# IAEA guiding on safety culture and human performance

Yvonne Dubbers, 16 January 2018

Introduction and history

The safety culture concept was first formally applied to the nuclear power industry by the International Atomic Energy Agency's (IAEA's) International Nuclear Safety Advisory Group. The term was used to explain how the lack of knowledge about risk and safety and failure to act appropriately contributed to the Chernobyl accident (see figure 1). The human factor was a major element of the accident. Personnel had an insufficiently detailed understanding of technical procedures involved with the nuclear reactor, and knowingly ignored regulations to speed test completion. According to this group the Chernobyl accident was caused by a "deficient safety culture at Chernobyl and throughout the Soviet design, operating and regulatory organizations."

Figure 1 Chernobyl, 1986
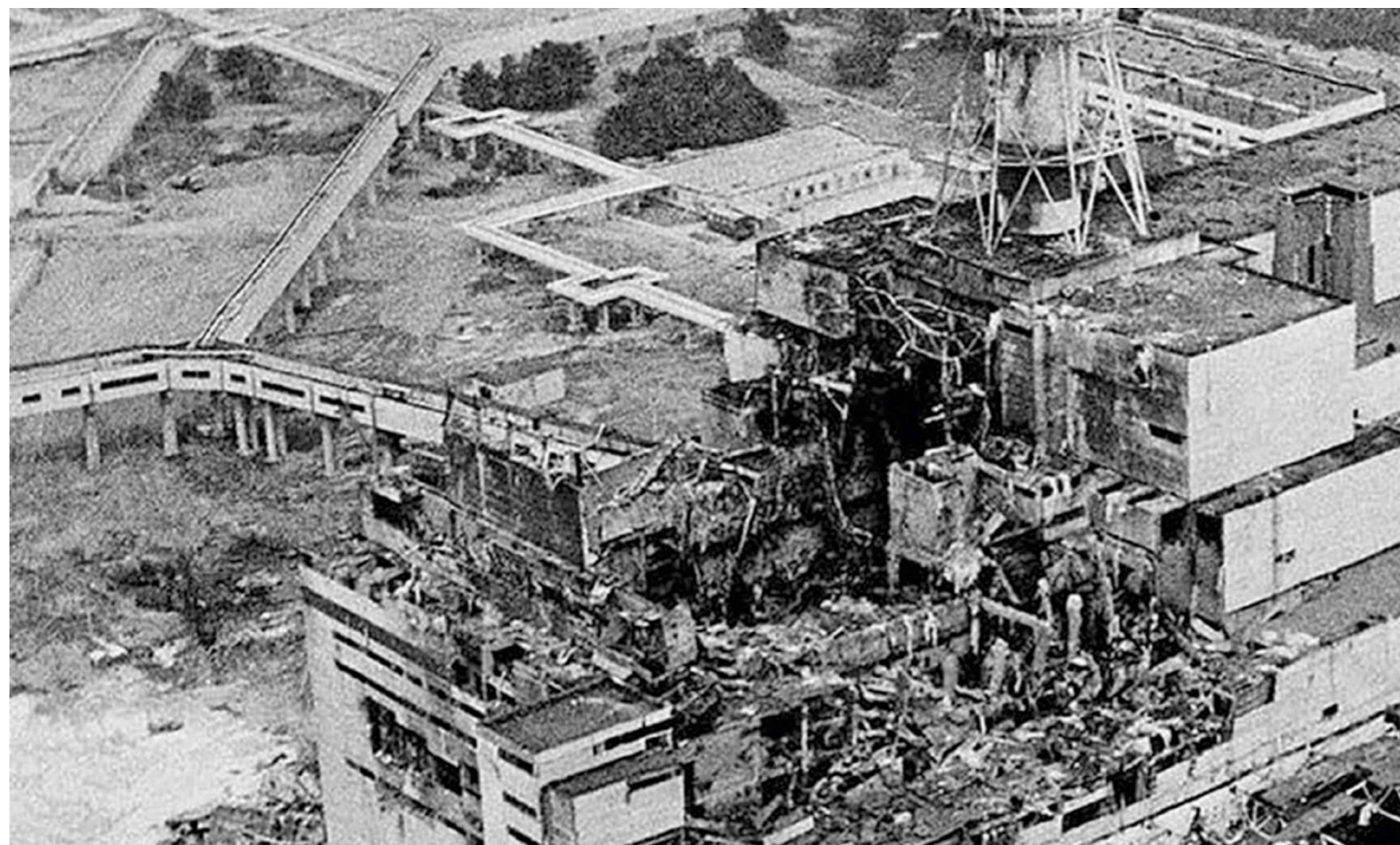
Safety culture defined by IAEA

A good organizational culture is critical to avoiding and managing incidents and addresses safety as well as security and other competing priorities. Assessing and understanding an organization's safety culture can lead to understanding how safety performance can be supported and sustained, and also to identify vulnerabilities which can lead to a decline in performance and be a cause of failure.

Figure 2 IAEA safety culture characteristics

The IAEA defines a strong safety culture as "the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance." The IAEA has developed an international framework for strong safety culture consisting of five overarching safety culture characteristics (see figure 2). Each one of these 'safety culture characteristics' has attributes that have been identified as essential for achieving a strong safety culture:

Safety is a clearly recognized value:
• The high priority given to safety is shown in documentation, communications and decision making.
• Safety is a primary consideration in the allocation of resources.
• The strategic business importance of safety is reflected in the business plan.
• Individuals are convinced that safety and production go hand in hand.
• A proactive and long term approach to safety issues is shown in decision making.
• Safety conscious behaviour is socially accepted and supported (both formally and informally).

Leadership for safety is clear:
• Senior management is clearly committed to safety.
• Commitment to safety is evident at all levels of management.
• There is visible leadership showing the involvement of management in safety-related activities.
• Leadership skills are systematically developed.
• Management ensures that there are sufficient competent individuals.
• Management seeks the active involvement of individuals in improving safety.
• Safety implications are considered in change management processes.
• Management shows a continual effort to strive for openness and good communication throughout the organization.
• Management has the ability to resolve conflicts as necessary.
• Relationships between managers and individuals are built on trust.

Accountability for safety is clear:
• An appropriate relationship with the regulatory body exists that ensures that the accountability for safety remains with the licensee.
• Roles and responsibilities are clearly defined and understood.
• There is a high level of compliance with regulations and procedures.
• Management delegates responsibility with appropriate authority to enable clear accountabilities to be established.
• "Ownership" for safety is evident at all organizational levels and for all individuals.

Safety is integrated into all activities:
• Trust permeates the organization.
• Consideration of all types of safety, including industrial safety and environmental safety, and of security is evident.
• The quality of documentation and procedures is good.
• The quality of processes, from planning to implementation and review, is good.
• Individuals have the necessary knowledge and understanding of the work processes.
• Factors affecting work motivation and job satisfaction are considered.
• Good working conditions exist with regard to time pressures, workload and stress.
• There is cross-functional and interdisciplinary cooperation and teamwork.
• Housekeeping and material conditions reflect commitment to excellence.

Safety is learning driven:
• A questioning attitude prevails at all organizational levels.
• Open reporting of deviations and errors is encouraged.
• Internal and external assessments, including self-assessments, are used.
• Organizational experience and operating experience (both internal and external to the facility) are used.
• Learning is facilitated through the ability to recognize and diagnose deviations, to formulate and implement solutions and to monitor the effects of corrective actions.
• Safety performance indicators are tracked, trended, evaluated and acted upon.
• There is systematic development of individual competences."

These attributes can be used by organizations as a reference when assessing and improving safety culture. After obtaining a better understanding of an organization's safety culture we should be e aware that a culture is seen as something we can influence, rather than something we can control

The underlying theory of Edgar Schein

The IAEA's approach is based on Edgar Schein's iceberg metaphor. According to Schein, any organizational culture should be studied at three levels which go from the very visible (conscious) to the tacit and invisible (unconscious) ones: typical behaviours, stated values and fundamental assumptions (see figure 3). To understand and continuously improve safety culture we have to observe the visible aspects (above surface) and interpret this information to reveal the cultural reasons behind (below surface). By interpreting what people say, the behaviour of leaders and staff, and other visible aspects (e.g. safety performance data, policies, standards of housekeeping and material condition, how incidents are investigated and how findings are addressed) strengths and blind spots within a particular culture can be identified.

Organizations rarely recognize the early signs of deterioration: gradually accepting declining conditions, ignoring risks and/or prioritizing other concerns over safety. The lack of a strong nuclear safety culture was also a significant contributing factor to the cause of the Fukushima nuclear incident at March 2011. While TEPCO had taken several steps over the years to strengthen its safety culture, it missed big issues including cultivating a questioning attitude, practicing safety-first decision making, promoting organizational learning and challenging assumptions. A shared basic assumption that that plants were safe was developed over time by the stakeholders of the Japanese nuclear industry.

Behavior can be altered by basic assumptions like "a severe incident can happen here" or "the technical design is inherent safe". Unfortunately, a group is seldom aware of its deep shared understandings as they are seldom voiced or visible. A strong safety culture can only exist when the shared norms, values and basic assumptions are continuously questioned – 'are we safe?' – 'what do we not pay attention to?'

Figure 3 Edgar Shein's iceberg metaphor
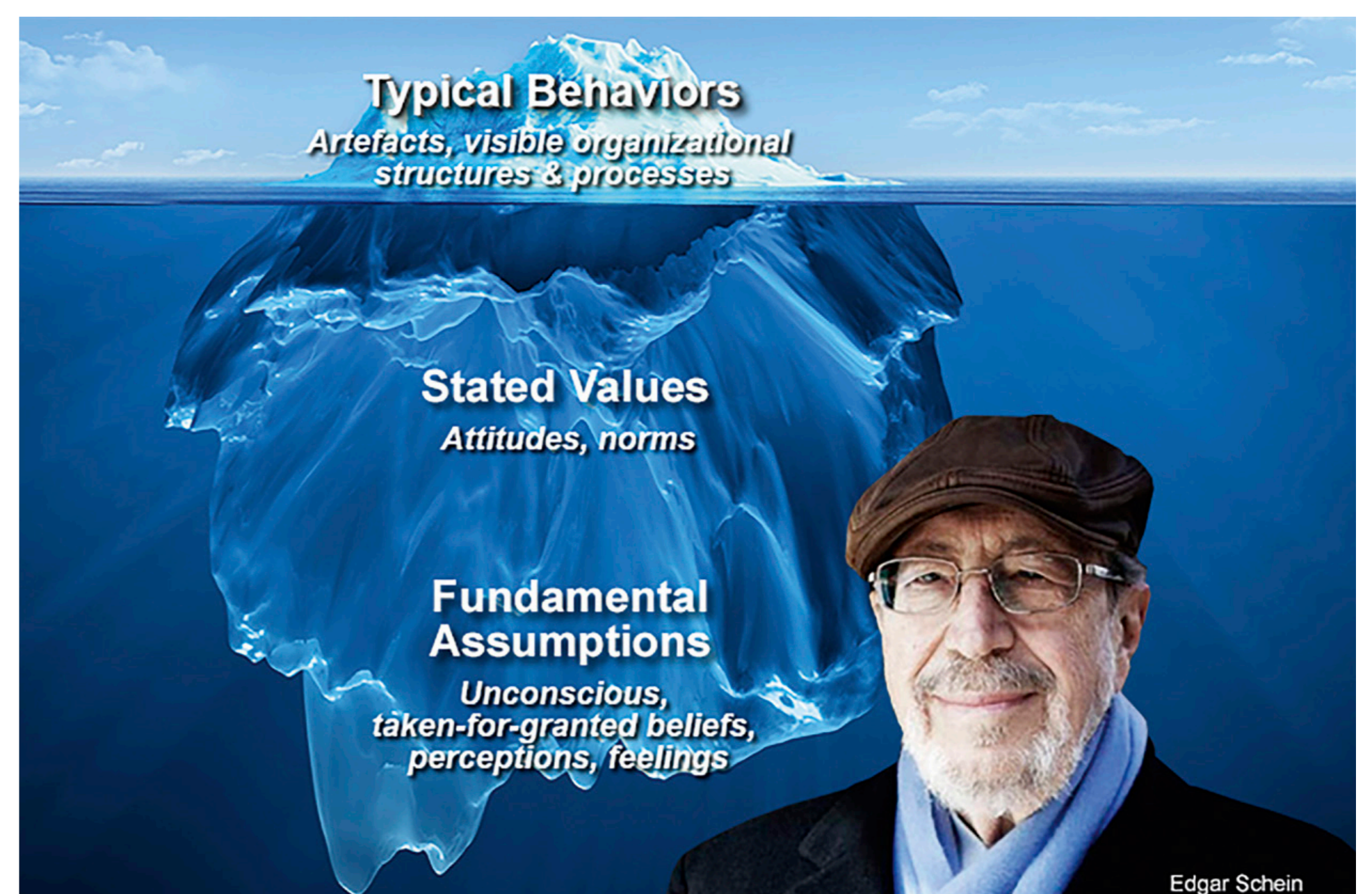
Regulatory oversight of safety culture

Regulatory oversight of safety culture requires a deeper understanding of the underlying organizational and cultural issues behind what is observed and reported. Regulatory oversight of safety culture will not generally lead to clear-cut and easily actionable results, but it will lead to an increased understanding of why different safety related issues appear, and it will provide insight into what may be done to enhance safety.

References

IAEA Safety Standards, Leadership and Management for Safety, No. GSR Part 2
IAEA Safety Standards, The Management System for Nuclear Installations for protecting people and the environment No. GS-G-3.5
IAEA-TECDOC-1707, Regulatory Oversight of Safety Culture in Nuclear Installations
Nuclear Energy Series, Technical Reports Guides No. NG-T-2.7, Managing Human Performance to Improve Nuclear Facility Operation
Safety Reports Series, No.83, Performing Safety Culture Self - assessments