managers adjust institutional norms as necessary (and as possible) to support workers' individual motives. Workers are able to identify the rationale underlying institutional norms that affect their interests. Workers are encouraged to communicate their interests and concerns to managers. The most recent examples of worker concerns indicate effective management response.

Benefits of Attribute: When managers and workers understand the need for compatibility between individual motives and institutional norms, open communication can be established and maintained. Cooperative engagement is easier to achieve. Workers identify more readily with the organization and job satisfaction is enhanced, which usually results in improved productivity.

Field Examples of Attributes:

Nevada. Improving safety performance is a recognized goal of every DOE contractor. At Nevada, the contractor has added to the effectiveness of traditional approaches to improving safety by incentivizing all workers. Performance-based incentives have been established between DOE and the contractor; in turn, the contractor has created formulas to allow every worker to share in the financial rewards that result from improved safety performance. Although,

as was pointed out, in some cases the financial rewards may be minimal, it places something tangible at risk for each employee. Individual motives of security, competence, and recognition are being fostered by worker-run safety and pretask hazards analysis programs. Safety observer teams now actively “patrol” to identify and help resolve potential safety issues; individuals see a real benefit in being safe. Overall, the approach has created a partnering relationship between the workers and the company. There is a personalized understanding of safety performance, and a very positive attitude of “being in it together.”

Livermore. Livermore has a history and culture that is founded on respect for its professional staff, with scientists and investigators given considerable control over the planning and execution of their work. The laboratory expects professionalism from their staff; the staff expects to be treated as professionals, reflected in latitude in conducting research. Work proceeds with a minimum of procedural controls but with suitable alternate controls that provide confidence that safety and laboratory standards are adhered to: formal facility safety parameters have been defined; personnel must demonstrate technical and operational competencies commensurate with laboratory standards before being granted the responsibilities and authority of Principal Investigators; formal review processes evaluate the safety and appropriateness of proposed new experiments. Laboratory leadership that is understood to represent both corporate and individual motives continues to foster a very strong corporate allegiance among the workers.

ATTRIBUTE 8: Workers have timely participation in work planning.

Evidence of Attribute: Workers express confidence that the results of the work planning and the associated work controls adequately reflect their knowledge of the work and the work environment. The timely participation of workers (e.g., on committees or teams) in work planning is institutionalized. Timely means that the workers at all levels responsible for doing the work—contribute to the development of work plans, not merely that they are given an opportunity to comment on the plans.

Benefits of Attribute: Employee involvement in planning results in better work because of their collective, detailed knowledge of the processes/operations and the work environment associated with the work. It also ensures their knowledge and understanding of the work, the hazards, and the ES&H and other standards applicable to the work. Workers who are knowledgeable about the work, hazards, and standards perform better and develop a sense of ownership for the work. Workers are more likely to support and use programs in which they have input. Also, workers who are encouraged to offer their ideas and whose contributions are taken seriously are more satisfied and productive.

Field Examples of Attribute:

PNNL. Planning of radiological work is controlled by a formal procedure. A “radiological risk assessment/ radiological work permit (RWP) request” form initiates the radiological work planning process. This form is prepared by the requesting line organization in cooperation with the cognizant radiological control technician (RCT) supervisor, and is accompanied by a detailed

technical work document (TWD) which will control the work. The TWD may be prepared by the worker(s) who will perform the work, the RCT(s), their supervisor(s), the cognizant engineer or scientist, or any combination of these staff. The risk assessment, RWP request, TWD and pre-job radiological survey constitute a “work package.” The work package is reviewed by the cognizant radiological engineer, who ensures that appropriate engineered controls have been incorporated. When approved, the work package is used to generate a RWP. At that point, the work is “approved.”

Fermi. Every other week the project manager meets with the people doing the work. The full range of technical jobs and the schedule are discussed. The workers learn about the schedule, problems others are having, and the expectation of the project manager. The project manager learns about the needs and problems of the workers. This meeting includes discussions of ES&H.

SRS. The Defense Waste Processing Facility (DWPF) maintenance group uses multi-disciplinary teams to plan work. The worker is a member of the team. The planning for work begins with a walk down to clearly define the maintenance task and to identify hazards. This walk down is performed by maintenance personnel and the worker (normally the person who identified the problem).

PUREX. Cross-functional teams now are responsible for planning, as well as performing, the work. Instead of receiving directions from a separate planning organization, the teams conduct their own job walk downs, complete computer-aided hazard assessment surveys, arrange for any additional reviews warranted by the hazards, conduct pre-job reviews, and then conduct the work. Having the team conduct the planning brings in first-hand knowledge of the job and the work environment and effectively introduces their skill and experience in designing the strategy for approaching the work. Work also proceeds without the iterative processing of paperwork that used to result from the inherent distance between work planning and immediate job knowledge. Productivity, safety, and morale have all benefitted from the restructured approach to planning.

ATTRIBUTE 9: Work planning is carried out with an integrated project approach.

Evidence of Attribute: Work planning procedures require formal (documented) consideration of potential interactions and interfaces between individual tasks within the work plan and between the defined work and other activities that can affect or be affected by the work. Work plans reflect this requirement. Individuals with task responsibilities are knowledgeable or aware of the other tasks within the defined work and who the other members of the work team are.

Benefits of Attribute: Using an integrated project approach provides all involved with a full and complete perspective of the work, eliminating fracturing of efforts, overlaps in assignments, and potential for stovepiping requirements. In terms of ES&H, the inclusion of relevant management and workers involved in integrated ES&H program activities will ensure that these considerations are not added to work at a later stage, but rather integrated up-front in the work

planning effort to take advantage of potential savings and schedule streamlining opportunities while minimizing program redundancies.

Hazards and interferences arising out of interactions and interfaces are identified and resolved during the planning process (e.g., radiation sources behind walls where work is being performed; limited resources being assigned to two concurrent tasks; one task requiring power and a second task requiring the circuits to be de-energized). An integrated project approach supports the goal of informed acceptance by managers and workers and enhances both safety and efficiency.

Field Examples of Attribute:

PUREX. Work practices at Purex are understood and evaluated within the larger perspective of deactivating an entire system (e.g., heating and ventilation). Using this larger perspective, the company has reorganized: cross functional teams now exist as opposed to traditional organizations reflecting different disciplines. Allowing a project approach supports better, more complete perspectives on the work: the relationship between tasks is clearer, as is the understanding of how one job may influence the hazards associated with another. The project approach has also fostered a deepened sense of ownership that precludes the idea of focusing on one task to the exclusion of the implications of how that work may effect subsequent work or shifts. The integrated project approach benefits both the company through higher productivity, and the workers through a better-informed, more enthusiastic work ethic.

ATTRIBUTE 10: Work planning and work controls are based on collective knowledge.

Evidence of Attribute: Multi-disciplinary teams plan work, decide on the work controls, and determine the criteria for performance assessments. The teams include the workers who are to perform the work. The teams depend mainly on consensus building but are encouraged to consult management to achieve timely resolution of differences and concerns. Where appropriate, multi-disciplinary teams are also used to perform the work. Communication among team members and between them and management is formally encouraged.

Benefits of Attribute: Workers feel ownership for the work and the work controls. Morale and performance are improved when workers are empowered to apply their knowledge to the design and planning of the work they do. Involving workers in the selection of criteria for performance assessments improves their understanding of the expectations for the work and their corresponding commitment.

Field Examples of Attribute:

PUREX. Cross-functional teams including craft workers, ES&H and engineering personnel, and other experts, as needed, are used to plan the deactivation tasks at the plant. During the planning activity, team members discussed their individual views, offering arguments to support their positions. They also stated that, although the current task did not require it, members of other teams would be consulted when specialized knowledge or experience is needed.

Oak Ridge. At K-25, Surveillance & Maintenance workers have become the owners of their standards since going through the Necessary & Sufficient Process. Now, the line organization is responsible for maintaining the Work Smart Standards and for ensuring that work is performed in accordance with those standards. In contrast, the Standards/Requirements Identification (S/RIDs) database was never used by the line organization because they were not involved with the development of S/RIDs, the database was too complicated, and the workers never understood the importance of implementing the S/RIDs.

ATTRIBUTE 11: Information necessary for work planning and performance is reliable, readily available, and communicated with appropriate tools and methods.

Evidence of Attribute: Information is delivered in a manner that is easy for the planners and workers to use and understand. Those who rely on the information are confident in its validity (currency and accuracy) and are able to use it in the forms presented. Configuration control is maintained so that changes that may affect the work are incorporated in ongoing and new tasks.

Benefits of Attribute: Work proceeds safely and efficiently when information is reliable, available, and useful. Rework is reduced and worker safety is enhanced. Worker and management confidence is increased, and costs and schedules can be maintained.

Field Examples of Attribute:

Nevada. Nevada is reassigning ES&H personnel from a centralized organization directly to the projects. This realignment provides better perspective from both facility management and ES&H professionals and expedites the planning and execution of work. Coupled with Nevada's introduction of projectized work, this realignment ensures necessary information is available and representative of the fuller project perspective rather than being segregated among the contributing functions.

SRS. A significant volume of information is needed in support of design, operations, and maintenance at SRS. In support of facilities like the Defense Waste Processing Facility (DWPF), SRS has improved the methods of assuring timely availability of accurate information. As example, all company-level procedures and the associated forms are available electronically. A single point of control for this information ensures materials are current. In a similar way, all engineering documentation (more than 150,000 drawings, specifications, calculations) can be accessed electronically; work planners, design engineers, control room operators, and mechanics have real-time access. Electronic access has also reduced or eliminated numerous controls needed to administer hard-copy collections. This electronic availability has also introduced additional flexibility; users can access and print out precisely the portions of documents they need.

PUREX. Work planning by multi-disciplinary teams was aided by a locally developed computer program that provided relevant information and guidance. The planning team expressed satisfaction with the program and with their opportunity to provide input to its development.

ATTRIBUTE 12: Training and qualification of workers support reliance on judgment and expertise.

Evidence of Attribute: Workers are knowledgeable of and can describe the details of systems they work with; they understand and can describe the hazards present as well as their magnitude; they are familiar with and can describe the details of engineered and/or administrative controls and processes which govern the conduct of their work.

Secondarily, individual job assignments are developed with input from the workers, which includes an identification and analysis of hazards. From this understanding of the work and hazards, an assessment of required knowledge, skills, and abilities is developed, a suitable pedagogy and plan for acquiring the needed skills and capabilities is assembled, and progress towards achieving and maintaining the plan is tracked. No work is performed until suitable proficiency is demonstrated.

Benefits of Attribute: Workers trained and qualified to plan and perform the work will reduce the need for highly proceduralized work controls. This results in (1) efficient performance of quality work in accordance with agreed-upon standards and (2) appropriate responses to unusual or unexpected events and circumstances.

Field Examples of Attribute:

SRS. Through analysis of the work and identification of the performance expectations for the Waste Water Treatment Plant, job tasks and hazards were identified. From this understanding of the work and hazards, an evaluation of needed knowledge, skills, and abilities was developed. The Enhanced Work Team was then carefully chosen to ensure the team members possessed the needed knowledge, skills, and abilities to perform high quality, efficient work. Cross training was completed. Members of the team are now referred to as “mechoperators” because they function in both maintenance and operations capacities. Mechanics have also completed state licensing requirements, allowing them to operate equipment and perform necessary maintenance as soon as items are discovered.

PUREX. Based on their training and qualifications, cross-functional teams have been entrusted with the full responsibility for planning and performing work. The team completes a computer-aided survey of job hazards; they then determine what additional reviews of the job (for instance by Health Physics) need to be completed before beginning the work. As a next step, the team, as a group, determines how best to conduct the work. Work planning and performance rely extensively on worker judgment and expertise.

Livermore. Livermore has a history that is founded on respect for its professional staff. Scientists and investigators are given considerable latitude in conducting their research. Work proceeds with a minimum of procedural controls. While several levels of administrative controls ensure experiments will not exceed established safety parameters, investigators have discretion in the number and detail of procedures. Reliance on judgment and expertise is a consequence of the

educational and experience levels of personnel. Technicians are generally degreed personnel (many of whom hold advanced degrees), and Principal Investigators have both academic credentials and significant experience. Even post doctoral students are not given automatic authority as Principal Investigator, but earn this level through demonstrated familiarity with and competence in satisfying laboratory operating and safety standards.

ATTRIBUTE 13: Workers know, understand, and believe in the agreed-upon standards.

Evidence of Attribute: Workers can describe the relationship between the standards and the work and hazards. They speak of the standards using possessive forms (“our standards” not “they want us to...”). They can describe the relationship between applicable higher-level standards and the standards that directly control the work for which they are responsible.

Benefits of Attribute: Gaining the full measure of worker buy-in is predicated on their understanding and acceptance of the standards. When workers know, understand, and believe in standards, they have a rationale for making sure those standards are incorporated effectively into work controls, that work controls are followed, and that timely feedback is provided when any deviation from the standards is identified. Worker commitment is far more effective than attempting to audit people into adhering to work policies and practices. Starting with participation in selecting the standards, in work planning, and in generating work controls and assessment criteria, workers can be expected to reflect a “comfort” with the standards commensurate with their degree of ownership.

Field Examples of Attribute:

Fermi. Technical personnel from the line organizations participate as partners in the development of the technical standards. There is a very broad review and comment by those who know the work—consensus is reached before the standards are adopted. When adopted, the standards are communicated back to the line organizations for implementation. Since the line managers have participated in the development, the standards are more easily incorporated into the work planning. The workers demonstrated knowledge and ownership of the ES&H program and expressed the feeling that they were an integral part of planning process.

PNNL. The Radiological Control Manager, in cooperation with line organizations, establishes the Radiological Control Program through the development of implementing procedures. In developing implementing procedures, the Radiological Control Department provides the technical expertise, while the line provides user input. When the need for a new implementing procedure is identified, a technical expert from the Radiological Control Department is assigned to draft the procedure. The draft is circulated to a committee comprised of “users” for their review and comments. At the same time, the draft is placed on an intralaboratory electronic bulletin with an invitation for comments from all interested staff. The technical expert from the Radiological Control Department is required to provide written resolution of all comments received. The approved procedure normally specifies an implementation period. During this period, training is provided to affected staff via computer based training available at all computer

workstations. The new procedure is also reviewed in the quarterly “radworker news” newsletter. A process for staff to request changes to existing procedures is in place and is frequently used by staff to identify opportunities for improvement. All procedure change requests receive a written response from the assigned technical expert in the Radiological Control Department. Requests for changes to procedures may also be generated as the result of post-job ALARA reviews or event critiques.

PUREX. When the work is planned by the workers, they agree upon the standards based on discussions related to the reasons for each of the standards selected. This ensures their understanding and contributes to their belief in the need for disciplined conformance to the standard.

ATTRIBUTE 14: Managers do not allow worker ownership without informed acceptance.

Evidence of Attribute: A method or system exists to provide workers sufficient information and skill to perform a task safely and in accordance with all applicable standards (expectations) before accepting responsibility for work. The system includes methods and resources for workers to obtain the needed skills and information about the work, work environment, hazards, and work controls through experience, training, or documentation (e.g., procedures).

Benefits of Attribute: Insisting on informed acceptance of responsibility engenders a sense of ownership. In turn, ownership that is grounded in informed acceptance ensures better performance of work, appropriate responses to unusual occurrences, and a proactive role in continued improvement.

Field Examples of Attribute:

SRS. The Enhanced Work Team for the Waste Water Treatment Plan was carefully chosen to ensure the members possessed the needed knowledge, skills, and abilities to get the job done safely, correctly, and efficiently. The team developed their plans and procedures and was given the necessary training needed to perform their job tasks. Teamwork and cross-training (i.e., maintenance and operations working together on tasks to learn the skills that each possessed) allowed for work to be done more efficiently. After the knowledge and skills are transferred among team members, a fuller array of tasks (maintenance and operations) could be done by each individual.

PUREX. Deactivation work at Purex has proceeded through a series of steps designed to ensure a clear understanding and absolute ownership of the work. As a first step, the goals and intermediate milestones were negotiated among the current facility owners, DOE, and the contractor who would own the facility subsequent to deactivation. To support these agreements, personnel were reorganized into cross functional work teams, with the appropriate expertise to address a major subset of deactivation work; e.g., utilities, heating and ventilation. This team was given the tools necessary to analyze and document hazards, and then provided with responsibility for work planning and performance. Team responsibility for work planning and

performance and the availability of the relevant expertise and tools provided a complete and thorough understanding of the work and hazards to support the team's ownership of the work plan and the work.

Livermore. Livermore is fortunate in that its historical culture supports, and is based on, ownership. Scientists and investigators own their work: they conceive it, propose it, defend it, and execute it. This model of ownership is also evident in discussions with facility managers and other workers. They take explicit advantage of the education and experience levels of workers when planning and executing work. They have an expert-based system. However, there exists a strong cultural imperative for professionals to behave professionally. Interestingly, technical knowledge alone is not sufficient qualification to run a project at Livermore. Principal Investigators are also expected to demonstrate thorough knowledge and understanding of laboratory standards and practices.

ATTRIBUTE 15: Work is conducted in accordance with agreed-upon work controls.

Evidence of Attribute: Consistent outcome of the work demonstrates that the work controls are in place and are being followed. Self-assessments and independent assessments find few or no nonconformances with agreed-upon work controls. Workers express confidence that work controls are being followed.

Benefits of the Attribute: Conformance with agreed upon work controls provides managers and workers with confidence that there is adequate protection against the hazards identified during the work planning process and compliance with all applicable higher-level standards.

Field Examples of Attribute:

Rocky Flats. The documentation that results from the Activity Control Envelope (ACE) process is a good example of how work is conducted according to agreed-upon work controls. The ACE identifies the standards, constraints, hazards, and controls associated with a piece of work. It also identifies such information as bounding conditions, task identification and flowcharts, impediments to implementation, and readiness criteria. The ACE is developed by a trained multi-disciplinary team. The ACE provides an analysis of a manageable scope of work, and supports the timely development of complete work control documents.

SRS. At DWPF, maintenance work packages are developed using multi-disciplinary teams including ES&H, maintenance, operations, and engineering (when needed). The applicable standards, procedures, and controls are identified and incorporated into the work package. There is a review by the line organization after the work is completed to ensure the work was performed in accordance with the work package instructions. The Wastewater Treatment Plant is now using a new work control system that provides for effective integration of site safety requirements and recognized industrial practices. The restructured work control system retains safety effectiveness while significantly reducing administrative burdens and costs.

ATTRIBUTE 16: Performance of work is based on worker knowledge and ownership.

Evidence of Attribute: Workers and work teams are selected on the basis of their experience and knowledge of the work. Line management discretion is allowed to determine when procedures and other formal work controls are necessary for carrying out the work, and the degree of rigor and detail needed in the procedures. Formal, documented work controls are limited to work that is hazardous, complex, or unconventional.

Benefits of the Attribute: Limiting the use of rigorous, formal work controls to cases where they are justified gives workers a broader scope for the exercise of their skills and judgment. This extends their experience and capability to perform effectively. Line manager discretion in matching work controls to the job improves efficiency.

Field Examples of Attribute:

Livermore. Project and administrative controls are designed with due consideration of the education and experience levels of workers when planning and performing work. There is a strong expectation that professionals will behave professionally, which in turn helps to motivate workers. Livermore relies on the Principal Investigator to determine when a procedure is needed. This reliance is evidence of the Principal Investigator's knowledge of the work and those that support the work; therefore they know best what work controls to put in place for optimal performance and results. Where appropriate, as in the authorization of new experiments, formal control media are used to complement expert knowledge in ensuring adherence to ES&H and laboratory standards.

Nevada. Nevada has given considerable control to project managers in determining whether detailed working procedures are needed for work activities. Throughout the N&S process, Nevada kept a focus on implementation—using techniques such as process simplification to decide how various processes should be administered and controlled.

PUREX. The work is performed by individuals who develop the work plan. Thus, worker knowledge and ownership are inherent in the performance of the work.

ATTRIBUTE 17: A formal program of self-assessment supports organizational learning.

Evidence of Attribute: A formal self-assessment program exists. People who work in the areas being assessed perform or assist in the performance of the assessments. The self-assessment program includes both objectives and procedures for drawing lessons from the information gathered during assessments (in addition to providing performance metrics). Self-assessment reports are routinely reviewed by management and the conclusions documented. Management follows up on decisions to correct deficiencies and improve performance. Internal findings of deficiency and recommendations for improvement are resolved in a timely and effective manner. External assessments generally result in neutral or positive findings. The number of negative

findings from external assessments does not exceed the number of negative findings from self-assessments.

Benefits of Attribute: Active and effective use of self-assessments by people who work in the areas being assessed fosters ownership and self-improvement. Management interest in and use of self-assessment findings stimulates a culture of continuous improvement and excellent performance. Consistently good results from external assessments result in a reduced external assessment burden.

Field Examples of Attributes:

Nevada. The new self-assessment plan being put in place in Nevada recognizes the importance of self-assessment. The plan is that project managers will be incentivized to ask for assessment, rather than having it forced on them. Assessors will be part of the project team which a project manager assembles to do work. Self-assessment is being seen as a way to identify requirements and enhance organizational learning, rather than as a punitive auditing activity. The Information Services (IS) department, as example, has taken this to heart. They took a hard look at why nobody came to them to do work and realized that their stovepiped organization made it incredibly difficult for customers to deal with them. So, they adopted a commercial model, assigned an account manager (who could cut across stovepipes to each customer) and started concentrating on customer feedback, particularly on price and schedule. Customers, who had been complaining for years and only using the department as a last resort, are now pleased. This organization learned dramatically from its self-assessment.

SRS. Facility management (for example, DWPF) has learned through experience in the past few years that achieving, demonstrating, and maintaining facility readiness to operate is dependent upon having a knowledgeable and informed work force. Achieving this goal has been in large measure due to introduction of a self-assessment strategy. Beginning with a formal process known as RSA (Readiness Self-Assessment), the facility personnel assess themselves against a standard set of requirements and expectations. Beyond this stage, regular self-assessments are required. However, to strengthen the value and learning achieved in the assessment, facility managers select the functional areas for assessment; this allows focused and productive use of resources, while concentrating on areas needing strengthening. The results of these assessments are fed directly back into the facility's and site's training and lessons learned programs. At the same time, the number of external audits have been reduced, and a Facility Managers Council—comprising senior facility managers' has been given more responsibility for and ownership of both performance and safety improvements and initiatives.

PUREX. At PUREX, the teamed approach to work planning resulted in identifying that the principal hazards associated with maintenance work on an existing electrical connection box came mainly from working on a ladder sixteen feet above the floor. The box was relocated (the work was redesigned) to allow work at floor level, thus improving safety performance and, probably, long term efficiency.

ATTRIBUTE 18: Assessment criteria are developed during work planning.

Evidence of Attribute: Work plans or documents associated with the work plans contain clear statements of the criteria by which performance will be measured against expectations. The definition or description of the expectations, criteria, and (quantitative or qualitative) methods for measuring performance are readily available to managers and workers responsible for conducting the work.

Benefits of Attribute: Defining assessment criteria during work planning establishes management expectations in the clearest possible form. This approach also contributes to informed acceptance and accountability of managers and workers, both of which contribute to improved performance.

Field Examples of Attribute:

Nevada. During the process of identifying standards for their work, the cross-functional standards identification teams took additional steps to identify recommendations for implementing the standards and to identify appropriate performance assessment criteria. Identifying assessment criteria during work planning allowed Nevada to look ahead at transitioning from the identification of standards to implementation of standards. Identifying the assessment criteria during planning benefitted all involved: DOE and contractor personnel were provided with the basis for new contractual agreements on performance; implementers and assessors had opportunity to establish a balance between safety and efficiency, using the right balance of performance measures and other indicators. Both DOE and contractor personnel credit this early determination of performance measures as a key factor in increasing productivity, morale, and cost effectiveness.

ATTRIBUTE 19: Assessment criteria are based on agreed-upon expectations.

Evidence of Attribute: Assessment criteria correspond directly with standards and expectations established for the work. Personnel involved in selecting the standards, work planning, and work performance recognize this correspondence. They can articulate how the assessment criteria directly contribute to maintaining adherence to the standards and achieving the intended outcomes. In turn, assessment findings focus on the safety, health, and environmental consequences of inadequate standards or non-conformance with agreed-upon standards. Assessment reports identify opportunities for improvement of performance in terms of improved protection of workers, the public, and the environment. Sanctions are levied only against systemic, repeated, or egregious non-conformance with agreed-upon standards, and are balanced by explicit recognition of superior performance. Managers and workers recognize the importance in providing a thorough and timely resolution of findings.

Benefits of Attribute: Assessment criteria based on agreements foster cooperation, participation, and commitment. The participants in planning, performing, and assessing work are seen by each other and see themselves as part of a team—as a community sharing a common

goal, with members contributing their particular expertise and experience toward achieving that end. When findings are identified, they are respected by management and workers. They challenge, but do not undermine, the feeling of ownership for the work and standards where it exists. They encourage and support a collaborative effort to correct deficiencies and improve performance, and provide a supportable basis for sanctions when ownership and a cooperative effort to improve are not evident.

Field Examples of Attribute:

Nevada. DOE and the contractor have defined assessment criteria related to the site's key goal: The need to bring new missions to Nevada. This has encouraged an intensive focus on introducing commercial standards and practices, on focusing on outcomes rather than methods. This change from a compliance oriented approach is captured in every stage: standards have been selected to achieve a balance between safety and efficiency; implementation and assessment strategies are considered during the planning stages to further support these objectives. The new measures of success are based on agreed-to expectations and outcomes: bringing new missions as a consequence of a significantly reduced overhead, an ability to perform safely and cost effectively, and a flexibility to respond to the needs of new (potentially commercial) customers.

SRS. Assessment strategies for the Waste Water Treatment Facility were restructured to reflect agreements that the plant should be measured against corporate and municipal standards. Refocusing the assessment criteria encouraged appreciable changes: conduct of operations standards were amended, the amount of documentation was reduced, cross training between mechanics and operators was implemented, sampling frequencies were adjusted. Assessment criteria now focus less on how things are accomplished (allowing significant cost savings), and more on the expected outcome: a plant that conforms to and satisfies pertinent regulatory standards while providing cost effective services to the site.

ATTRIBUTE 20: Cost effectiveness is one measure of performance.**Evidence of Attribute:**

The cost of work, in terms of direct and indirect charges is both assessed and tracked. Managers and workers contribute to a cost-effective balance among safety, economy and effectiveness in the planning and conduct of work. Cost considerations of various options are assessed. Appropriate measures and indicators are used for timely estimating, forecasting, capturing, and tracking of costs. Agreed-upon goals are developed. Programs are in place to assess the costs incurred, to compare them with the benchmarks, to make acceptable improvements, and to keep workers informed of the status.

Benefits of Attribute: Confidence that all resources are effectively utilized helps to foster organizational stability and provides an environment for effective short- and long-term planning. Plans may be more meaningfully developed and credibly assessed or defended. Staffing levels are defensible as necessary for the performance of work, and thus stabilized against non-

programmatic influences. Changes in staffing level are more easily planned and accommodated. Opportunities for economies of scale are more readily identified and assessed. Decisions for appropriate allocation of resources to eliminate/mitigate risk are better informed and an improved basis for agreement on these decisions is obtained.

Field Examples of Attribute:

Nevada. DOE Nevada and Bechtel Nevada top management are promoting a new way of doing business at Nevada. A key part of this new way of doing business is for the test site to begin to consider itself as a player in the commercial arena. Commercial type success measures are being encouraged. These include the amount of new work coming in, customer feedback, and, of course, cost effectiveness. The Bechtel Nevada top manager gave all-hands talks to his personnel to help convince them that their survival depended on these shifts to a more competitive way of doing business.

As an example of the change, Information Services (ADP support) has reorganized its services to become more cost effective and customer oriented, resulting in cost efficiencies, productivity improvements, more customers and better customer relations. Nevada is also moving to a project manager organization, where a project manager is responsible for controlling all resources for a project. Cost effectiveness is then applied as one of the performance criteria for project managers.

Rocky Flats. Rocky Flats has been engaged in a benchmarking program to compare aspects of their work with similar work performed elsewhere. A principal focus is to identify and introduce more cost effective approaches to doing business.

ATTRIBUTE 21: Planning and performance of work are responsive to feedback.

Evidence of Attribute: Processes exist for analyzing feedback and for incorporating it as lessons learned for future work planning and performance. When feedback is incorporated into changes in work planning and performance, it is done in a timely manner. Initiators of feedback express satisfaction with the responses. Workers can describe the feedback mechanisms they employ or have available to them and can point to tangible examples of where their feedback has resulted in changes to work planning and performance.

Benefits of Attribute: A process of continuous improvement is engendered: as worker knowledge and experience increases, improvements are introduced throughout the spectrum of planning and performance. Results are seen in more effective tailoring of work controls to the work, the hazards, and the physical and human characteristics of the work environment. Workers and supervisors develop a basis for enhanced understanding of efficient and effective work practices. Line management is kept informed of the efficiency and effectiveness of mechanisms they establish for the control of work. Worker pride and ownership are strengthened.

Field Examples of Attribute:

Nevada. Nevada is putting a new self-assessment plan in place. Self-assessment will be part of a project manager's responsibilities. The new self-assessment plan will encourage managers to ask for help rather than having auditing forced upon them. They view self-assessment as a way to identify requirements for future work planning and work performance. Thus self-assessment provides feedback. They also are quite aware of the need for feedback as they institute new programs and plans. Both workers and management stated that they were still learning how to do business differently, and that they had "to live it a few times" before anything became finalized. Feedback from the various initiatives for change at Nevada was being assured by the use of the same personnel for different initiatives. Feedback was given credit for helping the change process along and promoting awareness.

PUREX. Mutual respect between the plant manager and the multi-disciplinary work planning team was evident, thus supporting open communications. Feedback from the work planning team was a primary resource for the design and development of the computer program used to support work planning at the PUREX plant.

Attributes of Effective Implementation

- 1 Planning, performance, and assessment are focused on the work
- 2 ES&H standards are integrated with other expectations for the work
- 3 Line ownership of ES&H is evident
- 4 Worker ownership, confidence, and job satisfaction are evident
- 5 DOE and contractor line management provide tangible evidence of commitment to implementation of agreed-upon standards
- 6 Workers know and understand operational and strategic objectives
- 7 Management and workers promote compatibility between individual motives and institutional norms
- 8 Workers have timely participation in work planning
- 9 Work planning is carried out with an integrated project approach
- 10 Work planning and work controls are based on collective knowledge
- 11 Information necessary for work planning and performance is reliable, readily available, and communicated with appropriate tools & methods
- 12 Training and qualification of workers support reliance on judgement and expertise
- 13 Workers know, understand, and believe in agreed-upon standards
- 14 Managers do not allow worker ownership without informed acceptance
- 15 Work is conducted in accordance with agreed-upon work controls
- 16 Performance work is based on worker knowledge and ownership
- 17 A formal program of self-assessment support organizational learning
- 18 Assessment criteria are developed during work planning
- 19 Assessment criteria are based on agreed-upon expectations
- 20 Cost effectiveness is one measure of performance
- 21 Planning & performance of work are responsive to feedback