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# Traits of a Healthy Nuclear Safety Culture

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## INTRODUCTION

*Traits of a Healthy Nuclear Safety Culture* builds on the knowledge and experience developed since the publication of *Principles of a Strong Nuclear Safety Culture* in 2004. The change in the title reflects the commercial nuclear industry's alignment of its own terminology with that used by the U.S. Nuclear Regulatory Commission. This document was developed through a collaborative effort by U.S. industry personnel and the staff of the Institute of Nuclear Power Operations (INPO), with input from representatives of various regulatory agencies, the public, and the nuclear industry worldwide. *Traits of a Healthy Nuclear Safety Culture* reflects an alignment in two sets of terms that have been used to describe nuclear safety culture: INPO and the industry defined safety culture in leadership terms of principles and attributes, and the U.S. Nuclear Regulatory Commission defined safety culture in regulatory terms of components and aspects. Whereas each set of terms served its special function, the result created confusion within operating organizations as to the essential elements of a healthy safety culture.

*Traits of a Healthy Nuclear Safety Culture* describes the essential traits and attributes of a healthy nuclear safety culture, with the goal of creating a framework for open discussion and continuing evolution of safety culture throughout the commercial nuclear energy industry. For the purposes of this document, a trait is defined as a pattern of thinking, feeling, and behaving such that safety is emphasized over competing priorities. Experience has shown that the personal and organizational traits described in this document are present in a positive safety culture and that shortfalls in these traits and attributes contribute significantly to plant events.

Rather than prescribing a specific program or implementation method, this document describes the basic traits. These traits and attributes, when embraced, will be reflected in the values, assumptions, behaviors, beliefs, and norms of an organization and its members. Ideally, the traits will describe what it is like to work at a nuclear facility and how things are done there. Traits appear in boldface. The attributes clarify the intent of the traits.

Utility managers are encouraged to make in-depth comparisons between these traits and their day-to-day policies and practices and to use any differences as a basis for improvements.

In addition to the traits and attributes, two addendums are available. *Addendum I: Behaviors and Actions That Support a Healthy Nuclear Safety Culture*, describes executive, senior manager, manager, supervisor, and individual contributor behaviors that contribute to a healthy safety culture. An additional table is provided to describe detailed behaviors and actions for each attribute. *Addendum II: Cross-References*, provides cross-references from INPO 12-012, *Traits of a Healthy Nuclear Safety Culture*, to the previous *Principles of a Strong Nuclear Safety Culture*, U.S. Nuclear Regulatory Commission operating reactor assessment program cross-cutting area components, and the International Atomic Energy Agency safety culture attributes. This cross-reference can help individuals understand how the common language was developed and can be useful in change management efforts in this important area.

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## BACKGROUND

Watershed events over the years have influenced the safety culture at U.S. commercial nuclear power plants. The industry had its first significant wake-up call in 1979 as a result of the accident at Three Mile Island Nuclear Station. Many fundamental problems involving hardware, procedures, training, and attitudes toward safety and regulation contributed to the event.

In 1986, the Chernobyl accident was a stark reminder of the hazards of nuclear technology. This accident resulted from many of the same weaknesses that led to the Three Mile Island accident. In addition, it highlighted the importance of maintaining design configuration, plant status control, line authority for reactor safety, and cultural attributes related to safety.

Response from industry and regulatory organizations to both these events was sweeping. Improvements were made in standards, hardware, emergency procedures, processes, training (including simulators), emergency preparedness, design and configuration control, testing, human performance, and attitudes toward safety.

The 2002 discovery of degradation of the Davis-Besse Nuclear Power Station reactor vessel head highlighted problems that develop when the safety environment at a plant receives insufficient attention.

Most recently, the 2011 nuclear accident at the Fukushima Daiichi power plant illustrates the importance of thoroughly assessing possible nuclear safety impacts of a hypothetical, yet credible, extreme external event. It also illustrates the importance of emergency response command and control, training, and resource availability for such an event.

A theme common in these events is that, over time, problems crept in, often related to or a direct result of the plant culture. Had these problems been recognized, challenged, and resolved, the events could have been prevented or their severity lessened. The series of decisions and actions that resulted in these events can usually be traced to the shared assumptions, values, and beliefs of the organization.

These events and the notion that culture is a key ingredient in the overall success of the plant form the basis for this document.

Organizational culture is the shared basic assumptions that are developed in an organization as it learns and copes with problems. The basic assumptions that have worked well enough to be considered valid are taught to new members of the organization as the correct way to perceive, think, act, and feel. Culture is the sum total of a group's learning. *Culture is for the group what character and personality are for the individual.*

In addition to a healthy organizational culture, each nuclear station, because of the special characteristics and unique hazards of the technology—radioactive byproducts, concentration of energy in the reactor core, and decay heat—needs a healthy **safety culture.**

**Nuclear 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.**

*This updated definition was developed to apply broadly across all industries that use nuclear technologies. For the commercial nuclear power industry,* ***nuclear safety remains the overriding priority.*** *Although the same traits apply to radiological safety, industrial safety, security, and environmental safety, nuclear safety is the first value adopted at a nuclear station and is never abandoned.*

Nuclear safety is a collective responsibility. The concept of nuclear safety culture applies to every employee in the nuclear organization, from the board of directors to the individual contributor. No one in the organization is exempt from the obligation to ensure safety first.

The performance of individuals and organizations can be monitored and trended and, therefore, may serve as an indicator of the health of an organization's safety culture. However, the health of a facility's safety culture could lie anywhere along a broad continuum, depending on the degree to which the attributes of safety culture are embraced. Even though safety culture is somewhat of an intangible concept, it is possible to determine whether a station tends toward one end of the continuum or the other.

Commercial nuclear power plants are designed, built, and operated to produce electricity. Safety, production, and cost control are necessary goals for the operation of such a plant. These outcomes are quite complementary, and most plants today achieve high levels of safety, impressive production records, and competitive costs, reinforced by decisions and actions made with a long-term view. This perspective keeps safety as the overriding priority for each plant and for each individual associated with it.

*Nuclear safety culture is a leadership responsibility*. Experience has shown that leaders in organizations with a healthy safety culture foster safety culture through activities such as the following:

- Leaders reinforce safety culture at every opportunity. The health of safety culture is not taken for granted.
- Leaders frequently measure the health of safety culture with a focus on trends rather than absolute values.
- Leaders communicate what constitutes a healthy safety culture and ensure everyone understands his or her role in its promotion.
- Leaders recognize that safety culture is not all or nothing but is, rather, 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.

The traits described in this document are divided into three categories that are similar to the three categories of safety culture in International Nuclear Safety Advisory Group (INSAG)-4, *Safety Culture*. The categories and their primary traits are as follows:

- Individual Commitment to Safety
  - — Personal Accountability
  - — Questioning Attitude
  - — Safety Communication
- Management Commitment to Safety
  - — Leadership Accountability
  - — Decision-Making
  - — Respectful Work Environment
- Management Systems
  - — Continuous Learning
  - — Problem Identification and Resolution
  - — Environment for Raising Concerns
  - — Work Processes

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# THE TRAITS AND THEIR ATTRIBUTES

## Individual Commitment to Safety

### PA. Personal Accountability

**All individuals take personal responsibility for safety.** Responsibility and authority for nuclear safety are well defined and clearly understood. Reporting relationships, positional authority, and team responsibilities emphasize the overriding importance of nuclear safety.

Attributes:

PA.1 Standards: Individuals understand the importance of adherence to nuclear standards. All levels of the organization exercise accountability for shortfalls in meeting standards.

PA.2 Job Ownership: Individuals understand and demonstrate personal responsibility for the behaviors and work practices that support nuclear safety.

PA.3 Teamwork: Individuals and work groups communicate and coordinate their activities within and across organizational boundaries to ensure nuclear safety is maintained.

### QA. Questioning Attitude

**Individuals avoid complacency and continuously challenge existing conditions, assumptions, anomalies, and activities in order to identify discrepancies that might result in error or inappropriate action.** All employees are watchful for assumptions, values, conditions, or activities that can have an undesirable effect on plant safety.

Attributes:

QA.1 Nuclear is Recognized as Special and Unique: Individuals understand that complex technologies can fail in unpredictable ways.

QA.2 Challenge the Unknown: Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before work proceeds.

QA.3 Challenge Assumptions: Individuals challenge assumptions and offer opposing views when they believe something is not correct.

QA.4 Avoid Complacency: Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes.

## CO. Safety Communication

**Communications 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. Leaders use formal and informal communication to convey the importance of safety. The flow of information up the organization is seen as important as the flow of information down the organization.

Attributes:

CO.1 Work Process Communications: Individuals incorporate safety communications in work activities.

CO.2 Bases for Decisions: Leaders ensure that the bases for operational and organizational decisions are communicated in a timely manner.

CO.3 Free Flow of Information: Individuals communicate openly and candidly, both up, down, and across the organization and with oversight, audit, and regulatory organizations.

CO.4 Expectations: Leaders frequently communicate and reinforce the expectation that nuclear safety is the organization's overriding priority.

## Management Commitment to Safety

### LA. Leadership Accountability

**Leaders demonstrate a commitment to safety in their decisions and behaviors.** Executive and senior managers are the leading advocates of nuclear safety and demonstrate their commitment both in word and action. The nuclear safety message is communicated frequently and consistently, occasionally as a stand-alone theme. Leaders throughout the nuclear organization set an example for safety. Corporate policies emphasize the overriding importance of nuclear safety.

Attributes

LA.1 Resources: Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support nuclear safety.

LA.2 Field Presence: Leaders are commonly seen in working areas of the plant observing, coaching, and reinforcing standards and expectations. Deviations from standards and expectations are corrected promptly.

LA.3 Incentives, Sanctions, and Rewards: Leaders ensure incentives, sanctions, and rewards are aligned with nuclear safety policies and reinforce behaviors and outcomes that reflect safety as the overriding priority.

LA.4 Strategic Commitment to Safety: Leaders ensure plant priorities are aligned to reflect nuclear safety as the overriding priority.

LA.5 Change Management: Leaders use a systematic process for evaluating and implementing change so that nuclear safety remains the overriding priority.

LA.6 Roles, Responsibilities, and Authorities: Leaders clearly define roles, responsibilities, and authorities to ensure nuclear safety.

LA.7 Constant Examination: Leaders ensure that nuclear safety is constantly scrutinized through a variety of monitoring techniques, including assessments of nuclear safety culture.

LA.8 Leader Behaviors: Leaders exhibit behaviors that set the standard for safety.

## DM. Decision-Making

**Decisions that support or affect nuclear safety are systematic, rigorous, and thorough.** Operators are vested with the authority and understand the expectation, when faced with unexpected or uncertain conditions, to place the plant in a safe condition. Senior leaders support and reinforce conservative decisions.

Attributes:

DM.1 Consistent Process: Individuals use a consistent, systematic approach to make decisions. Risk insights are incorporated as appropriate.

DM.2 Conservative Bias: Individuals use decision-making practices that emphasize prudent choices over those that are simply allowable. A proposed action is determined to be safe in order to proceed, rather than unsafe in order to stop.

DM.3 Accountability for Decisions: Single-point accountability is maintained for nuclear safety decisions.

## WE. Respectful Work Environment

**Trust and respect permeate the organization, creating a respectful work environment.** 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.

Attributes:

WE.1 Respect is Evident: Everyone is treated with dignity and respect.

WE.2 Opinions are Valued: Individuals are encouraged to voice concerns, provide suggestions, and raise questions. Differing opinions are respected.

WE.3 High Level of Trust: Trust is fostered among individuals and work groups throughout the organization.

WE.4 Conflict Resolution: Fair and objective methods are used to resolve conflicts.

## Management Systems

### CL. Continuous Learning

**Opportunities to continuously learn are valued, 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 improve performance. Nuclear safety is kept under constant scrutiny through a variety of monitoring techniques, some of which provide an independent "fresh look."

Attributes:

CL.1 Operating Experience: The organization systematically and effectively collects, evaluates, and implements lessons from relevant internal and external operating experience information in a timely manner.

CL.2 Self-Assessment: The organization routinely conducts self-critical and objective assessments of its programs, practices, and performance.

CL.3 Benchmarking: The organization learns from other organizations to continuously improve knowledge, skills, and safety performance.

CL.4 Training: High-quality training maintains a knowledgeable workforce and reinforces high standards for maintaining nuclear safety.

### PI. Problem Identification and Resolution

**Issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance.** Identification and resolution of a broad spectrum of problems, including organizational issues, are used to strengthen safety and improve performance.

Attributes:

PI.1 Identification: The organization implements a corrective action program with a low threshold for identifying issues. Individuals identify issues completely, accurately, and in a timely manner in accordance with the program.

PI.2 Evaluation: The organization thoroughly evaluates issues to ensure that problem resolutions and solutions address causes and extents of conditions commensurate with their safety significance.

PI.3 Resolution: The organization takes effective corrective actions to address issues in a timely manner commensurate with their safety significance.

PI.4 Trending: The organization periodically analyzes information from the corrective action program and other assessments in the aggregate to identify adverse trends or conditions.

## RC. Environment for Raising Concerns

**A safety-conscious work environment (SCWE) is maintained where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination.** The station creates, maintains, and evaluates policies and processes that allow personnel to freely raise concerns.

Attributes:

RC.1 SCWE Policy: The organization implements a policy that supports individual rights and responsibilities to raise safety concerns and does not tolerate harassment, intimidation, retaliation, or discrimination for doing so.

RC.2 Alternate Process for Raising Concerns: The organization implements a process for raising and resolving concerns that is independent of line management influence. Safety issues may be raised in confidence and are resolved in a timely and effective manner.

## WP. Work Processes

**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.

Attributes:

WP.1 Work Management: The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work.

WP.2 Design Margins: The organization operates and maintains equipment within design margins. Margins are carefully guarded and changed only through a systematic and rigorous process. Special attention is placed on maintaining fission product barriers, defense-in-depth, and safety-related equipment.

WP.3 Documentation: The organization creates and maintains complete, accurate, and up-to-date documentation.

WP.4 Procedure Adherence: Individuals follow processes, procedures, and work instructions.

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