

INPO 14-005  
October 2014

# Principles for Excellence in Nuclear Supplier Performance

Revision 0

**OPEN DISTRIBUTION:** Copyright © 2014 by the Institute of Nuclear Power Operations. Not for sale or commercial use. All other rights reserved.

**NOTICE:** This information was prepared in connection with work sponsored by the Institute of Nuclear Power Operations (INPO). Neither INPO, INPO members, INPO participants, nor any person acting on the behalf of them (a) makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe on privately owned rights, or (b) assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this document.

## INTRODUCTION

*Principles for Excellence in Nuclear Supplier Performance* describes the essential principles and attributes that support achieving excellence in the services and products provided by nuclear suppliers. This document is applicable to suppliers who support the nuclear industry in areas such as nuclear facility design, procurement, fabrication, construction, inspection, and operations support. Nuclear suppliers include those contractors and subcontractors who provide materials, equipment, and/or services to nuclear power plants and other nuclear facilities and are subject to the unique requirements of the nuclear industry.

As used in this document, customers include private, public, and government owners and operators of nuclear facilities as well as organizations that receive products and services from subcontractors.

The principles and attributes were developed by a subgroup consisting of members of the INPO Supplier Participant Advisory Committee (SPAC) and representatives from several nuclear utilities with extensive nuclear industry experience. The principles are based on existing INPO principles for excellence established for nuclear power plants.

The principles and associated attributes have a strong basis in operating experience and provide a common platform to support improved use of nuclear supplier and customer resources and to enable innovation. Nuclear supplier participants and utility customers, through participation with INPO, support the principles and guidance for implementation described in this document. To achieve top performance, leaders of both the nuclear supplier and customer organizations need to establish, monitor, and reinforce expectations for following the principles.

The document is intended to be a resource for nuclear suppliers and their customers and should be used in conjunction with other INPO documents, Advanced Process documents (for example, AP-930, *Supplemental Personnel Process Description*), and other standards applicable to specific projects and tasks. Suppliers should use the principles both to establish work processes and to assess existing work methods and programs.

This page is intentionally blank.

## BACKGROUND

Over the past several years, standards and expectations for the nuclear industry have evolved, requiring increased demands for continuous improvement, reduction of events, and excellence in the safe and reliable operation of nuclear plants. Although many specific industry guidelines and standards have been created, little of this guidance is directly applicable to nuclear suppliers. In 2012, INPO's Supplier Participants Advisory Committee (SPAC) recognized this deficiency and worked with INPO to develop a document that outlines those key organizational elements and behaviors necessary to achieve excellence in supplier performance. The SPAC further appointed a subgroup of its members to work with utility representatives and the INPO staff to develop such a document.

This principles document is the result of the working group's effort. Senior representatives from suppliers and domestic utilities have reviewed and agreed to support its implementation. It defines expectations and standards for achieving excellence in nuclear supplier performance. Principles are in the following areas:

- nuclear safety culture
- materials, equipment, configuration control, and quality assurance
- human performance
- training and qualifications
- continuous improvement
- operating experience and lessons learned
- procurement and contracting of materials and services

These key principles were selected based on a review of comparable principles INPO developed for nuclear power plant operations. In most cases, the existing INPO principles were used or slightly modified to suit supplier needs. Since there is a wide range of material and service suppliers in the nuclear industry, the principles are intentionally high-level expectations for performance that transcend organizational differences. More detailed, specific sets of standards and guides are available through INPO and may later be adapted to support unique supplier-related needs.

This page is intentionally blank.

## Table of Contents

<u>Section</u>	<u>Page</u>
INTRODUCTION .....	i
BACKGROUND .....	iii
PRINCIPLES FOR EXCELLENCE IN NUCLEAR SUPPLIER PERFORMANCE .....	1
1.0 PRINCIPLES AND THEIR ATTRIBUTES .....	3
1.1 Nuclear Safety Culture.....	3
1.2 Materials, Equipment, Configuration Control, and Quality Assurance.....	6
1.3 Human Performance .....	8
1.4 Training and Qualifications .....	11
1.5 Continuous Improvement.....	12
1.6 Operating Experience and Lessons Learned.....	14
1.7 Procurement and Contracting of Materials and Services.....	15
2.0 IMPLEMENTING PRINCIPLES FOR EXCELLENCE IN NUCLEAR SUPPLIER PERFORMANCE .....	19
2.1 Establishing Expectations .....	19
2.2 Achieving Acceptance .....	19
2.3 Verifying Implementation.....	20
Acknowledgments.....	21

This page is intentionally blank.

## **PRINCIPLES FOR EXCELLENCE IN NUCLEAR SUPPLIER PERFORMANCE**

1. **Nuclear Safety Culture:** Nuclear suppliers and their customers are committed to a healthy nuclear safety culture. Leaders and managers demonstrate alignment on a commitment to excellence and nuclear safety, and personnel safety is highly valued. Nuclear suppliers and their customers identify, communicate, and resolve deviations, issues, and concerns to establish and maintain a safety-conscious work environment.
2. **Materials, Equipment, Configuration Control, and Quality Assurance:** Materials, equipment, and services nuclear suppliers provide meet all applicable requirements for form, fit, and function of the item(s), including the application of appropriate configuration controls and quality assurance program requirements.
3. **Human Performance:** Human performance behaviors, including procedural adherence and open communications, are used and positively reinforced to support safe and reliable operations.
4. **Training and Qualifications:** Personnel are trained and qualified for their jobs.
5. **Continuous Improvement:** Managers and workers seek continuous improvement and use effective performance improvement programs such as self-assessment and corrective action to identify and implement change.
6. **Operating Experience and Lessons Learned:** Nuclear suppliers share operating experience and lessons learned (within the confines of negotiated nondisclosure agreements), regarding nuclear and industrial safety, with customers and other nuclear suppliers to support continuous performance improvement.
7. **Procurement and Contracting of Materials and Services:** Nuclear suppliers acknowledge that the procurement and contracting processes customers require support progress toward excellence in nuclear supplier performance.

This page is intentionally blank.

## 1.0 PRINCIPLES AND THEIR ATTRIBUTES

### 1.1 Nuclear Safety Culture

***Principle:** Nuclear suppliers and their customers are committed to a healthy nuclear safety culture. Leaders and managers demonstrate alignment on a commitment to excellence and nuclear safety, and personnel safety is highly valued. Nuclear suppliers and their customers identify, communicate, and resolve deviations, issues, and concerns to establish and maintain a safety-conscious work environment.*

Safety culture is defined as the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment (INPO 12-012, *Traits of a Healthy Nuclear Safety Culture*).

Establishing and maintaining a healthy safety culture is a leadership responsibility (INPO 12-012). Leaders foster a healthy safety culture through communication and reinforcement of expectations and through frequent monitoring of safety culture trends.

Safety culture applies to every employee in the nuclear supplier and customer organization, from the board of directors to the individual contributors and supplemental personnel. No one in the organization is exempt from the obligation to ensure safety first. Safety is meant to be defined very broadly and includes special protections required for maintaining the safe operation of nuclear reactors, industrial safety (personal and process), chemical hygiene, radiation protection (occupational and environmental), nuclear criticality prevention, nuclear material safeguards (material control and accountability and physical security), and information security. Some or all of these safety aspects apply to each supplier facility and its work for customers. All of these elements of safety come with high expectations for performance from stakeholders, which is part of the business environment that makes having a strong safety culture so vital to success.

#### **Attributes:**

#### Actions to Foster a Healthy Safety Culture

- Leaders reinforce safety culture at every opportunity. The health of safety culture is not taken for granted.
- Leaders communicate what constitutes a healthy safety culture and ensure everyone understands his or her role in its promotion.
- Leaders recognize that safety culture goes beyond words and utilize formal application and resourcing of management systems, including: continuous learning, problem identification and resolution, environment for raising concerns, and work processes.

- Leaders recognize that safety culture is constantly moving along a continuum. As a result, there is a comfort in discussing safety culture within the organization as well as with outside groups, such as regulatory agencies.
- Leaders frequently measure the health of safety culture with a focus on trends rather than on absolute values.

#### Management Commitment to Safety

- **Leadership Accountability:** Executive and senior managers are the leading advocates of safety and demonstrate their commitment both in word and in action. The safety message is communicated frequently and consistently, occasionally as a stand-alone theme. Managers and supervisors observe worker performance and promptly correct inappropriate behaviors. Leaders throughout the nuclear organization set an example for safety. Managers and supervisors take timely actions to address physical conditions and behaviors that may threaten personnel safety (for example, housekeeping, work activities, overpopulated areas, trip hazards, sharp objects, and floor openings). Corporate policies emphasize the overriding importance of safety.
- **Raising Concerns:** Employees are encouraged to raise safety concerns. Concerns are promptly reviewed, prioritized based on their potential safety significance, and appropriately resolved with timely feedback to the originator of the concerns and to other employees.
- **Decision-Making:** Decisions that support or affect safety are systematic, rigorous, and thorough. Workers are vested with the authority and understand the expectation that when faced with unexpected or uncertain conditions, they are to place the equipment or components in a safe condition. Senior leaders support and reinforce conservative decisions.
- **Respectful Work Environment:** Trust and respect permeate the organization. A high level of trust is established in the organization, fostered—in part—through timely and accurate communication. Differing professional opinions are encouraged, discussed, and resolved in a timely manner. Employees are informed of steps taken in response to their concerns.

### Individual Commitment to Safety

- All individuals take personal responsibility for safety. Their responsibility and authority for safety is well understood. All employees have stop-work authority for immediate safety concerns on their jobs. Immediate work stoppages are used to correct unsafe conditions. Workers apply their training and practice behaviors that are proven to minimize risk. Workers observe and coach their peers, especially when preparing for hazardous tasks or for when work behaviors do not meet expectations.
- Individuals avoid complacency and continuously challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action. All employees are watchful for assumptions, anomalies, values, conditions or activities that can have an undesirable effect on safety.
- Effective communication helps maintain a focus on safety. Safety communication is broad and includes plant-level communication, job-related communication, worker-level communication, equipment labeling, operating experience, and documentation. The flow of information up the organization is as important as the flow of information down the organization.

### Management Systems (programs and tools)

- Opportunities to learn about ways to ensure safety are sought out and implemented. Operating experience is highly valued, and the capacity to learn from experience is well developed. Training, self-assessments, and benchmarking are used to stimulate learning and to improve performance. Safety is kept under constant scrutiny through a variety of monitoring techniques, some of which provide an independent fresh look.
- Issues potentially impacting safety are promptly identified, evaluated, and corrected commensurate with their significance. Identification and resolution of a broad spectrum of problems, including organizational issues, unsafe conditions, near-misses, and first-aid cases, are used to strengthen safety and to improve performance.
- A safety-conscious work environment is maintained in which personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment or discrimination. The organization creates, maintains, and evaluates policies and processes that allow personnel to raise concerns freely. Nuclear suppliers establish and maintain an employee concerns program or participate in their customers' program (depending on the specifics of the contracted arrangement).
- The process of planning and controlling work activities is implemented so that safety is maintained. Work management is a deliberate process in which work is

identified, selected, planned, scheduled, executed, closed, and critiqued. The entire organization is involved in and fully supports the process. High-risk activities are planned carefully, and contingency plans are developed for activities with significant potential for adverse consequences (for example, personnel injury and fuel damage). Training, tools, and equipment—such as human performance techniques, properly erected and inspected scaffolds, mock-ups, and personal protective equipment—are provided to achieve a safe work environment.

Every nuclear organization has many important behaviors and actions specified within its procedures, processes, written standards, and expectations. INPO 09-007, *Principles for Excellence in Nuclear Project Construction*, provides attributes for behaviors and actions for organizations involved in construction activities at a nuclear facility, many of which could apply for any nuclear supplier work. For additional information on the essential attributes, behaviors, and actions of a healthy safety culture, refer to INPO 12-012 and INPO 12-012, Addendum I, *Behaviors and Actions that Support a Healthy Nuclear Safety Culture, by Organization Level*, which provides a description of behaviors and actions, arranged by organizational level (executive/senior manager, manager, supervisor, and individual contributor).

## 1.2 Materials, Equipment, Configuration Control, and Quality Assurance

***Principle:*** *Materials, equipment, and services nuclear suppliers provide meet all applicable requirements for form, fit, and function of the item(s), including the application of appropriate configuration controls and quality assurance program requirements.*

The materials, equipment, and services that nuclear suppliers provide are essential to the nuclear industry. As a result, nuclear suppliers must ensure their products and services meet customer requirements for proper form, fit, and function. Configuration controls and quality assurance oversight are used as needed to verify requirements are met. Nuclear suppliers must have an understanding of the risk significance of their work and take action to address identified risk. Customers must have confidence that the installation or implementation of supplier deliverables and/or products will not cause detriment to their station or to the health and safety of the public.

### **Attributes:**

- Nuclear suppliers know and understand the technical requirements for the materials, equipment, or services they are providing and use appropriate processes and procedures to ensure they are met. Nuclear suppliers are responsible for identifying incorrect specifications or requirements before accepting specifications.

- Nuclear suppliers understand the importance of their product to safe and reliable plant operation. This includes both the nuclear safety impact if it does not function properly and the schedule impact if it is delivered late.
- Nuclear suppliers know and understand the quality requirements, including a clear understanding of how those requirements must be implemented. Nuclear suppliers work under the customer's quality assurance (QA) program or their own properly documented and approved QA program.
- Nuclear suppliers train personnel to confirm the correct revision of procedures and drawings, including how to check for updates during the execution of the work.
- Personnel execute work in accordance with the specified code basis, and any deviations are resolved with the customer before proceeding (for example, code reconciliation).
- Personnel involve the customer in decisions when the outcome may have an impact on the specified or critical attributes of the material, equipment, or service.
- Personnel understand and embrace the expectation to provide high-quality and defect-free materials, equipment, and services in accordance with the purchase order or contract-required time frames. As the purchase order requires, nuclear suppliers provide traceability of the materials to the finished product or installation as the contract specifies.
- Milestones for both the completion of detailed engineering and procurement of long-lead items must be identified early. Additionally, nuclear suppliers ensure designs have considered constructability.
- Nuclear suppliers have robust quality controls to detect and eliminate suspect or counterfeit items from entering the supply chain.
- Nuclear suppliers verify that appropriate personnel are aware of cyber security requirements. They understand the greatest cyber threat is mostly from off-the-shelf items. Nuclear suppliers analyze digital computer and communication systems and networks to identify assets that must be protected against cyber-attacks. They ensure the delivered product is free from known cyber security vulnerabilities and malicious codes.
- Nuclear suppliers understand the customer design basis and requirements to the level necessary to maintain integrity of the design and licensing basis information (DLBI). Nuclear suppliers agree to provide information needed to support customer maintenance of DLBI (Refer to EPRI Report 1019221, *Advanced Nuclear Technology: New Nuclear Power Plant Information Handover Guide.*).

- If a nuclear supplier discovers discrepancies, those discrepancies are documented in the problem identification and resolution process, and the supplier notifies and involves the customer in resolving the situation. Examples of those discrepancies requiring resolution include calculations, undocumented modifications, discrepancies among different design documents, code non-conformances, or other as-found problems.
- Nuclear suppliers implement additional contractual controls to review low-margin, risk-significant components and human actions. They support customer review and oversight of this work to protect the plant and public safety.
- Nuclear supplier personnel work with the customer to make sure any original equipment manufacturer or sub supplier recommendations and requirements (including maintenance requirements) are understood. Proper communication and handover of this information is contractually required.
- Nuclear suppliers have an effective documentation process to maintain evidence of compliance to the contract requirements, and personnel are committed to using it. Documentation must be both complete and accurate. The nuclear supplier documents and advises the customer of any noncompliance or deviations (even minor). Nuclear suppliers ensure that personnel understand that falsification of records will not be tolerated and constitutes a violation of government regulations.
- Nuclear suppliers do not release materials and equipment to the customer unless they are fully compliant with the contract requirements or unless the deviation has been submitted, accepted, and formally approved by the customer and regulator, as necessary.

### 1.3 Human Performance

***Principle:** Human performance behaviors, including procedural adherence and open communications, are used and positively reinforced to support safe and reliable operations.*

Excellence in human performance is a key element in achieving success in the nuclear industry. Human performance is a series of behaviors executed to accomplish specific task objectives. Behaviors—the mental and physical efforts to perform a task—are what achieve results. Although value-added results are important, desired behaviors must be the focus of improvement efforts. Nuclear suppliers share in the acceptance that humans are fallible and that even the best performers make mistakes; therefore, nuclear suppliers must focus on measures that minimize human-error and prevent events. Three points of focus for excellence in human performance are the individual, the leader and the organization itself.

**Attributes:**

**Individual**

- Individuals communicate up, down, and across all levels to ensure a mutual understanding of tasks, schedules, milestones, and expectations is achieved. Effective communication is accomplished through the use of repeat-backs, prejob briefings, turnover meetings, questioning, and input.
- Nuclear suppliers train individuals on techniques to anticipate and address error-likely situations. Operational experiences and lessons learned from various industries are applied to prevent events. Individuals self-check their actions to ensure all target objectives have been met. Peer-checks are used to challenge the planned actions and thought processes to ensure expected outcomes are achieved.
- Individuals are knowledgeable of the physical and administrative defenses built into the system and maintain the integrity of those defenses through the strict adherence to procedures, regulatory requirements, and industry practices.
- Individuals ask questions to validate assumptions and guidance. When individuals cannot validate assumptions or guidance, they have the integrity and certainty of managerial support to stop the task and resolve the issue. Individuals have the willingness to collaborate with others on the best approach to proceed safely and compliantly.
- Individuals take responsibility for their behaviors and are committed to improving themselves as well as the task and the work environment. Individuals improve their personal capabilities by taking ownership of their job responsibilities. Individuals take action to acquire the knowledge, skill, and ability for tasks they are qualified to perform.

**Leader**

- Leaders are central in the open-communication process in the workplace. They take care to ensure that each team member understands clearly his or her role, responsibilities, expected behaviors, results, and standards. Leaders avoid complacency by challenging assumptions and beliefs. They continually monitor organizational processes, values, and problem-solving methods to detect weaknesses that could adversely affect outcomes.
- Leaders encourage teamwork to eliminate error-likely situations and product flaws. Prejob briefings are used to promote teamwork and identify strengths and weaknesses before the work commences. Leaders monitor activities closely to ensure that weaknesses in supervision, training or procedures are taken care of before the work begins. Additionally, leaders participate in training activities and

provide feedback to improve training program quality and to reinforce performance standards.

- Leaders know their team members strengths and weaknesses. They understand each individual's experience and capabilities (mental, physical, training, skill sets and abilities) and how each contributes to completing tasks and meeting group goals. In addition to providing individuals the opportunity to work with positive role models, they monitor and coach workers through firsthand observations, active listening, and questioning. Leaders interact with the workforce in the field, reinforcing expected behaviors and resolving emergent human performance problems. Both aspects of performance, behaviors and results, receive close attention.

### **Organization**

- Organizationally, managers advocate a defense-in-depth philosophy by establishing various means to eliminate error-likely situations. They foster a culture that values prevention of events, simplification of work processes, and elimination of workarounds.
- Managers should put into place an organizational process that mitigates the additional risk that customer requirement changes introduce.
- Managers facilitate the free flow of information among work groups and individuals to strengthen the integrity of defenses and to mitigate the consequences of errors. Delegation of authority to the lowest competent level removes multiple layers of review and provides greater pride in ownership, accountability, and possibility of errors.
- Managers provide procedures that are clear, logical, in the correct sequence, and easy to follow. Managers communicate the need for procedure use and adherence and advise workers of the consequences for not complying. Along with the use of correct procedures to perform the tasks, managers have the responsibility to provide the right tools and processes for the tasks being performed. In addition, managers institute training on infrequently performed tasks before the tasks are performed.
- Excellence in human performance creates a learning environment that promotes continuous improvement throughout the organization. In addition to training, other tools used are self-evaluations, observations of others, event investigations, benchmarking, self-identification of problems needing correction, and performing postjob critiques. All of these tools allow the opportunity to learn from errors and to take corrective actions to prevent recurrences. These proactive and reactive measures make up the operational experience that becomes the lessons learned that improve human performance throughout the organization.

## 1.4 Training and Qualifications

***Principle:*** *Personnel are trained and qualified for their jobs.*

Nuclear suppliers have a responsibility to ensure that personnel are trained and qualified to perform their assigned tasks to the expected industry standard of excellence. Individual employees have the responsibility to ensure that their qualifications are current. Although nuclear suppliers each have unique internal work processes and programs providing various types of products and services, effective training programs share key objectives. INPO AP-930, *Supplemental Personnel Process Description*, Appendix A, describes the training and standards for supplemental workers and supervisors working at customer sites.

### **Attributes:**

- Nuclear suppliers train personnel on work processes, quality assurance programs, human performance, and nuclear and industrial safety standards.
- Personnel confirm they have the technical competency and are proficient to perform work—on-site or off-site—for their customers before starting it.
- Nuclear supplier supervisors confirm that their personnel meet customer training and performance standards and expectations and that required qualifications are current before starting work.
- Nuclear supplier personnel are qualified and proficient to perform assigned tasks, and appropriate task evaluations are used to validate their qualifications.
- Radiation workers are trained and qualified (through NANTeL) and understand site rules and industry regulations.
- Personnel at customer sites are trained in collateral procedures that impact their work. These include but are not limited to the following:
  - foreign material exclusion
  - lockout tag-out application
  - lifting and rigging
  - confined-space access
  - fire-watch responsibilities
  - work package preparation

— chemical (and chemistry) control

- Nuclear suppliers update training and qualification programs to incorporate lessons learned and industry operating experience.

## 1.5 Continuous Improvement

***Principle:*** *Managers and workers seek continuous improvement and use effective performance improvement programs such as self-assessment and corrective action to identify and implement change.*

Performance improvement programs are vehicles for identifying and implementing change. For this reason, they are important contributors to safe and reliable nuclear supplier performance and nuclear facility operation. Successful programs begin with an organizational culture that encourages self-critical, candid, and objective evaluation of performance against industry standards of excellence. Leadership and management (both nuclear suppliers and their customers) reinforce a questioning attitude within the workforce, promote a safety-conscious work environment, and encourage the discovery and reporting of areas for improvement. Both nuclear supplier and customer managers avoid a punitive approach to errors made in good faith or reacting defensively to suggestions for improvement. Working together, managers and employees are accountable for aggressively identifying problems, correcting performance shortfalls, and striving for continuous process and activity improvement. Nuclear suppliers adopt these principles, attributes, and behaviors in their own programs and/or through their participation in their customers' programs.

**Attributes** (*self-assessment program*):

- Nuclear suppliers formally define their self-assessment program, which includes guidance for both ongoing and periodic focused self-assessments.
- Nuclear supplier program owners ensure people with the necessary expertise perform self-assessment activities.
- The self-assessment process measures performance against management expectations, high industry standards, operating experience, and regulatory requirements.
- The nuclear supplier self-assessment program is applicable to each organization for routine self-assessments of programs, processes, and performance.
- Nuclear supplier program owners maintain the responsibility for addressing problems identified during self-assessments. Teams or individuals conducting self-assessments communicate closely with process owners to help ensure understanding of and ownership for the results.

- Management ensures issues are promptly entered into the corrective action program or other tracking systems for resolution.
- Management communicates self-assessment results to affected groups and individuals.
- Nuclear suppliers periodically review self-assessment program effectiveness, using a combination of ongoing and periodic focused reviews, and adjust the program as necessary.

**Attributes** (*corrective action program*):

- Nuclear suppliers and their customers' managers encourage employees at all levels in the organization to identify and report problems.
- Problem reporting criteria are formally defined, including the problem reporting systems(s) to be used, the desired level(s) of problem evaluation, and the timeliness of the corrective actions.
- Any problems identified that require interim actions and/or compensatory measures should be captured appropriately and included in the formal corrective action program.
- New problems reported in the corrective action program are screened promptly for their effect on safety, reliability, operability, and reportability.
- Problems are evaluated, commensurate with their significance, to determine the cause(s). A graded approach for investigating errors or events is established in accordance with INPO 14-004, *Conduct of Performance Improvement*. For significant issues that require detailed cause analysis, INPO 90-004 (Good Practice OE-907), *Root Cause Analysis*, provides information on some typical analytical tools available to determine event causal factors.
- Individuals or teams trained in root cause analysis techniques evaluate significant problems using a structured methodology to identify root and contributing causes and corrective actions to prevent recurrence.
- Evaluations of lower-significance problems focus on correcting the immediate or apparent cause.
- Corrective actions are approved, prioritized, and completed in a timely manner consistent with their significance.
- Employees who identify problems receive prompt feedback about corrective actions.

- Problems and associated causes are trended to identify repeat occurrences, generic issues, and low-level vulnerabilities before significant problems result.
- Information in lower-tier performance observation or reporting programs is periodically assessed for trends needing additional evaluation or corrective action.
- Corrective actions designed to prevent recurrence of significant problems are checked for effectiveness.
- The corrective action program is periodically monitored and assessed for effectiveness.

## 1.6 Operating Experience and Lessons Learned

***Principle:*** Nuclear suppliers share operating experience and lessons learned (within the confines of negotiated nondisclosure agreements), regarding nuclear and industrial safety, with customers and other nuclear suppliers to support continuous performance improvement.

Lessons learned from the industry operating and construction experience (OE/CE) are used effectively and efficiently to improve quality, safety, and reliability. Effective use of OE/CE will reduce the number and consequence of events and will reduce operational costs through avoidance of repeat failures and significant events. Learning from and applying these lessons are an integral part of a healthy nuclear safety culture and are encouraged by leaders and managers throughout the nuclear supplier and customer organizations. Personnel regard OE/CE as helpful and important, and use this information at every opportunity. Nuclear suppliers structure methods of using OE/CE to provide applicable information to the right personnel in time to make a difference. When analyzing the causes of significant errors or events, OE/CE is routinely reviewed to determine if and why previous lessons were ineffectively learned or applied.

### **Attributes:**

- The information used in the OE/CE program comes from a multitude of sources including, but not limited to, the INPO OE/CE Database (nuclear industry), the Department of Energy's Lesson Learned Database, and lesson learned databases developed and utilized by the individual vendors and nuclear suppliers. Nuclear suppliers review their lessons learned and report those of nuclear safety or other significance through INPO (within the confines of negotiated disclosure agreements) for broader distribution and use by other nuclear suppliers and customers.
- Leadership and management establish and drive expectations of an effective OE/CE program, including as follows:
  - clearly defined organizational roles and responsibilities for program ownership and implementation

- staffing of program by qualified and experienced personnel
  - timely review and screening of events
  - distribution to appropriate staff for event investigation and cause analysis
  - tracking of preventive and corrective actions
  - trending to identify recurrence
  - appropriate communication and access to lessons learned
  - periodic self-assessment of program effectiveness
  - industry sharing of nuclear safety issues
  - routine benchmarking, participation in industry forums, and use of Nuclear Network
- Nuclear suppliers should have an established program and industry best practices to ensure that counterfeit, fraudulent or suspect items (CFSI) are identified and captured in their performance improvement programs. Additionally, nuclear suppliers need to have a method for sharing any CFSI-identified parts, including any operating experience gained.
  - The nuclear suppliers communicate lessons learned from internal errors or events to appropriate personnel in a timely manner to prevent similar events; human performance errors; or problems resulting from weaknesses in processes, practices, procedures, training, and system or component design. Internal OE/CE is stored in a manner that makes it easy to retrieve and search.

#### 1.7 Procurement and Contracting of Materials and Services

***Principle:*** *Nuclear suppliers acknowledge that the procurement and contracting processes customers require support progress toward excellence in nuclear supplier performance.*

Procurement and contracting processes are a set of integrated supply processes that are designed to support nuclear facility operation. The nuclear industry established these processes to integrate the total cost of ownership with schedules, risk management, quality, nuclear safety, and supplier/customer relationship management. The industry also supports nuclear supplier and customer implementation of these principles. These processes are established to ensure that nuclear and personnel safety are addressed in the appropriate contracts, purchase orders, and operating activities.

**Attributes** (*procurement and contracting processes*):

**Materials Processes**

- Nuclear suppliers understand the types of communication challenges with the customer. The nuclear supplier minimizes those challenges by ensuring that customer specifications are clear and that the customer and the supplier have a common, detailed understanding. Customers also hold responsibility to mitigate this risk by ensuring timely issuance of purchase orders and change orders to nuclear suppliers.
- Nuclear suppliers and the customers understand and acknowledge the potential risks associated with the procurement of the item(s).
- When special procurement-related requirements or special terms and conditions are indicated, suppliers work closely with customers to ensure there is clear understanding and timely resolution of issues.
- Nuclear suppliers understand and approve purchase order item technical and quality requirements. Nuclear suppliers review the current purchase order revision(s) and qualification(s) to include, but not be limited to, specifications and technical requirements, drawings, and quality assurance program requirements.
- Nuclear suppliers assure compliance through review of purchase orders for packaging, shipping, receiving, storage, and handling requirements.
- Nuclear suppliers apply applicable standards when packaging material to prevent damage during shipment and to minimize delivery delays. These standards include requirements from the American National Standards Institute, the Occupational Health and Safety Administration, and the Department of Transportation.
- Nuclear suppliers clearly understand customer security inspection requirements and understand that items need to be packaged and shipped appropriately.
- Nuclear suppliers align methods of shipment with customer purchase order requirements or negotiated special requests.
- Nuclear suppliers will work with the customer for receipt problems and ensure they are documented, trended, and resolved.
- Nuclear suppliers avoid—or negotiate with the customer in advance—the impact of issues (for example, schedule commitments) relating to the quality of materials or the delivery schedule. Nuclear suppliers consider applying additional oversight and apply appropriate human performance tools to identify and eliminate error-likely situations early in the production of new or first-time items.

- Approved nuclear suppliers make effective use of a corrective action program (CAP) to identify, evaluate, and resolve product and process nonconformances as required by Criteria 15 and 16 of 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*. The effective use of CAP is described in this principles document and is limited to requirements complying with United States regulations.
- Nuclear suppliers are effective at balancing the time spent identifying and correcting problems and notifying the customer so that they have the opportunity to assist in the resolution.
- Nuclear suppliers and customers at all levels in the supply chain should be aware of the existence of counterfeit or fraudulent items in the global marketplace. Nuclear suppliers employ procurement practices, supplier selection, receipt inspection, testing, and other quality control practices in an effort to prevent the introduction of counterfeit, fraudulent, or suspect items (CFSI) into the supply chain.
- Customers support and endorse the use of these principles through their procurement and contracting processes with nuclear material suppliers.

### **Services Processes**

- Commercial grade dedication services, testing, and equipment calibrations are performed to applicable (specified by the customer and supplier) industry standards and federal regulations. This includes qualification of nuclear suppliers and certified laboratories on the NQA-1 Approved Supplier's List (ASL).
- An appropriate acceptance process is used to provide reasonable assurance that commercial grade items (for example, equipment and services) designated for use as basic components will perform their intended safety function consistent with applicable industry standards, federal regulations, and customer requirements.
- Nuclear suppliers are effectively audited, approved, and listed on an ASL to provide equipment and services under 10 CFR 50, Appendix B, and NQA-1.
- Nuclear suppliers perform work per terms and conditions of the contract and notify the customer in advance of any issues or concerns that need to be addressed.
- Mobilization activities include ensuring that the necessary job awareness prerequisites have been met through the use of nuclear supplier or customer programs or training as contracted.
- Nuclear suppliers verify the job schedule and complete prejob preparations before executing work.

- Nuclear suppliers perform appropriate contract reviews to verify discrepancy resolution within the scope of the original agreement and communicate any contract changes or concerns to the customer per the terms and conditions of the contract.
- Nuclear facility site in-processing activities, including nuclear security requirements, are properly scheduled, completed, and understood for plant access. Travel and hotel accommodations are arranged before starting work, and appropriate customer requirements for time, travel, and other costs are appropriately tracked and recorded.
- Nuclear suppliers evaluate and comply with applicable worker qualification, certification, and experience requirements for the requested work scope. The required training and qualifications records are maintained to demonstrate that the qualifications are met.
- Customers support and endorse the use of these principles through their procurement and contracting processes with nuclear suppliers.

## **2.0 IMPLEMENTING PRINCIPLES FOR EXCELLENCE IN NUCLEAR SUPPLIER PERFORMANCE**

Implementing the principles for excellence in nuclear supplier performance is a shared responsibility between the nuclear suppliers and their customers in support of the critical role both perform regarding quality and nuclear safety. Achieving industry wide implementation of these principles will require common understanding, expectations, communication and agreement.

### **2.1 Establishing Expectations**

Both nuclear suppliers and their customers should endorse these principles and attributes for excellence in nuclear supplier performance. Leaders in these organizations communicate to their staff, suppliers, procurement organizations, and subcontractors the purpose, basis, and approach to implementing these principles. Implementation should include the following:

- Nuclear suppliers and their customers must understand that investment in these attributes and associated programs is essential for excellent performance.
- Past experience has demonstrated that nuclear supplier performance can have direct and indirect impacts on customer performance.
- Implementation of these principles aligns directly with those areas essential to continuous performance improvement for both customers and nuclear suppliers.
- Implementation of these principles can occur through supplier-provided initiatives and/or through direct participation in similar customer-provided programs.

### **2.2 Achieving Acceptance**

Nuclear suppliers and customers define the roles and responsibilities of leaders and managers within both supplier and customer organizations regarding the implementation of these principles. Each role description, including the customer procurement process, includes a clear element for the reinforcement of these principles. These descriptions include:

- Leaders communicate to their organization's workforce the purpose, bases, and content of the principles for high-quality and safe performance.
- Managers and supervisors coach subordinates on expected behaviors in supplier and customer facilities.

- Workers coach their peers, especially when behaviors do not meet expectations.

### 2.3 Verifying Implementation

Both nuclear suppliers and their respective customers monitor and assess the implementation of the principles for excellence to verify that they have communicated these principles effectively. They should also check that processes, procedures, and contractual mechanisms (as appropriate) have been established and are implemented in conformance with the principles. Personnel at all levels are interviewed regarding their understanding of the principles, the roles in implementing and reinforcing them, and the actions they have taken to exercise the principles. Both nuclear suppliers and their respective customers review significant deficiencies or adverse trends to identify potentially flawed defenses in the commitment to quality and safety. Both nuclear suppliers and their customers identify and implement corrective actions when needed, and leaders follow up to ensure those corrective actions are effective.

**Acknowledgments:**

*The following individuals participated in the SPAC working group that developed the principles and attributes in this document.*

AREVA	Ms. Tara W. Werner Manager, Nuclear Oversight AREVA Inc.
AZZ/WSI	Mr. Anthony W. Papso Director, Business Development AZZ / WSI, LLC
Bechtel	Mr. Richard Miller Manager of Operating Plant Engineering Services Bechtel Power Corporation
Black & Veatch	Mr. Mark Gake Nuclear Chief Engineer Black & Veatch Corporation
B&W	Mr. Ronnie L. Gardner, PMP Director, Quality Assurance Babcock & Wilcox
CB&I	Mr. Daniel P. Fadel Vice President CB&I
Duke Energy	Mr. Michael W. Donovan Director, Nuclear Supply Chain Duke Energy Corporation
D&Z	Dr. Kristopher J. Cravey Vice President, Business Services Engineering, Construction & Maintenance Day & Zimmermann Power Services
Exelon	Mr. Joel Fern Director Supply Operations, Nuclear Exelon Corporation Exelon Generation/Exelon Nuclear

INPO	Maureen C. Kunapareddy Supplier Program Manager INPO
INPO	Steve Thompson Supplier Program Manager INPO
Kiewit	Mr. Jerry R. Reynolds Quality Assurance Manager Kiewit Power Constructors Kiewit Power Inc.
NFS	Mr. John W. Nagy Assurance Director Nuclear Fuel Services, Inc.
Sargent & Lundy	Mr. Ira H. Owens Senior Vice President Sargent & Lundy
URENCO	Mr. David E. Sexton, P.E. President and CEO URENCO USA Inc. Working Group Chair
URS	Joseph J. Ruggiero Vice President, Nuclear Engineering and Plant Services URS, Washington Division

This page is intentionally blank.

**INPO<sup>®</sup>**

***Institute of  
Nuclear Power  
Operations***

*Suite 100  
700 Galleria Parkway, SE  
Atlanta, GA 30339-5943  
770-644-8000  
FAX 770-644-8549*