Safety Reports Series
No. 83

Performing Safety Culture Self-assessments

IAEA
International Atomic Energy Agency

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PERFORMING SAFETY CULTURE SELF-ASSESSMENTS

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SAFETY REPORTS SERIES No. 83

PERFORMING SAFETY CULTURE SELF-ASSESSMENTS

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2016

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tel.: +43 1 2600 22417
email: sales.publications@iaea.org
http://www.iaea.org/books

Printed by the IAEA in Austria
June 2016
STI/PUB/1682

IAEA Library Cataloguing in Publication Data

Names: International Atomic Energy Agency.
Title: Performing safety culture self-assessments / International Atomic Energy Agency.
Description: Vienna : International Atomic Energy Agency, 2016. | Series: IAEA safety reports series, ISSN 1020–6450 ; no. 83 | Includes bibliographical references.
Identifiers: IAEAL 16-01043 | ISBN 978–92–0–101515–0 (paperback : alk. paper)
Subjects: LCSH: Nuclear facilities. | Nuclear industry — Safety measures. | Industrial safety — Management. | Safety education, Industrial.
Classification: UDC 621.039:331.482 | STI/PUB/1682

FOREWORD

Safety culture is a well known concept in the nuclear industry. It is recognized as an important factor in achieving high levels of safety performance. The IAEA provides extensive guidance on the attributes of a strong safety culture, the warning signs associated with a weakening safety culture and approaches to strengthening it. This Safety Report adds to that knowledge base in a rather distinct way. It takes an approach that fosters the development of in-house understanding and reflection regarding the organization's culture, rather than relying solely on external or outside evaluations that compare cultural attributes with international norms. Organizations that develop insights into culture and encourage ongoing dialogue on the influence of their unique culture on safety have greater opportunities to proactively improve safety awareness and performance.

Some organizations with a technical focus may find it difficult to form insights on how the attributes of their culture contribute to, or detract from, safety performance. Effective assessments of safety culture require considerable understanding of the science behind sociology, psychology and organizational behaviour. This Safety Report provides guidance on how to gain insights into important aspects of culture as a fundamental enabler for improving safety performance.

The IAEA expresses its gratitude to all those who assisted in the drafting and review of this Safety Report. The IAEA officer responsible for this publication was M. Haage of the Division of Nuclear Installation Safety.

EDITORIAL NOTE

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CONTENTS

1. INTRODUCTION

1.1. BACKGROUND

Safety culture is recognized as an important component of nuclear safety performance [1]. Weaknesses in safety culture have contributed to significant accidents at the Three Mile Island Unit 2 and Chernobyl, and significant events at Davis-Besse, Vandellos II, Paks and Forsmark, among others.

There are many ways to approach safety culture. For the purpose of this Safety Report, the IAEA safety culture normative framework is used as a basis against which to assess the strengths and weaknesses of an organization's safety culture. It describes five safety culture characteristics and their related attributes and can be found in IAEA Safety Standards Series No. GS-G-3.1, Application of the Management System for Facilities and Activities [2].

IAEA Safety Standards Series No. GS-R-3, The Management System for Facilities and Activities [3], identifies the need for safety culture self-assessment (SCSA) as part of a comprehensive approach for enhancing safety culture (see also Refs [2, 4]). Paragraph 6.2 of GS-R-3 [3] states that: "Senior management and management at all other levels in the organization shall carry out self-assessment to evaluate the performance of work and the improvement of the safety culture."

The nature of safety culture is not amenable to conventional assessment approaches. The enhancement of safety culture is a non-linear process, best considered as a dynamic learning journey. The benefits of SCSAs can only be realized when appropriate information gathering and analysis methods are used under the guidance of trained, experienced individuals. Therefore, SCSAs require considerable preparatory development within organizations. The skills required to conduct an effective exploration of culture are non-technical and involve such disciplines as psychology, sociology and organizational behaviour. First time organizers of such assessments are advised to obtain external support until the organization has developed sufficient familiarity with the methodology for assessing culture.

SCSAs involve, among other things, an exploration of the organization's diversity of reasoning, interpersonal power dynamics and management's capacity to influence the organization's culture constructively. In addition, the benefits of SCSAs depend on a high degree of engagement that fosters self-exploration and learning about safety culture and the organization's inherent cultural patterns which impact safety performance.

As with any cultural initiative, the approach taken needs to reflect the nature of the future state the organization wants to cultivate. Hence, a traditional assessment approach based on finding faults and identifying corrective actions

is usually not effective because it tends to result in defensiveness within an organization. A traditional assessment approach will also only capture the minor and shallow part of the culture and not surface the deeper aspects which drive behaviour. Culture is predominantly a self-determined, self-perpetuating phenomenon that is an invisible, yet significant, determinant of organizational performance. Embarking on self-assessment requires conscious effort to think in terms of the human system (the complex, dynamic interaction of individuals and teams within an organization) rather than the technological system. An organization may be technically competent without recognizing the latent risks inherent in the human system.

The very act of performing an assessment raises safety culture awareness within the organization and signals the importance of organizational learning related to safety. Since SCSAs engage all levels of the organization to a greater extent than many other types of assessment, they send a strong signal regarding senior management's commitment to understanding the important contribution of culture to safety performance. The various methods used for SCSA have broad application in many other areas of organizational performance. Building organizational capacity in the areas of facilitation and interviewing skills, the use of focus groups and other strategies that encourage high levels of engagement of all staff provide opportunities for finding creative solutions to enhance performance in other areas besides safety.

Through performing a self-assessment, the organization retains the learning and awareness of cultural expression as it relates to organizational performance, including safety performance. If performed well, a self-assessment involves a reflective look into all levels of the organization. Effective self-assessment fosters commitment to the results and facilitates decisions taken to encourage continuous improvements.

1.2. OBJECTIVE

The objective of this Safety Report is to provide practical guidance, building on good practices worldwide, on how to use SCSAs to enhance organizational learning and safety performance. It draws on experience from behavioural, social, psychological and organizational sciences to emphasize the importance of describing aspects of an organization's culture in an impartial manner before making comparisons with international norms and expectations. Guidance provided here, describing good practices, represents expert opinion but does not constitute recommendations made on the basis of a consensus of Member States.

1.3. SCOPE

This Safety Report is intended for use by senior management, safety culture specialists and employees working to assess and thereby strengthen the safety culture of:

— Nuclear facilities;
— Activities using sources of ionizing radiation;
— Radioactive waste management;
— The transport of radioactive material;
— Radiation protection activities;
— Any other practices or circumstances in which people may be exposed to radiation from naturally occurring or artificial sources.

This Safety Report can also be used for safety culture self-assessments of regulatory bodies which conduct oversight of the above mentioned activities.[1] The Safety Report further applies to technical support organizations and vendors as well as other high reliability organizations.

The publication is applicable throughout the lifetime of facilities. For a facility, this usually includes the following phases: siting, design, construction, commissioning, operation and decommissioning (or close-out or closure).

1.4. STRUCTURE

Section 2 provides background information on the understanding of safety culture. Section 3 explores the purpose of SCSAs and the particular role of self-assessments. Section 4 describes generic process steps for conducting an SCSA. Section 5 describes the use of specific methods: document reviews, questionnaires, interviews, observations and focus groups. Each method is explored in terms of the process, advantages, limitations and risks, and potential uses. Section 6 provides guidance on how to work with the information from each method to perform an integrated analysis. Section 7 describes approaches to communicating the findings and transitioning into action.

Appendices I–IX provide additional guidance on the application of the methods in Section 5, as well as the research and theoretical base for this methodology. A theoretical supplement is provided in the Annex.

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[1] A publication providing a safety culture self-assessment methodology aligned with this Safety Report is being developed for specific use by regulatory bodies.

1.5. TARGET AUDIENCES

The primary audiences for this Safety Report are identified below. In later sections, the term 'participants' is used to denote all interested parties, unless specific clarification is needed.

1.5.1. Owners and corporate organizations

Owners and corporate organizations need to recognize how SCSAs help in establishing a strong safety culture. Owners need to recognize that they retain full responsibility for nuclear safety and that this accountability cannot be delegated.

1.5.2. Operators (licensees)

Operators need to recognize the importance of understanding the culture of their organizations through the performance of SCSAs. This promotes safety culture and monitors potential cultural issues that might compromise safe operations.

1.5.3. Regulatory bodies

Regulatory bodies need to influence, monitor and provide oversight of operators' safety culture. In addition, they need to assess their own safety culture and recognize its influence on other stakeholders.

1.5.4. Technical support organizations

Technical support organizations support both regulatory bodies and operators and are encouraged to have sufficient knowledge of how to perform SCSAs.

1.5.5. Vendors

1.5.5.1. Main vendors

Main vendors, the facility owner and the facility operator need to maintain close collaboration and communication in terms of establishing a strong safety culture. SCSAs are a vehicle to determine whether vendor culture supports safe implementation of vendor programmes.

1.5.5.2. Subcontractors

Subcontractors often participate in SCSAs conducted at nuclear power plants. Subcontractors often have ongoing relationships with nuclear power plant operators. Their influence on safety can be determined through the use of SCSAs.

1.5.5.3. Manufacturers

Manufacturers of components for nuclear facilities can have a significant impact on the safe operation of nuclear facilities. Assurance that their organizational culture supports safety can be determined through the use of SCSAs.

2. SAFETY CULTURE

2.1. UNDERSTANDING CULTURE, ORGANIZATIONAL CULTURE AND SAFETY CULTURE

Various definitions of culture exist. In general, they tend to emphasize two aspects: (i) culture as established patterns of behaviour and human interactions; and (ii) culture as systems of shared meanings. Thus, culture encompasses artefacts, such as physical manifestations (behaviour, words and symbols) as well as invisible aspects, such as norms, values, thoughts, feelings and assumptions about reality. A common way of illustrating this is the image of an iceberg (see Fig. 1). An iceberg has the main part of its mass below the surface, so we cannot see the larger part. Similarly, many elements of culture remain hidden from view.

The greatest risk in trying to understand culture is to oversimplify it. It is tempting to believe that culture is merely 'the way we do things around here' or to reduce it to corporate slogans. Organizational culture is a broad term that encompasses all the different cultural facets of an organization, including safety culture. A well grounded image of an organization's culture needs to take into consideration the various visible manifestations — appearing above the surface — such as behaviour, verbal expressions and physical objects. However, any statement about the character of the culture also needs to reach below the surface. The accumulation and thematizing of (visible) attributes of the culture are the initial steps in a cultural analysis, but are not in themselves sufficient. The iceberg model means that the visible aspects may also be explained, for example, in terms of formal and informal control systems, and leadership. Thus, organizations do

not have cultures — organizations are cultures. Culture is a matter of seeing things from different perspectives or looking at alternative ways of explaining why things happen.

It is important to recognize that the elements below the surface in Fig. 1 are those that create and sustain all the visible manifestations in the organization. Often, management takes the position that if the visible attributes (e.g. policy, procedures or processes) are changed, the culture will follow. This is rarely successful if the underlying values and basic assumptions remain unchanged.

Continuing the iceberg model, two observations can be made. One is that the deeper we get into the culture, the more difficult and slower the change process becomes. Deeper levels of culture are often unconscious. The consequence is that we are not completely aware of how our culture influences our behaviour. Culturally held values in an organization often rest upon national and ethnic values, which in turn rest upon fundamental values, such as religious faith or other inherent beliefs and assumptions about reality.

In an organization, some of these deeper aspects, for example deference to authority, may not support safety conscious behaviour, such as a questioning attitude or a willingness to raise concerns. People generally do not want to be perceived as being different or difficult. Power dynamics may also inhibit the diversity of views required to make good safety decisions. Although teams usually make better decisions than individuals, this is only true if the team

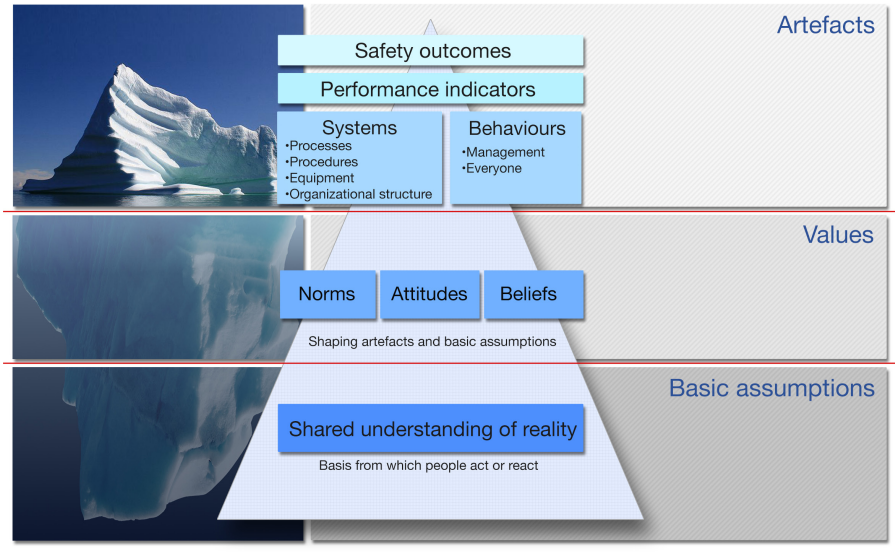

FIG. 1. The iceberg model of safety culture.

avoids the dangers of power dynamics and groupthink by soliciting and carefully considering diverse views.

Culture cannot be changed rapidly. It can only be made to grow in certain directions, and this requires systematic, long term work, and consistency and perseverance. It is often more constructive to focus on what can be done to facilitate positive safety performance within an existing culture than to try to change deeply rooted values and beliefs, and to work with the culture to achieve the intended changes.

The second important observation is that culture is seldom homogeneous. Subcultures exist in any group of significant size. Although culture is always something that is shared — it is not an individual characteristic — it is important to take into account that a member of an organization may also be a member of several groups. This means that it is extremely difficult to form an all encompassing image of an organization's culture, and any attempt will uncover many ambiguities and paradoxes. Therefore, cultural analysis needs to be open to the existence of various subcultures and to be ready to examine the relationship between them, as these may have positive as well as negative implications for the organization.

The concept of safety culture is a way of exploring how an organization relates to safety issues through a cultural lens. Any assessment of safety culture therefore requires the assessors to first gain an insight into the overall organizational culture at local and corporate levels.

Safety culture can be defined 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" [2]. This definition originates from a report by the International Nuclear Safety Group (INSAG) published in 1991 [5] and was developed following the Chernobyl accident. Although not as encompassing as 'culture' in general, 'safety culture' is still a broad concept that takes human and organizational aspects into consideration and operates at various 'levels'.

Strengths and blind spots within a particular culture can be identified 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). SCSAs differs from other types of self-assessment in that it requires a deeper understanding of the underlying organizational and cultural issues behind what is observed and reported. An SCSA 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.

This distinguishes between a descriptive and normative view of culture (see Fig. 2). A descriptive view of culture involves an attempt to describe as impartially as possible what the culture is actually like and how it operates. A normative view of culture describes what the culture should be like in comparison with an independent standard or expectation. It is important to distinguish the 'is' from the 'should be' in the assessment of culture. If the image of how the culture 'is' becomes clouded by what the assessor thinks it 'should be', the possibility of a well founded analysis of the relation between 'is' and 'should be' becomes less likely. Observational neutrality is a recognized challenge even for the experienced assessor, since all observers are influenced by their own pre-understanding.

Gaining an understanding of underlying safety culture issues requires extensive involvement and participation from all levels of the organization. The assessment process focuses heavily on the perceptions, views and behaviour of people at all levels. This is in contrast to audit type assessments, where the focus tends to be on technical facts rather than perceptions and behaviour.

Management commitment and involvement are essential components of the SCSA process. This includes:

(a) Active personal involvement in the planning, conduct and follow-up activities;
(b) Paying close attention to their own behaviour and approach to communicating in order to encourage employee involvement and to open the sharing of views during the assessment process;
(c) Developing insight into what the results of an SCSA mean — that is, it is a way of understanding and communicating the influence of the organization's culture on safety rather than a complete and definitive statement on what the organizational culture actually is.

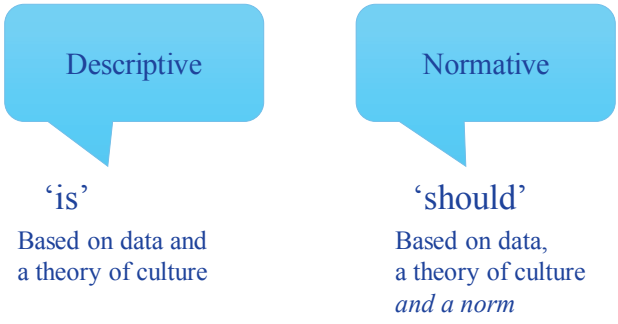

FIG. 2. 'Is' versus 'Should': The difference between descriptive and normative.

This Safety Report focuses on culture in relation to its influence on nuclear safety awareness, decisions and actions, although the concepts also apply to industrial safety.

2.2. IAEA APPROACH TO SAFETY CULTURE

In this Safety Report, the normative framework for safety culture is based on the five IAEA safety culture characteristics in IAEA Safety Standards Series No. GS-G-3.5, The Management System for Nuclear Installations [4] (see Fig. 3).

The five characteristics are broken down into attributes that describe important cultural aspects and provide a framework for what needs to be in place for a strong safety culture. These attributes are detailed in appendix I of GS-G-3.5 [4].

A simplified model of safety culture provides a useful structure for understanding and working with safety culture. Figure 4 presents an evolution of simple models [6, 7] that divide safety culture into four key interrelated elements.

Every organization has its own set of elements as indicated by the multilayered stack. Each safety culture characteristic of Fig. 4 can be considered in terms of these four elements when assessing whether all elements are in place to support effective implementation of the characteristic.

FIG. 3. Characteristics of a strong safety culture.

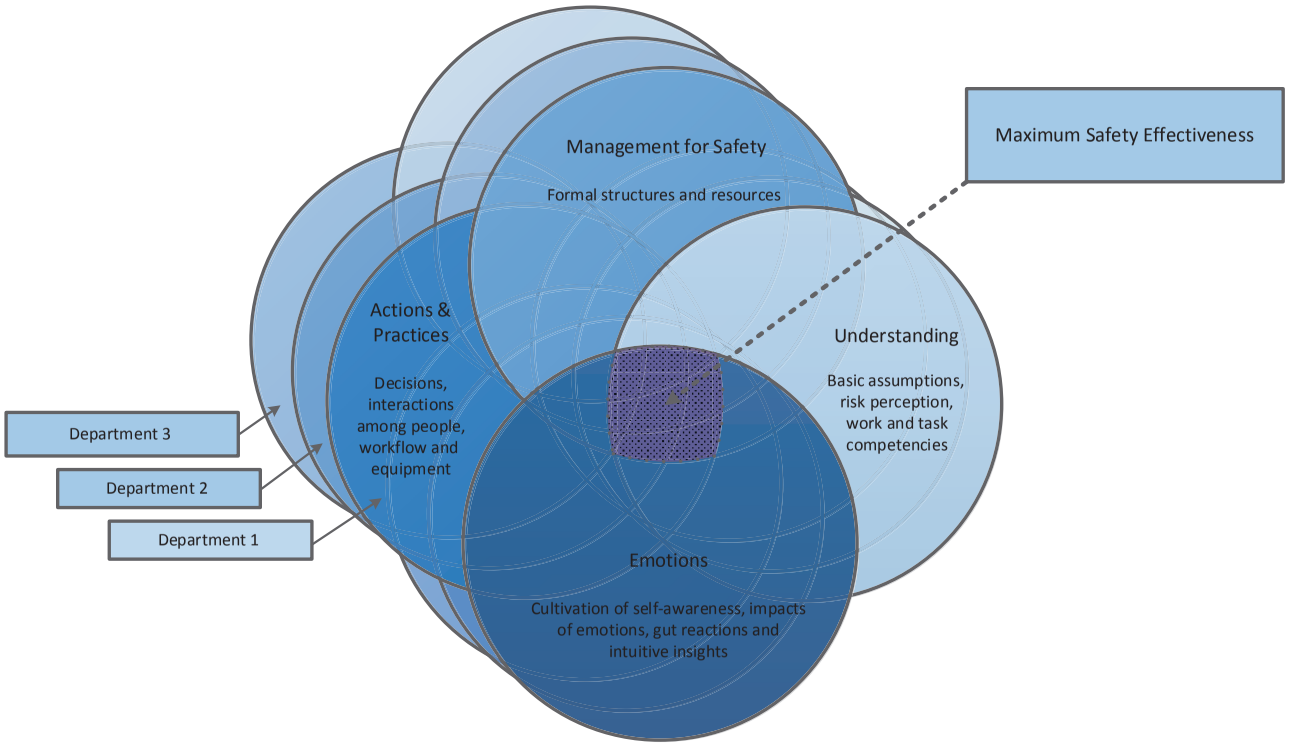

FIG. 4. A four element model for working with safety culture.

The elements of the simplified model are:

(a) Management for safety: This includes the management system, which is the formal normative framework, for achieving the desired practices and outcomes, such as policy and strategy, regulatory framework, processes, procedures, risk management, organizational structure, and management programmes and plans.
(b) Actions and practices: This includes actual practices and actions, such as decisions, leader and worker behaviour, learning focus, adherence to procedures, interactions between people, workflow and interactions between organizations and other stakeholders.
(c) Understanding: This includes cultural aspects such as individual and organizational sense making and interpretation of reality which influence basic assumptions, risk perceptions, comprehension of the work or task, perceived centres of control, perceptions of cause and effect, and comprehension that nuclear is 'different' from other risk significant industries, such as aviation or oil and gas, because of the nature of potential long term consequences of serious accidents. Understanding encompasses beliefs and values.
(d) Emotions: This includes inner sensing processes that reach beyond pure intellectual understanding to help individuals to know when they, others or situations are potentially at risk. At a physical level, this relates to managing personal well-being and using the body as a signalling system. At the intuitive level, it involves seeing patterns in unrelated data and serves as an early warning sign, such as weak signals (gut feelings and intuition) indicating that something is not right. Finally, the emotional level brings a dimension into safety which complements the intellectual capabilities to the organization's capability to work proactively.

The overlapping area between the elements represents the interfaces. The central square indicates overlap of all four elements, or the area of most impactful safety performance. If any element drifts away from the others, the central area decreases and the related interface areas get smaller, generating greater risk. For example, if 'understanding' shifts away from the other two elements, the interface between 'management for safety' and 'actions and practices' remains the same. However, the diminished alignment with 'understanding' introduces risk.

The layers of the model consider the 'stack' of departments within an organization, each of which may have its own subculture. The central square of the stack, if aligned through all departments, is similar to a spinal column in anatomy. Any department that shifts from the stack acts as a 'slipped disk' that pinches a nerve and may constrain the entire system. This is not to suggest that

every department will have identical subcultures, since this is contrary to human nature, and too much homogeneity would be unfavourable to organizational learning. Each department simply needs to understand its role in contributing to the safety and effectiveness of the overall system so that it can interact appropriately with the other participants.

2.3. SHARED SPACE: IMPROVING SAFETY CULTURE THROUGH HEALTHY SOCIAL INTERACTIONS

The impact of an organization's culture on its safety performance comes down to the nature of interactions between individuals, departments and hierarchies, as well as relations with external organizations. The quality of these interactions determines how people collectively engage, share information and integrate efforts to consistently make safety the top priority. The IAEA is introducing the concept of shared space as means for enhancing the quality of interaction to support mindfulness, engagement and well-being (see Fig. 5).

Some improvements in nuclear organizations have to be prescriptive because they relate to higher standards or new processes that have to be implemented rapidly and are non-optional. However, it always needs to be recognized that the sustainability and efficiency of improvements increases in proportion to the time and attention given to sharing ideas, engaging people in solutions, and creating a more open and constructive environment, with higher levels of trust and teamwork among all participants. A high level of trust and respect between individuals, both horizontally and vertically in an organization, facilitates change. The trust and respect built through this sharing of space is therefore a critical part of any work concerning safety culture improvement.

Trust is a characteristic that emerges through human interactions, hence promoting healthy and frequent interactions is important in making change. In this regard, the concept of shared space is critical to effective human interaction. Shared space involves the creation of working relationships that help to build shared meaning through an open, free flowing sharing of thoughts and ideas. Shared space goes deeper than sharing facts and exchanging information in a professional, respectful manner. It enables individuals to express views related to their inner thoughts and feelings about a particular issue without fear of recrimination or exclusion. In the absence of shared space, there is a risk that individuals will only contribute the minimum necessary to 'stay out of trouble'.

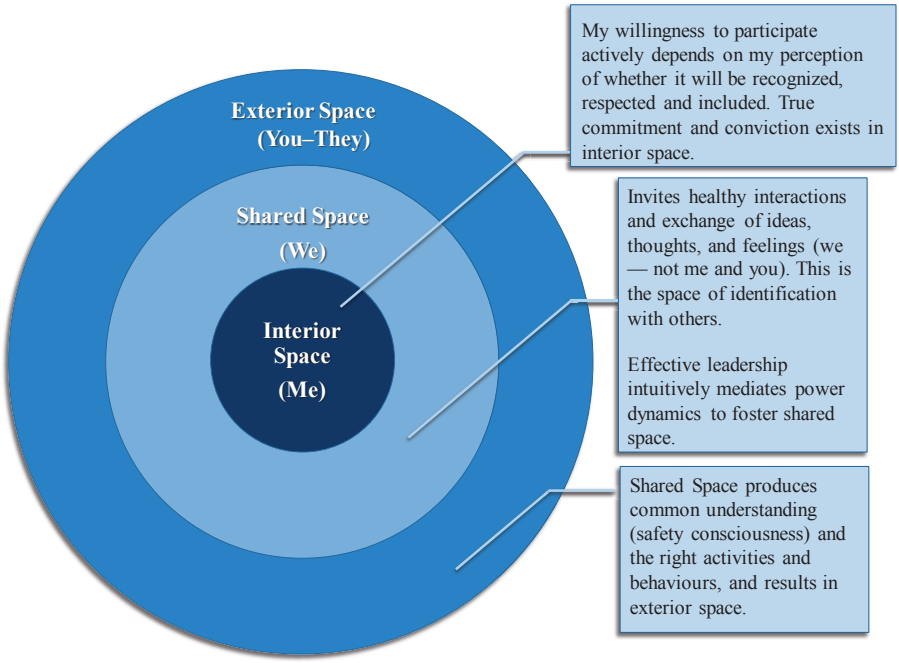

FIG. 5. Motivational elements related to the creation of shared space.

2.3.1. Hallmarks of a well functioning shared space

When employees are fully engaged, meaning that they are emotionally and mentally present and committed to the work environment and engagement with others, then several norms important to safety are more likely to be present.

2.3.1.1. Inquiring attitude

The organization has a mindset as well as specific practices that raise questions rather than accept whatever is happening or is likely to happen. Typical questions include:

— How might we do this better?
— What are our assumptions?
— Are they the best assumptions for us to use?
— Are there more powerful questions we could be asking?
— How might we or our equipment be at risk?
— Is there something we could learn from this situation?

Leaders are actively pursuing questions such as:

— What elements of culture can we influence to cultivate safety mindedness?
— What would make our safety culture more powerful?
— What would make employees feel like champions in the quest for improved safety?
— How can safety information compete with other, more interesting means of gaining information, such as social media which have entrained people into wanting information flows aimed at personal interests?
— What new practices would cultivate curiosity and minimize double standards, scepticism and complacency?

2.3.1.2. Teamwork

People in the organization fulfil their responsibilities in cooperation and coordination with other team members. This reflects an understanding that no one can see everything, no one is immune from making mistakes and no one is 100% vigilant. Individuals actively seek to support each other's efforts, leaders share information and encourage engagement across groups, and all employees willingly prioritize and align efforts to prevent individual efforts from creating confusion or misalignment that can undermine safe operations.

2.3.1.3. Trust

People know they are trusted and demonstrate trustworthiness. People keep promises and those who do not are cautioned. Managers clarify what they are counting on people for and ask for clear commitment. Employees are confident in the direction and commitment of management. Individuals are encouraged to ask for help when they need it and never pretend or conceal when they are unsure or may need help.

2.3.1.4. Open environment

People feel safe to ask questions and to provide critical feedback. Leaders declare the areas in which they are learning, and publicly track their progress. People may ask questions of anyone, and those who do are rewarded with acknowledgement. Mistakes are met with the question 'What might we learn from this?', thereby ensuring that the same mistake does not happen again.

3. SAFETY CULTURE AND SELF-ASSESSMENT

3.1. PURPOSE AND BENEFITS OF SAFETY CULTURE ASSESSMENTS

Safe operation requires effective leadership, a strong safety culture and effective management system processes. SCSAs provide insight into organizational behaviour and relationship dynamics that influence safety decisions and performance. Assessments enhance organizational learning through five dimensions:

(1) Concepts — to gain and share understanding of safety culture concepts and principles in practice;
(2) Behaviour — to learn about behaviour that contributes to, or detracts from, safety;
(3) Basic assumptions — to gain and share understanding how basic assumptions influence behaviours and safety performance;
(4) Programme implementation — to provide information on the current state of the safety culture programme and level of maturity;
(5) Impact — to identify the impact of safety culture on organizational performance.

A successful SCSA is able to improve safety performance by providing a clear picture of how the organization's safety culture influences safety. This involves an evaluation of the strengths and weaknesses of the safety culture by comparing what the culture is to what it should be. This, in turn, allows prioritization of areas for improvement and the implementation of changes, for example, to processes, training and behaviour, as part of continuous improvement efforts. In short, safety culture assessment is a way of working proactively to improve safety performance and to increase safety margins.

SCSAs are not a straightforward assessment of safety performance indicators against targets nor an assessment of the effectiveness of human performance programmes. Nor are they quantitative in a way that permits construction of a performance index. Furthermore, a traditional audit or assessment mindset may inhibit the gathering of information from participants and increase defensiveness. Safety culture assessments have distinct attributes compared with typical assessments or audits:

(a) Specialized training is needed to observe and interpret cultural influences, since linear, cause–effect approaches do not apply. SCSAs involve theoretical frameworks and multilevel, multivariate analyses that are

unfamiliar to most nuclear power plant staff. Inquiry is exploratory and requires applied insight into human and organizational behaviour.

(b) The approach involves a learning journey rather than a checklist against expectations.

(c) Success requires that the process be experienced by the organization as a constructive one that translates into personal and team learning. This builds receptivity to the process over time. SCSAs are part of a larger systemic learning–development–improvement cycle, rather than inputs to a corrective action process.

(d) A significant purpose of safety culture assessments is to capture information that helps to foster dialogue, reflection and insight within the organization regarding its behaviour.

(e) Safety culture assessments explore the dynamics of the informal and formal organization as well as thought systems, sense making, and personal perceptual biases or action logics that reflect common patterns of comprehension and response in the organization.

(f) Safety culture assessments help to reveal the complex interplay of multicultural dimensions of the organization. They seek to capture issues that manifest in daily activities in an almost unconscious fashion, and where understanding of the impact needs to be fed back into the whole fabric of the organization.

(g) Safety culture assessments provide clarity on the organizational effectiveness and its contribution to safety.

(h) Safety culture assessments give organizations an opportunity to be proactive about reducing latent systemic risks.

Investigations into events in nuclear and other industries consistently highlight organizational and cultural root causes. Common themes have been identified as [8]:

— An insufficient understanding of ‘operational reality’ by leaders (‘good news’ culture and a failure to encourage constructive challenge);
— Inadequate oversight and supervision, including contractors;
— Insufficient understanding of nuclear and process safety issues in decision making and actions;
— Normalization (acceptance) of abnormal conditions or deviations;
— A failure to learn from previous events.

These and other culturally related issues are not easy to describe or address, and require long term, persistent work to produce effects. Culture is often an unplanned product of long term growth processes. It is impossible to control such

processes totally, but through the careful application of SCSAs, it is possible to comprehend and influence culture. SCSAs play a key role in developing and maintaining an awareness of strengths and opportunities for improvement, as well as how and why the organization, or parts of the organization, acts in a certain manner.

In addition to periodic, in-depth SCSAs, it is important to carry out ongoing monitoring of safety culture as part of plant oversight processes. Other types of assessment method, such as peer and independent assessments, also need to be used to obtain different perspectives.

While the results of safety culture assessments are valuable in themselves, it is equally important to effectively communicate the findings to the organization. An important purpose of such communication is to promote self-understanding in the organization regarding cultural patterns, and thereby create an opportunity to continuously identify as well as to positively shape these patterns.

3.2. SPECIAL CONSIDERATIONS FOR SAFETY CULTURE SELF-ASSESSMENTS

Independent assessments of culture are relatively common. A number of consulting or specialist organizations provide expertise in performing assessments and analysing the results. The IAEA, for example, performs safety culture assessments as an integral part of its Operational Safety Review Team missions. Many commercial organizations also provide safety culture assessments.

The use of external support is often driven by the fact that the requesting organization does not have in-house expertise in behavioural and social sciences to design an appropriate assessment or interpret the findings. SCSAs provide a unique learning opportunity for an organization to develop such expertise, to examine and understand its own culture and to support ongoing monitoring and continuously improvement in a way that periodic external assessments cannot. Self-assessment team members have in-depth knowledge of the organization, its people, its processes and its key influencers. They belong to the organization and therefore tend to take more accountability for improvement.

However, SCSAs require special consideration of biases naturally present in any culture that examines itself. Organizations are likely to require external support for the initial application of this Safety Report. In accordance with the IAEA safety standards, training for both the senior management and the team performing the self-assessment is required in advance of the first SCSA. In addition, external support for conducting the self-assessment is to be considered. Nevertheless, the benefits of developing in-house experience in self-assessing the organization's safety culture are significant for the continuous improvements.

The development of skills related to interview techniques, performing observations and document reviews, facilitating focus groups, and analysing and communicating cultural information have broad and continuing application within the organization. The development of in-house skills helps employees to recognize and understand cultural dimensions and their influence on what happens in the organization.

This Safety Report contains detailed information on various methods applicable to SCSAs. When applying these methods, users are advised to utilize a graded approach based on the organization's specific circumstances and needs. However, several assessment methods are needed, according to the IAEA safety standards.

3.3. POTENTIAL PITFALLS WHEN PERFORMING SAFETY CULTURE ASSESSMENTS

It is important to consider potential pitfalls and risks that need to be managed when embarking on an SCSA:

(a) Prior to the assessment:
   (i) Management may be unclear about what will be achieved from the assessment or the importance of doing something about the results.
   (ii) Management may underestimate the amount of work and does not allocate sufficient resources.
   (iii) The assessment may be performed without taking any actions based on the results.
   (iv) The timing may be inappropriate in cases where the employees are stressed or feel overassessed.
   (v) The assessment approach may be poorly constructed or based on an instrument focused approach rather than engagement.
   (vi) Management may fail to select individuals with sufficient credibility, training or competencies to carry out the process.
   (vii) Management may commission the assessment but then disengage by delegating the complete work to the human performance or safety culture group, failing to follow up on the process. This is problematic as management commitment and support is key to a successful SCSA.

(b) During the assessment:
   (i) The assessment may apply a rigid, simplistic analysis based on an audit mindset rather than an exploratory approach.
   (ii) There may be overreliance on one particular instrument or excessive weight assigned to one finding or topic.

(iii) Violation of confidentiality and anonymity commitments may inhibit staff involvement.
(iv) The team may assign too many findings for the organization to deal with effectively.

(c) Dealing with the results of the assessment:
(i) The organization may be unable to formulate effective solutions to cultural issues, resulting in ineffective action.
(ii) Results may be inappropriately used to assign blame.
(iii) The results may be rationalized or responded to defensively, especially if there are surprises.
(iv) Management may fail to share the information or accept ownership of the personal implications of the results.
(v) There may be a desire to use the results as a report card for comparison with others rather than comprehending that the results are self-referential by nature — asking 'How are we relative to someone else?' as opposed to 'Are we who we want to be?'; the focus needs to be on the organization itself, as each organization is a unique culture which cannot be compared directly to another culture.
(vi) Management may rely on traditional approaches when translating outcomes into actions (i.e. more training, more expectations, and procedure enhancements) rather than encouraging ownership, leadership development and demonstrating commitment to understanding and improving.

Despite these issues, SCSAs provide broader, more useful information than limited approaches focused on human performance and behaviour. They help management to understand organizational tendencies that give rise both to organizational strengths and latent weaknesses. Depending on how effective the level of engagement throughout the assessment is, the assessment can expose potential risks and heighten both awareness and vigilance.

4. SAFETY CULTURE SELF-ASSESSMENT PROCESS

4.1. ORGANIZATIONAL READINESS

In undertaking an SCSA, there are several considerations related to the organization's level of readiness for performing an assessment. Importantly, the absence of these factors does not preclude doing a self-assessment, as the

outcome of a self-assessment may be pointing to the need to address these factors. Nevertheless, they are important to consider from the perspective of assessment scope and depth, and the change capacity of the organization post-assessment. Failure to consider these aspects may result in difficulty conducting the assessment or achieving acceptance of the results. Some of the readiness factors to consider include:

— Has the organization specified its direction in terms of vision, mission and values, desired performance outcomes, and organizational excellence plans related to the technical, human, organizational and process aspects of its function?
— Is a management system infrastructure in place and has the organization identified a continual improvement logic with ties to management system processes?
— Are there basic elements of a safety culture programme or is one in the process of being created?

Additional elements of organizational readiness include:

— Familiarity and experience with SCSAs and methods, either internally or externally;
— An appropriate representation of languages and multicultural aspects;
— A consideration of organizational dynamics related to temporary workers and contractors;
— A degree of understanding of organizational learning styles and preferences on learning styles such as training, reflections, workshops and coaching.

4.2. APPLICATION OF SHARED SPACE IN SAFETY CULTURE ASSESSMENTS

A well functioning shared space, as described in Section 2.3, is critical to the success of any safety culture assessment to build trust and an open climate to ensure all team members contribute. The shared space will leverage the infusion of diversity of thinking and experiences throughout the analysis process.

Firstly, the functionality of the safety culture assessment team should be ensured internally, as the ability of the team members to cultivate their own shared space is critical to the assessment. For this, the assessment team lead plays an important role in facilitating an open, trust filled environment within the team.

Secondly, shared space between the team lead and the management team is also a critical factor: during an SCSA, topics and issues may surface that can

affect the organization directly. To be able to treat such issues constructively, a well functioning shared space is of key importance.

Thirdly, shared space is the main tool to be applied when communicating with the organization throughout the SCSA. Whether it concerns preparing the organization through seminars and workshops, conducting the assessment through applying the data gathering methods, or communicating the findings, the organization will benefit from the qualities of a well functioning shared space.

4.3. PROCESS FLOW AND STEPS

The self-assessment process follows the general steps given in Fig. 6. The following summarizes each of the steps. Details are provided in subsequent sections of this Safety Report and more practical guidance is to be found in Appendices I–IX.

4.3.1. Step 1: Prepare the organization

For a safety culture assessment to be effective, senior management needs to be significantly engaged throughout the process rather than delegate responsibility. Senior management is advised to form a partnership with the organization's self-assessment team to bring visible commitment to the initiative. A workshop or seminar with senior management is an effective way to ensure alignment and:

— To confirm the scope of the assessment (e.g. corporate organization, headquarters, vendors, contractors, technical support organizations, timeframe and potential interferences), resources and organizational effort, and desired impact;
— To identify a self-assessment team including champions and participants from different levels and functions, and to choose team members according to the competencies needed to make the team successful (e.g. interpersonal and communication skills, and pattern recognition);
— To commit sufficient time and resources to allow the self-assessment team to conduct the assessment, and to allocate sufficient management time to participate in the initiative;
— To engage organized labour (unions) during this and subsequent steps of the process to ensure they are fully aware of the purpose and approach;

FIG. 6. Safety culture self-assessment process.

— To develop a strategy to address the results of the assessment, including responding to, and working with, areas in need of improvement;
— To prepare a communication strategy to inform personnel of the upcoming assessment and intent, and to emphasize the importance of active participation. It is important to position the safety culture assessment as a learning opportunity to identify what is working well, and what could be done differently to enhance safety performance.

4.3.2. Step 2: Prepare the self-assessment team

The self-assessment team orientation and training should be based on needs. It is important to train team members to ensure they are proficient in the assessment methodology and its methods to capture data as well as the approach of the analyses. This requires suitable behavioural, social sciences and organizational psychology resources to support the assessment process, either internally, through contracts or through support from organizations such as the IAEA. For the first several assessments, including independent assessors can reduce bias. Activities in this step include:

— Training the team members;
— Clarifying roles and responsibilities (see Sections 4.4 and 4.5) and team protocols;
— Identifying the assessment strategy and methods;
— Preparing the methods to be used, ensuring that the methods are applied as independently as practicable;
— Conducting a bridging seminar between senior management and the assessment team to clarify expectations of the respective teams and ensure alignment.

4.3.3. Step 3: Prepare the self-assessment plan

The assessment plan should cover activities from the pre-launch to the communication and follow-up of the results. The logistics of implementation and any concurrent plant activities to minimize organizational impact are to be considered.

According to the IAEA safety standards, several methods are needed for the assessment in order to capture an accurate and comprehensive image of the culture. Nevertheless, after having performed several assessments periodically, the methods used could be altered, not using all methods for each assessment (see also Section 4.1, regarding capacity and scope of self-assessment). When selecting methods, consideration should be given to the fact that some methods are more interactive and provide richer data and impressions. Methods include:

— Non-interactive methods: Document reviews, questionnaire and observations;
— Interactive methods: Focus groups and interviews.

Planning to apply the methods in parallel and independently to provide multiple sources of information around the same topics of interest minimizes the risk of biasing the assessment approach. Additional activities include:

— Testing the assessment infrastructure (e.g. questionnaire administration methods);
— Planning the communication and change approach;
— Conducting a pre-job brief for the assessment team before launching the assessment.

4.3.4. Step 4: Conduct the pre-launch

The activities in step 4 are:

— To orient the organization to the purpose of the assessment and the detailed execution plan through a variety of communication channels;
— To use senior managers to assist in promoting the assessment;
— To stress that the assessment is not an audit but a method of engaging the organization to learn about its existing attitudes and behaviour and their influence on safety.

4.3.5. Step 5: Conduct the self-assessment

The activities in step 5 are:

— To capture information as facts provided by the organization without interpretation or judgement;
— To maintain records throughout the process to assist in the interpretation phase;
— To not select topics or data based on personal biases;
— To ensure organizational access to information regarding the progress of the assessment;
— To respond to any questions.

In cases where observations indicate the need for prompt intervention because of a potential to create unsafe conditions, the issue is to be brought to the immediate attention of the parties involved, including the management and the assessment team lead.

4.3.6. Step 6: Analyse the results

Analysis is a two step process: a descriptive analysis followed by a normative analysis. The first step involves analysing the results from the individual methods and:

— Interpreting the results for each method independently;
— Looking for relationships and patterns as well as elements that do not appear to be consistent;
— Analysing the combined results to identify overarching themes after analysing the results for each method;
— Looking for relationships, patterns and elements that do not align across the methods;
— Determining whether more information is to be gathered.

The second step involves comparing the cultural findings in relation to a normative framework for safety culture (e.g. IAEA safety culture characteristics and attributes). This second step results in identifying the safety culture strengths and areas in need of improvement.

4.3.7. Step 7: Summarize the findings

The activities in step 7 are:

— To organize the information in a way that best suits the communication and learning style of the organization;
— To develop key messages to help the organization to influence behaviour that needs to be reinforced, changed, added or extinguished;
— To develop communication packages that suit the various target audiences.

Typically, the results are summarized in a report prepared by the team lead with input from all team members.

4.3.8. Step 8: Communicate the findings

The activities in step 8 are:

— To communicate the findings formally to management, encouraging open dialogue regarding the potential impact of the results;

— To communicate with the rest of the organization through various channels, such as dialogue forums with groups, posting the results on a commonly utilized and accepted platform such as the intranet.

In addition, communication methods that encourage interaction and dialogues are preferable to one way reporting because they support reflection and shared understanding of revealed cultural dimensions. This is of key importance for organizational learning.

4.3.9. Step 9: Develop and implement actions

Depending on the approach preferred by management, the communication activities in step 8 may include preliminary actions developed as a consequence of the assessment (e.g. actions that clearly fall under management accountability). However, it is preferable to communicate the findings and then to engage the organization in developing and finalizing the full action plan. Engagement will help the organization to buy into and make the required changes that have been identified.

4.3.10. Capture lessons learned

Lessons learned and improvements to the self-assessment process can be captured at any time during and after the process. Following the self-assessment, the activities are:

— To convene the team and selected parties, including management representatives, to review the lessons learned, successes and opportunities for improvement related to the assessment;
— To summarize the information for future assessment teams;
— To revise any of the support documentation or methods, where appropriate;
— To identify and record any additional lessons learned after the follow-up of the action plan is conducted.

4.3.11. Conduct a follow-up

Conduct a follow-up within 6–18 months of the assessment to confirm the progress and effectiveness of the activities in the action plan.

4.4. TEAM COMPOSITION AND COMPETENCIES

It is important to select a team with diverse thinking styles, ranging from critical and analytical to theoretical and strategical. An appropriate balance will ensure both divergent and convergent thinking. Additional attributes to consider are:

— The ability to maintain impartiality and minimize bias (i.e. the absence of specific issues that a team member feels compelled to pursue);
— Community consciousness (i.e. awareness of the influences that impact on an organization's collective behaviour);
— High ethical standards, including the ability to maintain confidentiality and the trust of their peers.

A self-assessment team needs to have a broad range of competencies and experience. Composition is to reflect a balance of functional areas, knowledge and experience with SCSAs, and understanding of the organization and technology. For the organization wide assessment, the team size would typically be in the range of 8–12 people, depending on the size and scope of the organization (more for large organizations or organizations with special considerations such as large numbers of long term contractors or major projects). The team size is to ensure sufficient resources to conduct the assessment within a reasonable time. The team is to represent all organizational levels and functions, and include at least one specialist in safety culture. In addition, administrative support needs to be assigned to the team for the duration of the assessment. The following backgrounds and core competencies are to be considered:

— Social and behavioural sciences (e.g. organizational psychology, social-psychology, sociology, ergonomics, anthropology, human factor specialists and human performance specialists);
— Maintenance;
— Operations;
— Technical support functions (planning, engineering, chemistry, nuclear safety, radiation protection and operating experience feedback);
— Administrative support functions (e.g. human resources, finance and security);
— Long term contractors;
— Senior management.

Self-assessment team members need to be trained to ensure they have sufficient working knowledge of:

— Safety culture;
— The IAEA normative framework of strong safety culture including its characteristics and attributes;
— Team roles, responsibilities and protocols;
— Shared space;
— Communication protocols;
— Group facilitation techniques;
— Assessment methods and techniques to be used for data collection;
— Descriptive and normative approaches to capturing and working with cultural information;
— Recording methods to capture sufficient detail for the analysis phase;
— Analysis methods.

4.5. ROLES AND RESPONSIBILITIES

4.5.1. Management

Members of the organization's management team are responsible for:

— Creating a good shared space between the management group and the assessment team;
— Supporting and actively participating in self-assessment activities during the planning, conduct and follow-up of the assessment, including the provision of commitment, resources, time and encouragement;
— Communicating the purpose, results and follow-up actions;
— Acting on the results of the self-assessment in a timely manner;
— Role modelling the values and behaviour consistent with a strong safety culture.

In addition, senior management is advised to appoint one of their members as a champion:

— To act as the management team focal point for the self-assessment;
— To provide regular updates on the self-assessment to the management team;
— To support and mentor the self-assessment team lead and members throughout the self-assessment.

4.5.2. Team lead

The team lead needs to possess a good understanding of safety culture and its assessment. The team lead also needs to have experience leading teams, possess strong communication and facilitation skills, and to be a role model for safety culture. An assistant team lead is to be assigned to support and act on behalf of the team lead throughout the self-assessment.

With support from the management team, team lead responsibilities are:

— To plan the self-assessment, including preparation of schedule, logistics and communication materials for the management team and employees;
— To identify and arrange training and coaching for self-assessment team members;
— To create a well functioning shared space within the team to develop and sustain good team collaboration;
— To lead the self-assessment, including coordinating the activities of the team;
— To arrange and chair team meetings during the self-assessment;
— To conduct meetings with the management team on a continual basis to provide information and feedback on the self-assessment such as progress, challenges and results;
— To lead the analysis of data obtained;
— To prepare the self-assessment report;
— To provide advice and support to the management team on communicating the findings to the whole organization;
— To provide periodic updates during the self-assessment to management and other stakeholders (e.g. employees and unions).

4.5.3. Team members

Self-assessment team member responsibilities are:

— To maintain a well functioning shared space throughout the process;
— To assist the team lead with planning the assessment;
— To prepare for the self-assessment by participating in training sessions;
— To conduct document reviews, interviews, observations, focus groups, reviews of questionnaire data and other assigned tasks;
— To take a lead role for specific areas or activities assigned by the team lead;
— To participate in the analysis and reporting of findings;
— To provide input to, and review of, the self-assessment report;

— To ensure confidentiality of information received during the self-assessment process.

5. METHODS

5.1. APPLICATION OF METHODS

This section addresses the application of methods that are useful for the conduct of SCSAs. In Appendices III–VII, more guidance is provided on how to use the safety culture assessment methods. The methods discussed are document reviews, questionnaires, observations, focus groups and interviews. These methods are recognized and used by researchers, safety culture experts and organizations working with safety culture assessments [1, 9–12]. See the Annex for a theoretical framework.

It is essential to use multiple methods. Each method provides different information and engages the organization in a different way. Assessors are to be assigned based on their suitability and interest in applying a particular method. It is advisable that each assessor tries all types of method. In each case, the method is to be set up and administered in a manner that provides a positive experience, engages participants and fosters learning.

During the application of methods, it is important to avoid jumping to premature conclusions based on the use of one method. For this reason, it is important to apply and analyse the results from each method independently and in a descriptive manner. One of the key strengths with the IAEA safety culture assessment methodology is the division between a descriptive and normative approach to capture and analyse the data (see Fig. 2, in Section 2.1). When performing safety cultural assessments, it is extremely important to stay away from subjective judgements while capturing data and performing the analyses. The assessors need to remain open-minded and only to describe what they observe without biasing the data with how they believe things ‘should be’.

It is acknowledged that such an approach is not always easy since the team may apply methods in parallel and team members interact with each other during the course of the assessment. In addition, people always have some kind of normative framework from which they unconsciously work. It is therefore important that the team lead and the team members are conscious of this and alert each other if the approach turns into being normative in the descriptive phase of the assessment (see Section 6.2 for further explanation about the difference between the descriptive and normative approach). The team lead also has a

specific responsibility to control the assessment team's inclination to use the results of one method to bias the application of other methods or shift the focus of the assessment before an impartial review of the data has been made. In later stages, additional information may be collected to substantiate or negate the findings of a particular method.

To maximize the learning from the self-assessment, it is essential to engage all levels of the organization. Static methods, such as document reviews and questionnaires, need to be supplemented by the use of interactive methods. The selection of approaches has an impact on the organization's perception of the degree of inclusion and comprehensiveness of the assessment. Safety culture assessments do not need to be a time limited, pressured exercise, and are often more accepted by the organization as an ongoing activity that takes snapshots supplemented by more comprehensive periodic assessments, typically at intervals of 2–3 years.

In the following sections, the discussion of each method includes intent, limitations and risks, and potential uses. To help to understand how each method contributes to the overall perception of the culture and safety culture of an organization, Appendix I provides information on various topic areas that may be explored from a cultural perspective. Appendix II establishes a case study that is elaborated throughout the discussion of the various methodologies presented in the appendices. Appendices III–VII provide in-depth information on each of the methods. Appendix VIII completes the case study demonstrating the normative and evaluative aspects of the assessment approach. Appendix IX provides an outline for an SCSA report. Finally, the Annex provides the research and theoretical basis for the methodology outlined in this Safety Report.

5.2. DOCUMENT REVIEW

Document reviews can be performed in advance of the actual self-assessment. They familiarize assessors with the full breadth of the organization's documentation, since this may not be familiar to assessors from specific departments. They also familiarize assessors with the language and terminology of various groups.

Document reviews reveal how an organization represents itself in writing, and what the organization's members shared values and basic assumption consist of. For example, historical performance data, policies, event investigation, organization structure scheme and procedures all provide a rich source of cultural information and insight into basic assumptions by showing common reasoning patterns. They reveal the adequacy of guidance and rigour in important safety areas.

5.2.1. Working with document reviews

The aim of a document review is to gather information on how the organization thinks and intends to behave. Document reviews can provide insight into how an organization prioritizes safety through its management system documentation, and how it intends its policies, programmes and processes to work in practice. Typically, documentation reveals approaches and beliefs related to ensuring compliance, including how positional power or authority is distributed in the organization and the degree of formality or informality of safety controls. Similarly, safety indicators and reports on compliance with requirements provide insight into safety performance and corrective action patterns. The extent and nature of documentation can show how the organization approaches and promotes connectivity or systemic views and prioritizes aspects such as accessibility and user friendliness of documentation to guide member actions. Document reviews can also give the basis for determining at a later stage whether people know of the existence of written guidance and use it.

Document reviews provide the basis for insight into differences between stated intent and actual behaviour. For example, the organization may adapt industry approaches to their situation or simply copy from others with little modification, thereby failing to fully integrate the approach into the organization's way of doing work. Document reviews can reveal how review and approval processes work, which may indicate latent organizational challenges such as upward delegation.

Document reviews frequently provide a means of understanding how organizational learning (e.g. from experience feedback, events and assessments) is translated into captured knowledge and guidance.

5.2.2. Limitations and risks

Document reviews are labour intensive. They require assessors to identify relevant information and patterns of thinking from within the large number of documents typical of nuclear facilities. In addition, they may not reflect the true internal thinking, understanding or action of the organization if they were created primarily in response to stakeholder requirements. Appendix III provides additional information on performing document reviews.

5.3. QUESTIONNAIRES

Questionnaires provide a convenient way to obtain input from a large number of people. Computerization allows quick turnaround of data. Questions

are consistent for all participants, and everyone has an equal opportunity to provide anonymous input. Questionnaires send a message that management values everyone's views.

It is, however, difficult to develop a valid and reliable questionnaire. For this reason, organizations should use a professionally developed and validated instrument, such as the IAEA Safety Culture Perception Questionnaire, or seek relevant expertise if a decision has been made to develop a targeted questionnaire. External organizations such as the IAEA can also provide helpful assistance in managing the questionnaire and provide statistical analyses.

5.3.1. Working with questionnaires

Questionnaires gather information on peoples' perceptions, values, beliefs and attitudes related to the organization and its culture. They give employees a voice in expressing their views, and because they quantify perceptual information, they can be used to compare responses between groups and levels of the organization to determine the degree of cultural alignment.

Questionnaires are useful in the self-assessment process because they serve to establish a baseline for tracking changes over time. They enable large scale reflection on topics of interest, and because they provide visual representations of large group findings, can help to focus discussions on issues, concerns and directions.

5.3.2. Limitations and issues

Questionnaires have several limitations. Numerical analysis may create a belief that the results are more precise or valid than may be true. Symptoms rather than underlying causes may be identified. Interpretation is vulnerable to the statistical expertise of those administering the instrument, and low response rates (less than 70%) can further compromise validity. A poorly developed questionnaire can result in erroneous conclusions or interpretations, and be too ambiguous to support improvement efforts. Appendix IV provides additional guidance on questionnaires.

5.4. OBSERVATIONS

Observations may be used on a continuing basis, not just during SCSAs. Hence, developing good observation skills is valuable for the whole organization. Cultural observations are different from task observations normally conducted

at nuclear facilities. The latter are based on normative standards or comparisons with expectations, whereas cultural observations are descriptive.

5.4.1. Working with observations

The aim of conducting observations is to reveal actual performance and behaviour in real time. Observations can serve to make the meaning or importance of relationships, symbols and other artefacts visible. They readily provide an indication of the work environment and field support systems, including the state of work areas when people have left. Observations provide information about people in their actual work contexts such as how people interact, work practices and what people pay attention to in their everyday work.

5.4.2. Limitations and risks

The greatest risk to observations is the tendency to overgeneralize from a small number of findings or to examine individual behaviour instead of underlying cultural indicators. Observations require training and experience, otherwise many items are likely to be missed or otherwise misinterpreted owing to the specialist blinder effect (i.e. a natural tendency to focus on one's own area of expertise). Internal observers are influenced by local norms when observing without an external comparator or observer. Observations are subject to the observer effect, whereby people behave differently when observed. Finally, it can be difficult to guarantee anonymity of the information gathered when observing. Appendix V provides additional guidance on observations.

5.5. FOCUS GROUPS

Focus groups are useful in a variety of situations and may be used at any stage of a self-assessment process. They are often effective when used early in the process for the purpose of raising awareness, engaging people, initiating organizational conversations and fostering learning.

Focus groups are flexible in the way information can be explored, for example facts, stories, opinion, experience, feelings, behaviours, values and concerns. They engage more people, which allows broader conversation. They may reveal issues and responses that are not easily accessible through quantitative methods, such as questionnaires. The interactive, open-ended nature creates learning opportunities for participants, including increased awareness beyond the primary purpose of the focus group itself, through discussion with peers.

5.5.1. Working with focus groups

The aim of focus groups is to explore a theme in an open-ended, interactive fashion. They provide an easy forum for directly observing the influence of group dynamics and power dynamics within an organization, particularly with participants from different levels and departments. Focus groups can help to raise awareness and to engage people in conversations of great importance to the organization. They can also allow a deeper exploration of issues or themes surfaced through other information gathering methods.

Focus groups can be helpful in deepening and broadening the organizational understanding of safety culture concepts, organizational behaviour and other aspects of interpersonal and organizational effectiveness. They are particularly useful for gathering feedback and insights on specific themes, and providing a creative environment in which to generate ideas on how to improve or do things differently.

5.5.2. Limitations and risks

The challenges with focus groups primarily relate to the need for skilled facilitators to manage the dynamics, especially if the topic is sensitive or controversial. Power relationships may distort the discussion, although such interactions still provide insight into organizational dynamics. The group or individuals may also air personal agendas or vent anger or frustration. Groupthink or peer pressure can inhibit authentic participation.

When sessions are conducted by familiar colleagues, participants may be influenced by factors such as perceived trustworthiness, reputation, credibility, dominance and positional power. Focus groups are susceptible to the biases of individual facilitators or dominant participants. As with all data collection methodologies, it can be difficult to collect and interpret the information in a meaningful, valid way. Appendix VI provides additional guidance on focus groups.

5.6. INTERVIEWS

Interviews are an important method for cultural assessment. When using interviews, care needs to be taken to ensure that the interviewer is proficient with the cultural application of the method and does not unduly influence the responses. Interviewees are sensitive to the behaviour of the interviewer. For this reason, two kinds of interviews are preferred for culture assessment: semi-structured and unstructured.

In semi-structured interviews, the purpose is to gather contextual information about the organization, such as how it functions, key participants, system overviews, roles and responsibilities. The interviewer uses general questions to gather information on specific topics, for example: “Can you explain how operational safety decisions are made?”

In unstructured interviews, the interviewer minimizes interference in the dialogue by posing few, and very open, questions, allowing the interviewee to steer the interview. The focus is on gaining a deeper understanding of how the interviewee thinks, what safety concepts are prioritized, what the person is passionate about, and what tends to be ignored or avoided.

Interviews provide a high degree of interaction, with opportunities for participants to introduce issues and themes. They allow interviewers to explain context to ensure that responses address the intent of the question. The format is adaptable (e.g. individual or small group, structured or unstructured) and generally allows more openness than may occur in large group settings. This flexibility enables exploration of nuances and subtleties of organizational dynamics and patterns of thinking. Non-verbal cues in response to topics (e.g. enthusiasm, caution, frustration or complacency) provide further insight into the organization. When performed well, interviews help to establish credibility of the information gathered.

5.6.1. Working with interviews

Interviews serve to obtain in-depth information and points of view from individuals that are not bounded by the topics selected by the assessment team. They naturally satisfy an organization’s request for involvement. From an assessor’s perspective, they can help to gain deeper insight into the intensity of sentiment around issues or to explore the complex logic behind patterns. They give understanding of the different perceptions of accountability across organizational levels and by groups. They also naturally provide an avenue for exploring issues or tentative themes surfaced through other assessment methods.

5.6.2. Limitations and risks

Interviews are complex interactions and hence have limitations. For example, they are not anonymous, so interviewees may not be completely candid in their responses. Interviewers may be perceived as representing management and therefore evoke caution or anxiety in the interviewees, diminishing the quality of information gained. It is therefore important to ensure confidentiality and to inform the interviewee about the protocol. The level of rapport between interviewer and interviewee can influence the responsiveness of the interviewee.

A rigorous approach may be perceived as a test or interrogation if not handled well, thereby affecting the information and impressions gathered during the interaction. Interviews can provide an opportunity for interviewees to vent long standing complaints. These may provide insight into, or distract from, the aim of the interview. Hence, caution needs to be applied in extrapolating individual views. Depending on the type of interview, questions play a significant role in shaping the content and flow of conversation. Question design needs careful thought to avoid bias in the results.

Finally, extracting themes from large volumes of interview transcripts is time consuming and complex. It can easily introduce bias based on what naturally attracts the reviewer's attention. Appendix VII provides additional information on interviews.

6. CONDUCTING THE ANALYSES

Creating an informed, thought provoking, relevant and challenging image of the organization's safety culture using the information collected during the self-assessment is an iterative process. It is not a linear exercise that attempts to 'build a case', but rather involves working iteratively with parallel information sets to analyse the results and explore cultural influences. The focus is to be on an exploration to capture the essential nature of the culture rather than simply draw conclusions in relation to the five IAEA safety culture characteristics and their related attributes. It is an exercise in reflection, and requires divergent rather than convergent thinking. The aim is to discover what drives organizational motivation and to identify potential consequences in relation to safety risk, as well as strengths. This requires a good understanding of cultural aspects such as motivation, behaviour, beliefs, attitudes, resentments, limitations, judgements, socializing patterns, information flows and decision making patterns that are prevalent in the organization. Because of the complexity of these interactions, first time organizers of SCSAs are advised to obtain outside expertise to assist the internal team.

This self-assessment methodology involves two types of information: qualitative and quantitative. In addition, it involves two types of analysis: descriptive and normative.

6.1. WORKING WITH QUALITATIVE AND QUANTITATIVE DATA

The results from a questionnaire are presented quantitatively as numbers and graphs. As shown in Fig. 7, the findings from interviews and other methods are presented as descriptive notes that capture the quality of interactions and experiences. Qualitative findings are not to be quantified or reduced to graphical representations because the value of the method will be lost. Instead, comparison across the quantitative and qualitative datasets needs to be undertaken at the level of conclusions and overarching themes.

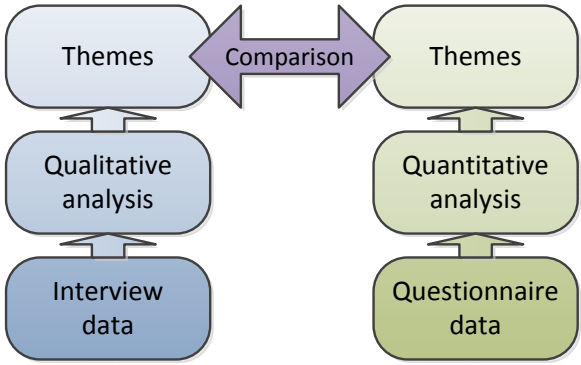

FIG. 7. Approaches to working with qualitative and quantitative data.

6.2. PERFORMING DESCRIPTIVE AND NORMATIVE ANALYSES

A descriptive analysis is made for the purpose of describing something as it is and creating a clear and valid image of its current state. A normative analysis evaluates results or conclusions against a selected standard or norm, thereby making it possible to identify strengths and areas for improvement, and to suggest changes. To maximize the benefits of this self-assessment methodology, it is important to perform the descriptive analysis as free as possible from normative statements or judgements, postponing such comparative statements to the normative phase.

As indicated in the example of descriptive versus normative approaches in Section V.3, when working with cultural information, it is important to avoid falling into evaluative judgement during the self-assessment.

6.2.1. Step 1: Extract themes from each method

The purpose of developing themes is to begin to formulate an image of the culture. One approach involves drafting topics and then taking a second look to ensure that they do not reflect the analyst's preferences and biases. When multiple assessors are involved, each reviewer needs to independently formulate themes before developing a combined set. General steps for extracting cultural themes are:

(a) To identify common themes arising from the different methods of collecting information (e.g. questionnaires, interviews, observations, document reviews and focus groups).
(b) To identify discrepancies across the different methods.
(c) To identify examples that are representative of the organization's culture (e.g. quotations, anecdotes, stories or observations that preserve anonymity).
(d) To identify the presence of subcultures across different groups and levels.
(e) To seek to understand what is happening within the organization, and its potential implications for safety (e.g. motivation, behaviour, beliefs, attitudes, resentments, limitations, judgements, socializing patterns, information flows, power dynamics, shared meaning, reasoning and decision making patterns).
(f) To seek evidence in terms of artefacts that show positive, incomplete or skewed meaning systems related to safety.
(g) To explore tendencies in the organization that indicate a default to unsafe behaviour or acceptance of degraded conditions.
(h) To explore the impact on the human system — how it affects peoples' level of engagement, curiosity, demonstration of competence and autonomy, relatedness, integration and cooperation, willingness to put organizational needs ahead of their own, and organizational learning.
(i) To surface underlying themes from a document review:
    (i) To look for consistency and inconsistencies of documented messages;
    (ii) To note how safety is represented across the organization;
    (iii) To confirm whether the documents reflect an ongoing effort to provide consistent, accurate and up to date information, including alignment with international practices;
    (iv) To capture gaps in the documentation (e.g. missing procedures, work instructions and flowcharts);
    (v) To confirm whether the procedures provide adequate configuration control for operation, maintenance and design;
    (vi) To identify what trend information is available and how it is supposed to be used;

(vii) To note what is measured (e.g. performance indicators, to comprehend what the organization is to pay attention to);
(viii) To note how themes or patterns relate to safety focus;
(ix) To note the quality or tone of regulatory or stakeholder messages;
(x) To examine the depth of root cause analyses in terms of organizational issues;
(xi) To examine budgetary allocations for safety and safety culture enhancement;
(xii) To identify backlogs of procedure revisions;
(xiii) To determine if timely actions are taken to address safety concerns.

(j) To reveal underlying themes from questionnaire results:
(i) If baseline data are available from a similar instrument, compare previous results for indications of trends;
(ii) To look for patterns — unexpected highs or lows, areas of commonality, apparent inconsistencies or discrepancies, or indications of subcultures;
(iii) To compare results to the actual performance and behaviour identified from other assessment methods, and routine internal indicators.

(k) To reveal underlying themes from observations:
(i) To identify behavioural patterns prevalent in the organization, such as interactions across levels or groups, approaches to timeliness, accuracy, approach to shaping behaviour, and understanding performance;
(ii) To identify significant observations related to nuclear safety culture;
(iii) To determine which observations are being conveyed to the organization, while preserving anonymity.

(l) To surface potential themes from focus groups:
(i) To allow the information gathered from participants to define the common issues and themes (use an emergent and non-evaluative approach);
(ii) To identify common behaviour — enthusiasm, degree of engagement, reflectiveness, awkward moments, tensions, wilfulness, resistance, hidden agendas, silence, unexpected reactions, diversions and discrepancies;
(iii) To identify recurring phrases, images, concerns, nature of improvement messages, and emotional tone, and to identify whether the tone of voice (silent, dominant, anxious or forced) and body language exhibit common patterns;
(iv) To identify the prevalent conduct in the various focus groups and what this implies with regard to hierarchy, cross departmental relationships, status or other ‘group’ distinctions, and to note whether the dominance

by a participant or class of participants has influenced the data or group perceptions;

(v) To identify proficiency levels, behavioural patterns, ways of reasoning, communication styles and approaches to decision making;

(vi) To examine any differences or inconsistencies in reasoning, understanding, and relationships, and how pervasive they are;

(vii) To note areas or topics that were:

— Uncomfortable, hidden, dismissed, disapproved of, forbidden or censored;

— Appreciated, valued, and praised;

(viii) To remain conscious of facilitator or analyser interpretation bias throughout (i.e. pre-existing perspectives).

(m) To surface potential themes from interviews:

(i) To allow the data to define the themes (emergent and non-evaluative) — depending on the type of interview, the themes may be quite different;

(ii) To capture recurring phrases, images, concerns, nature of improvement messages and emotional tone;

(iii) To capture proficiency level, and patterns in behaviour, communication and decision making;

(iv) To look at differences and disparities and their pervasiveness, and to consider disconnects and inconsistencies in reasoning, relationships and perceptions;

(v) To note any rote patterns related to how conclusions arise within a group's thinking and how that relates to the rationale for behaviour, concerns and organizational results, and to ask the 'why' questions that lie beyond superficial grouping of the cultural facts;

(vi) To remain conscious of interpretation bias (preconception).

6.2.2. Step 2: Develop conclusions for each method

Once the reviewers have formulated a set of themes for all of the data within a method, the team needs to work closely together to identify commonalities as well as noticeable inconsistencies across the themes. The aim is to build an accurate image of the culture as viewed from the results of that method.

For example, themes arising out of a series of cross-functional, mixed level focus groups might be combined as follows:

(a) Group 1 themes:

(i) Constrained interactions between people from different levels in the organization;

(ii) Warm interactions between new employees;
(iii) Clear boundaries evident between operations and maintenance personnel;
(iv) Reliance on 'expert' knowledge to make decisions.

(b) Group 2 themes:
(i) Open communication;
(ii) Displays of camaraderie between maintenance personnel;
(iii) Friction between planning and maintenance supervisors;
(iv) Many complaints about time pressure or poor planning.

(c) Group 3 themes:
(i) Joking to relieve tense moments;
(ii) Focus on shared activities external to work;
(iii) Competitive behaviour — people seeking attention and recognition from the plant manager;
(iv) Minimal participation from young personnel.

(d) Combined, the themes for the focus groups might be as follows:
(i) Clear subcultures — new employees, maintenance and operations;
(ii) Coordination challenges increased by departmental silos;
(iii) Limited focus on inclusion and mentoring.

6.2.3. Step 3: Complete the overarching analysis

This section describes the general steps for performing the overarching analysis that combines themes from the different methods. The overview of the approach in Fig. 8 shows how independent evaluation of the information from each method is combined through an overarching analysis and then evaluated against the IAEA safety culture framework to provide insight into strengths and opportunities for improvement.

The steps in the descriptive analysis to identify overarching themes are:

(a) To reflect on the team's overall perceptions of the assessment (response, openness, organizational support and cooperation);
(b) To analyse the information and themes from each method and outline draft overarching themes or create pictures of the observed cultural patterns that reflect the findings in the total dataset;
(c) To review the different information sources in detail for any anomalous results to determine the nature of the differences (additional information or follow-up may be required).

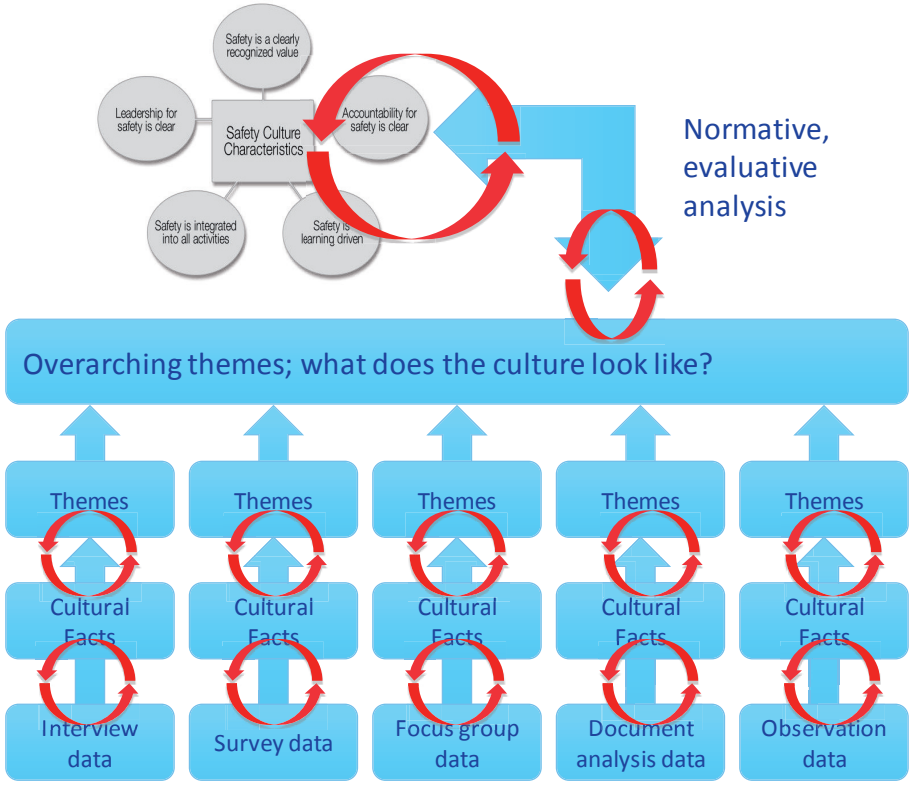

FIG. 8. Overview of the analysis approach.

Normative analysis to evaluate the organizational culture against a normative framework:

(d) To identify the safety implications of the descriptive results through comparing and interpreting the results in relation to the IAEA safety culture framework (five characteristics and related attributes, see Section 2.2);
(e) To select actual examples from the source information to illustrate summary observations (preserve anonymity);
(f) To describe the implications of the differences between the existing culture and the IAEA framework.

Steps (a)–(c) are of a descriptive nature, whereas steps (d)–(f) are of a normative and evaluative character. In step (b), the conclusions from the different methods are combined in an overall analysis to determine how the various

datasets relate to each other. In this step, themes appearing across the different data sources are used to explore patterns in the material. This includes:

— Identifying similarities, such as homogeneous values or behaviour that can be reflected by espoused values;
— Identifying differences (e.g. where different sources point in different directions) — values and behaviour can be heterogeneous or even contradictory or paradoxical;
— Identifying differences and similarities between groups (such as hierarchical level, professional identification, gender and age) and analysing the content of these;
— Understanding the organizational underlying dynamics which are influenced by the basic assumptions and shared values.

It may be necessary to revisit the original analysis to clarify the basis of the conclusions, and the team may need to collect additional material (e.g. by conducting a few more interviews or focus groups on specific topics). The analysis is to identify strengths as well as areas for the organization to improve to avoid a negative impact on safety.

A well functioning, diverse team contributes to the quality of analysis. Team members can help each other to see patterns and challenge the analysis. Maintaining a well functioning shared space to allow a creative, tolerant and open atmosphere is important.

Effective analysis requires either an existing or a new analytical framework. As the iceberg model suggests, the purpose of an SCSA is to explore 'beneath the surface'. This necessitates an active act of interpretation. Interpretations are always based on a framework. In culture analysis, this framework needs to be made explicit and include knowledge of how culture operates. For example, it is important not to take the actors' point of view as a complete explanation. What has been said in interviews or focus groups is information to be analysed, not ready made conclusions. For an SCSA, it is important to explore why people are saying what they say, why the think the way they do and why they act the way they do.

To avoid mixing normative elements into the descriptive analysis, the findings in step (c) need to be documented and finalized before moving to step (d). Step (d) is the first step to include normative considerations that move the analysis into an evaluative mode. The results from previous steps are compared with normative standards (i.e. the IAEA safety culture framework). For each of the five safety culture characteristics, how the organization compares with the related expectations and attributes should be thoroughly explored. It is important not to oversimplify, as the comparison between the organization's

safety culture and the IAEA framework is not always straightforward. Again, expressing the essential character of the culture is to be prioritized before the normative comparison and its safety implications.

There is generally a requirement to write a report of the findings. In performing step (e), it is vital to ensure that the anonymity of respondents is maintained, as any violation of this principle will make future SCSAs difficult. It is also important to find illustrations that make abstract lines of reasoning tangible and understandable to the recipients of the report (e.g. by using quotes from interviews or observation notes).

Step (f) requires a clear description of areas where the safety culture of the organization deviates from the target state, as well as those aspects that align with the normative ideal. This stage is to be framed as areas to be discussed, analysed and resolved within the organization. In line with the view of culture expressed in this Safety Report, to suggest 'quick fixes' and corrective actions at this stage misses the point of an SCSA. The intent is for the organization to identify strategies and actions to develop attitudes, behaviour and approaches that will, in the long run, become part of the organization's safety culture.

The results of an interpretive study are always subject to interpreter bias. Having a well functioning team with a reflective mindset is important to balance for this, but the interpretation will always be just an interpretation and not a final truth. The results of the self-assessment need thus to be treated as an input to further organizational development processes, not as a template of fixes to force onto the organization. Ideally, the results of an SCSA serve as an eye-opener that starts a process of reflection and learning in the organization, facilitating new ways of asking questions about how and why the organization's members act and think the way they do. No single interpreter has the right to define what the culture is. Instead, recipients have an obligation to reflect on what the interpretation means for them.

7. COMMUNICATION OF FINDINGS AND TRANSITION INTO ACTION

7.1. WRITING THE SELF-ASSESSMENT REPORT

By documenting the overall results, they serve as a foundation for communicating key messages, provide a baseline for subsequent SCSAs and

provide input to safety culture enhancement programmes. Consideration is to be made to include the following information in the written report:

— How the assessment was performed and by whom, including preparation, assumptions, approach and methods;
— How the analysis was conducted and by whom;
— A summary of the descriptive and normative analysis results;
— Issues, opportunities and discussion of relevance;
— Patterns and recurring themes or observations;
— Evidence of concerns related to cross-functional or hierarchical cooperation;
— Communication of results and feedback from the organization;
— Suggested approach to addressing the issues (without providing specific solutions) in a manner that encourages organizational reflection and continual learning;
— Lessons learned.

Appendix IX provides an example of a report template.

7.2. COMMUNICATING THE RESULTS

The communication phase involves engaging the entire organization in the outcome of the self-assessment, preferably through seminars or workshops, to receive feedback and to maximize organizational learning.

It is important to ensure that all participants receive information on the results, including shiftworkers, contractors and other interested stakeholders as appropriate. Communication usually occurs in several stages:

(a) Communication to management, typically in the form of a workshop led by the team lead. The information may be presented by the team lead or by individual team members. A key aspect is to facilitate management dialogue rather than present the results in an audit like fashion.
(b) Communication to the broader organization, typically led by management and supported by the team lead and team members as required. This may be supplemented by usual communication methods such as bulletins or the intranet, but the primary method is to focus on face-to-face meetings led by management together with the assessment team members.

The objective of communication is to sensitize senior management and the organization to the need for action and continuous learning. This requires an interactive approach when sharing the findings, rather than simply issuing a final

report. Management needs to obtain a clear understanding of tendencies within themselves and the organization at large that might cause unsafe behaviour or decisions.

The approach should be focused on maximizing the learning value to the organization. The following points are to be considered when summarizing and communicating the results:

— Consider graphical representations, taking care to avoid misleading pictures;
— Use a variety of communication vehicles to communicate to management and personnel;
— Include context to avoid misinterpretation;
— Request feedback as a reality check and confirm the messages have been understood as intended.

7.3. TRANSITION TO ACTION

Successful implementation of any programme requires an assessment of potential barriers. With respect to safety culture enhancement initiatives, potential barriers include:

— A lack of vision, understanding and an integrated plan focused on the desired state;
— Reward systems based on cost and production rather than a culture for safety;
— Complacency and natural defensiveness that ‘we are safe enough and do not need more safety culture effort’;
— Failure to take both a systemic and systematic view;
— ‘One size fits all’ approaches that import concepts such as error reduction methods, without considering the culture in which they are to be applied;
— Mechanistic approaches that favour ‘perfect systems’ and rely on technical fixes, without due consideration of the human system.

Senior management is advised to use the results of the self-assessment to determine what can be done to reframe the understanding or reshape tendencies that do not support a strong safety culture. Improvements require a long term strategy and plan in addition to ongoing promotion of continuous improvements. The approach taken in this Safety Report is that the self-assessment and the resulting report are separate from the action plan. Management may wish to give some indication of its approach to developing the plan and some key

considerations that might be included. However, the plan is not to be finalized without significant engagement with the groups affected. Their involvement results in a higher degree of commitment to successful implementation compared with top-down direction.

Some considerations in the continuous improvement of safety culture include:

— Taking a systematic approach to developing a safety culture programme;
— Utilizing safety culture experts knowledgeable in behavioural science, organizational psychology, and sociology, supplemented by training in nuclear technology;
— Using multidisciplinary, cross-functional teams to assist in understanding cultural aspects;
— Providing safety culture training to management;
— Providing workshops on safety culture for all levels and functions (managers, employees, contractors and corporate organizations) to ensure understanding of the fundamentals and not simply the use of human performance and error reduction methods;
— Positioning human performance techniques and error reduction in terms of organizational culture at all levels, rather than focusing on field workers and front line supervisors;
— Integrating a systemic approach to safety through for example placing organizational emphasis on doing the right things in the right context (e.g. building pre-job briefs into outage plans);
— Developing reward systems that support safety and long term thinking;
— Taking a 'plan to learn' approach that aggressively seeks to 'learn what we do not know';
— Involving corporate organizations in safety culture enhancement to ensure transparency in terms of what is needed in time and resources, and communicating an understanding that safety culture enhancement contributes to long term production results;
— Identifying management champions and advocates;
— Embracing transparency on safety matters throughout the organization.

Safety culture programmes involve integrated, generic and specific activities. Generic activities involve the entire organization including corporate personnel and long term contractors in a systematic manner. Specific activities include job related training needs, responding to issues triggered by events, identification of safety deviations and acting on assessment results. Integrated

activities take place when cultural improvement inventions are integrated into the ongoing, daily activities. Intervention may involve the entire organization or specific groups, depending on the nature of the issue.

Appendix I

AREAS TO EXPLORE FOR CULTURAL EXPRESSIONS

This appendix lists in alphabetical order areas of interest when learning about the organization during an SCSA. The list is not comprehensive and is not intended as a list of questions to be asked, but the list may be useful as a starting point for planning. However, the approach of collecting data needs to be broader than the listed areas below. An open-minded and explorative approach is needed to ensure a high quality SCSA.

I.1. BACKLOGS AND REWORK

(a) How large/small are the backlogs?
  (i) Modifications of safety systems;
  (ii) Updating of final safety analysis report;
  (iii) Corrective actions;
  (iv) Revisions of management system documentation;
  (v) Handling of improvement proposals.
(b) How is work prioritized at a general level and detailed level?
(c) Is rework trended and analysed for causes? If so, what do the data indicate?

I.2. CONDUCT OF OPERATIONS

(a) How is fitness for duty handled?
(b) How are qualifications for routines handled?
(c) Is there a basis for the shift complement?
(d) What indicators are used? Are trends used?
(e) What human performance/error reduction practices are used?
(f) What are the expectations for using error reduction practices?
(g) How are procedure changes in operations controlled (pending or red marked)?
(h) What is the limit for the number of temporary safety related modifications at the plant?

I.3. CONTRACTORS

(a) How is the assurance process for contractor qualifications structured and implemented?
(b) What are the safety behaviour expectations for contractors?
(c) How are those expectations communicated?
(d) How are those expectations followed up?
(e) How are contractors generally perceived in the organization?

I.4. EMERGENCY PREPAREDNESS

(a) What is the condition of fire equipment, such as emergency response team equipment, fire extinguishers and emergency lights?
(b) How is equipment inventoried and checked to ensure everything is in order?
(c) How does the labelling process work?
(d) How often are emergency drills conducted?
(e) What has been improved following lessons learned from drills?

I.5. FIELD OBSERVATION PRACTICES

(a) What is captured during field observations?
(b) What training is provided for those performing observations?
(c) Who conducts observations (managers, supervisors, front line workers and other disciplines besides operations and maintenance)?
(d) What is done with the results?

I.6. FOREIGN MATERIAL EXCLUSION

(a) What training and information is given to ensure foreign material exclusion (FME)?
(b) What are the expectations on contractors for FME?
(c) What types of FME information are in daily use?
(d) What are the procedures and processes to provide FME prevention equipment?

I.7. HEALTHCARE: FITNESS FOR DUTY

(a) What is included (common diseases, stress related concerns, fatigue management, addiction and family issues)?
(b) Are there limitations on hours of work? Do they apply during outages?
(c) Do the limitations on hours of work apply to contractors?
(d) How does the organization view work hour exceptions during outages?
(e) Are fairness and justice issues considered?
(f) Are work injuries and fatalities tracked? Do they include both internal workers and contractors?
(g) Are services available to everyone?
(h) Which trending and reporting is performed?
(i) Is this information used for outage support and training and orientation programmes?

I.8. HUMAN PERFORMANCE PROGRAMME

(a) What is the programme focus and content?
(b) Who owns and champions the programme?
(c) What indicators are used? Is trending used?
(d) How is it integrated into work and training?
(e) How is the training connected to everyday work?
(f) What results are being achieved?
(g) What is being improved?

I.9. INTERACTIONS BETWEEN PEOPLE

(a) How comfortable are people correcting the work of others?
(b) What are the most common relationship issues at the worker and management levels?
(c) How are relationship issues resolved?

I.10. INTERDEPARTMENTAL RELATIONSHIPS

(a) How do the formal structure and informal relationships operate?
(b) Who leads initiatives?
(c) How is problem solving handled?
(d) How is consistent messaging ensured across departments?

(e) What opportunities are available for cross-functional interaction?
(f) How often do personnel discuss safety issues with workers from other departments (engineering, maintenance, nuclear safety and radiation protection)?

I.11. LABOUR RELATIONS

(a) What are the most common issues raised?
(b) How are safety concerns handled (e.g. can an employee stop work)?
(c) How are infractions handled?
(d) Do union and management work together to identify and solve safety issues?
(e) Does the union promote safe work practices?
(f) Is there an effective union–management joint health and safety committee in place?

I.12. LEADERSHIP SELECTION AND DEVELOPMENT

(a) What is the approach to identifying suitable leadership candidates?
(b) Is there diversity in management levels in terms of differences in focus at successively lower levels (strategic, tactical and coach/supervisor)?
(c) What is sought at each level?
(d) How are leaders and potential leaders developed?

I.13. MANAGEMENT AND ADMINISTRATION

(a) What does the safety policy encompass, and how is it understood and used?
(b) How is safety integrated into strategic and operational planning?
(c) How does the organization structure work to coordinate and integrate key processes (e.g. work management, operations, maintenance, performance improvement, licensing and configuration management)?

I.14. MODIFICATION PROCESS

(a) How is work related to independent nuclear safety review performed — both primary and independent reviews?

(b) Are procedures with clear criteria used?
(c) What is the general attitude about the value of such reviews?

I.15. OCCUPATIONAL SAFETY

(a) What are the occupational safety incident and accident patterns?
(b) What is done to prevent incidents and accidents, beyond information and training?
(c) How are occupational safety issues reported?
(d) What indicators and trends are used?
(e) What is the plan to reduce the number of incidents and accidents?
(f) Which (if any) group has the most significant occupational safety issues?
(g) Are regular safety meetings held? Are contractors included?
(h) How effective is implementation at the field level (e.g. tripping hazards, markings, signage, barriers and safety data)?

I.16. ORGANIZATIONAL LEARNING

(a) What is the reaction to external and internal review results?
(b) How does the low level event reporting function?
(c) How is the corrective action programme (CAP) valued among personnel?
(d) How are improvement proposals created and implemented?
(e) When events are investigated, how are lessons learned shared in the organization?
(f) How are training activities valued?

I.17. OUTAGE PLANNING AND CONDUCT

(a) How is planning performed?
(b) How many modifications are approved at the last minute?
(c) How often is work dropped from the schedule and for what reasons?

I.18. PLANT MAINTENANCE

(a) What concerns do operations have about plant maintenance?
(b) How does the organization prioritize work related to safety?

(c) How does the organization prioritize work related to equipment deficiencies?
(d) How does the organization handle workarounds and deviations?

I.19. RADIOLOGICAL PROTECTION

(a) What is the coverage and quality of procedures?
(b) How is responsibility for radiation protection shared between specialists and field workers?
(c) How are non-conformances identified and handled?
(d) How does the organization sign and mark caution areas?
(e) What training is provided and to whom?

I.20. REGULATORY BODY INTERFACE

(a) What is the quality and nature of the relationship?
(b) How many open regulatory issues are there?
(c) How many licence violations occur and what is the nature of these? What is the trend?

I.21. RESPONSIBILITY FOR SAFETY ACTIONS IN THE FIELD

(a) When work is performed, does it require sign-off at an individual level?
(b) What is the response of supervision to concerns about physical conditions, procedures, materials or other aspects of working conditions?
(c) What are the expectations on managers for frequency to be out in the field?
(d) How often are managers out in the field?
(e) What are the practices for problem identification and raising complaints? What reporting system and follow-up process is in place? How much is it used? Is there a method for anonymous reporting?
(f) How are qualifications confirmed before work is assigned?
(g) What are the usual causes for unplanned work stoppages?
(h) How are overtime, fatigue and fitness for duty issues managed — especially during outages?
(i) Where can work instructions be found?
(j) What is the approach for marking up and revising procedures?

I.22. ROOT CAUSE ANALYSIS AND CORRECTIVE ACTION PROGRAMME

(a) How many root cause analyses (RCAs) are conducted each year?
(b) What are the criteria to perform RCAs?
(c) What perspectives are embedded in the RCA (e.g. are human and organizational factors considered)?
(d) How does management respond to RCA recommendations?
(e) What are the most common RCA findings?
(f) How are corrective actions followed up?
(g) Is the effectiveness of corrective actions evaluated?
(h) Is the CAP process efficient enough to prevent repeat events?
(i) What is the general attitude towards CAP?
(j) What is the process for evaluating the effectiveness of corrective actions?
(k) How does the organization learn from the CAP cycle?
(l) How does CAP fit into improvement planning?
(m) How are corrective interventions coordinated to maximize impact?
(n) What is the response to events that are clearly the result of human error?

I.23. SAFETY CULTURE PROGRAMME

(a) What is the programme focus and content?
(b) Who owns and champions the programme?
(c) What indicators are used? Is trending used?
(d) How is it integrated into work and training?
(e) How is training connected to everyday work?
(f) What results are being achieved?
(g) What is being improved or could be improved?

I.24. TRAINING PRACTICES

(a) What are the assumptions around how people learn?
(b) How is training organized?
(c) Does training focus on groups or is it cross-group?
(d) What is the common basic safety message?
(e) How are messages conveyed?
(f) How is learning transfer confirmed?
(g) What initiates training and retraining?
(h) How does training participate in outages?

(i) How are contractors trained?
(j) What does contractor training include (e.g. safety topics, safety culture and FME)?
(k) How are line managers involved in training?
(l) What types of practical approach for learning are used (e.g. mock-ups, simulators and demonstrations)?

I.25. WORK ORDERS

(a) How does the work order process function?
(b) Is there a good overview of all work going on in the station?
(c) How do work orders, radiation protection and industrial safety fit together?
(d) How do work orders and human performance fit together? Surveillance methods? Use of operating experience?

Appendix II

INTRODUCTION TO THE PLANT X CASE STUDY

In the nuclear industry, there is a stated commitment to safety through organizational learning using open and timely reporting of errors, near misses and events. Several attributes of the IAEA safety culture framework relate to this organizational learning focus:

— The presence of reporting programmes;
— The comfort level of staff to report errors and near misses;
— The responsiveness in addressing reported safety problems;
— The willingness of the organization to share information with regulators and industry peers.

How different organizations understand and demonstrate their commitment to organizational learning varies depending on the values, beliefs and attitudes present within their operating cultures. The role of the SCSA team is not only to confirm that the organization has each of these programmatic elements, or even that they are used, but rather to obtain insight into such things as:

— Who determines what is and is not reported;
— What balance the organization places on reporting versus issue resolution;
— What assumptions about 'who needs to know' are common in the system;
— How much the culture may encourage reporting through a no-blame culture or inhibit reporting owing to an ethic of public face-saving.

In short, which shared beliefs and attitudes pervade the culture with respect to transparency and learning from mistakes? Ultimately, the assessor's accountability is to determine whether the organization's culture contributes to safety by highlighting accepted ways of seeing and doing things that may be so much a part of the fabric of organizational life that members no longer question their validity or see their implications for safety.

This appendix introduces a case study on an SCSA at Plant X (see Box 1). This case study is further elaborated in each of the subsequent appendices to provide a more realistic perspective on what it means to apply each of the SCSA tools in practice. A tentative conclusion to the case study is contained in Appendix VIII.

BOX 1. CASE STUDY: INTRODUCTION

The SCSA team at Plant X decide to use all five methodologies to conduct a thorough self-assessment. Comprised of two behavioural scientists plus representatives from operations, maintenance, engineering, and health, safety and the environment, the team is eager to take on the work. One safety culture reviewer assumes primary responsibility for organizing interviews and focus groups, while another focuses on document reviews and an extensive field and meeting observation schedule. Each team member is given the opportunity to work with the different methodologies to help to broaden their understanding of the approach and to ensure that the review benefits from a broad range of perspectives. The team also enlists the aid of an analyst to help them to understand the findings from a questionnaire circulated to all Plant X staff and on-site contractors. The day the self-assessment starts, the team lead reminds the team:

> "Throughout the information gathering and analysis process, it is essential for all of us to stay open to new ideas and new insights. The use of multiple data sources and analysis techniques gives us the opportunity to triangulate data in order to strengthen our findings and conclusions. Let us wait for the facts to speak for themselves, rather than jump to conclusions and bias our line of exploration."

Appendix III

DOCUMENT REVIEW

Documents reveal the thinking and functioning of organizations. They are produced by individuals and groups in the course of their everyday work. They are typically geared for practical use, and contain evidence of the thinking and intentions of their authors and reviewers. They are presented in a certain manner or style that indicates their purpose, audience and desired impact. Documents may be generic, primary or secondary in nature:

— Generic refers to documents produced for use by the organization overall (e.g. policies and procedures);
— Primary refers to documents produced by people engaged first hand in an activity (e.g. work reports and minutes of meetings);
— Secondary refers to documents produced by people who were not present but who received the information after the fact (e.g. event reports).

All three types are useful for the purpose of conducting document reviews, as they provide insight into how past intentions and events were understood in terms of their meaning and value. When documents from different time periods or across different groups are compared, larger patterns of meaning become evident. These patterns can provide insight into values, beliefs, assumptions and attitudes that have implications for behaviour and outcomes in the present.

Document reviews are resource intensive. They involve much reading, and data gathering is time consuming. However, they also have great validity because they are grounded in the reality of the organization. Different approaches may be taken to surface cultural expressions, but in all cases, the work involves looking for events, behaviours and ways of reasoning that can be coded to find consistencies and differences. Consistencies reflect similar meanings or recurring basic ideas that can be formed into categories if they persist across larger volumes of document analysis, ultimately providing insight into core patterns.

III.1. STEP 1: SELECT DOCUMENTS TO BE REVIEWED

The first step in preparing a document review is to identify the internal and external information relevant to safety culture. This may include a broad range of information, such as the documents listed below. When selecting the documents, consideration is to be given that some will capture the organization's response

to issues over time and will provide insight into long standing patterns. It is not essential to review every document in a series, but rather to randomly sample the set. The following provides some documents to be included in a review:

— Documents related to safety policy, safety culture, human performance and safety procedures;
— Planning and operational decision making procedures;
— Indicators of safety performance and trends;
— Internal event reports, cause analyses, action status and lessons learned;
— Minutes of safety related meetings and rationale for safety decisions;
— Communications to staff regarding safety and safety culture;
— External inspection, evaluation and peer review results[2];
— Internal assessment results;
— Previous SCSAs;
— Corrective actions and closure of corrective actions;
— Maintenance backlogs;
— Training attendance records;
— Overtime and absentee records;
— Employee concerns programmes;
— Improvement plans;
— Operating experience used by the organization;
— Licence event reports and associated documents.

III.2. STEP 2: DETERMINE THE APPROACH TO IDENTIFYING RELEVANT INFORMATION

When undertaking a document review, assessors need to determine how to discover potential similarities and differences and what level of content analysis they will employ. There are two common approaches to surfacing relevant information:

(a) The first uses a predetermined rating scale, checklist or other organizing methodology to gather quantitative data on the qualitative documents (e.g. recording how frequently documentation is out of date, how frequently

[2] When reviewing internal and external assessment reports, caution should be taken to minimize the risk that previous findings bias the independence of the self-assessment. Consideration should be given to reviewing these last, or assigning them to a single team member, to minimize such bias.

particular roles or decision makers appear in the documentation, or how often a key word or phrase is used).

(b) The second involves a more organic approach whereby an informal content analysis surfaces categories that lead to conclusions about common themes, issues, processes or ideas expressed. While still qualitative in the end, this approach allows relevant material to emerge on its own.

It is recommended to combine the two approaches.

There are three levels of analysis:

(1) Literal meaning of documents from which their real significance needs to be reconstructed. For example, the scope and content of a root cause analysis (RCA) process document will contain literal statements about how this work is intended to be conducted.

(2) Interpretive meaning that goes beyond the literal meaning into the context in which documents were created. For example, the revision and implementation history of the RCA process document reflects the organization's execution and maintenance of the process.

(3) Inferences that go beyond the validity or relevance of the document's factual assertions. For example, the recurrence of plant events despite recommendations and actions from RCAs may suggest issues related to organizational learning and problem solving at the investigator, programmatic and event levels.

All three levels are relevant to understanding the culture. Because of the potential for misinterpretation or bias on the part of the assessor, it is essential that interpretations and inferences are independently corroborated through other methodologies before being taken as an accurate statement about the culture of the organization.

Document reviews involve handling large volumes of data, and require the assessors to ensure that references and quotes can easily be traced back to their originating documents. The easiest way to ensure traceability is to establish a consistent approach for capturing findings that defines how:

— To make descriptive notes, taking care to avoid judgemental or evaluative statements;
— To highlight document elements that substantiate observations of cultural aspects;
— To tag the findings with key words for easy future reference.

Figure 9 is a sample document review form and tagging approach.

In addition to identifying the documents to be reviewed and the approach to structuring the information gathering process, it is important to define clearly how team members will execute the task. The following steps provide a workable approach.

Document Review Form: Key Words*:_____

Type of Document and Date(s):
Author and Title:
Audience(s):
Characteristics of the Document: — Formality, distribution, series — Quality
Relevant Features: — Reason for creation of the document (intent) — Most important points/key messages — What is missing or underrepresented
Cultural Aspects: — Observations about the organization based on the existence and content of the document, including its apparent assumptions about the audience — Quotes or diagrams that are representative of the culture

* Tag the findings in the source document with the key words noted on the Document Review Form for easy future reference.

FIG. 9. Sample of document review form.

III.3. STEP 3: ASSIGN ASSESSORS

Document reviews are allocated to team members, and if resourcing allows, members perform duplicate reviews of important documents to lower the risk of subjectivity shaping the findings.

III.4. STEP 4: CONDUCT DOCUMENT REVIEWS

Each reviewer extracts relevant examples of observations including, but not limited to:

— Consistency of documented messages;
— How safety is represented across the organization;
— Themes or patterns related to safety focus;
— Whether the documents reflect an ongoing effort to provide consistent, accurate and up to date information, including alignment with international practices;
— Gaps in the documentation (e.g. missing procedures, work instructions and flowcharts);
— Indications that procedures provide adequate configuration control for operation, maintenance and design;
— Available trend information and how it is supposed to be used;
— Quality or tone of regulatory or stakeholder messages;
— Depth of RCAs in terms of organizational issues;
— Budgetary allocations for safety and safety culture enhancement;
— Backlogs of procedure revisions;
— Actions to address safety concerns.

III.5. STEP 5: IDENTIFY THEMES

Each reviewer is to formulate descriptive themes based on their individual findings. As with the other methods, the assessment team members assigned to conduct the document review should be given opportunity to practise before undertaking the actual review. Some individuals will find it easier to extract interpretive and inferential information than others. It is useful — during practice and the review itself — to have the assessors cross-review documents to verify observations.

A document review is not intended to verify the quality of documentation or to assess the comprehensiveness of the management system. The point is to gain an understanding of the way the organization reasons, and how it manages safety activities including organizational learning. Documents can provide a good indication of the underlying basic assumptions, beliefs and values operating in the organization.

In order to develop useful themes from a document review, the reviewer needs to approach the material with an open mind and consider:

— What is being overlooked that may have safety implications;
— What is being tolerated or accepted that may indicate a degree of complacency;
— What may indicate a lack of systemic thinking and how different factors can combine to create risk;
— What the power structure in the organization looks like, including key decision making patterns, and degree of control versus autonomy;
— Approaches to organizational learning and improvements;
— Approaches to communication, behaviour reinforcement and staff–management relationships;
— How the organization solves a range of problems.

The information the document review at Plant X revealed is in Box 2.

BOX 2. CASE STUDY: DOCUMENT REVIEW

Management system documents for Plant X includes well written processes in place for an operating experience programme and a human performance programme. Management designated both an operating experience coordinator and a human performance specialist. The documents reflect industry expectations, but there is no evidence that the two programmes are designed to feed information to one another. In addition, there are no implementing procedures in place for either process.

Maintenance procedures, including pre-job brief guidelines, do not mention operating experience or human performance as key references for information on safe work execution or for reporting on completion of the work.

RCA reports frequently reference inadequate pre-job briefs as a reason that avoidable mistakes occurred. The most typical recommendation for corrective action is increased supervisory training and field presence.

Health and safety committee minutes identify poor supervision and inappropriate use of personal protective equipment as frequent contributors to injuries.

Training records indicate that basic training on, for example, scaffolding, fall arrest and hand tools is routinely provided as refresher training in advance of outages. A review of the training materials for these programmes finds classroom based instructional designs with multiple choice tests to confirm learning, and an extensive set of presentation slides specific to each topic. Although practical examples are given, the training does not refer to plant operating experience or plant injury statistics.

Multiple licence event reports involve fire doors that were left open. The documented response to the issue is to increase coaching and to revise the relevant procedure.

At the time of the document review, the information in Box 2 should simply be captured as data. In the case of the fire door problems, the recommended improvements were ineffective. This fact could signal either tolerance of repeat deviations or tacit acceptance of the associated risk, and could therefore be a cultural expression of one or more of the following:

— A basic assumption or belief that documented expectations will change behaviour;
— A basic assumption or belief that it is an unsolvable problem;
— A belief that the likelihood of the risk coming to reality is not very high;
— A more general belief that degradation of the fire protection system, including open fire doors, does not pose a sufficiently significant risk to warrant attention.

At this point, however, these speculations on the underlying cultural expressions may in fact turn out to be incorrect. For this reason, the document reviewer only needs to record the observation that event reports indicate repeat problems with open fire doors and efforts to solve the problem through coaching and procedural means have not succeeded. Later in the assessment process, this observation may be combined with other document review observations (e.g. assessment reports) to indicate a broader challenge with regard to procedural adherence.

Looking more broadly, the line organization and specialty functions such as human performance and operating experience at Plant X appear to be working in silos without full integration with in-plant groups such as maintenance and training. In addition, management and supervision do not appear to understand the full intent of the programmes in terms of anticipating and avoiding errors,

or how to implement them effectively. From a safety culture perspective, these findings raise questions about whether the programmes exist more on paper than in practice, and whether the organization believes that operating experience and human performance tools can make a difference, or whether it prefers to rely on technical competence and experience to achieve safe performance.

Document reviews are a fact gathering exercise. Patterns will begin to emerge that form possible findings about cultural expressions. These themes will normally simply remain as themes for eventual comparison with the themes emerging from other methods. However, they may also suggest areas for exploration through other methods such as interviews or focus groups.

Appendix IV

QUESTIONNAIRES

Safety culture questionnaires are an effective method to gain information on broad perceptions in an organization. This information can be used to identify and understand how people experience aspects of the current culture, and also what they believe would potentially contribute to greater effectiveness. However, working with questionnaires is not easy. In order to prepare a valid questionnaire, it is essential to consider the following steps.

IV.1. STEP 1: ENSURE USER FRIENDLINESS

User friendliness of the questionnaire is important to ensure that the information gathered will be relevant and meaningful. The following should be considered when developing or selecting a useful questionnaire:

— Ensure clarity of language and questions;
— Consider translation issues, reading level and clarity of instructions for completion;
— Pilot the questionnaire with a sample of respondents to ensure the questionnaire is understandable and usable over a long time period to support trending;
— Assure confidentiality to avoid exposing individual results;
— Consider the need for both electronic and paper versions to ensure coverage of all respondents.

Some organizations provide an open field for the responder to add comments. However, interpretation of such comments is often difficult and may provide little added value, particularly since better vehicles, such as focus groups, can be used to gather additional information.

IV.2. STEP 2: PREPARE A COMMUNICATION PLAN

A communication strategy is prepared to build organizational understanding and interest. A high response rate is essential to ensure that the data gathered truly represent the views of the organization’s members. The likelihood of a high

response rate can be enhanced by using a communication strategy that helps the organization to see and understand:

— The purpose of the questionnaire;
— Timing;
— Anonymity and confidentiality considerations;
— What will happen with the information in terms of analysis and communication;
— How feedback and questions will be handled;
— Reminders;
— Rewards for completion;
— Management commitment in terms of presence and support.

IV.3. STEP 3: DETERMINE COVERAGE OF THE SURVEY TO MAXIMIZE REPRESENTATION

If possible, it is best to survey the entire population including site staff, corporate staff and contractors, among others. If this is not practical, a random selection is to be made of a minimum of 20%, with adjustments for the size of different departments and job titles, shift, employee category, years of service, education level and location to avoid over or underrepresentation.

Group administration can help to support a high response rate. The logistics to be considered include group settings, use of kiosks or drop boxes, shifts and off-work coverage, as well as ways of maintaining integrity during administration of the survey to avoid group responses and resultant social biases.

IV.4. STEP 4: ADMINISTER THE QUESTIONNAIRE AND PROVIDE SUITABLE FOLLOW-UP REMINDERS

The questionnaire completion process should be monitored to ensure that the infrastructure is working well and that participants can ask for clarification when completing the questionnaire. A means of tracking completion that does not violate anonymity can help to ensure a high response rate within the established timeframe. Typically, a timeframe for completion of 2–3 weeks (or 3–4 weeks if shifts are involved) is reasonable. Follow-up reminders help to encourage a healthy response rate.

IV.5. STEP 5: PERFORM STATISTICAL ANALYSIS OF THE QUESTIONNAIRE RESULTS

Questionnaires provide a significant amount of quantitative data, which can be a rich source of information if analysed impartially using statistical methods. Conversely, the same data can mislead assessors who draw conclusions where no statistical basis exists. Information may also be missed entirely because it is masked by large quantities of data.

A well performed descriptive analysis does not assign unwarranted significance to questionnaire findings in the absence of other information. It avoids the use of averages that can mask effects, and establishes appropriate cut-offs on group size to ensure anonymity. It compares demographic variables to identify subcultures, since subcultures may require different interventions. It identifies low response rates (less than 70%) for individual groups or for the whole organization to avoid conclusions not fully supported by the data.

Reliance on personnel proficient in statistical data analysis using a recognized statistics package can avoid common sources of error, such as:

— Falling into the trap of believing that since the result is numerical, it has more validity than non-numerical methods;
— Treating averages as valid comparisons without considering statistical variances;
— Not recognizing that a small number of respondents means that it is even more important to conduct the correct statistical tests, since differences that may appear to be large may be due to chance alone.

The analysis should provide the results of regression, factor and cluster analyses. Graphs representing responses to each survey question should be provided in addition to graphs grouping responses by patterns in the data. The information the questionnaire analysis at Plant X revealed is in Box 3.

BOX 3. CASE STUDY: QUESTIONNAIRE

A section of the questionnaire aimed at organizational learning asks respondents to rate Question 27 — It is common to share operational knowledge — on a scale from:

— 1 (strongly disagree);
— 2 (disagree);

— 3 (somewhat disagree);
— 4 (neutral);
— 5 (somewhat agree);
— 6 (agree);
— 7 (strongly agree);
— 8 (not applicable).

The responses to this question are shown in Fig. 10 for electrical maintenance, mechanical maintenance and management. The assessor decides to examine raw information rather than normalized (percentage) data out of personal preference.

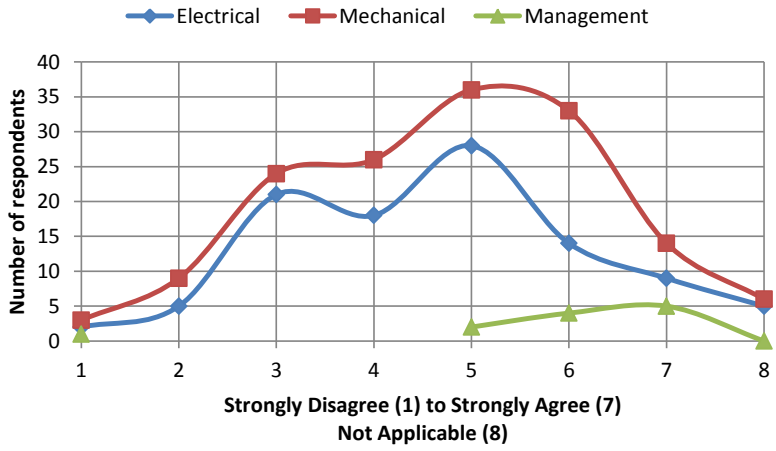

FIG. 10. Electrical, mechanical and management responses to Question 27.

The assessor notices that the weighted averages for the three groups are different, but experience tells the assessor not to attach too much value to cursory observations, since the assessor has jumped to the wrong conclusion before. The assessor wonders whether the small numbers for the management profile are giving a misleading picture. The assessor believes to be able to guess the identity of the lone manager in strong disagreement but, to be cautious, reviews the results of that questionnaire to ensure that the mystery respondent has not misinterpreted the direction of the rating scale. Running a statistical analysis indicates that the results for electrical and mechanical are within two standard deviations of each other, therefore not significant at the 95 percentile level. The management profile, despite the small numbers and the outlier response, is significantly different from the others.

These results suggest that management believe that information sharing is higher than is considered to be the case for mechanical and electrical groups. The analyst wonders whether managers have interpreted the question to mean sharing among themselves rather than sharing across the organization overall, whereas the assessor takes a different interpretation. The assessor supposes that the managers meet more often, have offices close together and therefore have more opportunities to share. Believing that there are many possibilities, the assessor decides to leave it for the rest of the team to interpret based on information from other methods.

The odd shape of the electrical and mechanical curves intrigues the assessor, who shifts attention to demographics and decides to run more analyses. The results for the mechanical maintenance group are shown in Fig. 11.

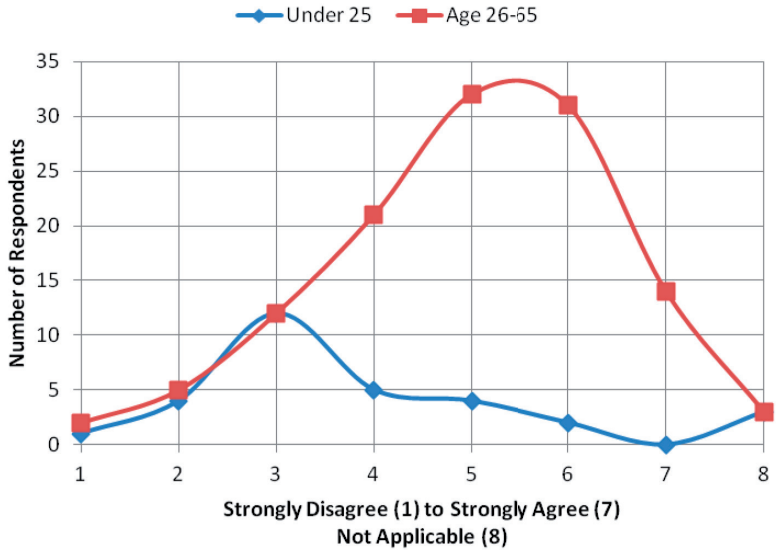

FIG. 11. Demographic distribution for mechanical maintenance.

The data appear to show that the under 25 group holds a dimmer view of the extent of sharing information than older employees.

The analyst has a strong hunch that this is something real, and is pleased when the statistical analysis supports this theory. The difference between the weighted averages are statistically significant at the 95 percentile — one chance in twenty that it might simply be chance. But, the analyst wonders, does the electrical distribution have the same shape? Further analyses reveal the same demographic issue in both electrical and engineering.

Clearly, the older staff are keeping key information to themselves, perhaps for job security reasons. The analyst is about to write this down but hesitates. Perhaps the younger staff are simply lower on the learning curve and are not sure whom to ask or where to find information. Perhaps tribal knowledge is the only way to find things, since the system for electronic work packages is not rigorously followed. The analyst remembers what the team lead said about drawing premature conclusions, and decides to record the observation without adding an opinion. Numerical results from a single question, the analyst knows, are not always what they seem.

On reviewing the results, the assessor also notes that the number of respondents for electrical maintenance was 90%, consistent with most other groups at the plant, compared with 75% for mechanical maintenance. During a coffee break, the assessor asks a team member from mechanical maintenance why this might occur. The mechanic responds with:

> "In the pecking order, engineers think they are smarter than electrical maintenance, who think they are smarter than mechanical maintenance, so we tend to avoid these competitive 'we scored higher than you' surveys. Besides, we have real work to do."

The assessor mulls over the results. Despite the instinct to speculate about causes or ask ad hoc questions of favourite sources to support the theories, the assessor decides to list the known facts for the team to pursue in a more systematic fashion. Among other findings related to learning, the assessor lists the following statistically significant observations arising from the questionnaire:

- The number of responses from the mechanical maintenance group, normalized to group size, was lower than that of all other plant groups.
- The demographic under 25 years of age indicates that key information is not commonly shared. This pattern is evident for electrical maintenance, mechanical maintenance, engineering and safety specialists. In contrast, by a significant margin, management feels that key information is shared.

— The degree to which electrical maintenance, mechanical maintenance and engineering report that key information is shared has a weighted mean that is in the range of 4.7–5.3, indicating that a general consensus among line staff is that key information is not commonly shared.

When comparing results of a questionnaire to what is actually going on, it is common to find discrepancies. For example, assuming that a question related to procedural adherence yields results of 6.7 on a 7 point scale, indicating a high level of perceived compliance. Document reviews may reveal that RCAs repeatedly identify procedural non-compliance among maintenance and operations personnel as a key contributor to events. Focus groups may indicate that procedures are not user friendly or are missing in some cases. From a cultural perspective, these discrepancies may indicate that the organization accepts the risks associated with avoidable errors. It could also indicate the prevalence of an expert culture where the members feel confident that they do not require procedures in hand or peer checks to ensure correct execution.

In order to gain the benefit of administering a questionnaire, the reviewer needs to explore the data with an open mind and ask questions about:

— Commonalities and differences in perspectives across departments or organizational hierarchy levels;
— Subcultures that have significantly different attitudes towards safety;
— Adequacy of key safety factors such as the visibility of leadership, the user friendliness of procedures and the relevance of safety performance indicators;
— Extreme scores, either low or high;
— Implications of responses to questions that indicate what the organization wishes to see more of or less of.

When developing themes, the reviewer should pay attention to the relative safety implications of different questions. For example, a low score on the question ‘My direct supervisor helps my team to adapt to change’ is of less concern than a low score on ‘My department manager corrects degraded safety conditions’ due to the relative safety significance of the two conditions. For a similar reason, results should never be colour coded based on a standard scoring, as this may inadvertently give the same weight to individual questions that have a substantially different safety significance.

Questionnaire results should not be reported in the absence of other corroborating information.

IV.6. IAEA SAFETY CULTURE PERCEPTION QUESTIONNAIRE

The IAEA have developed a safety culture perception questionnaire based on the IAEA safety culture characteristics and attributes in Section 2.2. This questionnaire is available to Member States, and the IAEA can provide comprehensive support in conducting and administering the questionnaire. For more information on the latest version of the questionnaire, contact the Division of Nuclear Installation Safety.

Appendix V

OBSERVATIONS

Cultural observations can generally be divided into two types:

(1) Naturalistic observations, where people are observed in their normal settings and activities without any manipulation or interference by the observers;
(2) Participant observations, where the assessor is, to a greater or lesser extent, immersed in the day to day activities of the people being observed.

The first method observes what can be seen from a passive standpoint, and emphasizes the capacity of the assessor to blend in. The second method is more engaged and therefore more useful for observing and recording behaviour under the widest range of possible settings. By definition, self-assessments are largely participant observations because the individuals are long term residents of the culture. In both cases, the objective is to observe the culture in action and to capture salient cultural expressions. These differ from a third type of observation:

(3) Task observations, where the focus is on noticing the flow and execution of work activities relative to prescribed expectations and standards.

From the perspective of culture, the specific observation of adherence to standards is of less importance than noticing the prevalence of particular behaviours and ways of thinking, levels of rigour or patterns in what is adhered to and what is not. For example, high adherence to personal protective equipment requirements together with many out of date procedures might indicate more personal safety focus than systemic thinking, which has safety implications.

Self-assessments involve organizational members shifting from being ‘members’ engaged in the normal flow of their assigned work activities, to being ‘participant observers’ that are actively noticing what, when, where and why from the perspective of seeing organizational patterns as cultural expressions, and where possible, to be ‘naturalistic observers’ in areas that may otherwise fall outside their normal role.

To become oriented to this different way of seeing the environment, it is important for assessors to become more consciously aware of their own relationship and impact within the organization, including such things as relative differences in gender, age and status, or other distinguishing features that may influence their own and others’ behaviour through direct interaction or simple

presence. Because the observations are more focused on the relational dynamics than on the content of interactions, it is particularly important for the assessors to choose their approach to the interaction. For example, if the assessor is observing a meeting and is asked a question by a meeting participant, the assessor needs to be aware of the impact the response will have and consciously note the intent of the question and the response.

The value of observations is that they do not require an underlying hypothesis that can introduce bias. They provide valid information because they reveal direct evidence of the truth of a given proposition, inference or conclusion. However, as with other methods, the assessor should be cautious of extrapolation and generalization. A self-assessment should involve a large number of observations in different areas and with different people across the organization to ensure the validity of the findings.

(a) Observations are useful for noticing cultural aspects that may be of a sensitive nature and therefore at risk of inauthentic responses. For example, direct questions about the relative degree of respect and credibility accorded to members from different departments could be uncomfortable, but would be readily visible in meetings, and relevant to information sharing and cooperation.

(b) Observations are time consuming because multiple observations are important to determining whether an observed cultural aspect is a pervasive cultural expression. For example, a single observation of distracting conversation in a control room does not warrant a conclusion of insufficient attention, but many different observations of, for example, pranks, loud laughter and food near control panels would suggest a lack of appropriate professionalism.

(c) Observations are more than a simply random watching of what is going on. Direct observation can influence the behaviour of those being observed. This need not be negative in so far as the response reveals aspects of social desirability — what is deemed to be ‘the right response’ and the level of ‘need’ to make a good impression. Repeat observations can counteract this behaviour, as can unobtrusive observations, where individuals are not aware that an observer is present. This may be an effective method for watching and listening to what is happening, but it raises ethical concerns if taken too far. An example of unobtrusive observation is noticing what people leave behind in meeting rooms and classrooms to gain insight into simple things such as the degree of commitment to maintaining cleanliness and order.

(d) Observations are rich in terms of the types of data gathered. This includes:
   (i) Purely descriptive information where the assessor notes what was seen. For example, incidences of fire doors being left open, or personal protective equipment not being worn.
   (ii) Inferential observations whereby the observer makes inferences about underlying dynamics. For example, a security officer makes three maintainers pass through controls again after removing their coats, but allows senior managers to enter without removing theirs.
   (iii) Evaluative observations where the assessor both makes an inference and a judgement about the behaviour. For example, the assessor might wonder whether pre-job briefs are routinely used to decrease the likelihood of foreseeable safety issues. This observation assumes that pre-job briefs are a useful error reduction tool and that participants to pre-job briefs internalize the information provided.

Successful observations depend on proper preparation which typically involves the first two steps of the following sequence.

V.1. STEP 1: TRAIN OBSERVERS

Observers are to be trained in:

— Preparation for the observation (protocols and manners);
— Techniques for conducting the observation (train observers to be balanced in their observations);
— Specific cultural aspects to observe;
— Note taking and photographs (be aware of note taking that could be distracting);
— When and how to intervene and report (condition reporting protocols and expectations);
— How to interact and provide feedback.

V.2. STEP 2: SELECT SITUATIONS FOR OBSERVATION

A spectrum of situations for observation is to be selected, such as:

— Meetings: Management, operations, maintenance, planning, operating experience and incident reviews, outage, plant contractor, safety, corporate oversight, decision making and system performance;
— Field activities: Pre- and post-job briefs, shift turnovers, field tasks, operator routines, control room practices and system walkdowns;
— Other: Training, housekeeping and material condition, and informal situations such as breaks, lunches and celebrations.

Assessors should select times for observations that cover different shifts, weekends, nights and shift changes, and determine whether to observe entire meetings or only parts. Steps should be taken to minimize distractions to ongoing work by following plant protocols as well as limiting the number of observers — ideally no more than two. It is also helpful for observers to have a working understanding of the activity being observed. The observation plan should include management as well as employees (e.g. accompany managers on their routine plant observations).

V.3. STEP 3: PERFORM THE OBSERVATIONS

The observations are to be performed and as much information as possible is to be captured using the following:

— Follow the protocol for telling people why the assessor is there and what the assessor will be doing as an observer;
— Observe the general atmosphere and relations between people;
— Observe the use of procedures and other relevant documentation;
— Observe whether the activities are fluid or complex;
— Observe the spatial organization and layout;
— Do not interfere with the team or the work process while they are performing tasks;
— Record observations;
— Provide feedback post-observation only if requested, ensuring that it is balanced and descriptive rather than evaluative;

— Use an interactive process between the observer and participants to promote reflection and learning;
— When making observations, it is very easy to fall into evaluative judgement based on personal beliefs, and preferences.

The following is an example of the progression from a descriptive to a normative analysis.

V.3.1. Observation: A manager dismisses a safety concern in a group meeting

Many observers would simply judge this behaviour as negative. However, this limits further exploration and should be avoided. Table 1 shows how to explore the observed behaviour from both descriptive and normative perspectives.

TABLE 1. USING EXPLORATORY QUESTIONS

Issue	Exploratory questions
Descriptive stage	
Individual	Why is this happening? How is this person using power? What is in the situation that has prompted this? Is this accepted, ignored or discouraged in the room? What is the impact on the atmosphere in the room?
Pattern	Is this a single incident or a recurring pattern? Are other information sources identifying the same behavioural pattern? Is this a cultural norm for people in positions of power?
Impact	Is there evidence that this behaviour pattern is influencing actions or decisions? What other information might verify the impact?

TABLE 1. USING EXPLORATORY QUESTIONS (cont.)

Issue	Exploratory questions
Evaluative (normative) stage	
Comparison with norms	What is the implication or impact of this pattern in the organization? Does it inhibit openness, questioning, exploration or other desired behaviour? Does it violate personal values, such as respect? Does it have the potential to increase risk or undermine good safety practices?
IAEA framework	Is this norm consistent with the IAEA framework?

The purpose of this approach is to explore what the information reveals about the culture without making evaluative judgements in the data gathering stage:

— What behaviour is prevalent?
— How prevalent is it?
— What are the implications of the behaviour on safety or on other organizational patterns such as communication?
— What appears to drive the behaviour (extrinsically)?
— What is the reasoning (sense making and response formulating) behind the behaviour (intrinsically)?
— How does social space mediate the expression of behaviour?

When documenting observations, assessors should include descriptive as well as inferential data, describe the setting and nature of the interactions in detail and notice things that might have influenced behaviour, such as the presence of supervision or the observers themselves.

The following subsections provide prompts for performing task and cultural observations. Combined, these two methods can provide well rounded observation data that capture information at the artefact level as well as more deeply at the espoused values and meaning levels, and note that an open-minded explorative approach will ensure a high quality assessment. Individual teams should develop questions appropriate to the specific circumstance.

V.3.2. Questions and prompts for task observations

Table 2 provides examples of points to consider during task observations. The purpose is to help the observer to identify safety culture indicators.

Behaviour or conditions observed do not, on their own, enable conclusions to be made on safety culture strengths and potential areas for improvement. The observer should discuss observations with those involved in the task following task completion (where possible) to explore underlying issues. The information from task observations should be used with other sources (e.g. outputs from interviews, focus groups and questionnaires) to develop overall conclusions.

TABLE 2. QUESTIONS AND PROMPTS FOR OBSERVERS

Questions and prompts for task observations
Are there prominent hazard signs and communications in the work area (e.g. posters reinforcing behavioural expectations)?
Are there adequate staffing and resources allocated for the task (including supervision, specialist support such as radiation protection advisors)?
Do supervisors clearly communicate the safety significance of the task (emphasizing nuclear and radiological safety)?
Do those involved in the task question and, if necessary, consult supervisors or request other experts when unsure?
Are any assumptions about conditions, risks or other aspects of the task questioned and confirmed?
If conditions change during the task, is there a thorough review of potential impacts on safety?
Are the safety requirements well documented and traceable?
Are the roles and responsibilities clearly defined in the procedures and in practice?
Do those involved in the task follow the procedures and behavioural expectations (e.g. self-checking)?
Are any problems encountered during task performance included in a condition report and shared with the supervisor?
Is there evidence of peer to peer challenge and checking at appropriate stages of the work?
Are records, sheets and survey reports completed as appropriate?
Is there an appropriate level of supervision and management presence for the safety significance of the task?

TABLE 2. QUESTIONS AND PROMPTS FOR OBSERVERS (cont.)

Questions and prompts for task observations
Do supervisors and managers observe and challenge any deviations from procedures or performance standards? Do they use a coaching or telling style?
Do supervisors and managers encourage challenge and questioning before and during the task?
Are any issues and concerns raised before or during the task? Do supervisors respond in a positive way and take appropriate action?
Is there evidence of ownership for safety (e.g. individuals taking care of their own safety and that of others during the task, paying attention to foreign material exclusion and housekeeping standards)?
Is there evidence that the work has been planned in sufficient detail (e.g. an absence of significant delays due to unavailability of parts or people)?
Is the task documented at an appropriate level for its safety significance and users?
Are the procedures up to date, verified and validated?
Are the procedures easy to use?
Are there any aspects of the task or work environment that make it difficult to perform (consideration of accessibility, adequacy of controls and indications, availability of tools, parts, time pressure and protective equipment)?
Is adherence to safety rules and requirements evident (e.g. foreign material exclusion and radiation protection)?
Have risks and controls for all types of safety been adequately addressed as part of the work planning process (nuclear, radiological protection, industrial and environmental)?
Was a pre-job brief carried out? Did it include the following: — Any relevant operating experience feedback (internal and external)? — Potential impact on nuclear safety? — What could go wrong, barriers and contingency plans? — Does the person carrying out the briefing actively invite questioning and challenges? — Are people actively involved in the pre-job briefing by, for example, asking questions and confirming requirements? — Did the supervisor check when the task was last performed? — Did the supervisor verify comprehension of the full requirements of the task? — Was a post-job brief carried out (for significant tasks)? Did it cover what went well and learning points to an appropriate level of detail? Were these recorded?

TABLE 2. QUESTIONS AND PROMPTS FOR OBSERVERS (cont.)

Questions and prompts for task observations
— Were any deviations, adverse conditions or errors identified during the task openly discussed, reported and appropriately acted upon?
— Was positive safety performance recognized and praised?

V.3.3. Recording task observations

Table 3 is an example of how to record observations, along with any potential underlying factors. Where possible, an open discussion should be held with people involved in the task following its completion to explore underlying cultural issues. Any significant or immediate safety concerns or issues should be addressed through the plant condition reporting or other established process.

TABLE 3. RECORD OF OBSERVATION

Observation	Notes and possible underlying cause (if identified)

V.3.4. Sample questions following task observations

The following are some example questions that can be asked of the person observed at the end of the task observation, where practicable.

— Was the procedure clear to you? Did you understand the purpose and details?
— How many times have you carried out this task? When was the last time?
— What were the risks associated with this task (industrial, radiological and nuclear safety)?

— What is the worst thing that could have gone wrong (from a nuclear or radiological safety perspective)?
— What actions would you have taken if this happened?
— Does the task need special considerations (e.g. qualifications, staff levels, barriers, confined spaces, tight spaces, different teams working on special shutdown systems to avoid common error, and work in a radiological area)?
— Are there any barriers to carrying out the task safely and reliably (e.g. defects, time pressure, equipment design and access)?
— Do managers visit the site regularly? What do they do when they visit?
— Have any improvements been made to, for example, the task, equipment or procedures, based on feedback from you or other sources?
— Do you have any suggestions to improve the way this or similar tasks are carried out?

V.3.5. Observations of meetings

Table 4 provides reminders of points to consider when performing meeting observations. The purpose is to help the observer to identify safety culture indicators. Observations relating to behaviour or conditions may be recorded using Table 3. Behaviour or conditions observed do not, on their own, enable conclusions to be made on safety culture strengths and potential areas for improvement. The observer should discuss observations with those involved in the meeting following task completion (where possible) to explore underlying issues.

TABLE 4. OBSERVATIONS OF MEETINGS

Questions and prompts for meeting observers
Do managers and meeting chairs refer to nuclear safety standards and expectations during the meeting?
Are nuclear and radiological safety issues and implications thoroughly explored?
Do those involved in the meeting question and if necessary, consult or request other expertise when unsure?
Are any assumptions about conditions, risks or other aspects questioned and confirmed?
Are conflicts openly discussed (e.g. potential to compromise quality and safety due to schedule pressures)?
Are independent reviewers and experts involved as appropriate? Do they put in good challenges? Are the views of experts listened to?

TABLE 4. OBSERVATIONS OF MEETINGS (cont.)

Questions and prompts for meeting observers
Is there evidence of ownership for safety, for example people involved in the meeting suggest solutions and offer to take on actions?
Is there an appropriate level of delegation evident during the meeting?
Do managers present have the authority to make decisions on the issue?
Is there evidence of constructive challenge and questioning (e.g. peer to peer and employees to managers)?
Are clear decisions made and responsibilities assigned for any follow-up/actions?
Is relevant learning (internal, external, nuclear and other industries) discussed and actively used during the discussions?
Are different possible solutions thoroughly explored (rather than a simple reliance on past approaches)?
Do managers and meeting chairs encourage challenge and questioning, respect others and listen to those present?
Do managers consistently emphasize the importance of quality and completeness, or do schedule and cost considerations dominate the discussion? Are they willing to change schedules or resources to ensure that issues are thoroughly investigated and addressed?
Are any issues and concerns raised? Do managers and meeting chairs respond in a positive way and take appropriate action?
Are people's contributions recognized and praised?
Do managers question assumptions and data (e.g. key performance indicators which present a 'good news' picture) as appropriate?
Do people express their views and interact with each other openly?
Are people with the right expertise present (including human and organizational factors, and operations and maintenance staff)?
Is a teamwork approach evident?
Is there any evidence of explaining away issues or tolerance of long standing problems?
Is there evidence of driving continuous improvement by managers and all involved in the meeting (e.g. discussion of good practices and what could be done better, exceeding rather than doing the minimum to meet regulatory requirements and expectations)?
Are decisions made to report issues up the line or consult other stakeholders as appropriate?

V.3.6. Questions and prompts for cultural observations

In addition to being task performers and decision makers who are meeting their requirements in exchange for remuneration, personnel are individuals who are fulfilling personal needs for identity, social validation, self-expression and autonomy. Significant drivers of the culture of an organization are unrelated to the demands of the work and are relatively hidden within the behaviour and interactions of people. Observations provide a window on the world views and motivations of organizational members, including socially constructed realities. Different observation points can provide insight into the underpinnings of the culture:

(a) Body language is a form of non-verbal communication which consists of body posture, gestures, facial expressions and eye movements that are conveyed and interpreted continuously at a subconscious level. It can provide clues to the attitude or state of mind of a person. For example, it may indicate aggression, attentiveness, boredom, relaxation, pleasure, amusement, relief and shame, among many other states. Physical expressions reveal many things about the individuals being observed. For example, gestures can emphasize a point or relay a message, posture can reveal boredom or interest, and touch can convey encouragement or caution. From a cultural perspective, noticing prevalent patterns and gaining an understanding of their meaning in terms of who engages with whom, how and with what intent can increase comprehension of how messages are conveyed and understood.

(b) Constellations are patterns of positioning that provide insight into where people experience themselves relative to others. For example, the recurring unmarked seating arrangement of participants in a plant meeting can indicate who has power and influence within the informal network, thereby shaping expectations and opinions, and influencing outcomes. It may also provide insight into whether the leadership is sensitive to such unconscious patterns and actively chooses to engage participants and balance conversations to ensure that latent power dynamics do not undermine the quality of discussion.

(c) Interaction mapping provides a view on how information and support flow between parties. Noting the prevalence of speakers and the types of contribution they make increases understanding of how particular cultural expressions come about. For example, a typically quiet team member is observed to synthesize the group's discussion and ask an exploratory question. Others may ignore or dismiss the question, and move on. Observed in different settings, this can indicate a discomfort with the

individual, or with the nature of the concerns raised, or even with systems thinking itself, a lack of which is a recognized contributor to organizational ineffectiveness.

(d) Personal space reveals the sense of inclusion, interdependence and trust within a culture, as well as the extent to which autonomy is understood and valued as a necessary aspect of a healthy interaction. Observing how people manage entry into their own personal space or enter somebody's personal space is indicative of the perceived relationship between the people. There is an intimate zone reserved for lovers, children and close family members. There is another zone used for conversations with friends and chats with associates. In group discussions, a further zone is reserved for strangers, newly formed groups and new acquaintances. A fourth zone is used for speeches, lectures and the theatre — essentially, public distance.

(e) Visibility refers to the degree to which individuals try to capture the attention of others. The characteristics of these individuals, what differentiates them, whether people consult them or they approach others, whether they appear to be treated as strangers or as well known, all these factors provide clues to what the organizational culture values and respects as well as what it dismisses or denies. These dimensions of 'conferred leadership' are useful in discerning the primary opinion and self-image drivers, which in turn have implications for what contributes to, and detracts from, safety behaviour. It can also provide insight into the informal network that drives the functioning of the organization.

(f) Interaction zones refer to patterns of human traffic that indicate desirable places and activities. Meetings, plant areas or preferred information sources provide insight into what kinds of concerns may prevail, how strongly expert power and access to information are controlled and influence the decision making, or even what kinds of cross-pollination of ideas are socially sustained and promoted compared to the other means of understanding reality which may be minimized or excluded. For example, inclusion or exclusion of support functions such as training, human resources or communications from key plant meetings will indicate the relative importance given to these factors in ensuring safe and reliable operations.

Participant observations may be done individually, in pairs, or even in a team where multiple observers disperse to witness a particular aspect of a culture. For example, multiple observers might witness how a planned drill is handled in various areas of the plant. Once the members have documented their findings, the team would regroup and compare notes to construct a more complete picture of how the organization managed itself.

Another useful observation is to see how members of the organization receive updates on the progress and interim findings of the self-assessment. For example, feedback on the self-assessment team's activities may be handled in a manner that is consistent with other experiences or with how other updates are handled. Conversely, the review team may experience awkward dynamics, which may indicate that the organization is not sufficiently mature to welcome feedback as an improvement method, thereby indicating opportunities for improvement in its learning culture. It could also raise a warning flag in terms of the commitment of the organization's leadership to making improvements once the results become known.

A concern in conducting observations, as with other methodologies, is confidentiality. This is particularly true where the decision is made to use unobtrusive observations, as these can raise ethical concerns. For that matter, conclusions derived from observations and interactions that are known to the participants can result in resistance to the findings, since people are frequently not collectively aware of their patterns, and will resist interpretations that indicate a negative aspect to their preferred way of interacting. For example, a tightly knit group where members primarily work and socialize with one another and maintain clear boundaries in terms of information exchanges with other groups may feel pride at their cohesion and may reject a concern that isolation increases the risk of miscommunication or effective process integration across organizational units.

The most important behavioural principle in observations is to be discreet in order to minimize disruption to the natural flow of activity. This can be achieved by dressing similar to the group, arriving and departing with the group, harmonizing behaviour (e.g. not dominating the conversation) and selecting a position that is visible, but not central, to people's lines of sight. It is also helpful to prepare a simple statement of the purpose for being present so that awkwardness in replying does not create unease.

V.3.6.1. Recording cultural observations

Documentation of cultural observations should be done as soon after the observation as possible and include:

— An account of the events;
— How people behaved and reacted;
— What was said in conversation;
— Where people were positioned in relation to one another;
— Their comings and goings;
— Physical gestures;

— The observer's subjective responses to what was observed;
— Other details to make the observation complete.

In some circumstances, simple sketches of the observation site can help to retain clarity of the cultural expression observed. Each observation should include the date, time, place and type of data collection. In addition, it is useful:

— To leave space on the note-taking page to allow fill-in once the formal observation is over;
— To take notes strategically — for example, capturing key words that serve as quotes and prompts to more extensive notation later on;
— To use shorthand or abbreviations to avoid distraction from observation through note-taking;
— To document a range of observations — events, emotions, gestures and interactions — concurrently to keep the flavour of the observation intact (see Box 4). Writing a narrative of what happened may be useful if notes were abbreviated and there is a risk of forgetting their significance.

BOX 4. CASE STUDY: OBSERVATIONS

During an observation of a training session, the assessor notices that the plant manager opens the session with a story emphasizing the importance a fall arrest harness played in a recent near miss at the plant. When asked by a contractor about the general availability of the harnesses, the plant manager immediately asks whether the individual has any concerns about availability. Later in the session, a supervisor remarks that "things would work a lot better around here if somebody cleaned up the purchasing process, so materials could be replaced when needed." Several participants nod their heads in agreement. The plant manager asks for specific examples to discuss with the head of procurement.

In a walk-about, the plant communications officer is observed speaking with several people. The first person touches the communications officer on the arm and offers congratulations on the retirement festivities that the communications officer had organized the previous evening and said "too bad the person does not deserve it". They both laugh. Passing through the cafeteria, the communications officer stops to speak to two employees and inquires about the status of an annual charity fundraising event. One employee comments: "Things are off to a slow start. Maybe you can get our new boss to kick in some big money." Passing into the controlled zone, the communications officer points at signs and tags on a nearby fire door and comments in a frustrated tone: "Look at these signs. There are six and you cannot read half of them. Why do they not ask for my advice? I could help them."

The lunchroom is filled with cafeteria style tables crowded with staff from many different areas of the plant. Younger and older employees sit at the same tables near the window. The production manager walks in and heads turn. Three operations staff in white shirts quickly close their lunchboxes and head towards the exit. Four people remaining at the table chuckle and avert their gaze. A union representative walks in and three employees share a high five from across the lunchroom. The production manager stops to speak to two engineers. They listen very attentively and nod their heads repeatedly. The only comment they make before the production manager moves on appears to be "thank you".

During a meeting to discuss whether to shut the unit down owing to problems with a transformer, the plant manager actively solicits each participant's views and concerns, and summarizes the issues and thoughts expressed by all parties. After a decision is taken, the plant manager asks each person around the table, "How do you feel about this decision?"

These observations give some interesting clues on the culture at the Plant X. For example, from a cultural perspective, the plant manager invited a high degree of participation and accountability, and also demonstrated inclusive leadership that respects and values each person's contribution. These actions demonstrated openness within the culture, and encouraged thinking and engagement while also minimizing fear. The plant manager actively used the group's silent knowledge, and intuition (gut feeling), by inquiring into everyone's sense of confidence in the course of action. The production manager in contrast, elicited more caution from the production staff as well as the engineering staff. Union loyalties and

perceived stratification in the workforce appear evident. Contractors are included in training sessions and expected to adhere to the same safety standards. Support functions such as communications may not be well integrated with plant functions.

From a safety culture perspective, clear differences exist in how the members of the management team present themselves to gain respect and followership. The dynamics between the members of the management team is representing a part of the the culture.

In order to get the most from observations, it is important to be alert to the power dynamics of who dominates the thinking and discussion in the room, who is silent and who is noticeably disengaged. How rooms, offices and workspaces are organized and equipped, how people organize themselves during meals and coffee breaks, and what the responses are to interruptions, time delays, announcements, displays of emotion and contrary views can all provide indications of who is in control and the nature and impact of power in the organization.

Patterns of interaction such as use of words, tone, pacing, volume and non-verbal signals can further elucidate the social dynamics of the organization. Similarly, the scope of issues considered in the exploration of a topic, such as technical aspects, procedural, human and organizational factors, and how decisions are made or avoided, can provide insight into prevalent cultural preferences and potential safety implications.

Appendix VI

FOCUS GROUPS

Focus groups are one of several qualitative methods for learning about the culture of an organization. They consist of in-depth discussion and dialogue between a small number of people under the guidance of one or two facilitators. For the purpose of a safety culture assessment, 8–12 people is constructive. Focus groups provide insight into people's perceptions of how the organization functions. Since focus groups are interactive and consist of free flowing conversation, they can reveal information that is not apparent through more structured methods. Focus groups also provide an opportunity to observe the culture in action, such as the relational aspects of social dynamics, the interpersonal behaviour that are considered acceptable, the diversity of feelings about an issue, and the impact of positional power on self-expression.

Focus groups are useful for exploring and observing the social dynamics and sense making within a group, and as a means of answering qualitative questions, such as 'why' rather than 'how many' hold a particular view. Focus groups can be used as a preliminary step to refine areas for further exploration through such methods as interviews, or as a follow-up to a questionnaire to expand understanding of the findings.

Focus groups arguably provide more surprises and insights than other methods because participants are allowed to speak freely within the confines of group norms. Participants may, for example, raise a topic or respond in a way that is unexpected but relevant, thereby opening a new line of inquiry. Safety culture assessors need to listen for the content of the group's discussion, as well as the emotions, ironies, contradictions and tensions. This enables the assessor to learn about 'the facts', as well as the meaning behind behaviour (i.e. how a group paints a portrait of combined perspectives). Patterns of participation, dominance, inhibition or passivity also provide insight into the mechanisms by which the culture controls individual behaviour and what views determine safety.

The aim of focus group facilitators is to produce good conversation on a given topic. Good conversation typically ebbs and flows. Individuals laugh, tell personal stories, revisit earlier questions, disagree, contradict themselves and interrupt one another. The role of the facilitator is to balance the need to allow the participants to interact naturally with the intent to keep the focus group reasonably on topic. To aid this natural flow, questions typically move from general to more specific, and are phrased in a way that invites openness and avoids bias. Interaction between participants highlights their view of the world, the language they use about an issue, and their values and beliefs about a situation. Interaction

also enables participants to ask each other questions, as well as to re-evaluate and reconsider their own understanding of their specific experiences.

Successful focus groups produce reflective conversations that are often self-revealing, private or deeply felt. It is essential that the facilitator ensures a reasonable degree of emotional safety. Avoidance of conflict is a common need. The degree of conflict avoidance can, however, be an indicator of whether the culture permits individuals to question, raise concerns or openly disagree. This can have safety implications.

Facilitators also need to be vigilant in observing what is not said. The silence can itself provide clues. For example, discussion within a focus group might recognize the roles that technical staff fill in achieving safety but omit reference to administrative, janitorial or other 'invisible' workers that also contribute to safe practices. This silence provides insight into the networks among participants, and who and what they perceive as important to safety. Humour is similarly important to monitor because it indicate which topics are uncomfortable or avoided entirely by the group.

Focus groups help to elicit information in a manner that allows facilitators to see why an issue or topic is relevant, and what is important about it. As a result, the gap between what people may say and what they may do can be better understood. Facilitators should take special note of where participants prefer to focus their conversation and where they ignore or quickly drop a topic. These are often pointers to how the culture reassures itself in the face of uncertainty, uncomfortable facts or hidden power dynamics, and hence can pose a risk to safety.

A comfortable, informal setting for focus groups can decrease the likelihood of participants responding in ways that are designed to present a positive image or please the facilitators. However, there are still reasons why inauthentic behaviour may occur. Individuals are speaking within a specific contextual setting and environment, and may not express their own definitive view for a variety of reasons:

(a) Participants may not understand why they are doing the things they are doing, and therefore cannot provide answers and explanations to questions. Their motivations and social conventions are partially or completely unconscious.
(b) Participants are attuned to their reasons and feelings, but cannot express them because they do not have the language to make themselves clear.
(c) Participants feel a need to preserve their view of themselves, and discomfort with the gap between what is true for them and how they want to appear in the eyes of others keeps them quiet.
(d) People are frequently uncomfortable reflecting on themselves.

(e) Participants often unconsciously censor their ideas and behaviour in the presence of people who differ greatly from them in power, status, job, income, education and personal characteristics.

This last point is not necessarily problematic, since these dynamics are a real manifestation of the power and social dynamics in the organization and are therefore instructive for their impact on aspects such as open information flows and cooperation.

The preparation for conducting focus groups is important, and is described in the following steps.

VI.1. STEP 1: PROVIDE SAFETY CULTURE ORIENTATION

The organization should consider providing safety culture orientation sessions in advance of focus groups to ground personnel and encourage thinking.

VI.2. STEP 2: IDENTIFY THE PURPOSE OF THE FOCUS GROUP

The purpose of the focus groups should be considered. Narrowly structured focus groups can capture very specific feedback; open focus groups can serve as group interviews or support group learning.

(a) Use examples of structured topics:
  (i) A case study based on actual events, experience or fictional situation;
  (ii) A topic or theme selected from the current self-assessment;
  (iii) A topic or theme selected from outputs of other assessments.
(b) Use a cartoon, film clip or story to initiate the discussion.
(c) Use brainstorming to engage participants in identifying topic areas to start the discussion.
(d) Invite the group to describe the three things they would change if they had three ‘wishes’.
(e) Invite the group to describe the desired future state of the safety culture using appreciative inquiry.

VI.3. STEP 3: DEVELOP A FOCUS GROUP PLAN

Several focus groups are typically needed to gather a breadth of cultural expressions and to demonstrate sufficient engagement with the organization.

These groups should consist of representatives from different parts of the organization to provide insight into the dynamics across organizational boundaries. The following describes three example focus group plans.

VI.3.1. Focus group 1: Safety work in practice

This first focus group consists of leaders from across the organization and the draft questions include overview dimensions that one would expect to be of concern for these individuals.

(a) Participants (leadership level):
  (i) Plant manager;
  (ii) Maintenance manager;
  (iii) Operational manager;
  (iv) Plant modifications manager (engineering/technical department);
  (v) Work management coordinator;
  (vi) Maintenance supervisor (mechanical);
  (vii) Radiation protection or conventional safety representative;
  (viii) Shift supervisor.

(b) Sample questions:
  (i) Describe the safety work in your area.
  (ii) Which programmes do you have in place in your area to ensure safety?
  (iii) If we asked ten employees in your area, how would they describe the safety culture?
  (iv) Can you give an example of how you handled an event at the plant? What did you learn?
  (v) Could you give an example of proactive safety work?
  (vi) Which stories are circulating that reflect safety attitudes at the plant?
  (vii) What does leadership for safety mean to you?
  (viii) What is the best way to influence employee behaviour?
  (ix) Which areas require the greatest effort to ensure safety?
  (x) What is the most frequent concern raised by your employees regarding safety?
  (xi) How do you solve cross-functional and larger organizational issues?
  (xii) How do you handle violations of good safety practices? Can you give examples?
  (xiii) What is the biggest concern that keeps you awake at night?

VI.3.2. Focus group 2: Safety work in practice

This second focus group consists of frontline personnel from across the organization, and the draft questions are intended to open up discussion on the impact of leadership and power dynamics.

(a) Participants (frontline staff level):
  (i) Maintainer — mechanical;
  (ii) Maintainer — electrical;
  (iii) Radiation protection representative;
  (iv) Maintenance trainer;
  (v) Reactor — fuel loading;
  (vi) Fuel configuration — engineering;
  (vii) Safety reviewer — safety department;
  (viii) Human performance;
  (ix) Field operator — operations.

(b) Sample questions:
  (i) Explain what safety work looks like in your area?
  (ii) Which programmes are in place in your work area to ensure safety?
  (iii) Can you give an example of how an event at the plant was handled? What did you learn?
  (iv) What is your view of the procedures you have to use in your day to day work?
  (v) Can you give an example of proactive safety work?
  (vi) Can you give an example of a good or bad leadership practice that you have experienced during your time at the plant?
  (vii) What is the best way to strengthen safety behaviour?
  (viii) What recommendations would you make for improving safety leadership at the plant?
  (ix) What does good safety culture look like?
  (x) If you were in charge for a day, which three things would you do to improve safety at the plant?

VI.3.3. Focus group 3: Safety work in practice

This third focus group consists of a mixture of frontline personnel and leaders and the intent is to gain an appreciation of how the different levels engage around the given topic.

(a) Participants (management and frontline staff level):
  (i) Manager (support function);

(ii) Manager (operating plant);
(iii) Manager or supervisor (radiological protection);
(iv) Supervisor (planning, maintenance);
(v) Engineer;
(vi) Maintainer;
(vii) Radiological or industrial safety officer;
(viii) Trainer.

(b) Sample questions:
(i) Explain what safety looks like in your area.
(ii) Describe what the perfect nuclear employee is like.
(iii) How do relationships influence safety here?
(iv) How does communication work in your department?
(v) What does good safety leadership look like?
(vi) Can you give an example of how an event at the plant was handled? What did you learn about our safety culture?
(vii) What is the best way to strengthen safety behaviour every day?
(viii) What is motivating for people here?
(ix) How has your organization changed over time?
(x) What do you think we should do to improve safety culture?
(xi) Which three things would you like to see that would improve safety?

An additional focus group may also be desirable for exploring leadership responses to findings arising out of the self-assessment. In this case, key observations from the assessment findings would be formulated as questions and posed for discussion. For example, a question based on multiple findings indicating that the organization demonstrates insufficient formalization might be: "What do you think the reasons might be for why the organization struggles to complete plans and projects in a timely way?" Follow-up questions could then explore such topics as: integration challenges, management system design, organizational structure, management and leadership practices, employee knowledge and understanding of what is expected of them.

VI.4. STEP 4: TRAIN FOCUS GROUP FACILITATORS

The focus group facilitators are to be trained in their primary functions, which are:

(a) To develop the focus group questions;
(b) To welcome and orient the participants to the process;
(c) To introduce questions to guide the flow of group conversation;

(d) To capture what is said as well as observed, with minimal disruption to the flow of interaction in the room.

These activities require the facilitators to be individuals who are comfortable in group settings and who readily establish ease and a sense of inclusion with others, while receding in importance as the participants become engaged with one another. It is essential to train facilitators on a range of facilitation methods and techniques to engage participants, handle different interpersonal situations and dynamics, and capture useful information.

VI.5. STEP 5: DETERMINE THE LOGISTICS

The timing and logistics of the focus groups are to be planned and the necessary arrangements are to be made:

(a) Set up the space to encourage conversation (e.g. chairs for all participants, including the facilitator in an open circle rather than classroom or table style, and with the note taker sitting to the side or behind the group).
(b) Plan how to capture information through note taking, flip charting or more creative methods such as pictorial representations or stories.
(c) Ensure role clarity for facilitators — facilitators should be as neutral as possible and be prepared to state their role in terms of how they will present themselves and how they will treat any management participants as equal to others in the group.
(d) Schedule sufficient time:
    (i) The duration depends on the number of the participants and the purpose and approach of the focus group;
    (ii) More time is needed for a creative or open exploratory process (half a day);
    (iii) Less time is required for a more structured approach (two hours).
(e) Issue an invitation notice to advise participants that their support is needed as part of a self-assessment on safety culture:
    (i) Provide a brief summary of the focus group approach;
    (ii) Do not provide information on the focus group topic in advance, since it may inhibit creativity during the session by having participants lock in their views prior to the session.
(f) Prepare a brief explanation of the approach to the focus group (e.g. focus groups are a way to gather thoughts and information from a group of people about a particular topic) and an introduction to orient participants to the process and topic.

VI.6. STEP 6: CONVENE THE FOCUS GROUP

A manner to convene the focus group and to initiate the session with a simple introduction is described in the following.

(a) Welcome the group and have each person give their name, where they work and how long they have been at the organization;
(b) Ask people to switch phones to vibrate;
(c) Explain that the session is confidential, and that notes will be taken, but nothing will be attributed to specific individuals;
(d) Explain that the purpose of the focus group is to capture cultural aspects of safety in terms of how safety is conducted in the organization;
(e) Explain the process for the session;
(f) Pose questions and encourage the free flow of dialogue within the group (the facilitator will pose a new question when appropriate to redirect the conversation).
(g) Specify the duration of the focus group session (normally two hours);
(h) Reassure participants that there are no right or wrong answers to the questions, and that it is not a test of their knowledge;
(i) Explain that there will be an opportunity to ask questions during and at the end of the session and also to provide feedback on the experience;
(j) Remind participants that the report will discuss collective issues, not individual responses.

VI.7. STEP 7: CONDUCT THE FOCUS GROUP

During the session, participants are to be encouraged to speak to each other rather than to the facilitators. The focus is to be on observing and capturing the proceedings with the minimum of interference.

(a) Understand that social status outside the room will translate into the perceived power and credibility of participants, and note informal leadership roles.
(b) Use reflection and silent spaces to encourage participants to reveal more.
(c) Do not be afraid of silence — hold the space open for diversity of perspectives and answers.
(d) Have people jot their thoughts down before starting each round of discussion to avoid parroting or building on the first speaker. This also helps people who are hesitant to speak in groups or who are concerned that they might forget their points by the time their turn comes.

(e) Explore any differences or inconsistencies in reasoning, understanding and relationships. How pervasive are they?
(f) Explore connections that go beyond general comments or observations, and explore at a deeper level why participants behave and feel the way they do (use the multiple 'why' approach).
(g) Use active listening methods such as paraphrasing and reframing to confirm understanding if needed.
(h) Remain conscious of facilitator or analyser interpretation bias throughout (pre-existing perspectives).

The greatest challenge for internal facilitators is observing what is happening as opposed to becoming fully immersed in the reminiscing and sense making, among other things, that is a normal behaviour in a familiar group. By consciously focusing on what is said in order to capture it as close to verbatim as possible, and noting interaction patterns, sudden shifts in direction and emotion, the facilitator can retain a degree of objectivity. If two facilitators are involved, it is helpful to agree in advance on who will open the session and how guidance of the group will be shared. Rapport and coordination between the facilitators is important to minimizing their distraction for the group.

When a focus group discussion is inauthentic or stays at a superficial level, it is acceptable to reflect this observation back to the group in an effort to deepen conversation. For example, the facilitator might say: "I cannot help but I notice that you paint a very rosy picture of things. Is this reality?" It is also important for the facilitators to listen for when the group has exhausted a topic. When the conversation begins to cycle or the discussion deviates to irrelevant side topics, it is appropriate to introduce a new question, taking care to select a question that fits easily into the natural flow of the conversation.

VI.8. STEP 8: RECORD THE INFORMATION

Effective note taking is critical to capturing the rich information made available through the focus group methodology. Notes and quick diagrams are:

(a) To capture the discussion verbatim as much as possible;
(b) To document personal and interpersonal behaviour such as who speaks, who is silent, who frames the discussion, language, facial expressions, emotional tone and other non-verbal communication;
(c) To capture the nature of interactions, key points, anecdotes, stories, scope of discussion and specific outputs or ideas;

(d) To capture recurring phrases, images, concerns, nature of improvement messages and emotional tone;
(e) To describe the prevalent conduct in the room and what this implies regarding hierarchy, cross departmental relationships, status or other 'group' distinctions;
(f) To capture proficiency levels, behavioural patterns, ways of reasoning, communication styles and approaches to decision making;
(g) To note areas or topics that were uncomfortable, hidden, dismissed, disapproved of, forbidden and censored, or appreciated, valued and praised;
(h) To note whether dominance by a participant has biased the data or group perceptions.

VI.9. STEP 9: CONCLUDE THE FOCUS GROUP

When the focus group is brought to a close, at least 15 minutes at the end of the session should be allowed to open the floor to questions and comments from the participants.

(a) Remind participants that this is not an observation of them as individuals and that no identifiable information will be used;
(b) Remind participants to honour the confidentiality agreement;
(c) Encourage each participant to comment on the experience, and consider the use of a simple rating scale to have participants rate the experience;
(d) Share constructive factual observations;
(e) Tell them what will happen to the information;
(f) Thank participants.

VI.10. STEP 10: TRANSCRIBE THE FOCUS GROUP NOTES

After the focus group, the main observations (i.e. interaction patterns, main themes and messages, noticeable individual behaviour that reflect on emotional engagement, and reference quotes and language) should be transcribed as soon as possible to retain the flavour and content of the session. Verbatim quotes that are representative of the session should not be traceable to any individual (see Box 5).

BOX 5. CASE STUDY: FOCUS GROUPS

In a focus group comprising operations, maintenance, medical, radiation protection, engineering and nuclear safety staff, the group cautiously responds to the established questions with the two operations participants consistently assuming the lead. At no point do the more vocal members directly address or prompt the largely silent representatives from maintenance to participate. The vocal members laugh, joke and banter with the facilitators. When a question about work planning raises the frequency of deferred work due to missing parts, one maintainer comments: "It has been like that for years. We rob one person to pay another." When asked to explain further, the maintainer states that parts ordered for outage work are being used to address emergent needs. When asked why the problem has been going on for so long, the reply is: "It is a head office purchasing problem. They do not know the real state of the plant." The tone is one of frustration.

During another focus group session, when participants are asked the question "Can you give an example of how an event at the plant was handled?", the discussion quickly moves to how contract staff demonstrated the use of personal protective equipment when conducting independent construction work at a manager's home. The manager explains: "They learned the importance of fall arrest equipment and I felt very proud of how well we taught them." When asked for another situation, there is an extended silence and then the example turns to an event at a sister plant. Participants are later asked which three things they would like to see changed in order to improve safety. One participant remarks: "I would put an end to the corporate purchasing process. It takes too much time and we cannot choose what we want." Another responds: "Different personal protective equipment should be purchased. We do not get the right stuff." A third employee suggests a need for "more opportunity to learn from other plants". Several suggest that benchmarking trips are reserved for the "special people".

Following the opening of a focus group with a management team, the senior manager immediately speaks for several minutes about the organization's approach to safety. The senior manager often interrupts people to reframe the participants' comments and, in one case, states that what a person has just said is incorrect. Participants watch the senior manager closely, especially when they want to introduce a new topic. The feeling in the room is reserved and cautious.

From a cultural perspective these snapshots provide insight into several valuable dimensions. The senior manager has clearly established authority in the room and with it, outlined the scope of permissible conversation. The senior manager has also revealed that positional power and a particular commanding image is very important. Camaraderie appears to flow strongly within functional lines, with operations having higher status than other groups. There is a clear perception that access to learning opportunities is a privilege and potentially a level of frustration about perks that stratify the organization.

From a facilitation perspective, the nature of such interactions is important to record. The challenge for the facilitator is to ensure that other voices are heard without becoming an argumentative force that unduly affects the nature of the cultural expression. This can be done through open-ended questions that explore the nature of the interaction itself and the feelings that exist in the room.

From a safety culture perspective, questions arise with respect to the influence of power dynamics within the organization and the extent to which social standing and appearances are more important than in-plant safety, solving supply issues with direct impact on equipment condition, and fostering an open learning environment at all levels.

As with all the self-assessment methodologies, it is important not to generalize the themes derived from focus groups to the entire population without sufficient corroboration gained through independent findings.

Appendix VII

INTERVIEWS

Interviews are widely used tools for accessing people's experiences, perceptions, attitudes and feelings about reality. Interviews can be structured, semi-structured and unstructured. Of these three types, unstructured interviews are the most difficult to conduct effectively, yet also the most informative when trying to elicit people's social realities.

VII.1. STEP 1: SELECT THE TYPES OF INTERVIEW FOR THE ASSESSMENT PROCESS

VII.1.1. Structured interviews

Structured interviews include a formulated set of questions. During the interview, focus is returned to specific questions. It is good practice to end structured interviews with an opportunity for interviewees to add their perspective ("Is there anything that we might have missed or that you would like to add?"). The use of structured interviews should be minimized, since they are less effective at capturing cultural aspects. Interviews may be conducted by telephone or videoconference, but this approach should be avoided unless there is no other way to include the individuals.

VII.1.2. Semi-structured interviews

Semi-structured interviews have some pre-formulated questions or themes that may be explored based on responses from the interviewee. The interviews have a clear purpose and scope, and involve the use of broad guiding themes to solicit common information across interviewees. It is generally beneficial for interviewers to prepare an informal 'interview guide' with groupings of topics and questions that can be asked in different ways for different participants. This helps the interviewer to focus on the topics at hand and to tailor their questions to the interview context or situation, and to the people being interviewed. A list of topics that may be useful to explore is contained in Appendix I.

Semi-structured interviews allow the freedom to formulate new questions that will deepen or broaden discussion of a topic raised by an interviewee. These interviews are beneficial in the early stages of a self-assessment process when the focus is on understanding how different aspects of the organization function. The

breadth and depth of the self-assessment team's experience will determine how much use should be made of semi-structured interviews. Specifically, if the team members have worked in different departments and levels and therefore have a good understanding of how different activities are performed and integrated, it may be less important to use semi-structured interviews. On the other hand, if the team has relatively junior individuals who may not fully understand how different functions and processes are carried out within the organization, then semi-structured interviews are an effective way to gain insight without foreclosing the depth of discussion that may reveal deeper aspects of the culture.

When working with a semi-structured interview approach, it is useful to start with a topic area and then move to different topics as they best fit into the flow of the interview, making sure to cover all the areas before concluding. Introduction of a new topic area can be used to redirect an interview when the interviewee has taken the conversation into unproductive territory or is at a loss to respond to a particular inquiry.

VII.1.3. Unstructured interviews

In unstructured interviews, neither the question nor the answer categories are predetermined. Instead, they rely on the social interaction between the interviewer and interviewee. They are a method for gaining an understanding of complex behaviour without imposing any predetermined categories or judgements. They largely rely on the spontaneous generation of questions in the natural flow of interaction.

Unstructured interviews involve open-ended inquiry and exploration and are the preferred method for safety culture assessments. Respondents are encouraged through positive verbal and non-verbal cues to present their story and elaborate on their responses. The tone is conversational. The interviewee sets the territory and pace of interview. The interviewer uses simple redirecting prompts if needed.

In an unstructured interview, the safety culture assessor is working without a theoretical framework, with no hypotheses to investigate and no specific questions about the social relationships being explored. Instead, the assessor is interacting and listening in order to gain an appreciation of prevalent themes, thereby developing a better understanding of the interviewee's social reality from the interviewee's perspective.

To prepare for an unstructured interview, it is important for the assessor to be clear on the overall purpose and general scope being explored. With this, the assessor will be able to listen attentively for cues and themes, and to encourage the interviewee to relate experiences and perspectives that are relevant to understanding the organization's safety culture. The greatest challenge in a

self-assessment situation is the degree of shared meaning, familiarity with stories, impressions, implications and nuances that will already be in existence. These can too easily cause the safety culture assessor to accept as fact what are actually socially constructed realities within the organization.

An initiating question for an unstructured interview could be: "Tell me about a normal working day." The difference between semi-structured and unstructured interviews is not only the opening question, but also the entire approach to interacting with interviewees and capturing information on their experiences and interactions.

To conduct an effective unstructured interview, interviewers need to be able to minimize interference from their own perceptions and to focus on obtaining the interviewee's point of view without regard for expertise or position. This involves listening to understand not only what the interviewee is saying, but also noticing such things as: what is left unsaid, what is emphasized or diminished, and what brings forth passion (positive and negative). Inviting examples or storytelling is an important skill in this method. When recording information from unstructured interviews, it is essential to record what the interviewee said instead of interpreting or summarizing the information. Open-ended follow-up questions are used to gain deeper insights into the thinking of the interviewee. The reason for this approach is that the interviewer is seeking to gain insight into the construction of shared meaning, beliefs, assumptions and motives that underlie the behaviour evident within the organization.

In a well conducted unstructured interview, the safety culture assessor spontaneously develops questions based on reflections on the interviewee's narration. Verbal and bodily cues should be minimized, other than to encourage the interviewee by demonstrating full attentiveness. Unstructured interviews are demanding in so far as the safety culture assessors are themselves an important part of the process.

VII.2. STEP 2: ASSESS THE PROFICIENCY OF INTERVIEWERS AND PLAN APPROPRIATE TRAINING

Every engagement by the assessor influences what is created, and thus risks bias being introduced by the assessor. For this reason, it is very important that the interviewers are able:

(a) To initiate conversation from a very broad question, such as "How do you feel about….?", and to be able to establish rapport and to listen carefully during the conversation.

(b) To redirect and guide the conversation by quickly generating insights and questions that fit easily within the flow of the conversation.
(c) To formulate effective questions that:
    (i) Allow the interviewee to provide descriptions about their activities in a wide-open way (e.g. "Tell me about a typical day");
    (ii) Attempt to find out how an interviewee organizes their knowledge (e.g. "How does operating experience influence your work?");
    (iii) Contrast situations to enable interviewees to compare different circumstances (e.g. "How do day and night shifts deal with employees who are clearly fatigued?").
(d) To manage the tone and direction of their comments and gestures to avoid biasing the interview, but to acknowledge the interviewee's point of view without judgement.
(e) To know when to follow a new topic when it emerges in a conversation, or conversely to know when to interrupt a flow and to redirect it in more fruitful ways.
(f) To act as a 'learner' throughout the conversation, trying to make sense of the interviewees' experiences from their point of view.
(g) To maintain sufficient objectivity or separation to avoid becoming immersed in the lives of the interviewees.
(h) To maintain control of the pace and direction of the interview despite the overall non-direction of the interaction.

These skills take practice to acquire. Team members should receive training with feedback to help them to gain competence and confidence in applying these methods. Specifically, it is important to help interviewers to engage in a way that does not feel like an interrogation, a test of specialty knowledge or an invitation to recite acceptable answers. The focus is on gaining an authentic representation of how the interviewee experiences life at work.

Training for interviewers should help to ensure that they are able to behave respectfully, and show empathy and open-mindedness by focusing on others. This will help interviewees to feel seen and listened to. Interviewers should also be reminded to demonstrate professionalism by avoiding personal prestige, presenting themselves as authorities on a topic, or debating and confronting an interviewee. It is also important to train interviewers to listen closely to what is behind what is said and to avoid filling in or becoming impatient with a respondent's way of speaking. It is important for the interviewer to remain objective and not impose personal value judgements or emotional responses on the interviewee. Similarly, it is important for the interviewer to maintain awareness of the total process.

Interviewing by internal assessors can be further complicated by power relationships. When interviewing individuals of higher status in the organization, it is important to establish a balance of control despite the power differential. The selection of interviewers needs to consider their comfort level with interacting with more senior individuals. Conversely, when interviewers have a higher status in the organization, they need to take additional care to note whether the interviewees are feeling apprehensive or intimidated, and to take steps to reassure them that there will be no negative consequences as a result of anything shared. A final point of caution is to ensure that assessors identify any close personal relationships with interviewees, since the pre-existing relationship may make it impossible for the assessor to maintain the level of separation needed to experience the conversation objectively.

VII.3. STEP 3: DETERMINE THE NUMBER OF INTERVIEWERS

One interviewer makes it easier to establish rapport. However, it is more difficult to take notes and be an attentive interviewer simultaneously. Two interviewers can take turns interacting and note taking. Having mixed teams (e.g. maintenance and operations staff, engineers and human factors specialist) provides a broader perspective and builds acceptance. The disadvantages are that multiple interviewers can create a feeling of power asymmetry for the respondent. They might also revert to tag-teaming questions, which may tire the respondent.

VII.4. STEP 4: SELECT INTERVIEWEES

The following should be considered:

(a) Base the selection on positions and functions to ensure cross-functional, multilevel representation (e.g. work performers, first level supervisors, mid-level managers and senior managers).
(b) Include administrative personnel, contractors, corporate staff, relevant expertise and individuals close to the issue under consideration.
(c) Although numbers depend on practicality, consider 5–10% of the target population. It is more important to focus on inclusion than on statistical representation to ensure that people and groups feel heard.
(d) Consider power relationships to avoid interviews where the interviewer and interviewee are:
    (i) Within direct reporting lines up or down the hierarchy;
    (ii) Friends, relatives or close colleagues.

Approximately 20 semi-structured and 15 unstructured interviews should be conducted by the self-assessment team members to gain a broad perspective on the safety culture across functions and levels. Positions and areas to consider include:

— Plant manager;
— Operations manager;
— Technical manager;
— Maintenance manager;
— Nuclear safety manager;
— Radiation protection and industrial safety manager;
— Quality manager;
— Operations at all levels;
— Maintenance at all levels;
— Regulatory body;
— Chemistry;
— Fuel handling;
— Radiation protection;
— Safety culture and human performance;
— Procurement and supply chain;
— Incident investigation and RCA;
— Human resources;
— Health, medical and nursing staff;
— Trade union representatives;
— Finance department;
— Contractors at management, supervisor and worker levels.

This is a large number of people to interview. If possible, or when working with relatively inexperienced assessors, two people could perform the interview. This would allow one individual to stay actively in rapport and engagement with the interviewee while the other takes notes as close to verbatim as possible and captures descriptive observations about the interviewee's behaviour.

VII.5. STEP 5: ARRANGE APPROPRIATE INTERVIEW LOCATIONS

Neutral spaces near the work location of the interviewees should be considered (e.g. an empty office or small meeting room). These spaces should be arranged to put the interviewee at ease (e.g. avoid facing each other across a desk or large table). If an employee's work environment is used, a quiet space should be considered to be able to speak freely and in confidence, with no interruptions.

VII.6. STEP 6: PREPARE AN INTERVIEW SCHEDULE

When developing an interview schedule, including semi-structured interviews with key leadership positions earlier in the process should be considered to gain a practical understanding of how things are intended to work. Unstructured interviews can be used to gain insight into how the organization understands and experiences day to day working. Interviews are typically conducted with one person at a time to ensure the interviewee is free to express their personal views. However, group interviews may be conducted provided the topics are not sensitive. Space in the schedule should be reserved to be able to explore further and gain insight into management's awareness and response to information or impressions gathered from different levels in the organization.

An allocation of at least two hours for semi-structured interviews and an hour and a half should be considered for unstructured interviews. Fifteen minutes between interviews allows time to review or summarize notes. Time allocated depends on the agenda. Structured interviews permit more control of time than an exploratory open-ended approach. A suitable number of interviews per day can prevent fatigue and ensure the quality of information captured.

VII.7. STEP 7: PREPARE TOPICS AND QUESTIONS

When preparing the topics and questions, consideration should be given to the topics:

— To make the questions straightforward, concise and clear;
— To begin with stem questions and then use open-ended questions based on responses to deepen the inquiry;
— To not overwhelm the interviewee with too many questions — prioritize the must-get, want-to-get and nice-to-get questions;
— To tailor the language to that of the interviewee.

The following is an example of themes and questions from a self-assessment process for a semi-structured and an unstructured interview. A single page format that is easy to reference will help the interview to flow smoothly. Appendix I can be used to formulate useful topic areas and questions.

(a) Semi-structured interview themes and questions:
  (i) Learning:
    — How do you use learning from within and outside the organization in your work? Examples?

— What have you learned from event X? (Select a relevant nuclear or other event or near miss.) What changes have been made in response?

(ii) Procedures:

— What is your view on the procedures you have to use in your day to day work?

(iii) Leadership:

— Give an example of either a good or bad leadership practice that you have experienced during your time in the organization?

— What would you change about leadership focus or direction in the organization? What works well? What does not?

(b) Example of unstructured interview questions:

(i) What is your work about? Describe an ordinary day at work.

(ii) How does your role relate to safety of personnel and the plant?

(iii) What do you like about your job?

(iv) What frustrates you?

(v) If you were in charge for a day, which three things would you do to improve safety here?

VII.8. STEP 8: DETERMINE THE APPROACH TO BE USED IN CAPTURING INTERVIEW DATA

To the extent practicable, the interviewer should try to capture the discussion verbatim, particularly key phrases, examples and stories. Brief descriptions of prevalent behaviour and mannerisms (e.g. nervousness, frustration, level of cooperation and engagement, facial expressions and emotional tone) should also be noted.

Audio or video recorders can be used, but only with the permission of the interviewee. It is very important to explain what will be done with the recording. The advantages of recording include the ability to analyse language use in detail, avoidance of filtering of expressions and metaphors through note taking, and freedom to allow the interviewer to focus on the conversation. Disadvantages include making the interviewee uncomfortable or even making the interview impossible. Recording may also reduce the degree of openness and increase concerns that personal information may be spread. The interviewer may not listen as intently or actively. The transcription work load is also significant.

VII.9. STEP 9: EQUIP THE INTERVIEWERS

When preparing assessors to conduct interviews, it is important to confirm that they know the type of interview they plan to conduct, the job scope of the interviewee and the approach to be used to ensure successful data gathering. With this information, the development of themes and questions becomes easier. The interviewer (or lead interviewer when two assessors are involved) should prepare a brief explanation of the self-assessment process, the nature and purpose of the interview, and what will be done with the information provided by the interviewee. These speaking points should reinforce the anonymity of the information and reassure the individual that there will be no repercussions to frank and open conversation. In the introduction the interviewers can:

(a) Welcome the individuals and briefly confirm their position in the organization and willingness to participate in the interview.
(b) Explain that the interview is confidential and that notes will be taken, but nothing will be attributed to those interviewed.
(c) Explain the purpose of the note taker if there is a second assessor present.
(d) Explain that the purpose of the interview is to capture cultural aspects of safety in terms of how safety is conducted in the organization.
(e) Confirm the duration of the interview (typically 1–1.5 hours).
(f) Explain that there will be an opportunity to ask questions at the end of the session and also to provide feedback on the experience. They should, however, feel free to ask questions at any time during the interview.
(g) Reassure the interviewee that there are no right or wrong answers to the questions. It is not a test of their knowledge. The report will discuss collective issues, not individual responses.
(h) Explain that the session will involve exploration of several topic areas if it is a semi-structured interview.
(i) Initiate the dialogue if it is an unstructured interview, with a wide open question such as: “Tell me about your role and what you do in a typical day.” The free flow of dialogue can be encouraged beyond that point with minimal interference except to keep the exploratory nature of the discussion moving.

VII.10. STEP 10: CONDUCT THE INTERVIEW

The steps in conducting the interview include:

(a) Opening:
  (i) As discussed in the previous step, explain the purpose and nature of the interview (e.g. to gather thoughts and information from individuals across the organization about safety culture and how things work);
  (ii) Provide assurance of anonymity;
  (iii) Encourage the interviewee to speak freely and candidly.

(b) During:
  (i) Use active listening techniques — being silent allows for reflection and encourages the respondent to expand or continue;
  (ii) Use non-verbal rapport building techniques (e.g. eye contact if comfortable for the interviewee, mirror body posture to indicate alignment and demonstrate interest to encourage talking);
  (iii) Honour the natural rhythm of the exchange;
  (iv) Focus on getting the respondent's story, not the interviewer's version of the story;
  (v) Reflect the language and jargon of the respondent (e.g. skill, hierarchical level and background);
  (vi) Use simple, concise questions focused on the interviewer ("What is your view on…");
  (vii) Use open-ended questions before using specific or probing questions;
  (viii) Avoid asking double questions or questions within a question (e.g. "Are supervisors knowledgeable and available?");
  (ix) Ask for examples and descriptions, especially if the answer is vague;
  (x) Rephrase the question if comprehension appears to be a challenge, and when clarifying, use role specific language;
  (xi) Ask follow-up questions:
    — To ensure questions and responses are understood;
    — To obtain more in-depth information;
    — To open up related topics;
  (xii) Notice areas or topics that are:
    — Uncomfortable, hidden, dismissed, disapproved of, forbidden or censored;
    — Appreciated, valued and praised;
  (xiii) Remain open-minded to exploring connections that lead from external observations, to forming ideas about how people typically interact and to understanding patterns of internal motivation.

(c) Closing:
   (i) Do not force an extension of the interview, but instead arrange for a follow-up if additional time is needed by either party to complete the discussion;
   (ii) Remind the interviewee that this is not an observation of them as individuals and that no identifiable information will be used;
   (iii) Share constructive factual observations;
   (iv) Thank the interviewee.

VII.11. STEP 11: DEVELOP THEMES FROM THE INTERVIEW DATA

The greatest challenge to working with the output of semi-structured and unstructured interviews is to recognize patterns in the large volumes of data gathered and to synthesize across respondents who will have covered a broad range of issues. The focus is on capturing compelling and recurring cultural expressions that provide insight into how the organization explains itself to itself: what it values in its interactions; how it decides what is 'true' and important; why decision making patterns flow the way they do; and what people take for granted in their reasoning without clarity or reflection on where it came from or its potential impact on their point of view.

Of particular interest are cultural aspects that provide insight into power dynamics within the organization that determine to whom and what attention is paid, and conversely what may be ignored or suppressed. For obvious reasons, external interviewers have an advantage in this regard, since implicit understandings and shared meaning will not interfere to the same degree. At the same time, individuals who are fluent in the language, symbolism and history of the organization will find it easier to establish rapport and maintain a non-intrusive presence in the interview process (see Box 6).

BOX 6. CASE STUDY: CONDUCTING THE INTERVIEW

A series of interviews are conducted at Plant X. A junior mechanical maintainer tells the story of making a serious mistake during an outage. When the maintainer reported the mistake to the plant manager (who clearly understood the significant cost implications of the error), the maintainer was relieved and surprised that the plant manager expressed appreciation for reporting promptly and directly. From a cultural perspective, this story provides insight into several valuable dimensions. The employee feels safe reporting the error. The plant manager understands that it is more important to encourage self-reporting and to receive this kind information as early as possible, rather than to create fear in the organization by invoking disciplinary action.

In another interview, the on-site human resources specialist at Plant X explains that the recommendations for how to improve performance, which included stronger emphasis on performance appraisal and progressive discipline, were well received by line managers. When asked, the human resources specialist also confirms that the union was supportive: "They want employees to be treated fairly in accordance with the collective agreement."

During an interview later in the self-assessment process, the maintenance manager expresses the view that: "This place is run like a country club where anything goes." When asked for a clear example of what is meant, the maintenance manager talks about the Corporate Well-being Programme, which encourages lunchtime walking to increase physical fitness and alertness, while reducing stress. When prompted further, the maintenance manager describes growing frustration about differences in treatment between administrative staff who have embraced the programme and are frequently seen walking, and maintenance staff who are not able to eat lunch and to go for a walk in the time allotted:

> "It is management's right and responsibility to enforce the collective agreement. I have instructed the supervisors to observe who is late returning from lunchtime walks and to give verbal warnings for repeat occurrences."

The vice-president explains that the majority of plant staff have worked their entire careers with the facility. Workforce challenges such as attrition, long term disability and 'entitlement' are becoming a concern. When asked about the greatest concern, the vice-president replies: "Mistakes resulting from poor knowledge transfer and a lack of cooperation between experienced and new staff."

From a cultural perspective, these stories provide insight into several valuable dimensions. The employee felt safe reporting the error. The plant manager understood that it was more important to encourage self-reporting and to receive this kind information as early as possible, rather than to create fear in the organization by invoking disciplinary action. The vice-president was concerned about employee satisfaction and intergenerational challenges. The maintenance manager and the human resources specialist understood the importance of procedural fairness. What is also evident is a lack of alignment between different levels of leadership about the use of disciplinary measures and constructive self-management programmes to influence desirable behaviour in the organization.

From a safety culture perspective, the different views on when and why disciplinary measures will be taken can easily result in confusion among employees about what is acceptable behaviour.

Appendix VIII

PLANT X CASE STUDY CONCLUSION

BOX 7. CASE STUDY: CONCLUSION

The assessment team takes several days to compile their findings and move from the descriptive exercise of gathering information and developing preliminary categories, to formulating themes and drawing conclusions about the safety culture at Plant X. The team lead reminds every one of the importance of the two step approach, and how the methodology forces the team to move beyond initial impressions to improve the likelihood of accurate and reliable findings. When asked how, the team lead explains:

> "We will deliberately sort the data in many different ways to expose or create new insights. We will deliberately look for conflicting data that might invalidate our hunches. And we will categorize, tabulate and recombine the information we have gathered, and then cross-check facts and discrepancies to help us to formulate a rigorous picture of key cultural aspects at Plant X. If needed, we will conduct some short interviews to gather additional data to verify key observations or to check facts."

Over the following three days, the team members revisit all the data, recategorize findings from scratch, count the frequency with which items appeared and work to formulate combined groupings or themes within each methodology. In the case of the large volume of interview and focus group data, multiple reviewers work together to identify patterns within each method.

Once topics are developed for each method, the team undertakes a second cross-check, looking for patterns across the different methodologies. The tagging method used during the document review is adapted and used by the team to keep track of topics across the different sources. At the end of the theming process, the team presents to the team lead the core findings with references and quotes for corroboration.

As a final step, the entire team works together to evaluate the findings against the IAEA safety culture characteristics and attributes. When asked by the team lead whether the culture at Plant X supports organizational learning, the team presents the following findings and conclusions from their draft report. For each new item, the information in brackets includes the source method as well as related IAEA attributes and characteristics (see Fig. 3, in Section 2.2) as listed in appendix I of GS-G-3.5 [4].

Evidence of organizational learning

(a) Prevalence of an 'expert' culture where the members feel confident that they do not require procedures in hand or peer checks to ensure correct execution [questionnaire; (c) of (3) Accountability for safety is clear].

(b) Differences are evident in how members of the management team present themselves to gain respect and followership. The dynamics are a 'topic' within the culture [observations, focus groups and interviews; (f, h) of (2) Leadership for safety is clear; (a) of (4) Safety is integrated into all activities].

(c) Displays of interpersonal power establish distinct boundaries around what is permitted in discussions, and compliance is reinforced by interrupting and correcting people in front of peers and outsiders [observations and focus groups; (f, h) of (2) Leadership for safety is clear; (a) of (4) Safety is integrated into all activities].

(d) Inconsistencies exist across leadership levels regarding the degree of inclusion and engagement [questionnaire, observations and interviews; (f, h, i) of (2) Leadership for safety is clear].

(e) Significant power dynamics exist within the organization such that social standing and appearances are more important than plant safety, for example an inability to resolve supply issues with direct impact on equipment condition and inadequate fostering of an open learning environment at all levels [focus groups and interviews; (h, i) of (2) Leadership for safety is clear (h, i); (i) of (4) Safety is integrated into all activities].

(f) Coordination challenges are exacerbated by departmental silos without full integration with in-plant groups [focus groups; (b) of (2) Leadership for safety is clear; (h) of (4) Safety is integrated into all activities].

(g) Distinct subcultures exist — new employees, maintenance and operations [questionnaire and focus groups; (h) of (4) Safety is integrated into all activities];

(h) Fewer responses from the mechanical maintenance group than from all other plant groups [questionnaire; (f) of (2) Leadership for safety is clear].

(i) Employees under 25 years of age feel key information is not commonly shared. This pattern seems to apply to electrical maintenance, mechanical maintenance, engineering and safety specialists. In contrast, management are very confident that key information is being shared to a degree that meets everyone's needs [questionnaire; (f, h, i) of (2) Leadership for safety is clear].

(j) Formal organizational learning programmes exist more on paper than in practice, and the organization does not believe that operating experience and human performance tools can make difference, relying instead on technical competence and many years of experience to sustain safety performance [document review, focus groups and observations; (b, d) of (5) Safety is learning driven].

Conclusion based on IAEA framework

On the basis of these findings, the team concludes that organizational learning at Plant X needs improvement and, when asked, gives the following reasons:

> "There appears to be a basic assumption or belief that expertise and experience provide sufficient assurance of future safety performance at Plant X. As a result, formal programmes for learning are not seen as adding value and are therefore not implemented effectively. Technical knowledge, combined with positional power and control, are considered to constitute effective leadership. This contributes to organizational silos, lower levels of staff engagement, and feedback from core groups, indicating they are not receiving the breadth and depth of information needed to perform their jobs effectively. In addition, some junior staff report that they are excluded from the sharing of key information, potentially impairing long term organizational learning."

Following the normative analysis of the overall themes and conclusions, the team decides to include several findings related to the above items in the final presentation and to report to management. These findings, supported by explanatory text and examples, relate to the following two IAEA characteristics [4].

Leadership for safety is clear

(a) An underlying cultural belief that expertise and experience provide sufficient assurance of safety performance inhibits questioning and the potential for learning from internal and external sources.
(b) Management is not consistently performing their accountability related to fostering engagement, openness and trust, resulting in organizational silos and diminished cooperation and sharing of information.
(c) Organizational silos, diminished levels of staff engagement and feedback that core groups are not receiving required information increase the risk that operational decision making may occur in the absence of full awareness of all relevant factors.

Safety is learning driven

(a) Formal programmes for learning are not seen as adding value and are therefore not effectively used to correct adverse conditions and proactively reduce the likelihood of events.
(b) The organization does not consistently support the development of junior staff, potentially impairing long term organizational learning.

Appendix IX

SAMPLE TEMPLATE FOR A SELF-ASSESSMENT REPORT

This appendix provides a sample template for a final self-assessment report. The actual content, headings, and order are dependent on the specific circumstances of the assessment, therefore the following headings should be used as a suggestion only. Sections 3.2–3.5 have the same subsections as Section 3.1.

EXECUTIVE SUMMARY

1. INTRODUCTION

    1.1. Culture and its relevance to safety
    1.2. Normative framework

2. OVERALL SELF-ASSESSMENT METHODOLOGY AND APPROACH

3. RESULTS

    3.1. Document analysis
        3.1.1. Method summary
        3.1.2. Results
            3.1.2.1. Theme 1
            3.1.2.2. Theme 2
            3.1.2.3. …
        3.1.3. Analysis and interpretations
        3.1.4. Conclusions
    3.2. Questionnaire
    3.3. Observations
    3.4. Focus groups
    3.5. Interviews

4. OVERALL CONCLUSIONS

    4.1. Method summary
    4.2. Overall themes
        4.2.1. Theme 1
        4.2.2. Theme 2

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Annex

SAFETY CULTURE SELF-ASSESSMENT: THEORETICAL SUPPLEMENT

The concept of safety culture has become increasingly important in the area of nuclear safety. Having gained increased popularity after the Chernobyl accident, in 1986, safety culture has become an important means of ensuring long term safe performance of nuclear power plants. Meanwhile, the notion of safety culture has increasingly come under discussion for its assumptions regarding culture, some authors taking a stance towards more anthropologically informed views on culture [A–1, A–2]. The safety culture self-assessment (SCSA) method presented in this Safety Report is a way of embracing such a view on culture and to start a collective process of cultural self-reflection in an organization.

The purpose of this Annex is to provide the scientific background to the IAEA method for SCSAs. This Safety Report introduces the notion of culture in relation to safety culture and presents a series of methods for studying and interpreting culture from different empirical angles. The text is based on the assumption that while organizational culture is a descriptive concept, the notion of safety culture is essentially normative [A–2]. This distinction is presented in Section A–1.

The focus is on presenting a number of texts in such a manner as to invite the reader to investigate the topic further. This Safety Report does not go into detailed technical issues; nor does it engage in polemics regarding the various ontological, epistemological and methodological choices and debates that underlie the approach.

A–1. CULTURE AND SAFETY CULTURE

An important assumption in the approach to culture favoured in the SCSA approach is the metaphorical nature [A–3, A–4] of the culture concept, deriving from anthropology [A–5], including aspects such as myths, stories and rituals [A–6, A–7]. In a seminal article, Smircich [A–8] juxtaposes the "metaphor view" with the "variable view". The variable view portrays culture as an organizational subsystem that can be manipulated and controlled by managerial intervention. Such was the position of some influential early writings on corporate culture, paired with assumptions of a direct link between culture and organizational performance [A–9, A–10]. The metaphor view portrays culture as something that is part of all organizational activity and that can be understood by

analysis from a cultural perspective. Thus, culture is something an organization 'can be seen' as rather than something it 'has'. It gives priority to the 'meaning' that actor's attribute to, for example, actions, systems, images, stories and language use in the organization. The metaphor view is extensively developed in Refs [A–11 to A–15].

A–1.1. Layers of culture

Culture is often pictured as layered — that is, there are deeply held values that manifest in attitudes as well as actual behaviour and in physical manifestations. Several authors emphasize the importance of recognizing deeply held norms and values [A–9, A–16], underlying assumptions [A–17], ideology [A–7] or systems of meaning [A–18]. The origins or nature of the deeper layers of culture can be seen as stemming from various sources, for example human nature [A–16] or intragroup problem solving [A–17]. In Schein's view [A–17], solutions to problems over time become taken for granted, thereby creating a pattern of assumptions on the functioning of reality which becomes invisible to the group. Thus, the history of the organization becomes an important aspect of culture. The notion of layers of culture, while following the same basic logic, differ somewhat between different authors. In this line of reasoning, Guldenmund [A–19] proposes a three layer model for safety culture, consisting of a core of basic assumptions including, for example, the nature of reality and truth, the nature of human activity and relationships, and the nature of time and space. The middle layer consists of attitudes towards specific objects (e.g. people and risk) and the outer layer consists of artefacts (e.g. physical objects). The outer layer is easy to access empirically but difficult to interpret in terms of cultural meaning; the core is difficult to access empirically while actually being about cultural meaning. The iceberg model is a way of visualizing the logic proposed by layer approaches to culture, indicating the difficulty of accessing deeper layers of culture as well as the need for interpretation of visual artefacts.

A–1.2. Culture as shared

A core characteristic of culture is that it is something that is shared by the actors in an organization [A–17]. Culture is essentially a collective phenomenon. This does not mean that an organization's culture is always homogeneous. The SCSA approach takes into account the heterogeneous nature of culture. Martin and Meyerson [A–20] note that different characterizations of the concept of culture embody different ways to handle subcultural phenomena and ambiguous aspects of culture. There may be, for example, occupational cultures embedded in the organizational culture, with important differences that should

be highlighted [A–21]. Subcultural phenomena may exist alongside common cultural aspects and may be related to aspects such as occupation, interaction patterns, hierarchy and gender. Tight interaction, common experiences and common personal characteristic typically contribute to the development of subcultures [A–7].

A–1.3. The importance of interpretation

In the SCSA approach, culture is seen as a qualitative phenomenon, essentially impossible to measure. Hence, in order to understand an organization's culture, it needs to be interpreted. Often this means extensive use of ethnographic methods and an ethnographic style of writing [A–22, A–23]. Here, the role of culture analysts and their preconception of culture as well as theoretical repertoire is emphasized, as they are an integral part of the interpretive process (cf. Section A–7).

There are many forms of empirical material that are possible to include in a cultural analysis. The interpretive stance puts less emphasis on the empirical material per se and more on interpretation. Generally, there are some cultural expressions that are common to include. Some are stories [A–24, A–25], myths [A–26], rites and rituals [A–7, A–9], organizational routines [A–20] and physical structures [A–17]. These are all tangible manifestations that can be basis for the interpretation of a culture. Working with several of these leads to a more multifaceted analysis that invites broader interpretations [A–27] and captures the contextuality of the material [A–28]. Many studies of safety culture are based on questionnaires [A–19]. The approach suggested by this Safety Report takes a broader view. As culture is a multifaceted and complex phenomenon, instruments aimed at reducing data are not suitable as stand alone applications. Therefore, the SCSA is based on a multimethod approach, using questionnaires as well as interviews, focus groups, observations and document analysis. The following sections will discuss the use of these.

There are also many important insights to be drawn from comparative studies of other cultures. These approaches a not part of the SCSA method but may be valuable reading for anyone engaging in an SCSA process (e.g. see Refs [A–16, A–29, A–30]). Other important sources of inspiration are the in-depth case studies of cultures and cultural change processes (e.g. see Refs [A–31 to A–34]). It may also be of importance to note that cultures are not always unique but tend to contain similar elements when compared across organizations [A–24, A–35].

A–1.4. Descriptive and normative: The distinction between culture and safety culture

The concept of culture is essentially value neutral, while the concept of safety is by definition value laden [A–2]. This means that the two cannot be analysed with the same approach, one needs to make an analytical separation between the notion of organizational culture and the notion of an organization's safety culture [A–36]. As suggested by Moray and Luthans [A–37], there will always be intermediary steps between the 'insiders' and 'outsiders' view, as any analysis of culture will rest on preconceptions and implicit and explicit assumptions. In order to facilitate a descriptive approach, an 'inside' emphasis in the analysis of culture is suggested, and hence a postponement of the 'outside' (normative and evaluative) stage. This point will be more comprehensively developed in Section A–7.

A–2. INTERVIEWS

In order to investigate how people view their world (i.e. the meanings they give to various phenomena and relations), interviews are an important tool. Interviews in the SCSA approach rely heavily on a semi-structured method with a conversational approach to interviewer–interviewee interaction. The point of interviews is to obtain the informants' point of view on various topics. For a broad overview of interview methodology, see Ref. [A–38]. For an overview of the historical background of interviewing in organization studies, see Ref. [A–39].

In organization studies, the advantages of less structured interviewing approaches were highlighted in the famous Hawthorne studies [A–40]. The studies reveal that when the interviewees were allowed to talk more freely on a topic, interviewers gained important information about aspects of the work situation they had not conceived of beforehand. This explorative character of interviewing is maintained in the SCSA approach. The rules to which the interviewers in the Hawthorne studies were subjected included listening with patience, avoiding presenting themselves as an authority, not giving advice or moralizing, and using questions carefully [A–40]. The advice is still relevant.

Interview practice in organizational culture studies largely rely on an ethnographic tradition. Here, issues of interpretation are more salient than, for example, statistical validity and reliability. The approach to interviews in the SCSA approach mirrors this. It should also be emphasized that no interview method will work as an out of the box tool, interviewing is a practice requiring experience to master [A–41]. It also means that the most important interview tool is the interviewer. Their personalities, experiences and skills will inevitably affect

the interview outcome [A–42]. Over time, interviewer skills will be developed and refined. Interviews then cannot be described as a singular method. Rather, an interview approach always means that several choices have to be made, for example in terms of structure, how to fashion questions and themes, how to handle narrations and how to transcribe and analyse.

A–2.1. Structure

Interviews can range from structured, through semi-structured to unstructured. Structured interviews have more questions and a strict interviewer schedule, predetermined areas of interest, and attempts to create as similar interview situations as possible when several interviewers are used. This typically allows a larger sample and shorter interviews. Semi-structured and unstructured interviews allow for longer interview time and favour an approach where the respondent's interest plays a larger part relatively to the interviewer's. In a semi-structured interview, the interviewer follows an interview guide consisting of broad themes and general questions. Open questions are predominant. In unstructured interviewing, the respondents view on the topic at hand is allowed to dominate the interview. Interviewer interventions are minimized and can consist of non-verbal cues to stimulate discussion and follow-up questions. The interview guide is limited to very few topics of interest. This basic dimension is treated in most literature on interviews (e.g. see Refs [A–43 to A–47]).

A semi-structured interview approach thus allows for a predetermined focus as well as a significant degree of freedom to the respondent. Questions and interview themes need to be designed to facilitate dialogue. In an SCSA, the semi-structured interview rather leans towards the unstructured end of the spectrum than the structured. In terms of interaction, the less structured the interview, the more it resembles a conversation [A–48].

A–2.2. Questions and themes

Questions in a semi-structured interview should mainly be open and encourage the respondent to talk freely on the topic at hand. The interview should not take the form of an interrogation where respondents feel that they can be right or wrong in answering. It is the viewpoint of the respondent that is important and this should be clearly communicated. To facilitate such a situation, several types of question can be used [A–4]:

(a) Introducing questions: "Could you tell me about your work at …?"
(b) Follow-up questions: "Could you tell me more about that situation?" (This encourages elaboration.)

(c) Probing questions: “Why do you think the person intervened at that point?” (This encourages specific elaborations on interesting aspects.)
(d) Specifying questions: “How did you feel at that point?”
(e) Direct questions: “Do you feel you have enough knowledge of the plant’s safety policy?” (These questions can affect the direction of the conversation to some degree and should be kept until the end of the interview.)
(f) Indirect questions: “How do people in the organization relate to management in general?”
(g) Structuring statements: “I would now like to ask you something about the safety policy ….”
(h) Silences (in order to leave space for reflection and indirectly encouraging the respondent to develop an answer further).
(i) Interpreting questions: “When you say this, do you mean that the radiation protection supervisor really do not understand your work conditions?” (This can help in the interpretation of ambiguous statements.)

In order to be able to follow this approach, the interviewer needs to learn to listen reflexively and attentively in order to be able to ask (or not ask) the right question at the right time. It is also important to recognize that the interviewer–respondent interaction is part of the interview material, and the meanings conveyed in an interview are always a co-construction between those interacting [A–49].

A–2.3. Narrations

An important part on interviewing is narratives [A–50, A–51]. In organizational culture studies, the stories told and circulated in an organization provide important insight into the organization’s culture [A–24]. Acknowledging the importance of this, interviews are an important tool to tap into the narratives of an organization [A–52]. Narrative approaches to interviewing often focus on, for example, the life stories of individuals, and these can also be of importance, as they communicate how individuals relate to organizational phenomena in terms of their life experience and, for example, work–life balance issues [A–53]. Moreover, stories appear in accounts of personal experiences of events and provide insight into how experiences are shaped and shared in the organization, as they lie in a borderland between personal and public space [A–54]. Moreover, the type of narrative structure in an account can be of importance to highlight, for example, how causality is perceived [A–55, A–56].

A–2.4. Transcriptions and analysis

Recording interviews allows for precise registering of choice of words, expressions and jargon. As language is an important part of culture, recording interviews is a powerful tool. These recordings then need to be transcribed before analysis. A systematic method for this should be developed [A–28], and it should be remembered that analysis already begins in transcription [A–57, A–58]. Transcriptions are not neutral representations of the interviews, and it can sometimes be important to return to the interview recordings in the process of interpreting interviews [A–44]. In cases where an audio recording of the interview cannot be made, the simultaneous transcription should aim to be verbatim. Recording and transcribing have a number of advantages, including that they make analysis less reliant on the interviewer's memory, they capture the exact language use of the respondent and thus allow for a more close analysis of what was said, and they help to counter accusations of interviewer/analyst bias [A–59]. The quality of transcriptions will depend on the audio quality, the use of skilled and experienced transcribers, a well informed choice of transcription notation (taking the type of analysis into account) and the continuous review of transcription quality [A–60]. Recording interviews does not, however, mean that notes are not necessary. Gestures and mimicry sometimes need to be captured [A–61]. Notes may be important in order to scribble down follow-up questions or ideas for further inquiry later on in the interview.

A–3. FOCUS GROUPS

Focus groups have become increasingly popular in social science. Originating in the 1940s, they have become popular in marketing as well as health studies [A–62, A–63]. Focus groups are commonly characterized by organized discussion, collective activity and interaction [A–64]. In focus groups, the data obtained depend not only on the individuals and their characteristics but also on the group process and the relationships between the individuals in the group [A–65].

A–3.1. Characteristics of focus groups

A focus group can be characterized as social situations in which people under guidance discuss a certain topic [A–66, A–67]. Brymann and Bell [A–46] characterize them in the following manner:

> "The focus group method is a form of group interview in which: there are several participants (in addition to the moderator/facilitator); there is an emphasis in the questioning on a particular fairly tightly defined topic; and the accent is upon interaction within the group and the joint construction of meaning."

Focus groups are particularly well suited to exploring new topics and generating themes for further investigation [A–64]. Moreover, focus groups are group contexts and therefore provide insight into collective processes regarding opinions, feelings and attitudes. They highlight the collective process of forming understanding [A–67]. They provide insight not only to attitudes but also into attitude formation [A–66]. Focus groups are suitable for exploring topics, but the topics have to be familiar to the group in order to create meaningful interactions and the group needs to possess knowledge on the topic at hand [A–68]. This means that the process of interaction in the focus group is also a way of creating new insights and knowledge [A–65]. Some argue that the interaction process also produces a degree of authenticity, as the social situation by itself is less controlled than, for example, an interview, where the interviewer largely sets the stage [A–64]. The role and power of the facilitator in directing and leading the group should not be disregarded, however, neither in the process nor in the analysis [A–65]. In addition, focus groups are contexts where group dynamics, power, group cohesiveness, and group heterogeneity and homogeneity will affect processes as well as results [A–65], and these issues need to be well understood by facilitators as well as by those analysing the data.

A–3.2. When to use focus groups

The situations particularly well suited to focus groups include:

(a) Where there is a distance between people (e.g. due to hierarchy or different professions);
(b) When investigating complex behaviour and motivations;
(c) When trying to understand diversity;
(d) When the choice of method itself conveys an attitude on part of the investigator [A–69].

The latter point is of particular importance if the SCSA method, as "focus groups convey a willingness to listening without being defensive that is uniquely beneficial in emotionally charged environments" [A–69].

Thus, using focus groups is a way of sowing seeds for a desired change process (cf. Section A–8). Of course, there are times when focus groups may have

to be avoided or modified, for example when the participants are not comfortable with each other or when the topic cannot be framed in an appropriate manner (for these and other situations, see Ref. [A–68]). As with all methods, focus groups should be employed with reflexivity.

A–3.3. Running the group

The prepared questions for the focus group need to deal with generic as well as specific questions, often moving from the former to the latter. On the other hand, the most important questions should be placed early, which often conflicts with the first criterion [A–65]. This requires a well thought out strategy, sometimes moving back and forth in generality. The facilitator will have an important role in dealing with this during the session. The degree of structure and the type of questions that are suitable have to be adapted depending on what type of group it is [A–65].

The time frame for the group should also take into consideration the time for preparation and setting up for the facilitator as well as post-session work, typically around 30–45 minutes before and 30 minutes after the session [A–69]. Each session then should be planned for 2–3.5 hours. The physical environment is also of importance, and this should be taken into consideration in planning and preparing [A–65]. Various viewpoints and recommendations on physical set-up in meetings exist [A–70 to A–72]. Group size may vary. Stewart et al. [A–65] suggest 8–12 participants, warning against the power effects in smaller groups where one single person can more easily dominate. Morgan [A–68] suggests 6–10 participants. Actual group size will have to take group composition as well as facilitator skills and experience into consideration.

A–3.4. Facilitating

As indicated earlier, the facilitator role is important. Morgan [A–69] argues that it is a myth that professional facilitators are needed, but this does not mean that facilitation does not require skills to deal with the complexities of group dynamics [A–65]. Group facilitators need to be genuinely interested in the topic and needs to be able to interact with the group smoothly. They also need to be able to handle difficult situations in terms of the power of expertise, encouraging people to talk and managing hostility [A–65]. The main concern will be between letting the group interaction flow according to its own logic and intervening to make it stay on track. In this, it is usually better to allow for more freedom in interaction than imposing structure [A–46].

A–3.5. Recording and analysing

Recording and analysing focus group sessions can be performed in various ways. Of core importance is to capture what the group produces, unbiased by the recording process. Techniques such as 'group memories' with a neutral, non-involved person responsible for continuous note taking are sometimes employed (for such techniques, see Ref. [71]). Morgan [A–69] suggests four different recording forms: transcript based analysis, tape based analysis, note based analysis and memory based analysis. Transcript based analysis involves audio recording and transcribing the whole session, opening up for detailed analysis of not only topics but also for group interaction and attitude formation. Memory based analysis, on the other hand, relies entirely on the memory of the facilitator and will inevitably be biased by this. The advantage is speed and the possibility of instant feedback to the group. Tape based analysis and note based analysis fall in between in degrees of detail and speed. Ideally, this should be decided beforehand, as it requires different set-ups, different times for analysis and different skills on the part of facilitators as well as the analysts. Analysing the group process and interaction patterns requires knowledge of group dynamics and perhaps conversation analysis [A–73].

A–4. DOCUMENT ANALYSIS

Documents such as accident reports have been used as basis for document analysis (see Refs [A–36, A–74, A–75]). This shows that official organizational documentation can be an important source of insight into the functioning of an organization. Document analysis in an SCSA is not an audit or quality assessment of the management system, where documentation is analysed to find flaws and improvement points. In SCSAs, documentation is used along with other methods to gain insight into an organization's culture.

In SCSAs, few problems associated with document research occur, such as issues of availability and authenticity [A–76]. Sampling documents can pose difficulties, as a degree of pragmatic judgement in sampling is needed. This means focusing on those documents believed to contain interesting aspects, and it will inevitably lead to a bias. On the other hand, some documents will be able to provide more rich material for interpretation than others (e.g. accident reports, investigations, analysis and technical documentation). The specific type of document will also affect the conclusions drawn in the analysis [A–77]. It should be remembered, however, that documentation is always produced in an organizational context and can also be biased in various ways (e.g. through the organization's political processes) [A–78].

Of particular importance is documentation that can provide insight into the lines of reasoning, assumed causalities and explanatory models in use in an organization. These types of account are interesting expressions of culture [A–56]. Moreover, documents are interesting in the way that they produce facts in the organization. What aspects, for example, of a critical incident are included? Which are excluded? Here, procedures as well as finished reports provide insight into the 'machinery' of fact production in the organization [A–79] — how the organization produces facts to act upon and to create new routines. They also describe ways of doing things and prescribe preferred ways of behaviour, thereby signalling legitimate patterns of behaviour, thinking and interacting in the organization [A–48]. Documents also signal intent (e.g. policies, strategies and plans).

It is important to remember that the words in documents do not necessarily imply the same meaning for various groups [A–79]. The consumption of documents is as vital as production, and this is a way of approaching that aspect [A–79]. Document analysis should also take into account that documentation can be heterogeneous [A–48]. Documents, or parts thereof, can be read to mean other things than what they ostensibly are about. Document analysis should take this into account (e.g. in thematic classification). This is a generic aspect of interpretation (see Section A–7).

A–5. OBSERVATIONS

Observations are part of the fundamental methodology in ethnography. Classic works such as Malinowski [A–80] and Douglas [A–81] are based on long term participatory observation. Important works in this regard are also found within the Chicago school in sociology [A–82]. In contemporary organizational culture studies, ethnographic observations continue to be of core importance. There is an extensive genre of organizational ethnographies [A–32 to A–34]. The ethnographic tradition seeks to study naturally occurring situations and the meaning attributed to these by participants. Ethnographies require long term field participation and are, in the SCSA context, too cumbersome (see, however, the notion of microethnography [A–83]). Observations in SCSAs rather resemble instances of ethnographic observation, but they share the ambition of studying naturally occurring situations. Participatory observation can be defined as "a method in which a researcher takes part in the daily activities, rituals, interactions, and events of a group of people as one of the means of learning the explicit and tacit aspects of the life routines and their culture" [A–84]. In the SCSA context, the investigator or researcher will often be more familiar with the context than in academic research, therefore the participant observation will somewhat resemble

a "self-ethnography" [A–85]. Observations are sometimes very informal and mainly consist of "hanging out and asking questions" [A–86], and many sociologists have been able to learn much about interpersonal interaction simply by studying behaviour in public [A–87].

A–5.1. Overt, covert and degrees of participation

Covert observation (i.e. observing without being perceived as an observer) carries ethical as well as technical difficulties. Ethically it can vary between different types of situation (e.g. public, quasi-public and private) [A–45]. Technically, it is difficult to remember all details in interactions, and researchers have been known to resort to lavatories or similar hiding places to write field notes [A–88]. Of importance here is to ensure that the approach is also in line with company ethical guidelines, as ethics and (organizational) politics are not separate entities [A–89]. The observation can also range between passive participation (where the observer is a passive bystander, recording the activities, sometimes unknown to those interacting), moderate participation (where the observer is identified by those interacting as an observer, but interaction between observer and observed is limited) and active participation (where the observer actively takes part in the activities at hand). There is also complete participation, where the observer actually becomes part of the group studied [A–84]. In an SCSA, participation will most likely be moderate or active.

A–5.2. Selecting situations

Observations often concern specific situations (e.g. meetings and carrying out tasks). Selecting these situations involves practical aspects, such as access and risk assessment, as well as appropriateness (i.e. the fit between the topic at hand and the situations available) [A–45]. As often in qualitative methodology, statistical sampling for representativeness is less important than the potential richness of the data (this is sometimes called purposive sampling [A–46]). On the other hand, it should be remembered that behaviour and interactions can shift according to time and context, which has to be taken into consideration when choosing situations for observations [A–46].

A–5.3. Structured observation

Participatory observation is largely unstructured in that it seeks to capture the whole situation. Structured observations seek out specific data about a situation. Some famous studies of managerial work were designed as structured observations and were supplemented with unstructured observational data to

capture aspects not in the coding schedule [A–90]. Structured observations can be reminiscent of early time and motions studies, but used reflexively structured observations with well adapted coding schedules could be part of an SCSA.

A–5.4. Shadowing

An option for observations is shadowing (i.e. following the individuals through their work for a continuous period of time). This overcomes the temporal and spatial restrictions limiting 'ordinary' observations, as it focuses on a specific actor rather than a situation [A–91]. In the process of observing, opportunities to interact with the observed and to uncover intentions, motifs and contextual information are given and this can gain important information for the interpretation of data [A–44]. Shadowing can thus add an important dimension of contextualization of, for example, interview data.

A–5.5. Writing and analysis

In observation studies, the analysis will be highly dependent on the written account of the event(s). When making field notes, important framing activity is already undertaken [A–92, A–93]. The very notion of observing relies on a theory, directing the gaze and attention of the observer to what is considered important, and it takes training to become a good observer [A–84]. In ethnographic research, much interest and methodological development have been invested in the notion of inscribing or narrating society. Choices of narrative style, metaphors and phrasings will all influence the analysis and the conclusions drawn. As there is no neutral language, this will always be a choice among alternatives that all influence the result in various ways (see Refs [A–5, A–22, A–23, A–52, A–94, A–95]).

A–6. QUESTIONNAIRES

The use of questionnaires in surveys is a way of measuring aspects of safety across an entire population (e.g. nuclear facility). Results from questionnaires are quantitative and as a result, they can be treated with various mathematical methods. Analysis of quantitative data should be undertaken using several different methods. Statistical packages for computers facilitate various and complex forms of data analysis (see Ref. [A–96] for an overview of some of the available statistical packages). Data analysis in SCSAs should not stop at using averages and standard deviations, but should make use of more advanced methods (e.g. cross tabulations, regression analysis, cluster analysis and factor

analysis). This requires training in, and knowledge of, statistical methods described in textbooks on statistical analysis [A–97, A–98]. There are more errors in questionnaire surveys than is often assumed. As early as 1944, Deming [A–99] lists 13 different potential errors that are still relevant today.

Using the existing IAEA safety culture questionnaire for the survey should be considered in an SCSA. Questionnaire design and evaluation is discussed in Refs [A–100, A–101].

A–6.1. Sampling

There are several sampling methods available, and the way sampling is undertaken will affect interpretation of data. For example, sampling can be random (randomly drawing a sample from the entire population), systematic (e.g. drawing every nth person from a list) and stratified (where sampling is adapted to the population) (see Ref. [A–101]). Sampling error will skew data and make interpretation difficult. Bryman and Bell [A–46] illustrate various sampling errors and discuss countermeasures. Moreover, strategies for non-response bias need to be planned from the start [A–101, A–102].

A–6.2. Analysis

Statistics can use various forms of analysis. Univariate analysis focuses on singular variables and measures of, for example, frequency, mean and deviation. Bivariate and multivariate analyses check for variation among two or more variables. In an SCSA, it should be considered to explore the survey data through different suitable methods and to employ advanced methods for analysis. Examples include (but are not limited to):

(a) Cluster analysis: Exploring groups as defined by their commonalities and differences. This can be used to create typologies and developing conceptual schemes for groupings as well as hypothesis generation or testing (e.g. see Refs [A–103, A–104]).
(b) Factor analysis: Exploring interdependencies among variables. Factor analysis can be used, for example, to investigate how hypothetical variables may explain variation and correlations in a set of data. Factor analysis can be used both in an exploratory and a confirmatory manner (e.g. see Refs [A–105 to A–107]).
(c) Regression analysis: Exploring dependencies among variable, particularly in time series data. Regression analysis can be used for hypothesis testing and testing of the strength of dependencies as well as model construction (e.g. see Refs [A–108, A–109]).

The difficulty with these forms of analysis lies in interpreting the results and how they can be used to create an image of the organization and its culture. When it comes to interpretation, there is less rigour and more imagination as well as a more theory driven method.

There are many pitfalls that should be taken into consideration in statistical analysis, for example that correlation does not mean causality, spurious relationships and intervening variables [A–46]. Survey analysis is not a straightforward process of calculating means or testing hypotheses. In an SCSA, an approach favouring a more explorative view on data is suggested, where different relationships are explored and tested for and where various forms of analysis are tried out [A–110].

A–7. ANALYSIS

Analysing qualitative data is a form of text analysis and mainly a question of interpretation. There are no standard methods for analysing texts and interpretive science relies on a long and varied tradition (see Ref. [A–111] for an introduction to various perspectives and their historical origins; an accessible introduction to the basics of qualitative research can be found in Ref. [A–73]). Moreover, analysis requires a theoretical framework (in this case on culture) in order to be undertaken.

The ‘how’ of analysing interview data is not something easily subjected to predefined methodological steps. Interpretations in the SCSA approach will be informed by not only the data gathered but also by the theoretical framework and the analysts involved. Understanding the theoretical and ontological foundations of the SCSA approach is fundamental. A core aspect of qualitative methods is their focus on meaning given by actors to different phenomena [A–112]. This contrasts to quantitative strategies, where numbers, frequencies and quantities are of primary importance. An interpretive approach relates in an interpretative manner also when it comes to quantitative data (e.g. from questionnaire surveys).

A–7.1. Ontological foundation

The ontological foundation of the approach described in SCSAs is social constructivism. This is a contested concept and many views abound (see Refs [A–113, A–114] for a classical accounts, Ref. [A–115] for discussions on organization theory and Ref. [A–116] for a recent discussion). Briefly, people relate to phenomena in the world according to the meaning that these phenomena have to them — that is, “if men define situations as real, they are real in their consequences” [A–117]. From such a perspective, it becomes

important to understand what are the different or common meanings regarding certain situations, objects or other phenomena which exist in a group. This is just as relevant for seemingly 'objective' phenomena such as risk and safety (see Refs [A–118 to A–120]). For further literature on the ontological foundations of culture research, see Section A–1.

A–7.2. Authentic images of culture

The amount of empirical material gathered in an SCSA can be daunting. In many ways, avoiding the "1000 page question" [A–44] relies on having a clear strategy from the start, a clear goal and gathering the right type of material. The quality of material is more important than the quantity, as interpretive approaches do not rely on statistical methods for establishing validity and reliability [A–28]. Lincoln and Guba [A–121] present concepts for establishing validity in interpretive approaches (fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity) where the notion of authenticity is highlighted. The audience needs to consider the material and the empirical story told in the SCSA report authentic, and it needs to be able to recognize its relevance [A–32].

Authenticity exists in the relation between the analysis results and the 'natives' of the organization. According to Schein [A–17], a description of a culture needs to be authentic both to those in an organization and to an outsider confronting the organization for the first time. This highlights the communicative qualities of a culture analysis. That the description is authentic does not, however, mean that all recipients immediately agree upon it. Intersubjective reliability can sometimes be a way of testing the validity of interpretations. Here, different analysts independently review the same dataset and compare their findings. There are difficulties here, however, as a strict adherence to this can lead to a "tyranny of the lowest common denominator" [A–44], where an interpretation is only considered legitimate when shared by everyone. This can lead to a trivialization of results. Disparate and differing views can often lead to new insights and should not be neglected. The interpreters' skills are important tools in this regard. Any description of a culture will thus be subject to different interpretations by those representing various interests and subcultures. The result of a cultural analysis is less about corrective actions; rather, it is about facilitating communication to enhance the understanding of the culture's impact on safety. The way the SCSA is reported back to the organization and its results taken up should reflect this.

A–7.3. Basic principles of interpretation

At the core of the SCSA methodology presented here is the notion of interpretation and the assumption that shapes the world view of people should be subjected to qualitative analysis if it is to be understood [A–122]. The practice of interpreting is, however, difficult, if not impossible, to describe in detail, since it is not a method in the sense of a step by step approach. Rather, it involves continuous reflection and reconsideration of interpretations and conclusions on various levels [A–123]. Interpretations of data often take the form of thematic analysis, where statements on different topics (e.g. leadership and safety) are gathered and compared. Taylor and Bogdan [124] describe the process in several steps. The first is to read and re-read your data (i.e. collect the data from interviews and read them several times until the content is familiar). Second, one should keep track of themes, hunches, interpretations and ideas to follow concepts as they emerge and have a clearly established relation to data. Third, looking for emerging themes involves searching for topics, terminology, recurring stories and feelings. Some will be more obvious than others. From these typologies and propositions, central aspects of the data can be constructed. Here, strategies such as meaning categorization and meaning condensation can be used [A–44]. (Taylor and Bogdan's method has further steps, but they are directed towards theory development and are thus of less relevance in an SCSA [A–124].)

As implied in Section A–7.2, ambiguities, contradictions and paradoxes should not be omitted or downplayed, as culture is a complex and multifaceted phenomenon. Neyland [125] describes the problems of transforming field notes and interview transcripts to themes where, for example, statements from interviews can be ordered. Next, statements that contradict these themes need to be managed. They may enrich the theme by showing the opposite or serve as reminders that the themes are not all encompassing. Moreover, subthemes may emerge and themes may have different relations to each other (e.g. supporting, contradicting and nuancing). In this, the tension between cultural homogeneity and heterogeneity should be kept in mind (see Section A–1).

Taking an 'inside' view does not mean that analysis is limited to organizing and sorting statements or observations. As noted by Silverman [A–126], the actor's point of view should not be treated as an explanation. The actor's point of view is the input to analysis, not the output of it. Thus, statements from respondents or focus groups about the state of things in the organization are treated as the meanings given to these phenomena, not as truths about them.

The interpretation work largely consists of reading, taking notes, marking up sections of phrases of significance, re-reading notes and material, and arranging and rearranging. The interpretive practice is often rather unstructured and explorative. It is also a process that already begins with collecting data and

continues through reading, re-reading and writing (see Section A–8) [A–124]. The analyst's developing understanding turns into a pre-understanding when revisiting data, thereby forming the basis for a further developed understanding, and so forth, often referred to as an hermeneutic circle [A–44]. This does not mean the process is entirely subjective, since the guidance from the theory and the disciplining effects of the empirical data play an important part [A–75]. Moreover, in the SCSA approach the team can use intersubjective reliability (see Section A–7.2 on authenticity).

A–7.4. Descriptive and normative analysis

As noted in Section A–1 (see Ref. [A–2]), the notion of culture is treated here in a descriptive sense (i.e. with an ambition of describing what an organization's culture is like), while the notion of safety culture is necessarily normative (and thus involves values regarding what is considered good and not so good practices). In the SCSA approach, this is managed by separating the analysis in two distinct steps.

The descriptive analysis rests on ontological assumptions gathered from ethnographic approaches to cultural studies, which sets it aside from some current research streams within safety culture research, as the latter has had an emphasis on other methods and theories [A–2, A–36]. Organizational ethnography aims to capture the everyday life in an organization, and the understanding of everyday life of the organizational members [A–125, A–127]. In a sense, the descriptive part of the analysis in SCSAs can be understood as influenced by the grounded theory approach suggested by Glaser and Strauss [A–128], in that it serves to build an image of an organization's safety culture from the ground up (i.e. starting with empirical data and building from that). It does, however, acknowledge theoretical pre-understanding a larger role than the grounded theory approach, but it does not share the systematic theory building ambitions of grounded theory. That said, tools and techniques from grounded theory could be incorporated into the SCSA method to ensure high quality and accurate results. The normative part of analysis is based on the IAEA safety culture framework. Here, the results of the cultural analysis are compared to established safety practices. In this, drawing on results from safety culture research as well as other studies high reliability organizations is important in learning to apply the framework (see Refs [A–2, A–19, A–36, A–129, A–130] for overviews of safety culture research). Research from other perspectives, such as high reliability organizations, is also valuable, as this often concerns cultural aspects (see Refs [A–131 to A–134]).

A–8. PROCESS AND LEARNING

According to Czarniawska [A–91] (original emphasis):

> "An observer can never know *better* than an actor; a stranger cannot say *more* about any culture than a native, but observers and strangers can see *different* things than actors and natives can."

An SCSA aims to continuously improve safety culture in an organization, and this involves learning for the organization. Issues of organizational learning and knowledge development are common in studies of organizations (see Refs [A–135 to A–137] and see Ref. [A–138] for an overview and introduction to the concept of organizational development). The view taken in SCSAs is that learning and knowledge development should be seen as an ongoing process of change [A–139 to A–142]. In this, the commitment of the entire organization is important for the role of senior management. Several authors emphasize the importance of senior management involvement in cultural change [A–10, A–143, A–144]. This aspect is also pursued in the literature on transformational leadership [A–145, A–146]. Problems relating to managerial commitment, especially on middle manager level, are discussed by Alvesson and Sveningsson [A–31].

A–8.1. The pragmatic truth criterion

The purpose of an SCSA is not to establish a 'final truth' about the characteristics or state of the organization's safety culture. Rather, it is to facilitate a discussion in the organization in order to enhance the understanding of the culture and its impact on safety. Kvale [A–147] presents three classic philosophical approaches to truth in a discussion on validity (original emphasis):

> "The *correspondence* criterion of truth concerns whether a knowledge statement corresponds to the objective world. The *coherence* criterion refers to the consistency and internal logic of a statement. And the *pragmatic* criterion relates the truth of a knowledge statement to its practical consequences."

In this regard, the purpose of the SCSA is to live up to a pragmatic criterion — that is, the value of the SCSA is the way it contributes to an organizational development process.

A–8.2. Writing

The SCSA report needs to be accessible as well as complete and adapted to the audience [A–124]. As in research writing, the basis for analysis (i.e. theory) should be accounted for, as well as which methods were used and how they were employed [A–73, A–148]. The specific perspective taken should be accounted for, and issues of fact production will need to be managed [A–45], for example how observation field notes have been transformed into written accounts or how interviews have been conducted. Moreover, there are several writing styles available. An SCSA report will most likely follow a realistic approach [A–23], where the author's subjectivity and presence is downplayed and interview excerpts and observations are presented in factual form. An awareness of stylistic choices is, however, beneficial. In addition to the realist style, Van Maanen [A–23] discusses "confessional tales" (where the experiences researcher–subject is put in focus) and "impressionist tales" (where the main interest is to affect the reader, inviting the use of exaggeration to make a point). Traits from other styles may benefit the report if employed with care. Section A–7.2, on authenticity, is of particular relevance in the writing process, together with the pragmatic truth criterion in Section A–8.1. It should be remembered that the report is an act of communication, and as such needs to take a reader oriented perspective.

The writing process should start early in the project, method by method, as writing in itself is a way of discovering aspects, generating ideas and analysing data [A–45]. As the SCSA report will have multiple authors, much communication will be needed in the writing process, especially as it feeds back to analysis. Here, computer based co-authoring tools may be beneficial.

A–8.3. Talking

Another part of the development process is to make sure that talk about the safety culture development process starts in the organization. In this, the SCSA suggests the use of focus groups (see Section A–3). Repeated use of focus groups is a way of facilitating communication in two ways. First, a focus group is a method for gathering information in the SCSA process. Second, a focus group is a way of feeding back SCSA information and results to the organization while simultaneously gathering more information. "Focus groups create lines of communication" [A–69], and these are always two way. Using conclusions or examples from an SCSA for new focus groups is a way of improving intra-organizational communication and facilitates shared understanding. In many ways, trying to change a system is a good way of gaining understanding about it [A–17].

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ABBREVIATIONS

CAP	corrective action programme
FME	foreign material exclusion
RCA	root cause analysis
SCSA	safety culture self-assessment

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ISBN 978–92–0–101515–0
ISSN 1020–6450