Human Aspects of Nuclear Safety
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Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body

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The mission of the NEA is:

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Foreword

The OECD Nuclear Energy Agency (NEA) Committee on Nuclear Regulatory Activities (CNRA) approved the creation of the Working Group on Safety Culture (WGSC) at its 37th meeting (May 2017). The group's main objective is to provide a senior-level regulatory forum for fostering discussion and exchange of information and experience on diverse practical approaches to developing and sustaining a healthy safety culture within the regulatory body and across the wider, interconnected system. To this end, the working group also develops concepts from the NEA regulatory guidance report, *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016). This report identifies five principles that underpin and support the safety culture of an effective nuclear regulatory body and describes their associated attributes. The need to focus on practical tools for developing a safety culture is of particular interest for the CNRA. This explains why, to date, the main attention of the WGSC has been to explore and structure the diverse tools and methods regulatory bodies in member countries are using to foster a safety culture, as well as those of licensees and regulated entities.

In November 2017, the WGSC held its first meeting with the aim of informing each member country's efforts in addressing the safety culture of the regulatory body and to start developing its programme of work. The group decided to focus on two tasks: building safety culture competence and awareness; and promoting self-reflection and self-assessment of the safety culture of the regulatory body. Upon the CNRA's approval of these tasks in June 2018, the WGSC developed its approach to gather insights, experiences and lessons learnt to form the basis of this report.

As a first step, a pilot questionnaire was distributed to WGSC members in July 2018. Once the questions had been refined, the final questionnaire was sent to all CNRA members in February 2019. Responses were received by April 2019. With the aim of enhancing a safety culture across and within the regulatory body, the questionnaire was designed to gather insights, experiences and lessons learnt on training and competence-building activities, as well as applied approaches, practices, methods and tools that regulatory bodies use to carry out self-reflection and self-assessment. In total, 17 member countries responded to the final questionnaire: Belgium, Canada, Finland, France, Germany, Hungary, Japan, Korea, the Netherlands, Poland, Russia, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States. These NEA member countries represent nuclear programmes of different size and scope. As an NEA strategic partner, the People's Republic of China also provided responses, which are included in the analysis. The organisations that responded include regulatory bodies and their technical support organisations.

The questionnaire responses were analysed by two task groups of WGSC members, each composed of senior-level officials and safety culture experts with backgrounds in psychology, social sciences and engineering. Findings were further refined by the WGSC members during several task group meetings (held throughout 2019 and 2020) and in plenary discussions during the WGSC biannual meetings.

This report is targeted primarily towards leaders and managers, as well as staff members, responsible for activities to strengthen the safety culture of the regulatory body. In the first case, senior management should be aware of the practices performed by regulatory bodies around the world. In turn, to ensure that safety is prioritised above all else, managers should know that a variety of approaches and tools for competence building and self-assessment/-reflection can contribute to continuous improvement of the safety culture of the regulatory body, which may ultimately impact the safety culture of a licensee. Secondly, the regulatory body needs qualified staff who have expertise in the theoretical basis of a safety culture and in the practical tools

available to strengthen it. This report provides both an overview and practical information on the methods and tools used by regulatory bodies to assess their own safety culture and to build safety culture competence and awareness. The WGSC encourages regulatory bodies to use this report as a reference for reviewing and improving their activities to foster and enhance a healthy safety culture.

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In addition to these individuals, many thanks are due to the individuals who took the time to fill out the questionnaire from the following countries: Belgium, Canada, the People's Republic of China, Finland, France, Germany, Hungary, Japan, Korea, the Netherlands, Poland, Russia, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States. Thanks are also extended to those who provided useful comments and editing suggestions, for which the team is grateful.

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Table of contents

List of figures

List of tables

List of abbreviations and acronyms

CNRA	Committee on Nuclear Regulatory Activities (NEA)
CSNI	Committee on the Safety of Nuclear Installations (NEA)
CSSCF	Country-Specific Safety Culture Forum (NEA)
HOF	Human and organisational factors
HTO	Human, technology and organisation
IAEA	International Atomic Energy Agency
INPO	Institute of Nuclear Power Operations (United States)
INSAG	International Nuclear Safety Advisory Group (IAEA)
IRRS	International Regulatory Review Service (IAEA)
NEA	Nuclear Energy Agency
OECD	Organisation for Economic Co-operation and Development
RSC	Regulatory safety culture
SCSA	Safety culture and self-assessment
SRSA	Self-reflection self-assessment
SSM	Swedish Radiation Safety Authority
STUK	Radiation and Nuclear Safety Authority (Finland)
TQM	Total quality management
TSO	Technical support organisation
WANO	World Association of Nuclear Operators
WGSC	Working Group on Safety Culture (NEA)

Executive summary

It is essential that organisations in the nuclear community maintain a healthy safety culture to achieve the common goals of safe operation of nuclear facilities and safe use of nuclear material. Regulatory bodies are no exception, as a key element of the interconnected system that includes licensees, research institutions, technical support organisations, as well as governmental organisations and other stakeholders. By directly and indirectly interacting with each other, all organisations within this interconnected system have an impact on nuclear safety and mutually influence their respective safety cultures.

Regulatory bodies, by their nature, deeply influence the safety culture and the safety of the organisations they regulate and oversee. Based on their regulatory strategy, the way they carry out their daily oversight work, the type of relationship they cultivate with licensees, the values they convey and the importance they give to safety, regulatory bodies profoundly impact the licensees' safety culture, their sense of responsibility for safety and, by extension, the safety of their installations. Each regulatory body needs to be conscious of this impact in order to promote the willingness and efforts of the nuclear operating organisations, while simultaneously discharging their primary responsibility for safety (NEA, 2016).

The Nuclear Energy Agency (NEA) regulatory guidance report *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016) (noted hereafter as "the NEA Green Booklet") identified and described five principles and their associated attributes leading to a healthy safety culture within the nuclear regulatory body. The NEA Green Booklet recognises the challenges to the safety culture of regulatory bodies and the need to turn these challenges into opportunities; it also stresses an attitude that values continuous improvement and learning. This report aims to help by further developing concepts from the NEA Green Booklet in a practical way. In particular, this report covers Principle 5, which states that "continuous improvement, learning and self-assessment are encouraged at all levels in the organisation", along with its associated attributes.

Regulatory bodies apply a number of methods, practices and approaches to foster and sustain a healthy safety culture. This report provides an overview and practical examples of how to build their safety culture competence and to carry out self-reflection and self-assessment of the regulators' own safety culture and its impact on the safety culture of organisations they oversee. Based on experiences from NEA member countries, the report discusses effective methods to disseminate safety culture throughout the regulatory body, to build competence in safety culture, and to develop self-reflection and self-assessment activities.

Senior management within the regulatory body plays a crucial leadership role in fostering and sustaining a healthy safety culture. They should be aware of the practices performed by regulatory bodies around the world and should give due regard to their own human and organisational factors (HOF) practitioners. This will help the organisation apply the methods and approaches provided, analyse the results, understand their implications and perform actions to enhance the safety culture of the regulatory body. Senior management should also support an environment of continuous learning based on internal and external experiences, and provide training and competency building in the area of safety culture.

Based on the lessons learnt and best practices, the ten following conclusions aim to inspire managers to undertake and sustain efforts to continuously develop the safety culture of the regulatory body.

1. Understanding the significance of the safety culture of the regulatory body

   The safety culture of the regulatory body influences the safety culture of licensees. Reflecting upon, assessing and developing further the safety culture of the regulatory body helps to improve the safety culture and the safety of regulated installations. In turn,

staff of the regulatory body become familiar with the concept of safety culture, as well as the challenges of the licensees in reflecting, assessing and improving it. Thus, the staff develop knowledge and skills for evaluating licensee's safety culture activities as well.

2. Fostering management commitment and involvement

   The commitment and involvement of the management at all organisational levels is crucial; it demonstrates to staff that engagement in safety culture is important and necessary. The example set by senior management plays an especially important role for the success of such activities.

3. Actively involving staff

   Most methods and approaches are effective only if participants are open to engage and willing to share their expertise and experiences. Regulatory bodies can reinforce the acceptance and involvement of their staff by using methods that are enjoyable, creating a pleasant atmosphere, ensuring a safe environment and confidentiality, focusing on the process rather than the result, and communicating transparently the actions and results.

4. Learning from the experience of others

   A wide range of methods and approaches successfully applied by regulatory bodies around the world are available, from which all regulatory bodies can extract hints, ideas, inspiration and advice to understand and foster their own safety culture.

5. Getting started

   The exact choice of method to begin with is less important than starting a process that creates a positive atmosphere, generates a feeling of success among participants and opens the door for continuing activities.

6. Creating early successes

   It is advisable to start with straightforward methods and approaches that will deliver early successes, thereby allowing the regulatory body to build on them and continue a positive feedback loop towards more open communication among employees, more elaborate approaches and a healthy safety culture.

7. Applying the right expertise

   HOF practitioners possess specific safety culture expertise that, combined with the right method for the context applied in a collective and interdisciplinary way, support the regulatory body in assessing and enhancing its safety culture.

8. Combining methods, tools and approaches

   Fostering and improving safety culture is a continuous process; a combination of methods, tools and approaches is advisable, tailored to the specific needs and available resources.

9. Planning, monitoring and evaluating

   An interdependence exists between an organisation's management system and safety culture. To be effective, actions related to safety culture should be planned, monitored and evaluated according to – and as an integral part of – the organisation's management system. Outcomes from these actions can also help identify opportunities to improve policies, processes and procedures, and should thus be fed back into the management system.

10. Ensuring continuous improvement

    Strengthening safety culture cannot be a one-time activity. It is a journey consisting of keeping awareness alive, continuing to improve, evaluating the effectiveness of actions, being open for possible corrections, and pursuing continuous improvement and learning.

Through its Working Group on Safety Culture (WGSC), the NEA is continuing to foster discussion and exchange information and experience among member countries on different practical approaches to developing and sustaining a healthy safety culture, both within the regulatory body and across the wider, interconnected system. This open exchange of experience and lessons learnt allows regulatory bodies to examine and analyse examples that help them to enhance competence and awareness, as well as to reflect on and assess their own safety culture.

Future work in this field includes the need to further investigate how the safety culture of the regulatory body influences that of the regulated organisations, and vice versa. Regulators also need to develop methods and tools that allow them to reach deeper layers of culture and to monitor the effectiveness of improvement actions.

Chapter 1. **Introduction**

Safety culture was highlighted as a fundamental management principle by the International Nuclear Safety Advisory Group (INSAG) of the International Atomic Energy Agency (IAEA) in their INSAG-3 report *Basic Safety Principles for Nuclear Power Plants* (IAEA, 1988). The concept was further refined in the INSAG-4 report *Safety Culture* (IAEA, 1991), which outlined requirements and characteristics to judge the effectiveness of safety culture in particular cases. INSAG defined the concept of safety culture, after the Chernobyl accident, as "…that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance" (IAEA, 1991). This definition considers that safety culture is both structural and attitudinal. The former refers to the organisational structure, roles and responsibilities, documentation, policy statements, etc.; the latter refers to perceptions, social norms, ways of thinking and patterns of behaviour (Bernard, 2014).

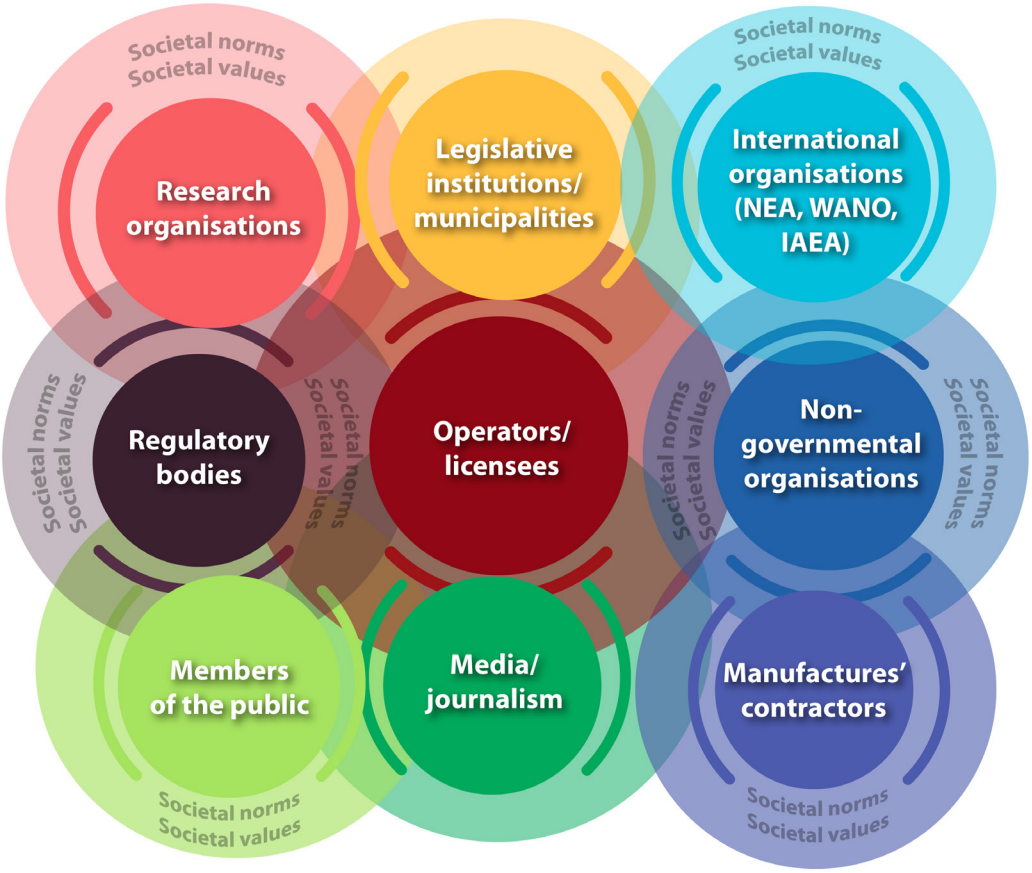
The World Association of Nuclear Operators (WANO) and the Institute of Nuclear Power Operations (INPO) have also published traits of a healthy nuclear safety culture and have identified the main organisational processes critical to such a culture (INPO, 2013; WANO, 2013). According to INPO (2013), the categories of the traits of a healthy nuclear safety culture include: individual commitment to safety (personal accountability, questioning attitude and effective safety communication); management commitment to safety (leadership safety values and actions, effective decision-making, and a respectful work environment); and management systems (continuous learning, problem identification and resolution, environment for raising concerns and work processes). These three categories are similar to components proposed in INSAG-4 (IAEA, 1991): requirements at policy level, requirements on managers and response of individuals. IAEA Safety Guides (IAEA, 2006 and 2009) include additional recommendations on how to take account of safety culture in the organisation and in the management system. Along with conceptual development, a series of documents published by the IAEA provide practical advice on key aspects to develop and strengthen safety culture. They cover various topics including: safety culture in the pre-operational phase (IAEA, 2012); surveys or self-assessment methods (IAEA, 2002a, 2002b and 2019); and establishing regulatory oversight of safety culture (IAEA, 2013b).

Safety culture was, for many years, understood and treated as an issue primarily related to nuclear operating organisations. The role of a regulatory body with respect to safety culture was regarded as developing and applying methods for oversight on safety culture in the regulated organisations. After the accident at the Fukushima Daiichi nuclear power plant, however, awareness has increased regarding the importance of safety culture within regulatory bodies. In turn, competences related to safety culture within the regulatory bodies have been developed, along with practical methods for self-assessment.

The human and organisational factors (HOF) analysis of the Fukushima Daiichi accident also led to recognition of the need for a systemic approach1 that encompasses interactions among all stakeholders involved in nuclear safety. All participants of this wide, interconnected system interact directly and indirectly (NEA, 2016). Those stakeholders, including the regulatory body and licensees, collectively shape an overarching culture and mutually influence each other, being at the same time an outcome and a determinant of this overall culture (Ryser, 2019) (Figure 1.1).

1. According to IAEA GSR Part 2, this refers to "an approach relating to the system as a whole in which the interactions between technical, human and organizational factors are duly considered" (IAEA, 2016a).

Figure 1.1. **Overall interconnected system of stakeholders**



From the viewpoint of regulatory oversight, the safety culture of regulators has a potentially significant impact on that of organisations they oversee, in particular through values and norms they demonstrate, the way they regulate and oversee the nuclear industry, and the way they interact with licensees. Today, this view is widely shared. For regulatory bodies, safety culture is a challenge from two perspectives: 1) safety culture as an issue of oversight, with the need to develop suitable approaches and tools for oversight on the licensee's safety culture; and 2) safety culture as an issue of regulators' own self-reflection, with the need to give shape to their own safety culture and understand how it influences the safety culture of licensees (Ryser, 2019; NEA, 2016).

The Nuclear Energy Agency (NEA) established its commitment to safety culture in the late 1990s and has since mainly examined the regulators' side of the issue from the two perspectives mentioned above. The NEA report, *The Role of the Nuclear Regulator in Promoting and Evaluating Safety Culture* (NEA, 1999), focuses on regulatory oversight of safety culture and discusses how the regulatory body could recognise early signs of declining safety performance of operators. Another guidance report, *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016) (hereafter referred to as the "NEA Green Booklet"), identifies and describes five principles and their associated attributes that underpin and support the safety culture of an effective nuclear regulatory body.

The NEA Green Booklet (NEA, 2016) emphasises that it is the combination of these characteristics – i.e. the principles and attributes – that leads to a healthy safety culture within the nuclear regulatory body (Table 1.1). In effect, no one characteristic is sufficient on its own. The NEA encourages nuclear regulators to use these principles and attributes to self-assess their safety culture and to continuously strengthen their effectiveness while fulfilling their mission to protect public health and safety.

Table 1.1. **Principles and attributes of a healthy safety culture in regulatory bodies**

Principles	Attributes
Principle 1: Leadership for safety is to be demonstrated at all levels in the regulatory body.	• "Safety first" is a guiding principle in the regulatory body. • All leaders throughout the regulatory body demonstrate a commitment to safety in their decisions and behaviours. • Leaders create an environment for positive development of the safety culture. • Leaders clearly define individual roles, responsibilities and authority. • Leaders ensure that the necessary resources are available to meet the safety mission.
Principle 2: All staff of the regulatory body have individual responsibility and accountability for exhibiting behaviours that set the standard for safety.	• Personal commitment to and accountability for safety from every staff member, at all levels of the organisation. • A strong sense of collaboration and co-ordination of activities across the organisation. • The need for moral courage and agility in doing the right thing.
Principle 3: The culture of the regulatory body promotes safety, and facilitates co-operation and open communication.	• Openness and transparency. • Clear organisational commitment to co-operation. • A questioning attitude, and mechanisms to raise differing opinions on regulatory decisions. • Promotion of safety and associated knowledge.
Principle 4: Implementing a holistic approach to safety is ensured by working in a systematic manner.	• A healthy respect for the consequences of all actions and decisions taken by the regulatory body. • Clear awareness of roles and responsibilities in relation to licensees. • A clear regulatory framework. • Proactivity, adaptability and a holistic approach. • Recognition of the complexity of safety issues.
Principle 5: Continuous improvement, learning and self-assessment are encouraged at all levels in the organisation.	• Safety culture self-assessment and peer reviews. • Learning from experience, fostering exchanges and increasing knowledge. • Knowledge management to build a healthy safety culture. • Continuous improvement as a clear value of the regulatory body.

The characteristics summarised in Table 1.1 are not exhaustive and are intended to complement other work. For example, national culture is indicated as one of the elements influencing safety culture, but the issue is not further elaborated in the NEA Green Booklet (NEA, 2016) as it requires an individualised approach. A collaborative effort to explore the influence of national culture led to the establishment, by the NEA and the WANO, of the Country-Specific Safety Culture Forum (CSSCF). The CSSCF provides a unique forum to explore and reflect on how a national context impacts on the safety culture, and how operators and regulators should think about these effects in their day-to-day activities, with the goal to ensure safe nuclear operations. The first CSSCF was convened in Stockholm (Sweden) in January 2018 with collaboration between the NEA, the WANO and the Swedish Radiation Safety Authority (SSM) (NEA, 2018). The second CSSCF was held in Finland in March 2019 as a joint effort between the NEA, the WANO and the Radiation and Nuclear Safety Authority of Finland (STUK) (NEA, 2019).

In addition, the Working Group on Safety Culture (WGSC) was established in 2017, under the Committee on Nuclear Regulatory Activities (CNRA) of the NEA. The main objective of the WGSC is to provide a senior-level regulatory forum for exchanging information and experiences, and planning work to ensure that the safety culture of the regulatory body and the wider, interconnected system has a positive impact on safety. As part of its mandate, the WGSC is tasked with compiling experiences and lessons learnt associated with implementing policies and strategies to support a healthy safety culture, with a specific focus on related NEA documents.

Regulatory bodies around the world have made efforts to strengthen their own safety cultures in diverse ways, keeping in mind their potential influence on the culture of licensees. In this respect, many regulators have already gained extensive experience in activities related to safety culture, including self-assessment, self-reflection, training, awareness building and improvement. It is important to share those experiences, not only the methodologies, but also the rationale, limitations and challenges encountered. Hence, this report catalogues methods for competence and awareness building, as well as for self-reflection and self-assessment. Lessons learnt and recommendations are provided so the report can serve as a basis for member countries to enhance safety culture of both the regulator and regulated entities.

The NEA Green Booklet (NEA, 2016) indicates that more work is needed in the development of assessment methodologies. Besides assessing tangible elements of the culture (e.g. artefacts, behaviours), self-assessment and self-reflection should also address intangible elements (e.g. norms and values, as well as deeply rooted basic assumptions), as suggested by Schöbel et al. (2017). Gaining better awareness of these intangible elements will be important for regulatory bodies, considering their influence on licensees' safety culture at deeper levels. While finding ways to dig deep into the basic assumptions may be a future challenge, a broad base will be necessary for developing such a methodology. From this viewpoint, the present report compiles information about diverse methods, approaches and practices that may be able to access the safety culture at different levels.

This report is intended for senior management and managers, as well as staff members who are responsible for activities to strengthen the safety culture of the regulatory body. Firstly, senior management should be aware of the practices performed by regulatory bodies around the world. As stated in the NEA Green Booklet (NEA, 2016), a certain sense of self-importance, complacency or infallibility can result from working in isolation from other stakeholders and from the international community. Learning from peers can also be an opportunity to develop awareness of the regulatory body's own strengths and weaknesses. Secondly, the regulatory body needs qualified staff who understand the theoretical foundation of safety culture and different practical tools to strengthen it. The NEA Green Booklet (NEA, 2016) states that, "a specific safety culture expertise should be available to the regulatory body in order to implement assessment processes, facilitate dialogue in the regulatory body and analyse the results." Accordingly, senior management should give due regard to the knowledge and experience of their HOF practitioners in relation to safety culture to carry out the methods and approaches provided in this report, as well as to help analyse results and make recommendations to enhance the safety culture of their regulatory body.

This report provides both an overview and practical information regarding the methods and approaches performed by regulatory bodies to build safety culture competence and awareness and to assess their own safety culture. The remainder of this report is divided into five chapters. Chapter 2 provides the rationale of the report and an overview of the two focus areas: safety culture competence and awareness building, and self-reflection and self-assessment. The next chapters highlight results and discussion of good practices to build safety culture competence and awareness (Chapter 3), and methods for self-reflection and self-assessment (Chapter 4). Each chapter describes and discusses different methods, reviews lessons learnt, and features recommendations and conclusions. Finally, the main conclusions are summarised in Chapter 5 and topics for further research are discussed in Chapter 6. Annexes catalogue methods to build safety culture competence and awareness on safety culture (Annex A) and methods on self-reflection and self-assessment (Annex B).

Chapter 2. **Rationale**

Regulators, by nature of their role, deeply influence the safety culture of the organisations they oversee. Depending on their regulatory strategy, the way they carry out their daily oversight work, the type of relationship they cultivate with licensees, the values they convey and the importance they give to safety, regulatory bodies can have a profound impact on the safety culture of licensees as well as on their sense of responsibility for safety and hence the safety of their installations as a whole. The regulatory body needs to be aware of the impact of its own safety culture on the safety and safety culture of the organisations it regulates and oversees in order to promote the willingness and efforts of the latter to discharge their primary responsibility for safety (NEA, 2016).

Since its establishment in 2017, the Nuclear Energy Agency (NEA) Working Group on Safety Culture (WGSC) has focused on developing practical tools and cataloguing approaches to address issues related to the safety culture of regulatory bodies. To do this, WGSC members established two subgroups to work on two main tasks. One task addresses safety culture competence and awareness building, with the overall objective to develop and promote safety culture awareness of the regulatory body through provision of relevant existing materials and methods. The other task focuses on self-reflection and self-assessment of safety culture in regulatory bodies, with the overall objective of identifying and structuring relevant approaches and methods, including ways of working with and impacts on regulated organisations.

Both tasks are in close alignment with the Nuclear Energy Agency (NEA) publication, *The Safety Culture of an Effective Regulatory Body* (NEA, 2016), commonly known as the NEA Green Booklet, which states that regulators deeply influence the safety culture of the organisations they oversee. Thus, it is important for the regulatory body to examine how it disseminates information concerning safety culture throughout its organisation, how it builds competence in safety culture and how these actions affect the safety culture of the regulatory body. The NEA Green Booklet also stresses the importance of self-reflection and self-assessment activities of regulatory bodies, including an attitude that values continuous improvement and learning.

Both tasks are closely interrelated. On one hand, application of methods for self-reflection and self-assessment requires some pre-existing degree of competence and awareness related to safety culture within the organisation. On the other hand, the use of methods for self-reflection and self-assessment of the safety culture of the regulatory body can, in itself, build such competence and awareness. Therefore, the methods and approaches identified in both tasks should be considered as two integral components of building, sustaining and improving the safety culture of the regulatory body, as well as fulfilling its oversight function with respect to safety culture.

In recent years, regulatory bodies have gained broad experience in assessing and improving their safety culture, as documented in publications of the NEA (2010 and 2015) and the International Atomic Energy Agency (IAEA) (2002b, 2016, 2019 and 2020). Experience in this continuously evolving field is still growing. As a wide range of methods are applied by regulatory bodies, they are customised to specific needs and further developed. To identify relevant and effective methods, the NEA asked member countries to share their most useful methods and approaches. In turn, from the array of deployed approaches, the WGSC was able to create a manageable catalogue of useful and effective methods.

Reflecting the output of both tasks, this report comprises two catalogues: one of activities for enhancing safety culture competence within the regulatory body; and one of practices, methods and tools used by regulatory bodies to self-reflect on and self-assess their safety culture. These activities include training methods for inspecting or assessing safety culture in

licensees and other regulated entities, as well as practices and approaches to raise awareness and enhance safety culture. The catalogues provide information about activities, practices, methods and tools that were applied by regulatory bodies and are considered to be effective by the practitioners. Essential information is given in the annexes of this report. More detailed information regarding the activities collected in the catalogue is available by contacting the Committee on Nuclear Regulatory Activities (CNRA) and/or the WGSC Secretariat, as listed on the WGSC page of the NEA website: www.oecd-nea.org/wgsc.

2.1. Methods and approaches for building safety culture competence and awareness

The regulatory body must maintain its competence in all relevant technical areas, including safety culture. Safety culture competence and awareness across the entire regulatory body – not just for safety culture specialists – is a key factor in determining positive safety outcomes in licensees. Maintaining regulatory competence is recognised in the NEA Green Booklet (NEA, 2016) as a challenge to sustaining the safety culture of the regulatory body. New staff, for example, must be trained, be able to gain experience and be integrated into the safety culture of the regulatory body. In parallel, the regulatory body must mitigate the risk of loss of corporate memory and knowledge due to staff turnover.

This report discusses the role of training, competence building and awareness for safety culture. The term "training" refers to a structured method or mechanism for developing knowledge, skills and experience while "competence building" has the broader goal to improve the necessary capabilities of staff. Competence is the combination of knowledge, skills and attitudes needed by a person to perform a particular job. All three aspects are important and interrelate. In this context, competence building covers all activities to ensure development of knowledge, skills and attitudes needed for safety culture and leadership. This applies to both the regulatory body's external oversight responsibilities, as well as to its own internal safety culture. The concept of awareness is even broader than competence building: it refers to a general state of understanding of a given topic, idea or goal. In this report, training and competence building are considered to make important contributions to developing safety culture awareness and skills.

The ability of organisations to make safe decisions and take safe actions is affected by the knowledge of individuals – with any gaps in or loss of knowledge having specific impacts. Managing essential knowledge as a strategic organisational asset is a factor of high relevance, and competences can be seen as critical carriers of knowledge. In this context, many nuclear organisations now include capacity building in their work programmes, as a means to continuously improve societal, organisational and individual competences and capabilities necessary to achieve safe, secure and sustainable nuclear programmes.

The term "capacity building" emerged in the lexicon of international development of the nuclear industry during the 1990s. However, wide usage has resulted in the definition depending on the context of each organisation – and thus to controversy over its true meaning. In essence, capacity building is a concept that comprises human resource development, knowledge management and networks, along with education and training activities to develop capacities and competences at three levels: governmental (societal), organisational and individual. Capacity building at governmental level is essential as, without its support, organisational and individual capacity will be affected.

In Chapter 3, methods employed to build safety culture competence and awareness on safety culture are structured in five categories according to their overall objectives and target audiences. The chapter summarises the main lessons learnt by regulatory bodies, the advantages and disadvantages, as well as practical considerations to be taken into account when implementing different activities to build the competences and raise awareness of safety culture. A sample of methods to build such competence and awareness is provided in Annex A (the catalogue).

2.2. Methods, approaches and tools for self-reflection and self-assessment of safety culture

The main motivation behind undertaking self-reflection and self-assessment is to understand and evaluate the performance of regulatory responsibilities and to improve the regulatory body's own oversight culture in order to positively impact the licensee's safety culture. Performing regular self-reflections, self-assessments, and external reviews – as well as adopting a learning attitude – are critical to identifying areas of improvement in all regulatory body activities and support continuous improvement.

Methods used by regulatory bodies often focus primarily on one of the following purposes, although the allocation is not always clear-cut:

- **Self-reflection** refers to descriptive, introspective activities within the regulatory body (groups, organisational units or the entire organisation) aimed at *understanding* its own way of functioning and its impact on safety and the safety culture of licensees, thus contributing to an environment of continuous learning.
- **Self-assessment** refers to normative assessment activities within the regulatory body against a set of predefined criteria by means of a systematic and structured process. Such assessment aims to *evaluate* the current situation and opportunities for continuous improvement towards the fulfilment of specific norms or requirements.

Many methods for self-reflection and self-assessment also include activities to identify a concrete proposal for actions and measures to improve the safety culture of the regulatory body or achieve an improvement in a specific area. They aim to *change* specific elements of the current situation.

Chapter 4 analyses the methods employed as a collective group of approaches. It examines similarities and differences between individual methods within each group of methods, identifies activities focused on improvement, and evaluates the experience of the countries in order to highlight best practices. Further details of each method can be found in Annex B.

Chapter 3. Methods to build safety culture competence and awareness

Competence in safety culture is a key characteristic of an effective regulator. Safety culture competence supports a holistic approach to regulatory oversight of licensees, considering human, technological and organisational aspects in an integrated way. It also supports self-awareness of how the safety culture of the regulatory body impacts that of licensees and vice versa.

Regulatory bodies report using a wide variety of methods to build safety culture competence and awareness within their organisations. These include training in a variety of forms (including classroom training and e-learning), workshops, seminars and tutorship programmes. The triggers that motivate regulatory bodies to undertake these activities can be external or internal, as suggested also by the International Atomic Energy Agency (IAEA) (IAEA, 2020). Some of these triggers[1] reported by Nuclear Energy Agency (NEA) member countries include the following:

- articulation of leadership commitments and desired behaviour at all levels of the organisation;
- better alignment of internal personal values with external organisation values;
- incorporation of lessons learnt (e.g. of accidents and events, revision of the management system);
- need to improve ways of working and individual behaviours (e.g. among departments and between supervisors and subordinates; level of involvement of staff; prioritisation of tasks and duties; embedding a graded approach in everyday work; harmonise education and experience level of new recruits; conducting safety culture inspections by generalist and specialised inspectors);
- international incentives or pressure (e.g. observations from IAEA International Regulatory Review Service (IRRS) missions, international standards and good practices).

3.1. Categories of methods for building competence and awareness

The different methods used by NEA member countries to build safety culture competence and awareness have been categorised according to their overall objective and target audience (Table 3.1).

While some methods have a clear “external” focus (e.g. building the competence of inspectors to undertake regulatory oversight of safety culture in licensees), others have a clear “internal” focus (e.g. raising awareness of all staff in the regulatory body on safety culture and fostering good leadership behaviours). Other methods have both an external and internal focus. Further details of methods can be found in Annex A. As several methods have close similarities, only a sample of methods has been included in the catalogue.

1. Additional, detailed triggers can be found in Annex A.

The five categories (A, B, C, D and E) used to structure the methods are as follows:

- Category A: Human and organisational factors (HOF) expert workshops to share knowledge and information on the safety culture of the supervised organisations.

  Number of methods described: 1.

- Category B: Training for inspectors to raise knowledge and awareness of safety culture and build competence in regulatory oversight of safety culture.

  Number of methods described: 9.

- Category C: Methods for inspectors to regularly share knowledge and experience of safety culture inspection practice.

  Number of methods described: 1.

- Category D: Methods to raise knowledge and awareness of safety culture among staff.

  Number of methods described: 8.

- Category E: Methods for staff to fulfil the regulatory mission.

  Number of methods described: 2.

Table 3.1. **Overview of the methods for safety culture competence and awareness building**

Overall objective	Target audience	Title	Specific objectives
Category A: Share knowledge and experience of safety culture	HOF experts	A1. Workshop on safety culture in the regulatory approach	• Exchange experience. • Share information on new developments. • Discuss questions, methods and regulatory approaches.
Category B: Raise knowledge and awareness of safety culture; build competence in regulatory oversight of safety culture	Inspectors	B1. Internship by licensees during the initial training programme for new inspectors	• Create an immersive experience in regulated activity. • Understand the operational worker's culture, environment and constraints. • Create different communication conditions from an inspection. • Increase technical knowledge.
		B2. In-house seminar with national and international HOF experts	• Refresh knowledge and promote individual and group experiences of safety culture. • Communicate, discuss and share experience of interactions among different elements of the human, technology and organisation (HTO) model. • Increase awareness of generalist inspectors in specific HOF topics (e.g. human performance optimisation tools and leadership for safety).
		B3. Safety culture observation training	• Improve safety culture oversight by the regulatory body.
		B4. In-house safety culture training	• Develop a better understanding of safety culture to support supervision activities. • Develop a better understanding of how the safety culture of the regulatory body can have a positive and/or negative impact on licensees.

Table 3.1. **Overview of the methods for safety culture competence and awareness building** (cont'd)

Overall objective	Target audience	Title	Specific objectives
Category B: Raise knowledge and awareness of safety culture; build competence in regulatory oversight of safety culture	Inspectors	B5. Site inspector training course	• Understand expected behaviour of a site inspector. • Understand the role of the site inspector in overseeing safety culture in licensees. • Understand organisational and cultural causes of accidents. • Identify "weak signals" of organisational dysfunction. • Understand the regulatory approach to safety culture.
		B6. Safety culture course for new inspectors	• Convey a common understanding of the elements of safety culture that can or cannot be observed and assessed, and how this can be realised. • Develop an understanding of how an inspector's own oversight work and behaviour can impact (positively or negatively) the licensee's safety culture.
		B7. Safety culture competence and awareness building of inspectors	• Study the basis of safety culture. • Understand the contents of the regulator's "Safety Culture Guideline", including evaluation of a licensee's activities to foster a safety culture. • Prepare a "Safety Culture General Evaluation Form".
		B8. Tutorship of new or promoted staff	• Optimise professional development. • Support staff to adapt to activities of the regulatory body. • Accelerate development of staff to fulfil regulatory duties. • Assist staff in developing behavioural skills. • Develop a sense of personal responsibility, respect for others and diligence in carrying out work.
		B9. Formal training of inspectors and other experienced staff to qualify as safety culture assessors for safety culture assessments of operators	• Help gather information or practice a skill that may be important during safety culture assessments by completing a variety of activities to be qualified as safety culture assessor. Qualification requires a firm understanding of both safety culture and inspection skills, and is an essential part of oversight of safety culture.
Category C: Share knowledge and experience of safety culture inspection practice	Inspectors	C1. Annual workshop on safety culture oversight practice	• Exchange experience. • Reflect on "concrete" inspection scenarios. • Establish a common understanding of an inspector's role and activities.
Category D: Raise knowledge and awareness of safety culture	All staff	D1. E-learning on management system and safety culture of the regulatory body	• Increase staff awareness and understanding of the management system and safety culture of the regulatory body, reflecting lessons learnt from the accident at the nuclear power plant of Fukushima Daiichi. • Make implementation of the management system more effective.
		D2. Safety culture presentations	• Improve safety culture awareness of all staff.
		D3. Workshops with international experts in safety culture	• Improve internal leadership and increase internal and organisational awareness of safety culture in connection with preventive behaviours.
		D4. Safety culture training	• Deepen understanding of cultural and leadership aspects and their connection with past catastrophes. • Discuss and reflect on cultural characteristics of the regulatory body in the context of real-life accidents.

Table 3.1. **Overview of the methods for safety culture competence and awareness building** (cont'd)

Overall objective	Target audience	Title	Specific objectives
Category D: Raise knowledge and awareness of safety culture	All staff	D5. Training in the concept of safety	• Enhance awareness of staff on safety. • Understand safety culture and how to apply it in daily activities.
		D6. Safety culture of the regulatory body training	• Provide an overview and common understanding of the meaning of safety culture. • Introduce the key elements of safety culture assessments and results. • Provide a forum for questions and discussion on safety culture.
		D7. Behaviour and communication training course	• Support inspectors in being more aware of how their behaviour and communication (interaction with others) influences the learning abilities of the organisation and its safety culture through practical training in compassionate/collaborative communication, appreciative inquiry and reflecting in action programme.
		D8. Safety culture training for all staff to build necessary knowledge, skills and abilities	• Provide safety culture awareness, and necessary knowledge, skills and abilities. • Enhance safety culture awareness and implementation across the organisation.
Category E: Fulfil the regulatory mission	All staff	E1. Leadership model	• Provide a roadmap to communicate – in one place – how staff, individually and collectively, demonstrate leadership in fulfilling the regulatory mission, elaborating upon six fundamental characteristics: participative decision-making; receptivity to new ideas and thinking; empowerment and shared leadership; diversity in thought; innovation and risk tolerance; and collaboration and teamwork.
		E2. Integrate regulatory safety culture (RSC) within strategic planning process, performance measurement, technical competencies and key behavioural competencies	• Integrate safety culture knowledge, skills and abilities into various organisational components, thereby providing a wide arena for continuous emphasis and dissemination of expectations. • Model desired behaviours while putting measures in place towards applying competencies in support of RSC.

3.2. Discussion, lessons learnt and practical observations from safety culture competence and awareness building

This section summarises reflections on the main lessons learnt by regulatory bodies as well as the advantages, disadvantages and practical considerations to be taken into account when implementing different types of activities to build competences and raise awareness for a healthy safety culture.

Category A. Human and organisational factors (HOF) expert workshops to share knowledge and information on safety culture of the supervised organisations

Workshops on safety culture in the regulatory approach, and in particular small group discussions, are considered useful given the complex nature of safety culture oversight and the challenging task of conducting supervision activities. The format, with sessions covering four key topics, is especially appropriate to share knowledge and experience in supervising safety culture. The intense discussions in groups, with the composition of groups changing in each session, fosters a high exchange of information and knowledge while also supporting networking among different experts. Although the central topic is the licensees' safety culture, the influence of the regulatory body and the role of the safety culture of the regulatory body can also be included and discussed.

Providing opportunities to discuss and exchange ideas in "safe and small" groups resonates with the IAEA concept of "shared space" that 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 (IAEA, 2016b).

Safety culture competence is not primarily a competence of knowledge but of behaviour. Therefore, it is important to focus on desired behaviours for competence building. These can be learnt through simulated situations, in role plays, by mentoring or by giving and accepting feedback on observed behaviour. Dialogue on safety culture and specific topics related to safety culture, including a discussion of unexpected situations, is important and valuable.

Two practical considerations need to be taken into account when organising workshops:

- That such a workshop is an appropriate method to bring together HOF experts from regulatory authorities, technical support organisations and scientific institutes. A sufficient number of participants representing all organisations of the regulatory body and the right mix of participants from these various organisations should be carefully considered when planning the workshop.
- Given the heavy workload for the organising team, the additional role of facilitating the discussion groups should be carefully considered.

Category B. Training and other methods for inspectors to raise knowledge and awareness and build competence in regulatory oversight of safety culture

That training on safety culture cannot be completed in a single training event is one main lessons learnt from activities aimed at raising knowledge and awareness of safety culture among inspectors and building competence in regulatory oversight of safety culture. There is a need to regularly revisit this type of training, repeat the basics and introduce new inputs and situations. It may also be beneficial to supplement classroom training with supervision in real conditions during inspections.

In some cases, establishing a steering committee – often involving senior management and/or staff – was found helpful in developing or improving training programmes. This steering committee can identify redundancies, assess knowledge gaps and determine the need to introduce new methods (e.g. more e-learning, role plays, visual information). The steering committee could also ensure that the lessons learnt from an accident or event are reflected in training materials as quickly as possible.

In-house training on safety culture is seen as a good tool for raising understanding and awareness of the safety culture for those participating, beyond providing support to supervision activities. It is also useful for launching dialogue on safety culture and specific related topics. For instance, a two-day, in-house seminar with national and international HOF experts on regular basis provides learning opportunities across different perspectives and industries. Additionally, the cross-cutting nature and overriding relevance of HOF and safety culture becomes clearer.

Sharing self-experience and incorporating group exercises require an openness to this type of learning and support from a credible, convincing expert. Thus, it is important to have formally qualified individuals, who are experienced and knowledgeable in the concepts of safety culture as well as in assessment methodology, as a part of the regulator's staff.

It is important to combine training to inspectors with guidance and other tools to ensure that they understand what safety culture is and why it is important and can recognise signs of a weak safety culture. This will enable inspectors to make useful observations on the culture of a licensee through their everyday interactions. In turn, this will help inform inspection priorities.

Developing training programmes for formal assessment of safety culture may be costly. Implementing such programmes may take significant time for inspectors, as they need to understand safety culture, complete coursework and study to become qualified. However, with the development of a skilled group of inspectors who can provide insights into the deeper layers of culture within an organisation, the benefits soon outweigh the costs and time required.

Category C. Methods for inspectors to regularly share knowledge and experience of safety culture inspection practice

There is a need to regularly refresh training on the importance of safety culture concepts and to continue raising awareness. One way to do this is through an annual workshop, the objective of which would be multi-faceted and may include: reviewing the basics; exchanging experience on inspection practice; providing inspectors with concrete inspection scenarios and realistic examples of on-site situations; and establishing a common understanding of the inspectors' roles and activities. Annual workshops also foster a mutual understanding of how inspectors can influence the licensee.

Close alignment between training content and challenges inspectors face in their everyday work ensures greater understanding by the participants, meaning that the training is, therefore, more effective. Intensive exchange among participants and final feedback related to the solution supports mutual understanding of "proper" behaviours and underlying values.

Category D. Methods to raise knowledge and awareness of safety culture among staff

Training of all staff of the regulatory body provides a better understanding of safety culture, enhances inspectors' capabilities to address safety culture and HOF issues, and improves safety culture awareness across the organisation.

Different formats can be used to raise knowledge and awareness of safety culture for the entire staff of the regulatory body. Training events and workshops provide a valuable platform for open and honest discussion on safety culture and leadership aspects. The discussions are valuable opportunities to analyse and consider safety culture through personal and organisational perspectives. Seminars can also be highly adaptable for both senior-level staff and the rest of the organisation. Practical exercises allow staff to become more aware of their own contributions to safety culture. The use of fictional scenarios can prompt thinking about events that staff have not yet experienced. Conducting training courses to convey lessons learnt from accidents in the industry is also crucial to ensure such learning is retained.

Guided site visits can have a positive effect on the understanding of safety culture. Staff will acquire a deepened understanding of perspectives on investigating licensees' approaches and measures for safety culture according to regulatory guidelines. However, it may be difficult to accommodate a large number of staff members in such visits.

If an e-learning format is chosen, consideration should be given to the fact that it can be difficult to change content that operates on a dedicated system. E-learning must have interesting features to attract the attention of trainees. One disadvantage is the lack of opportunities for discussion.

It may be preferable to have training led by external, international experts rather than by internal instructors. It can be easier to understand and embrace an interesting activity that has been implemented with success in another regulatory body, and that could be transferred or

replicated internally. Discussions with external experts can show staff that other regulatory bodies have both similar and different challenges and problems, and that they also have to look for different approaches.

Regarding workshops and training events, in the case that participants come from diverse countries, it is important to consider potential language barriers.

Category E. Methods for staff to demonstrate leadership in fulfilling the regulatory mission

A leadership model, as well as training on its implementation, can help to ensure alignment of behavioural expectations that positively affect safety culture. It is also important to model desired behaviours while putting measures in place towards applying competencies in support of safety culture. The advantages of using this model is that it allows all staff to consider safety culture as part of daily life and leadership and encourages them to speak up and raise safety issues. However, staff may be hesitant to raise safety issues with senior leaders. For instance, staff may show a strong reluctance to attend sessions for training of inspectors. The hesitation may be deeply rooted in the inspector's perception that the trainer or HOF expert often misses the practical points or cannot address real needs arising in the course of the inspector's activity, and rather focuses on theoretical grounds and administrative aspects of planning, conducting and reporting on inspection results. Strong leadership support, together with inviting the most experienced and knowledgeable lecturers, as well as trainers with inspection backgrounds, is a prerequisite in planning and delivering successful sessions.

3. Conclusions and observations on best practices to build competence and awareness

Understanding and inculcating safety culture into an organisation requires regular training, ongoing discussion of its importance, and revisiting awareness of key concepts from time to time. It is beneficial to both repeat the basics of safety culture and enhance awareness through examples with new inputs and situations.

The regulatory body should consider offering a formal qualification programme to train inspectors and other experienced staff to become safety culture assessors. Such a qualification programme should require a firm understanding of both safety culture and inspection skills and should form the basis for oversight of safety culture. To that end, it should include a variety of activities, each designed to help acquire information or practice a skill that may be important during formal safety culture assessments. These activities differ from the observations of an inspector during routine inspections, during which safety culture issues may arise and are noted.

Sharing examples of good safety culture training models, especially if they have already been implemented with success in other regulatory bodies, is advisable. Benchmarking or discussion with other regulatory bodies reveals different or similar challenges and problems. Some approaches may work in some organisations but not in others. A deep understanding of a given organisation's overall culture may be of benefit.

Best practices considered to be effective by various practitioners drawing from their experience are outlined below. They cover four main topics: management oversight, format of the training, content of the training and interaction with other stakeholders.

Management oversight

- Close supervision of a new inspector's training by their line manager to help bridge the gap between theoretical understanding to practical application.
- Senior management commitment to safety culture and active participation by senior management in safety culture training.
- Clarity around expected behaviours of staff in the regulatory body, linked to the vision, mission, values and desired organisational culture. Training of behaviours requires practical exercises such as simulated situations, role play and mentoring. It is important

to provide and accept feedback on observed behaviours, in both training and work situations. The regulatory body should also consider its own safety culture when instituting expectations for the regulated community, as the regulatory body will be looked upon to set the example. Development of a sound leadership model to incorporate safety culture is one way to ensure alignment of behavioural expectations.

- Development, implementation, monitoring and review of programmes to support a positive safety culture, e.g. systematically encouraging and rewarding diverse and dissenting professional opinions.

Format of training

- Trainee inspectors spending a week in an entity performing the same activities that they will eventually oversee.
- Trainee visits to a facility that has experienced a severe accident to understand and maintain the currency of lessons learnt.
- Development of practical skills in observing and evaluating a licensee's safety culture (e.g. through individual in-field coaching).
- Use of a variety of complementary learning formats (e.g. e-learning, classroom training, workshops and coaching in the field).
- Discussion and sharing of knowledge among HOF practitioners and regulatory body staff in small groups, similar to IAEA's "shared space" concept.
- Application of a systematic approach to training (IAEA, 2002c) for safety culture and competence building within the regulatory body.
- Use of actors to enliven safety culture training and make it more practical and effective.

Content of training

- Delivery of a substantial part of new inspector training by senior inspectors with deep experiential and organisational knowledge.
- Use of an interdisciplinary approach to oversee and promote awareness of HOF and safety culture topics.
- Training and development in relevant "soft" skills (e.g. communications and constructive feedback) alongside technical skills.
- Use of real or "concrete" scenarios to support safety culture training and workshops.
- Inviting senior representatives of licensee organisations to give an industry perspective as part of regulatory training.

Interaction with other stakeholders

- Regular engagement of the regulatory body with academia and other sources of HOF expertise to explore innovative approaches, promote self-reflection, and share knowledge and experience.
- Benchmarking regulatory oversight of safety culture with regulators in other industry sectors (e.g. aviation, rail and healthcare).

Chapter 4. Methods for self-reflection and self-assessment

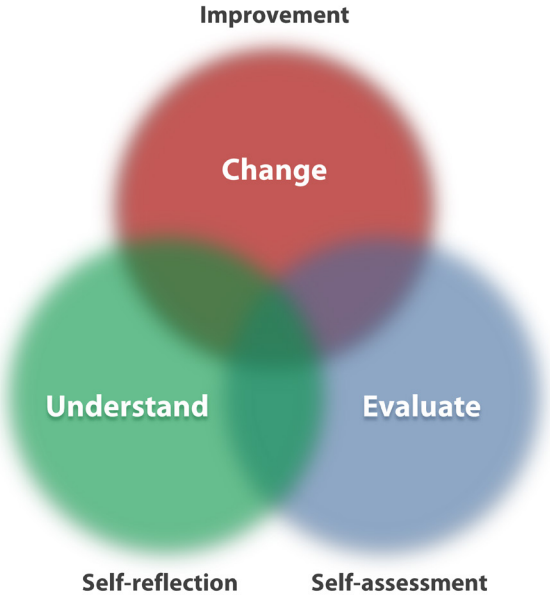
It is useful to differentiate between self-reflection and self-assessment activities (as noted in Section 2.2), for the purpose of this report, even though the two methods are closely interrelated. The following paragraphs explain the two methods and the rationale for their distinction. Additionally, a specific focus is placed on improvement activities that are an integral element of many methods for self-reflection and self-assessment.

Self-reflection, as defined in Section 2.2, is an exercise of introspection; it is descriptive in nature, not based on a precisely predefined benchmark or norm. Its primary goal is to reach a collective *understanding* of the functioning of the organisation, including the cultural elements that drive the behaviour of its members. By contrast, self-assessment is normative in nature and is conducted against a predefined set of criteria, requirements or norms. Its main goal is *evaluation*. While self-reflection can stand on its own, self-assessment necessarily includes self-reflection. The first descriptive step of self-assessment (i.e. collecting and describing data and facts with the goal of understanding how the organisation functions in its daily operations) can be characterised as self-reflection in the sense described above. In a second step, self-assessment evaluates the data, facts and insights gained in the first step, usually by comparing them with the predefined benchmark or norm.

Self-assessment is an analysis of the existing situation, compared with a predefined set of criteria. A good analysis provides valuable information – and is even a prerequisite – for identifying areas for improvement. Many self-assessment methods and some self-reflection methods include such identification as a key element of the activity. These areas for improvement are often rather general; moreover, the initial self-assessment does define concrete actions for improvement. Hence, a further creative step is necessary to search for effective actions for improvement. The decision to proceed with an action is often made by management. In many cases, management ultimately appoints another team or person to carry out the improvement project and provides resources, including access to the preceding self-reflection or self-assessment project. In other words, one can distinguish the identification of weaknesses and areas for improvement from the determination, planning and performing of improvement actions. For this reason, the present report, besides studying the procedures used by member countries for self-reflection and self-assessment, also focuses explicitly on procedures aimed at developing or implementing concrete actions to effectively address identified areas for improvement. These procedures have the explicit objective to achieve concrete actions and measures to improve the safety culture of the regulatory body. Their primary goal, thus, is to initiate and achieve a *change*.

Figure 4.1 shows the overlap and interaction between self-reflection and self-assessment, as well as improvement activities. For this report, the analysis and discussion of these methods is undertaken according to their main purpose, namely understanding (self-reflection) and evaluating (self-assessment) safety culture, then taking action to support change (improvement).

Figure 4.1. **Relationship between self-reflection, self-assessment and improvement**



4.1. Categories of the methods for self-reflection and self-assessment

According to the differentiation described above, the methods to examine or evaluate safety culture proposed by the regulatory bodies were allocated to two types of activities, reflecting their main purpose: self-reflection (Category F) or self-assessment (Category G).

- Category F: Self-reflection
  - Self-reflection is descriptive (i.e. non-normative) in nature. Self-reflection is based on introspection. In the context of the present report, the focus is on collective introspection. The range of those who might be involved can vary from small groups (e.g. a few staff members working together in daily oversight activities) to organisational units or entire organisations. Usually, self-reflection is not based on a precisely predefined benchmark, norm or normative criteria. If predefined benchmarks or norms are used as a basis, they are not intended as criteria for a judgement, but rather as a framework for the reflection process.
  - The focus of self-reflection can be tangible elements (e.g. behaviour of regulatory body's staff, oversight practices, regulations, enforcement actions, interactions with licensees) or intangible elements (e.g. values, norms, basic assumptions) of safety culture.
  - Self-reflection involves *understanding* "how we function" and how we impact a licensee's safety culture.
  - Number of methods described: 13.
- Category G: Self-assessment
  - Self-assessment is normative in nature: the assessment is made against a predefined set of criteria, requirements or norms.
  - Self-assessment can cover both tangible and intangible elements of safety culture.
  - Self-assessment is based on a structured and systematic process, consisting of a descriptive analysis, followed by a normative assessment and the definition of an action plan.

- Self-assessment can cover the entire organisation or focus on specific parts (units).
- Self-assessment involves evaluating the current situation and planning continuous improvement towards the fulfilment of specific requirements or norms.
- Number of methods described: 19.

Table 4.1 provides an overview of all the methods of self-reflection and self-assessment as well as their specific objectives. More details about the methods can be found in Annex B.

Table 4.1. **Overview of methods for self-reflection and self-assessment**

Overall objective	Methods in the catalogue (Annex B)	Specific objectives
Category F: Self-reflection To foster self-reflection of groups, organisational units or the entire organisation To increase overall awareness and understanding of safety culture within the organisation	F1. Update and revise the organisation's mission statement	• Reflect the authority's organisational culture with a broad participation of all employees and to foster common views and values.
	F2. Develop a common understanding on safety culture of the regulatory body consisting of different authorities	• Develop of a common understanding among different organisations of the regulatory body and fix it in a policy document.
	F3. Seminars for reflection on leadership and management *	• Develop leadership in management groups. This includes direct feedback from employees about their managers, as well as peer reviews of colleagues.
	F4. Department-specific activities of organisational climate	• Foster transparency and openness within the department.
	F5. Regulatory nuclear interface protocol *	• Improve the efficiency and effectiveness of working relationships between the regulator and stakeholders.
	F6. Discussion during periodic meetings *	• Promote self-reflection and self-assessment. • Promote safety culture and good communication and co-ordination among departmental units.
	F7. Metaphor workshops	• Prompt the group (e.g. organisational unit) to reflect on their own safety culture by finding a metaphor for their way of working and the values to which members attach particular importance in their oversight work. • Prompt collective reflection on subcultures within the organisation.
	F8. World Café *	• Practise interdisciplinary reflection and collaboration among staff of different organisational units and hierarchical levels. • Participative development and consolidation of a policy (or other) document (e.g. new mission statement) or other product.
	F9. The "Serious Game"	• Start and maintain a discussion on safety culture to collect ideas from employees about what is necessary to further improve safety culture within the organisation. • Present an overview to both management and employees about this reflection of the safety culture and increase awareness.
	F10. Self-reflection on regulatory approaches	• Identify examples (both successful and unsuccessful) of different regulatory approaches used in the regulatory body.
	F11. Guidelines "Pot of Safety Culture" *	• Develop a deeper understanding of safety culture and acting according to it.
	F12. Seminars with regional offices *	• Exchange across different hierarchy levels of the regulatory body. • Identify common actions for improvement.
	F13. Behaviour framework *	• Support creation of a more open and inclusive culture.

Note: Methods marked with an asterisk (*) can also be used for improvement purposes. They can help to foster a good working environment (openness, trust, co-operation, leadership for safety, etc.), identify ways to improve the safety culture and perform improvement actions.

Table 4.1. **Overview of methods for self-reflection and self-assessment** (cont'd)

Overall objective	Methods in the catalogue (Annex B)	Specific objectives
Category G: Self-assessment To assess against existing principles/norms. To compare with previous results, other organisations, etc. To identify areas of improvement and strengths.	G1. Self-assessment to measure employee motivation, satisfaction and attitudes based on total quality management (TQM) system	• Evaluate and map actual state of the safety culture against existing principles/norms and identify areas for improvements and strengths.
	G2. Safety culture self-assessment	• Identify various aspects of regulatory body behaviour, focusing on safety culture and leadership.
	G3. Self-review of safety culture based on specific events *	• Identify actions for improvement by reviewing events. • Increase safety culture awareness.
	G4. Safety maturity matrix	• Provide an overall picture of the organisational culture. • Identify maturity levels of different safety culture dimensions and sub-dimensions (rating step). • Identify drivers for change. • Foster awareness of staff.
	G5. Independent assessment of safety culture (internal)	• Comprehensively consider all aspects of safety culture within the organisation. • Focus on weaknesses identified from internal survey and department-level inputs. • Find further insights and improvement areas for weaknesses.
	G6. In-depth survey and follow-up focus group interviews with licensees *	• Understand main causes of complaints raised by licensees. • Solicit licensees' views on any good or bad practices and areas for improvement regarding interactions with regulatory staff. • Share results to ensure mutual understanding between licensees and regulators.
	G7. Safety culture external evaluation	• Establish a baseline measure of the organisation's safety culture. • Focus an independent measure on safety culture within the regulatory body. • Compare with previous results/other organisations. • Identify areas for improvements and strengths.
	G8. Staff survey *	• Provide staff with opportunity to express their views on the regulator and its future. • Explore the performance of the organisation. • Assess the ability to retain and develop staff, resources and capabilities.
	G9. External stakeholder survey *	• Better understand how regulatory body is regarded by those it works with.
	G10. Regulatory assurance activities *	• Provide assurance of the adequacy and effectiveness of the regulator's risk management, control and governance processes.
	G11. Self-assessment of safety culture using a questionnaire	• Assess current level of the organisational safety culture, identify weaknesses and potential developed areas. • Evaluate and compare with results of subsequent self-assessments.
	G12. Employee viewpoint survey (Office of Personnel Management)	• Investigate performance of the organisation. • Assess ability to retain and develop staff, resources and capabilities.

Note: Methods marked with an asterisk (*) can also be used for improvement purposes. They can help to foster a good working environment (openness, trust, co-operation, leadership for safety, etc.), identify ways to improve the safety culture and perform improvement actions.

Table 4.1. **Overview of methods for self-reflection and self-assessment** (cont'd)

Overall objective	Methods in the catalogue (Annex B)	Specific objectives
Category G: Self-assessment To assess against existing principles/norms. To compare with previous results, other organisations, etc. To identify areas of improvement and strengths.	G13. Safety culture climate survey	• Focus on an independent measure of safety culture within the regulatory body. • Compare with previous results. • Identify areas for improvements and strengths.
	G14. Assessment of systems, programmes and processes: assessment of non-concurrence process and differing professional opinion programme *	• Assess and optimise existing programmes and processes. • Identify areas for improvements and strengths.
	G15. Safety culture self-assessment	• Gain information concerning the status of safety culture within the organisation. • Increase overall awareness and understanding of safety culture within the organisation.
	G16. In-house questionnaire on safety culture	• Determine status of 1) Individual awareness, 2) current activities on safety culture and 3) Institutional awareness. • Identify areas for improvement and consider specific activities.
	G17. Safety culture assessment	• Evaluate actual state of safety culture against principles and attributes set in the NEA Green Booklet (NEA, 2016) and identify the factors that enhance or compromise its robustness.
	G18. Regulatory safety culture self-assessment (RSC-SA)	• Improve regulatory body's awareness and understanding of safety culture and associated expectations.
	G19. Multi-method self-assessment *	• Gain understanding of the status of regulator's safety culture and acquire valuable input for various improvement actions.

Note: Methods marked with an asterisk (*) can also be used for improvement purposes. They can help to foster a good working environment (openness, trust, co-operation, leadership for safety, etc.), identify ways to improve the safety culture and perform improvement actions.

4.2. Discussion, lessons learnt, and practical observations from performing self-reflection and self-assessment

This section first describes and discusses the two categories of methods (Category F: Self-reflection and Category G: Self-assessment); it examines the main lessons learnt and recommendations to implement action in each category.

Category F: Self-reflection methods

The main purpose of self-reflection is to provide the regulatory body with an understanding of its own way of functioning and its impact on safety and safety culture of the organisations it oversees and regulates. Due to their broader scope, some methods are also discussed with respect to improvement (cf. Section 4.3).

The overarching purposes of these methods are to:

i. Foster self-reflection of groups, organisational units or the entire organisation.

ii. Increase overall awareness and understanding of safety culture within the organisation.

Description and discussion

Self-reflection methods can be described according to different characteristics: 1) scope of self-reflection; 2) objective of the method and expected or observed outcomes; 3) degree of collaboration; 4) material output; 5) foundation; 6) context and way of use; 7) focus on process or result; and 8) accessibility of deeper levels of culture.

1) Scope of self-reflection

Several methods focus on self-reflection regarding *general cultural aspects* such as the authority's organisational culture, safety culture or oversight culture (e.g. F1, F2, F7, F8). Other methods focus on one or more *specific themes*, such as leadership/management or regulatory approaches and strategies and their effectiveness (e.g. F3, F10, F12).

Self-reflection activities may concern the organisation as a whole (e.g. F1), an organisational unit or any subculture within the organisation (e.g. F7, F8, F12). They can also concern self-reflection across several organisations involved in oversight within one country (e.g. F2, F13).

2) Objective and expected outcome

The objectives and outcomes of self-reflection methods can be broadly grouped into three categories: understanding, promotion and practice.

- Understanding: Gaining insight and understanding is an important aim of methods for self-reflection. Several methods aim to foster a common or deeper understanding, either by sharing views of safety culture among participants (e.g. staff members) or providing an overall picture (e.g. F2, F9, F11, F10).
- Promotion: Another aim of self-reflection methods is oriented towards promoting specific attitudes or types of climate within the organisation, or towards the comprehension and acceptance of basic principles or policy documents. For example, the methods can aim to create an open, constructive and just environment, improving the discussion climate and promoting a positive attitude towards self-reflection and self-assessment (SRSA) and interdisciplinary reflection. The objective is thus to prompt organisation-wide discussions about safety culture in a pleasant and safe environment, promoting safety culture and enhancing the commitment of staff in relation to it (e.g. F1, F3, F5, F6, F7, F8, F9, F13). The methods, thus, target medium-term and possibly long-lasting effects on attitudes and climate within the organisation (see also Section 4.3).
- Practice: Some methods are designed to have immediate effects by producing a concrete output, serving as a practical exercise for specific competences, or exchanging ideas and discussing specific issues across organisational units and hierarchical levels. For instance, while using such methods, participants practice overarching collaboration within the organisation or self-reflection about safety culture, which may lead to them fulfilling a specific task (e.g. work on a document such as a mission statement or develop ideas for further steps, improvement measures or recommendations). Or, participants may give and get feedback and exchange information (e.g. F8, F9, F10, F12) (see also Section 4.3).

3) Degree of collaboration

The methods for self-reflection proposed by the regulatory bodies vary in the degree to which they require collaboration of participants. It should be noted that one method can use different types of activities, with different levels of collaboration.

Four levels can be distinguished:

- Collaborative: This largest group of methods encompasses approaches such as workshops or discussion meetings, either entirely dedicated to self-reflection or involving collaborative elements as part of regular meetings (e.g. F1, F2, F3, F4, F5, F6, F10, F11, F12). Less traditional approaches, such as creativity techniques or games, are proposed as well (F7, F9). These approaches are used as tools to work collaboratively on a topic and develop a common product or output.
- Bilateral communication: A few approaches proposed, such as presentations or seminars, centre around interaction, but primarily on the basis of already elaborated results (e.g. by a dedicated team) that are presented to staff for further discussion (e.g. F1, F10). One method involves conversations between staff members and their line managers (F13).

- Unidirectional information: These methods primarily use (among other approaches) one-way communication: written reports or brochures, preparation of educational or training material, guidelines, etc. (e.g. F2, F5, F10, F11).
- Individual activities: This method uses activities performed by individual staff members, such as a voting system (F2).

4) Material output

Many of the methods proposed deliver both intended "immaterial" outcomes and concrete outputs. Typically, such outputs consist of different kinds of written documents, such as reports describing (in more or less detail) results of activities, identified improvement actions or lessons learnt. They may also offer recommendations or descriptions of specific examples or elements of safety culture (e.g. F5, F8, F11). A concrete output can also be an official guidance document for the organisation, such as a new or revised mission statement or another type of document as part of the organisation's management system (e.g. F1, F8). In addition, other types of material outputs can also be produced, such as figurative representations (metaphors) of cultural elements (F7).

5) Foundation

Some methods use theoretical or normative foundations as a framework for self-reflection. For instance, the five principles for a safety culture for the regulatory body – described in the NEA Green Booklet (NEA, 2016) or the safety culture traits defined in IAEA documents (IAEA, 2002a) – are used in different methods (e.g. F2, F10). The foundation upon which the approaches and activities of these methods are based can, however, also be developed situationally within their context of use (e.g. using results from a previous phase of the project or activity on safety culture to develop a clear set of agreed-upon values within the organisation or the nuclear industry of a country) (e.g. F5, F8, F13).

As noted in the definition of self-reflection provided earlier, some of these methodologies are based on normative theories. However, for the purposes of self-reflection, these methods should not be used to rate, assess, or otherwise make normative or value judgements. Rather, the theoretical foundation is used as a framework that helps structure the reflection process, by setting the topics and the direction of the reflection(s).

6) Practical arrangements

The methods presented differ in the way they are used in several respects:

- Involvement of staff: The methods can be divided into those in which *the entire staff* of the organisation, including all organisational units across all hierarchical levels, are involved or at least invited to participate in related activities (e.g. F1, F2, F4, F6, F7, F8, F9, F12, F13), and those in which *only part of the staff* is involved (e.g. a dedicated working group of selected staff members or staff on the management level) (e.g. F2, F3, F10). Some methods include both activities addressed to the entire staff and activities addressed to a specific group or level of staff (e.g. F2).

  Several methods are led by a *project* or *core team*, responsible, for example, for organising the process, analysing data and results, and documentation and writing reports (e.g. F1, F7, F8, F9, F10).

  Often, implementation of the method is supported by a *facilitator* (e.g. F1, F3, F6, F7, F8). The latter can be an *internal* staff member (e.g. F1), an *external* facilitator or expert (e.g. F3, F6), or even a combination of internal and external individuals (e.g. F7, F8). The external facilitator can be invited to facilitate the envisaged activities and to provide an independent, third-party point of view.

  The composition of teams participating in the method can either be *diverse* (e.g. composed of participants from different backgrounds, experience, organisational units, hierarchical levels or even from different stakeholders) (e.g. F1, F2, F5, F6, F7, F12) or *homogeneous* (e.g. targeting the management group or a specific organisational unit) (e.g. F3, F7).

- Involvement of senior management: Senior management can be involved in methods in diverse ways and have different roles at different moments in time. Often, senior management is involved from the *beginning of the planning phase* on a strategic level, first setting goals and then expressing and showing commitment, support and sponsorship (e.g. F1, F2, F6, F7, F8, F9). Senior management involvement from the beginning is key to ensure that the necessary resources are available and to motivate staff to engage in the planned activities.

  During the *implementation phase* of the methods, senior management can have the role of overseeing the process and activities or of leading the activities (e.g. F5, F7, F8, F10, F13) or can have an active role by being involved as a member of the project team (e.g. F1, F7, F8) and/or actively participating in activities (F1, F3, F4, F6, F7, F8, F12).

  In the *final phase*, senior management can also have diverse roles. These vary from being informed about the results via submitted reports or other reporting channels (e.g. F11), to discussing results and deciding on follow-up actions, for instance implementation of improvement measures (e.g. F1, F7, F8), to showing appreciation for work done by staff (e.g. F1).

- Need for human resources: The amount of human resources to be invested in activities varies greatly from method to method, and depends on whether an organisational or an individual perspective is taken. In many cases, the resources to be invested by a single staff member are low or medium (e.g. a few hours or days, as in F1 and F13). However, depending on the number of staff members involved, the sum of individual resources can be considerable from the organisation's point of view (e.g. F1, F7, F8, F10). The amount of human resources needed tends to be medium to high for members of core teams who are responsible for planning and driving the activities and for analysing and documenting results (e.g. F1, F7, F8).

- Frequency According to frequency of use, the methods can be divided into three main categories: one-time application, repeatedly as needed, and regular or continual repetition.

  Some methods are most suitable for a *one-time application*, as they aim to accomplish a specific task, which does not need repeating or repetition of which is unlikely to provide new insights or further develop desired outcomes (e.g. F2, F7, F8, F10). Nevertheless, after some time, a reconsideration and verification of results of the first application may be warranted and repeating the method could be considered.

  The second group of methods can, or should, be performed *repeatedly as needed*; for instance when a new issue arises or a basic document, such as the mission statement, needs to be revised (e.g. F1, F3, F4, F9, F11). No fixed frequency is defined.

  The third category of methods involves *regular or continual repetition*, with either a fixed interval established (e.g. monthly meetings, yearly questionnaire survey) or clearly defined trigger criteria (e.g. a feedback loop with stakeholders during each meeting) (e.g. F5, F6, F12, F13).

- Setting: Methods can be differentiated according to whether they are *explicitly dedicated to the safety culture of the regulatory body* (e.g. dedicated workshops or questionnaires) as "stand-alone" activities or fit within the frame of a larger project on safety culture (e.g. F1, F2, F3, F4, F7, F8, F9, F10) and thus are methods that are *part of daily oversight activities* (e.g. reflection activities within regulatory meetings) (e.g. F5).

7) Focus on process or result

The methods can be analysed with respect to whether they focus more on the process or the result – or both. In some cases, the *application* of the method itself is the main purpose of the method, as it fosters self-reflection collaboration or other values the organisation strives for (e.g. a collaborative creative task or a game) (e.g. F1, F7, F9, F12). Some methods focus primarily on a specific *goal*. For example, the results of a survey, the definition of improvement actions or the production of a document (e.g. a mission statement or others [e.g. F5]). In some cases, the methods can be used to serve both purposes (e.g. F8, F11).

8) Accessibility of deeper layers of culture

Finally, member countries report that experience in using methods for self-reflection reveal the difficulty of accessing deeper layers of safety culture. Methods for self-reflection most often appear to be particularly well suited to: identify tangible elements of safety culture within an organisation; better communicate with staff about general assumptions on safety culture; reflect on values and norms, ways of working and their impact; make implicit values more explicit; and create opportunities for learning and continuous improvement. Thereby, self-reflection methods have the potential to reach deeper layers of culture and to prompt the emergence of deep-seated and implicit cultural assumptions. To reach this goal, however, some features of the methods and of conditions for their application need to be met. For instance, an open, trustful atmosphere (e.g. in a workshop) must be established to promote reflection and assessment of individual values as well as shared underlying organisational values. Small-sized groups appear to promote deeper understanding among participants. A multi-method approach is also important, meaning that a combination of different approaches (e.g. workshops, interviews, observations, case studies) is recommended to reach deeper layers of safety culture. Based on the countries' responses, the degree of the organisation's experience with using the methods impacts their ability to reach deeper layers of culture.

Lessons learnt/recommendations

Lessons learnt and recommendations can be gleaned from the experience of regulatory bodies that have performed self-reflection methods and can help future users to choose, plan and implement the most suitable methods.

- Leadership/management involvement: Fostering safety culture within the regulatory organisation is seen as a leadership task, in particular with regard to communication and the formulation of expectations. Involvement and openness of senior management is needed for successful application of self-reflection methods.
- Motivation and engagement of staff: One condition for success is a positive attitude of staff and a belief that things can be changed. Motivating and engaging staff, in particular staff members who are not directly involved from the beginning (e.g. in preparing activities) proves especially challenging. To motivate staff to actively engage and participate in planned activities, the methods and activities should be recognised by participants as useful and having a connection to their daily work. When choosing methods and procedures, attention should be given not only to the formal and cognitive or rational aspects, but also to creating entertaining, positive experiences. A participatory process enhances the degree to which staff identifies with the organisation and fosters safety-oriented individual behaviour. The effectiveness of the methods decreases when staff are not involved in self-reflection activities. Broad staff involvement makes it possible to focus on the individual staff member's personal contribution to the process and attract the attention of involved staff to topics and products. It is crucial to invite staff as early as possible in order to achieve acceptance and include all points of view. Results of self-reflection activities need to be disseminated throughout the organisation in order to build a common understanding and thus improve regulatory effectiveness. Moreover, it is important to inform staff about activities carried out at higher levels of the organisation.
- Focus on the process: Attention should also be paid to the process of using the methods, and not only to their results or outputs. The methods proposed have different focal points, with some more on the process, some more on the results and some on both. Methods and approaches should always allow for a positive "user experience" by participants, even in cases that specify a clear goal towards developing a specific product (e.g. mission statement, guidance document).
- Practical advice on the methodology: Several methodological aspects need to be considered when deciding the most suitable method of self-reflection for a given regulatory body. The integration and discussion of viewpoints of diverse groups is demanding. Methodological difficulties concern the interpretation of results gained from using the method, handling confidentiality issues and managing the complexity

that arises from a broad participatory process, particularly in organisations with a large number of staff or when the result of the activities is highly heterogeneous. The methodological aspects to be considered include:

- Flexibility, simplicity and customisation: If possible, choose simple, flexible and not unduly time-consuming and cumbersome methods, with little formalism that can be applied at any time. In some cases, a setting with more sophisticated and large-scale methods will be necessary (e.g. when an organisation-wide project needs to be started, targeting a comprehensive reflection on basic organisational values and the oversight work). As a rule of thumb, always choose the most flexible and simplest setting that is suitable to the stated goals. Customise the activities, as much as possible, to the needs and features of the regulatory body and staff. The degree of sophistication of the method chosen should be commensurable with the level of competence and practice of the staff of the organisation, as this will likely impact the quality of the results.
- Plan: Carefully plan ahead in regard to the intended use and way of evaluating results from activities, as well as confidentiality issues.
- External facilitator: The involvement of an external expert or facilitator should be considered even when the project and activities are managed by an internal team. An external facilitator can provide an independent view and give useful input for the reflection process within the organisation.
- Composition of groups: The composition of groups in planned activities (e.g. workshops) needs to be carefully considered to foster openness and frankness of participants. Small groups are perceived to foster more open discussions and a deeper level of understanding than bigger groups.
- Choice of methods: Choose the methods for self-reflection according to the intention to address cultural elements on deeper levels or to focus on more tangible elements of safety culture of the organisation. Even if quantitative methods (e.g. surveys) may seem less time-consuming, and therefore attractive, they may not be as effective as qualitative methods to explore deeper layers of safety culture.
- Resource intensity: When choosing a method, it is also important to consider the resource intensity, particularly when associated with sophisticated methods. Notably, for self-reflection, the use of qualitative methods (e.g. workshops, dialogues, games) seems not only appropriate but perhaps even of paramount importance. However, these methods involve higher efforts compared to quantitative methods (e.g. questionnaires). The resources needed should be carefully considered when planning activities; the person/team responsible for planning and implementation should be granted enough time. In addition, potential conflicts with other duties and priorities should be resolved beforehand.
- Effectiveness: Ideally, the results of self-reflection activities are not intended (primarily) to give categorical answers to specific questions but should be understood as a source or trigger for further thinking and discussion within the organisation. Thus, it is important to consider how to ensure the effectiveness and endurance of activities performed and results achieved, and, indeed, to consider how to use the outputs from the method beforehand. For instance, the results can/should be communicated to all members and to new members who join following the activity. The question of whether to repeat the self-reflection process from time to time should also be considered.

Category G: Self-assessment methods

For the purpose of this report, self-assessment methods are those that have a normative nature, using a predefined set of criteria and requirements or norms to compare to the results of the assessment. Additionally, lessons learnt from incidents or accidents can be used as a framework for self-assessment. The purpose of the assessment is to understand and evaluate elements of safety culture, through a structured and systematic process consisting of a descriptive analysis,

followed by a normative assessment and the definition of an action plan. A self-assessment method often focuses on the entire organisation or parts (units) thereof. It is related to *evaluation* of the current situation and continuous improvement towards fulfilment of specific requirements or norms. Self-assessment should address not only symptoms, but also the deeper causes of a weakness, gathering and analysing specific information for the purpose of improvement. Involved parties are interviewed or workshops with focus groups are held. By gathering such specific information and involving staff, the project team gets ideas for improvement actions.

Description and discussion

Self-assessment methods can help to draw a picture of safety culture within the organisation. Their overall purpose is threefold:

- assessment against predefined principles/norms;
- comparison with previous results or with other organisations;
- identification of areas of improvement and strengths.

In many countries, the self-assessment methods listed above are used regularly (e.g. annually or every second or third year), and the requirement to perform follow-ups is often included in the method. The first step of the methods is usually an analysis based on reviewing the structure of the organisation, its history (as previous assessments, reports on events or lessons learnt, etc.) or any other information to help orient the assessment. In most methods, the predefined set of criteria on which assessment is based are the principles and attributes of safety culture that the organisation has previously defined. Most of the methods use questionnaires as one of the data acquisition tools. Some methods have a multi-tool approach, combining both qualitative and quantitative methods to gather information on different aspects of safety culture. In the multi-tool approach, the questionnaire is often followed up by individual interviews and/or focus groups or other types of data collection.

The methods allocated to this section, considered to be "assessments" against predefined criteria, can be classified considering specific characteristics (e.g. scope or type/number of tools used to perform the assessment) as follows:

- Using a broad spectrum of tools (survey, interviews, focus groups, etc.) vs. using specific tools: Using a combination of tools (e.g. G6, G18) allows for a cross-check between the findings each delivers and takes advantage of the capabilities of each tool to understand the underlying reason for those findings and their validity. Conversely, using specific tools (e.g. G8, G11, G16) could be less time-consuming and may help in certain circumstances as a starting point (e.g. G11), or to perform a follow-up (e.g. G13). However, this approach will lack the validity given by the use of other tools that allow confirmation of results. Therefore, the limitations of using a single tool should be kept in mind.
- Based only on quantitative tools (e.g. G8, G13) vs. qualitative tools (G4) or mixed tools (e.g. G7, G15, G17, G18): The combination of qualitative and quantitative tools allows further comparison results, leading to conclusions by convergence and cross-check. Some countries that have used only quantitative tools recognise the additional value of qualitative tools as a lesson learnt.
- Covering a large set of safety culture issues/attributes (e.g. G5, G7, G15, G17, G18) vs. focusing on a specific aspect (e.g. G2, G6, G9, G14): Whereas some approaches are holistic and endeavour to capture a broad picture of safety culture issues and attributes, in other cases, the organisation focuses on specific aspects. By focusing on leadership, designated programmes, or the relationship between the regulator and licensees, for example, the assessment aims to obtain information about particular areas or issues considered relevant or requiring attention.
- Dedicated exclusively to safety culture (e.g. G5, G7, G15, G16, G17, G18) vs. addressing safety culture among other topics (e.g. G1, G12): In some cases, broader assessments performed as part of an official, organisation-wide evaluation programme are used to obtain information about safety culture in the regulatory body.

- Including all staff (e.g. G6, G8) vs. involving a limited number of members (e.g. G1, G15, G17): Some of the methods target all staff within an organisation including the top management; others narrow the engagement to only one part of the organisation (e.g. a section or unit).
- Involving internal staff (e.g. G5, G8, G16) vs. involving external stakeholders (e.g. G6, G9): A few methods address the regulatory body´s relationships with stakeholders (e.g. licensees or other organisations), not only regarding how they perceive the regulatory body but also in order to compare among organisations in the nuclear field whether they use the same type of method.
- Internal vs. with external support: Some regulatory bodies conducting self-assessment methods use external support, such an independent or third-party expert or consultant (e.g. G1, G7). Other regulators have an internal safety culture expert or a core team within the organisation carrying out the survey (e.g. G5, G17). Still others use external benchmarks to support the assessment or to evaluate the result (e.g. G16, G18).

The objective of using these methods is to discover weaknesses or areas for improvement as well as potential needs for development. The methods are mostly used to gather insights into elements of the organisation's safety culture and awareness of the views and opinions regarding leadership and general safety culture within the organisation. Most methods also aim to influence safety culture on a group level. The outcomes may be an action plan and/or a development plan or activities designed to improve safety culture awareness within the organisation, (as further discussed in Section 4.3). Some methods result in recommendations. Sometimes the objective of self-assessment is the process itself. In other cases, the goal may be to develop action items for a previously identified issue.

Lessons learnt/recommendations

Lessons learnt and recommendations related to the self-assessment process as experienced by regulatory organisations are as follows:

- Expertise in safety culture: Before embarking on self-assessment activities, it is important to rely on the necessary internal and/or external expertise – e.g. experts who have the competences to understand safety culture principles and know how to perform the methods for self-assessment. Starting with easy methods and activities can improve the chances of experiencing a successful process, thus building receptivity that can motivate the organisation and its staff to progress with time and use more advanced methods.
- Strong commitment (from top executives, senior management and staff): To assess safety culture and find ways to improve practices, top executives and senior management need to be strongly involved, participate and encourage participation of all staff. They should also engage in the follow-up and undertake necessary improvement actions and address potential weak spots. Voluntary participation of staff is fundamental for a successful self-assessment (IAEA, 2019), but it may limit the data gathered and requires the staff to be motivated to participate. While mandatory participation may increase the amount of data collected, it may be against the will of staff who do not enjoy such activities and may not be willing to engage in an open and honest way. Management should ensure that staff members understand that safety culture concerns everyone and convince them of the usefulness of the assessment. They could lead by example by participating themselves.
- Building transparency and trust: These features are prerequisites to assure honest answers and cultivate a positive staff attitude towards any self-assessment initiatives. Transparency on how data collected via the survey will be used is essential, at the same time protecting the anonymity and/or confidentiality of participants. Anonymity must usually be maintained in extensive surveys in which adequate data about respondents must be collected in order to perform the analysis. However, the possibility of singling out a participant based on collected data should be avoided. Confidentiality is also a key issue when dealing with observations or in interviews, placing importance on *what* is observed and said, not by *whom*, while simultaneously allowing the possibility to follow

up or clarify, if needed. To avoid resistance to answering the survey or participating in other data collection tools, measures taken to ensure anonymity/confidentiality must be clearly communicated. Building trust within the organisation is crucial to foster a climate of openness and provide an accurate and solid basis for further development of safety culture in the organisation.

- Clear understanding of what safety culture is and what it includes: Safety culture should not mean putting safety culture labels on existing assessment practices; rather, it should be regarded as a process. Many organisations might have empirically developed a method that contributes to building a healthy safety culture, without being fully conscious of it. In that case, the existing method may be better accepted than a totally new one and is part of the process to build up a healthy safety culture. Changes with regards to safety culture need sufficient time to consolidate. Therefore, it is important to foresee follow-up and monitor development of safety culture over time, evaluate if and how awareness changes, assess whether measures and action plans have a positive effect, and identify whether there are additional issues that need to be addressed. Conducting a self-assessment (i.e. analytic step) in parallel with activities to raise safety culture awareness (i.e. communication/promotion step) is advisable.
- External view: Assigning an external expert to support the organisation or undertaking external benchmarking to support analysis of results are common practices. An external party has the advantage of being independent in conducting the survey and in the analysis of the results.
- Multi-method approach: Using a single tool to perform the analysis (either quantitative, as a survey answering in numbers, or qualitative, as events review or allowing free answers) may be too limited. While using a multi-method approach can be time-consuming, it ensures capture of different perceptions. A multi-method approach can benefit from the strengths of each method, avoid or limit weaknesses, allow cross-check of data obtained by different methods, and assure validity of results. In the case of having to use a single tool, compensatory measures should be considered to avoid risks linked to lack of cross-check and validation of results. For example, if using a quantitative survey, inserting some opportunity for free text helps to further interpret responses. The advantage of using a quantitative survey is to reach the whole organisation with a relatively low effort and allow statistics analysis. However, it has a risk of misinterpretation and not capturing causes, which may lead to not reaching deeper layers of safety culture. Therefore, combining quantitative and qualitative methods is advised, as it has a higher potential of reaching a deeper layer of safety culture in the results. Conducting a survey, interviews or face-to-face discussion and observation as parallel methods to gather information could help to gain a deeper understanding of safety culture and ensure validity of results. Thus, the use of multiple methods, both quantitative and qualitative, is highly recommended.
- Improvement: Safety culture assessment should be considered as a means to improve the organisation. For this reason, it is important that self-assessment methods do not remain at a descriptive level but are linked to action plans (e.g. G8, G9/H5, G14) (cf. Section 4.3). Defining improvement actions and demonstrating changes are crucial. The organisation must be able to access results fairly soon after completing the survey, otherwise there is a risk of fatigue in participating in such surveys. It is also important to review the authority's management system, and to make relevant updates and changes to meet the results expressed by the organisation.

4.3. Improvement of safety culture

The methods for self-reflection and self-assessment presented and analysed in the previous sections often help to identify (rather generally) areas for improvement as a first step. In a following step, regulatory bodies perform activities to identify, plan and implement concrete improvements. A variety of approaches for improvement exists.

This section discusses methods on self-reflection and self-assessment presented previously from the viewpoint of improvement. It intends to show that many of the methods used by the countries to *understand* and *evaluate* their safety culture also contain elements and activities that can prompt *change* of (elements of) their safety culture. The following analysis intends to help regulatory bodies to choose suitable methods for their own needs or get insights and ideas for designing a new improvement method.

Therefore, this section discusses those methods with a specific focus on finding concrete ways to improve broadly or to achieve improvement in a specific area. It covers three types of methods:

- methods that provide direct improvements of specific, predefined aspects of safety culture;
- methods that identify concrete actions for improvement;
- methods that, within a self-reflection or self-assessment process, provide an explicit improvement of specific aspects of safety culture.

Description and discussion

This section provides ideas, approaches or solutions for specifically improving safety culture within the regulatory body.

Each of the 15 methods considered belongs to 1 of 2 groups with respect to improvement of safety culture:

i. Methods aiming at *direct improvements*: The regulatory body uses these methods in order to improve or promote one or more specific and predefined safety culture aspects, e.g. openness, co-operation, communication or leadership behaviour (e.g. F12, F13, G10, F6, F8, F3, F5 and F11).

ii. Methods identifying concrete *actions for improvement*: The regulatory body uses these methods to identify concrete actions for improvement. The methods support the finding of adequate improvement actions but do not include their implementation (e.g. G3, F4, G8, G9, G6, G14 and G19).

Furthermore, the methods differ in what they change or aim to change in order to achieve an improvement (target of change):

a) Formal elements of an organisation: Methods in this group seek to trigger change of the regulatory body's procedures, processes, structures, regulations, routines, work conditions, workplace, technological measures, etc. (e.g. G14).

b) Social interactions: Methods in this group intend to exert positive influences on co-operation, team spirit, patterns of interaction, etc. (e.g. F4, F6, F8, F3 and F5 and F12).

c) Individuals: Methods in this group aim to influence individuals, focusing on their knowledge, competence, attitude or behaviour (e.g. F11, F13 and G10).

d) No predefined target: These methods do not specifically address the targets above. Rather, the target is defined in the course of applying the methodology – and all of the above could become targets (e.g. G3, G6, G8, G9 and G19).

Table 4.2 sums up the categorisation of the methods.

Table 4.2. **Categorisation of the methods**

	Target of change			
	Formal elements	Social interactions	Individuals	No predefined target
Achieve direct improvements	-	F12, F6, F8, F3, F5	F13, G10, F11	-
Identify concrete actions for improvement	G14	F4	-	G3, G8, G9, G6, G19

In case the regulatory body decides to apply more than one method, those chosen must be geared to each other and to the mutual improvement goal. For each category of "target of change" of the improvements described above, the methods' main features are described below.

Improvements of formal elements of the organisation

Methods that address the formal elements of the organisation aim to improve procedures, processes, structures, regulations, routines, work conditions, technological measures, etc. to better support the safety culture of the regulatory body. These methods usually establish an internal project team to collect data concerning the views of employees who are impacted by certain procedures or programmes within the organisation, and who can help to identify and execute potential improvements. For instance, the regulatory body may have a process that fosters raising concerns among employees (G14). To find ways to improve the effectiveness of this process, the established internal project team conducts and analyses interviews and surveys. This results mainly in formal adaptations of the "raising concerns process". Some additional actions to support and strengthen the process (e.g. a "to-do list" for the managers or a campaign to boost all employees' awareness of the process) can also be considered.

Influencing social interactions

Methods that address social interactions target co-operation, team spirit, patterns of interaction or interpersonal relations either among staff members within the organisation, between members of the organisation and stakeholders, or within a subgroup of the organisation (e.g. a selected organisational unit or group of managers). Unit-specific meetings are a possible method to identify potential improvements of social interactions in the organisation (F4). The members of each unit hold a regular meeting focusing on a given safety culture topic and develop unit-tailored improvements addressing areas such as openness, co-operation and constructive contact among members. Afterwards, additional activities might be necessary to integrate and harmonise the different unit-specific actions into a common organisation-wide action plan.

Methods focusing on group dialogues (F6, F12, F3) typically comprise repeated meetings such as monthly organisation-wide discussions, yearly seminars with the Director General or externally facilitated dialogue sessions within the group of managers. As a result, social relations improve whether on the level of organisation-wide communication, direct contact between headquarter and regional offices, or an enhanced discussion climate among managers. Social interactions may improve by using a workshop format that encourages discussions among groups of people from different units (F8). The method could be applied for an organisation-wide self-reflection; however, the mutual exchange in this format may simultaneously contribute to improvements in co-operation and communication among different organisational units.

Most of the methods presented here aim to influence interactions of people within the organisation. One method (F5) offers the possibility to positively influence interactions between the regulatory body and licensees, based on a mutual framework including a shared set of values and ways of working together. When coming together in meetings or projects, each party assesses their own and the other party's compliance with this framework. Immediate feedback may prompt direct improvements. In addition, the method involves semi-annual (i.e. every six months) dialogues to reflect on overall results, such as lessons learnt or wider areas for improvement.

The group-focused methods provide opportunities for direct contact among participants and mutual exchange of knowledge, information, views and experiences. The group dynamics are key to improving social aspects such as trust, openness and respect. However, the regulatory body should consider the following aspects when applying these methods:

- These methods rely on a substantial participation rate of the target group. This ensures that contributions of group members reflect representative and broadly held views, identify problems and prompt ideas for solutions. Broad participation is also essential to achieve the intended improvements in social interactions.
- Regular meetings are usually mandatory for the employees in question. In contrast, special seminars and workshops are often voluntary and therefore need the participants' motivation. Management may positively influence participants through encouragement,

support or active participation. Motivation to participate also depends on recognition of the usefulness of the activity to produce actual improvements.

- The regulatory body's target groups and boundary conditions (e.g. size of the organisation and spatial distance between locations of units) determine the suitable design of group dialogues, such as integration into a "normal" meeting, group discussion format, use of an external coach, joint or separated meetings, etc. Consequently, the required effort varies significantly (e.g. personal resources, time, appropriate agenda and helpful facilitation techniques).

Influencing individuals within the organisation

Some methods address individuals in order to influence behaviours, attitudes or knowledge for the purpose of improving safety culture. One method (F11), distributes a brochure that contains guidelines, specific examples and tangible aspects of safety culture as educational material for staff to understand safety culture and act accordingly. The main benefit of this method is for individuals involved in designing the brochure or who participate in additional workshops offered.

Another method (F13), uses one-to-one conversations between the superior and the staff member to reflect on and improve on an individual level. The conversations involve personal advice and feedback, and directly affect the employee's personal goals and development. The superior and the employee can follow up on the effectiveness in a subsequent meeting. Direct feedback is a characteristic of another method (G10), in which the individual behaviour of an inspector is subject to an observed inspection and subsequent feedback and reflection.

It is important to integrate use of these methods focused on the individual level in an overall, systemic approach, as safety culture has, by definition, an organisational (not individual) focus. It should also be considered that the individual behaviour is influenced and determined by organisational structures and processes, and by circumstances and external triggers. Thus, a focus solely on individuals should be avoided, as most often change in behaviours can only be attained by changing structures, processes and the culture within an organisation.

Target of improvement not predefined

Some methods do not stipulate beforehand a specific target for improvement activities. Depending on content and results of activities performed while using a method, improvements of a combination or all three previously mentioned targets of changes may result. Methods in this group aim to identify yet unknown weaknesses. Therefore, they start with a self-assessment based on a staff survey (G8), a stakeholder survey (G6, G9) or an event-based self-review (G3). Because they include subsequent steps that help to "dig deeper", these methods have greater potential to result in *concrete* improvement areas or actions. That means, based on a starting point (e.g. a critical event or survey results), the regulatory body further investigates the reasons behind the potential weaknesses. Understanding the concrete weaknesses eventually prompts changes of formal organisational elements, social interactions or individuals. To illustrate, in the situation where a safety culture review is prompted by a specific event (G3), the process may include discussion meetings between those involved and safety culture experts. The latter may then develop action-oriented recommendations to prevent such events. Actions for improvement may include updating a procedure or increasing individual awareness.

In case of a comprehensive self-assessment as a starting point (G6, G8, G9, G19), the regulatory body uses a range of follow-up activities (such as focus group discussions, in-depth interviews, targeted follow-up surveys, observations and document analyses) to gain usable information on concrete weaknesses and potential corrections. For instance, in one method (G6), the regulatory body investigated the deeper causes of complaints of the licensee through interviews and focus groups with licensee representatives; it subsequently discussed, formulated and communicated improvement actions. Sound analysis prompted the need for a concrete improvement on the individual level among others (e.g. an ad hoc education course on the attitudes of inspectors).

When applying these methods in practice, it can be a challenge to handle the large amount of qualitative data collected (e.g. statements from interviews, opinions during discussions or views of different stakeholder groups) in order to come to a final selection of improvement actions to eventually implement.

In general, ongoing, periodic use of comprehensive self-assessment methods makes it possible to track improvement actions and evaluate their effectiveness. In one method (G19), this is explicitly stated. In the case that a planned improvement has not yielded the expected positive effect, the self-assessment entails further investigations on the underlying reasons. This can trigger readjustments of the improvement actions.

Lessons learnt/recommendations

From the application of the methods aiming at improvements, the following lessons and recommendations can be deduced:

- Inclusion of people directly involved

  All improvement approaches considered heavily involve the people whom the improvements will directly impact. Methods to improve formal organisational elements, such as a process of the management system, use the knowledge of the people involved. They know best how work should be done, what is actually done and what obstacles hinder the desired procedures. Methods aiming at improvements to social interactions or individual behaviour build upon an understanding of their situation and thinking. Therefore, group discussions and other means of communication are used to identify the problem and to find and implement ways to improve the behaviour, relationships, etc. This approach uses not only the knowledge of those involved but also their ideas and suggestions. Their involvement encourages support for the improvement.

- Involvement of stakeholders

  Methods that focus on improving safety culture of the regulatory body have the overall goal of ensuring that the regulator fulfils its tasks effectively and efficiently. To enhance the regulator's impact, it may be advisable to involve the stakeholders' view in the planning of improvement actions. Only a few of the methods considered involve people from regulated entities, largely by using surveys, interviews or group discussions. Nevertheless, consulting licensees and other stakeholders (e.g. NGOs, elected representatives, facility neighbours, other authorities, technical support organisations [TSOs]) can provide helpful insights about actions of the regulatory body and their impacts.

- Strive for reasonable actions

  People who are engaged in self-assessment and improvement activities expect changes and concrete improvements. A proceeding that results in an extensive action plan but sees no actions completed must be avoided. Similarly, developing too complicated or an unrealistic number of actions should also be avoided since a failure to implement actions is likely to hamper staff motivation and have counterproductive effects. Furthermore, the willingness of management to change the status quo by implementing actions is paramount and should be confirmed from the beginning.

- Tracking improvements and aim for long-term improvements

  Safety culture encompasses profound elements that are unconscious and thus not directly accessible, as well as behaviour that may result from these invisible or unconscious elements. Deriving effective improvement actions to address identified weaknesses is not trivial. It involves the need to transfer the topic from an abstract level to one that is concrete and practical. In addition, changing cultural aspects takes time. While fast corrections and visible results are important, changes in safety culture may require long-lasting, continuing efforts. Striving for long-term improvements requires evaluations of the actions' effectiveness and adjustments in the long-term improvement process. Because of this complexity, the regulatory body should regularly check if it is still on the right track. Improvement actions should not be only a temporary success.

For instance, the regulatory body can apply an iterative approach by alternating specific improvement actions and assessments or reflections to evaluate their effectiveness. Tracking improvements by evaluating the effectiveness of improvement actions is important and should be considered in the planning stage. It may be advisable to have a person, team or organisational unit responsible for monitoring the improvement process and implementing improvement actions. Permanent support of – and active example by – senior management is necessary. Accountability for improvement rests with management and each staff member.

- Apply methods that lead to direct improvement

  To choose a suitable method for improvement, the regulatory body must first determine its goal. An open and positive attitude towards safety culture is a prerequisite for applying any method. A regulatory body that launches safety culture activities may first pursue the overall goal of establishing a basis for open exchange and communication among employees. A more mature regulatory body, which has already introduced employees to the concept of safety culture, can build upon previous self-reflection and self-assessment activities and pursue more concrete improvement goals. In some cases, the regulatory body chooses a method providing both outputs: i.e. to self-reflect on safety culture aspects and achieve a direct improvement. For instance, reflecting in discussion groups on contributions to safety culture from different organisational units may directly improve cross-unit understanding and co-operation. Such direct improvements in communication, co-operation, leadership, etc. are often observed in self-reflection activities, as conveyed in the expression "the journey is the reward". It is advisable to apply methods leading to direct improvements repeatedly, in order to have a lasting effect.

4.4. Conclusions and observations on best practices for self-reflection and self-assessment

The sections above contain lessons learnt and recommendations for using the methods for self-reflection and self-assessment. They cover specific aspects such as choosing a suitable method and its application, including the involvement of staff, support by management, required resources, etc. A common general conclusion arising from the analysis above is the prominent role of open communication in all the methods described. This aligns with the phrase "communication creates culture: culture is a means of communication" (Thiong'o, 1986), which expresses that communication is a prerequisite of every type of culture and that cultures are created through communication. The importance of communication relates to the fact that values and perceptions are explicitly and implicitly articulated and exchanged through talking, exchanging views, discussing and collaborating in concrete improvement activities. As a result, common values and basic assumptions are strengthened. While openness during the communication and collaboration process is an important factor, it should be remembered that not every communication is open. An open communication is characterised by trust, respect, honesty and avoiding offence. It can be facilitated by communication rules that help to create a trustful atmosphere and a protected environment. In such an open atmosphere, explanations and reasons for basic assumptions may become apparent. In this way, open communication can lead to a common understanding and reach the deeper layers of safety culture.

Despite the great potential of open communication, getting to and changing the deeper layers – which are at the core of safety culture – remains a big challenge when using the methods of self-reflection and self-assessment. The deeper layers of safety culture consist of mostly intangible and unconscious basic assumptions, which are enduring and broadly shared. The following practical advice helps to address this complexity:

- Acknowledge both tangible and intangible elements of safety culture by recognising the importance of observable elements (such as results from a questionnaire, behaviour of staff, interactions with licensees, work problems) while additionally looking for qualitative data on potential underlying values, meanings, assumptions, etc.

- Acknowledge the shared nature of safety culture by using group-based methods to focus on social processes and interventions.
- Acknowledge the stability and slow-shifting nature of culture by seeking endurance through repeatedly and continuously conducting self-reflection and self-assessment activities, including concrete improvement actions.

Based on the overall experiences gained by practitioners in this field, the following conclusions can be derived:

- Self-reflection and self-assessment methods have an immediate positive effect, if not on behavioural or organisational levels, at least in the minds of participants. This is true even for a simple, quick SRSA method.
- Most comprehensive methods may have further positive impacts on different aspects and processes, such as improving the quality of the management system, instituting formal knowledge management processes, revising internal control systems, establishing reporting standards, fostering competence building, and defining and encouraging in-house training.
- Often, for self-assessment, a combination of both qualitative and quantitative tools appears to be most effective. While quantitative tools are useful to create a baseline for a comparison and for finding trends and specific issues, qualitative methods are useful for more detailed analysis and to acquire deeper insights.
- Most self-reflection methods are used in the frame of a dedicated project or activity aimed at reflecting on safety culture or related aspects in a general way, whether across an organisation or within an organisational unit. Such methods can also be applied to reflect on concrete and specific issues or situations related to daily oversight work.
- To promote self-reflection and self-assessment activities, and improve safety culture continuously, it is necessary to allocate sufficient resources and raise awareness of all staff in an effective way, typically this implies the strong involvement of senior management.
- Self-reflection and self-assessment help to build awareness on safety culture aspects that may not have been previously addressed in daily work. They provide valuable insights and help to build understanding of diverse subcultures in the organisation and promote mutual understanding among staff members. Thus, self-reflection and self-assessment also contribute to competence building and boosting staff knowledge across disciplines.

Chapter 5. **Conclusions**

Maintaining a healthy safety culture is essential for the safe use of nuclear energy. Organisations that have an impact on nuclear safety are part of an interconnected system in which the safety culture of each participant mutually influences all others – and all contribute to the overall safety culture of the system itself. It is therefore necessary for each organisation, including the regulatory body, to strive to foster and sustain a healthy safety culture through continuous improvement and learning. This will be best achieved by taking a systemic approach to safety in which individuals, technology and organisations are considered as a complex and dynamic system of interacting parts.

Within the scope of the present report, the relationship and mutual impact between regulatory bodies and the organisations they regulate and oversee are the focus of interest. While licensees are responsible for the safety of their own installations, the regulatory body, by nature, impacts the safety culture of regulated entities, including their ability and willingness to uphold their statutory responsibility. To understand how its own approaches to oversight can impact (positively or negatively) the safety culture and sense of responsibility of those organisations, the regulatory body needs to question and foster its own safety culture.

Several methods, practices and approaches can be applied to enhance safety and to foster and sustain a healthy safety culture. This report draws on information collected from regulatory bodies in Nuclear Energy Agency (NEA) member countries. These entities have shared their experiences and lessons learnt regarding: 1) methods for building competence and awareness of safety culture; and 2) activities related to self-reflection and/or self-assessment of their own safety culture.

The main conclusions can be summarised as follows:

1. Understand the significance of the safety culture of the regulatory body

   The safety culture of the regulatory body comprises internal processes, structures, behaviours, shared values and basic assumptions. It affects how individuals execute their work, make decisions, co-operate with colleagues, execute leadership tasks, etc. Importantly, these cultural aspects of the regulatory body come into play when interacting with licensees and can have an important influence on their safety culture. Because of this influence, it is important that the regulatory body reflects upon, assesses and improves its own safety culture (NEA, 2016). To meet this responsibility regulatory bodies engage in various activities to strengthen their safety culture – as demonstrated by the broad number of examples different countries provided in this report. Reflecting on, assessing and developing further the safety culture of the regulatory body can contribute to improve the safety culture and safety of regulated installations. Staff at the regulatory body become familiar with the concept of safety culture – as well as the challenges of licensees – by reflecting, assessing and improving it. In this way, staff develop knowledge and skills for evaluating the safety culture activities of licensees. Furthermore, the regulatory body thus reflects its own influence on licensees, for instance, why it matters to fulfil its regulatory tasks efficiently or to what extent it demonstrates an exemplary function. Some regulatory bodies explicitly address the interface with licensees by taking their views into account when applying methods for self-reflection and self-assessment.

2. Ensure management commitment and involvement

The commitment and involvement of senior management and of management across all organisational levels demonstrates to staff that engagement for safety culture is important and necessary. In particular, the behaviour of senior management plays an important role for the success of any activity. Notable forms of involvement and support by senior management include (among others): deciding on or initiating a specific activity; establishing a project team and providing necessary resources; promoting a high participation rate and participating in activities; ensuring the responsible project team report findings; appreciating the results and efforts; deciding on, implementing and following up on actions.

3. Actively involve staff

Most methods and approaches are effective only if participants are open to engage and willing to share their expertise and experiences. Thus, active participation of all staff – those carrying out regulatory and oversight work and all others – is crucial. Regulatory bodies can reinforce acceptance and involvement of staff by using methods that are enjoyable. These might involve: creating a pleasant atmosphere; ensuring a safe environment and confidentiality; focusing on the process rather than the result; and communicating transparently the results and actions. Participating in safety culture activities may be also an incentive in its own right. For instance, staff can benefit from: being part of an interesting group discussion; learning something new; having new experiences; seeing connections to daily work and each person's accountability; developing a mutual understanding of safety culture; getting support or feedback; contributing personal knowledge and ideas; or achieving improvements together.

4. Learning from the experience of others

Regulatory bodies of NEA member countries provided a multitude of examples covering different methods and approaches that they have successfully applied for competence and awareness building or for self-reflection and self-assessment. From this variety of experiences, all regulatory bodies can extract ideas, inspiration and advice to understand and foster their own safety culture. Great potential also exists to propose new ideas and gain new experiences in this developing and broad field.

5. Getting started

For the purpose of the present report, a distinction was made between methods for safety culture awareness and competence building on the one hand, and self-reflection and self-assessment on the other. In practice, the distinction might not be that clear or that important. For instance, more often than not, methods for self-reflection and self-assessment also aim at – or at least contribute to – improving competence and awareness for safety culture among staff members. In that sense, methods for self-reflection and self-assessment could also be considered as methods for safety culture competence and awareness building. It is also the case that during safety culture training, reflection on the safety culture of the regulatory body and its impact on supervised organisations can be an intended part of training or arise as a side-effect. Therefore, one can conclude that the choice of one or more methods – of one type or the other – with which to begin is less important than actually beginning. The focus for selecting the method(s) should be placed on choosing and customising the method(s) to the conditions and specific goals of the organisation, and on creating a positive atmosphere and a feeling of success among participants. If this first goal can be achieved through the choice of a good "starter", the appetite for an even better "main course" will open the doors for continuing activities on safety culture awareness and competence building and on self-reflection and self-assessment, as well as on improvement of safety culture.

6. Creating early successes

Some organisations recognise the need to better understand, reflect and assess as well as to further develop their safety culture, but have little experience or are faced with difficulties in deciding on an effective starting point. In this case, it is advisable to begin with straightforward methods and approaches, and to aim for early successes. This can arouse an (initial) interest for organisational cultural aspects, creating an "aha experience" or a "eureka moment" about the relevance of safety culture. In turn, it can promote a positive attitude towards this topic, allowing for an enjoyable, open and useful exchange with colleagues, or identifying and implementing a (small) positive change. Building upon such small successes, the organisation can continue an "upwards spiral" (a positive feedback loop) towards more and more open communication among employees and more elaborated approaches to establishing or sustaining a healthy safety culture.

7. Using the right expertise

Human and organisational factors (HOF) practitioners possess specific safety culture expertise. They can identify and solve problems and contribute their knowledge in choosing, implementing and conducting the methods to build safety culture competence and awareness or for self-reflection and self-assessment, and the improvement actions described in this report. Regulatory bodies should use this expertise in analysing results and making recommendations based on the outputs and outcomes from conducting these methods. Combining this safety culture expertise with the right method for the context, and in a collective and interdisciplinary way, will help ensure the regulatory body reaches its goal of assessing and enhancing its safety culture.

8. Combining methods, tools and approaches

To foster and improve safety culture in a continuous process, a combination of methods, tools (qualitative and/or quantitative) and approaches is advisable. This reflects that each method has its own benefits and limitations. Some methods described in the annexes of this report are more suitable for self-assessment or self-reflection; others are appropriate for training and awareness building. A third group is better suited to help implement concrete improvements. Users of this report can find a variety of methods categorised by these different goals to tailor their choice of methods to actual needs and available resources.

9. Planning, monitoring and evaluating

Planning, monitoring and evaluating safety culture activities is very important. Many regulatory bodies establish a project team or determine responsible competent people for conceptual pre-work and for planning and performing the activity. Planning the organisational execution should consider time frame, resources, project plan, involvement of internal/external experts, integration of senior management, extent of confidentiality, communication, etc. An interdependence exists between an organisation's management system and safety culture. To be effective, actions related to safety culture should be planned, monitored and evaluated according to, and as an integral part of, the organisation's management system. Outcomes from these actions can help identify opportunities to improve policies, processes and procedures, and should thus be fed back into the management system.

10. Continuous improvement

Safety culture is a dynamic, complex and multi-faceted concept, but it becomes tangible in every organisation through concrete examples and various connections to daily work. Because of this richness, developing a culture takes time. Strengthening safety culture cannot be a one-time activity; rather, it is a journey consisting of maintaining awareness, analysing the effectiveness of improvement actions, being open for possible corrections, and pursuing continuous improvement and learning.

The regulatory body management and staff should not find themselves exhausted after the first activity, since a self-assessment should be conducted as a means to continuously improve and not as an end in itself.

It is therefore recommended that this report be used as the starting point before launching a competence building programme or a self-reflection/self-assessment process on safety culture. The report provides a good overview of different methods and tools, including their advantages, disadvantages and best practices. Learning from what other regulatory bodies are doing is key to making further improvements. While emphasising the focus on continuous improvement, it is important to bear in mind that the approaches shared in this report should always take into account, and adequately adapt to, the specific context and needs of the regulatory body.

Chapter 6. Recommendations for future work

The field of regulatory safety culture evolves quickly. This report is based on responses of regulatory bodies in 18 countries who completed a questionnaire to share their experiences of safety culture awareness building and training, as well as of methods used to reflect on and assess their own safety culture. The countries were asked to provide explicit information on approaches, practices, methods and tools that they considered notable and effective for those purposes. Thus, this report analyses those practices that are assumed or assessed by practitioners as being most effective.

Nevertheless, activities undertaken so far give rise to a call for monitoring evolution in the following areas:

1. Continue accumulating practices

   It is necessary to continue accumulating practices, experiences and examples related to a healthy safety culture. It is also necessary to combine these practices with information addressed in other publications developed by the Nuclear Energy Agency (NEA, 2010 and 2015), the International Atomic Energy Agency (IAEA, 2002b, 2016 and 2019) or other international organisations such as the World Association of Nuclear Operators (WANO), which have wide experience of safety culture assessment.

2. Investigate how regulatory body safety culture influences that of regulated organisations

   The main goal of applying methods described in this report is to strengthen the safety culture of the regulatory body for the sake of positively impacting the safety culture of supervised organisations and, thus, the safety of their installations. Despite the numerous methods and approaches included, there is little information and guidance available to date about ways to measure or evaluate their effectiveness. While it is difficult to accurately assess how efforts to improve the safety culture of regulatory bodies impact on regulated organisations, the safety of regulated nuclear installations cannot be independent of the safety culture of the regulatory body. This is evident in two ways: 1) safety culture efforts of the regulatory body will contribute to improve its own policies related to nuclear safety and staff capabilities (and, consequently, the quality of nuclear oversight); and 2) the regulatory body's day-to-day oversight activities always influence the safety culture of regulated organisations and the safety of their installations. Hence, it is a matter of the safety culture of the regulatory body to investigate how it influences the safety culture of regulated organisations, including using feedback from them, and to find concrete ways to positively influence it. This is an important topic for future work.

3. Develop simple tools for reflecting day-to-day work

   Exploring methods and approaches for integrating safety culture reflection into day-to-day operations, decision-making and the management system is essential to support positive impacts on the safety culture of supervised organisations – and to avoid negative impacts. In particular, the development of simple tools that can be applied quickly for reflecting day-to-day work is desired.

4. Develop methods to reach deeper layers of safety culture

As argued throughout this report, oversight strategies and daily oversight activities of the regulatory body, as well as the nature of its relationships with the regulated organisations, impact the safety culture of the latter in essential ways. These tangible aspects of the safety culture of the regulatory body are driven by the more intangible aspects of the culture, i.e. values, norms and basic assumptions. The collectively shared basic assumptions represent the basis for making decisions and undertaking (or omitting) actions within individual organisations, as well as across the wider, interconnected system. This can be seen, for instance, by the analysis of the accident at the Fukushima Daiichi nuclear power plant (cf. IAEA, 2015). It is therefore crucial that individuals and organisations question their own basic assumptions and their implications on actions that impact nuclear safety (IAEA, 2015). This is particularly true for regulatory bodies, given the pivotal role they play in developing the safety culture of organisations they oversee, and across the wider, interconnected system of stakeholders. Experience, to date, of the regulatory bodies developing and using methods for self-reflection and self-assessment shows that despite recognising the importance of digging deeper into basic assumptions, it is not self-evident how to reach these deeper layers of safety culture with such methods. Therefore, further work should be dedicated to developing more methods to help in this endeavour.

5. Follow up and monitor effectiveness of improvement actions

Many regulatory bodies are currently improving activities and processes in their management system related to safety culture. The improvements include, for example: stronger focus on risk analysis in regulatory activities and management systems; implementation of management reviews; describing activities related to improvement of safety awareness in the management plans; performing safety culture self-assessments with external assistance; and others. In this regard, exchange of concrete examples on ways to follow up and monitor the effectiveness of improvement actions may be a topic for future work. Although the importance of tracking the effectiveness of improvement actions is often stressed, to date, little concrete information is available on this topic.

6. Support qualitative data analysis and infer improvement actions

It is a challenge to handle the large amount of qualitative data collected (e.g. statements from interviews, opinions during discussions or views of different stakeholder groups) in order to make a final selection of improvement actions for the regulatory body to implement. Thus, it is important to develop and apply effective methods and tools to support these critical activities.

7. Discuss best practices with non-nuclear industries

Many of the methods described in this document also apply in non-nuclear industries, where safety-related aspects have a similar nature and importance as in the nuclear industry. The NEA Green Booklet (NEA, 2016) highlighted the benefits of sharing experiences with regulators of non-nuclear sectors and discussed best practices. Some of the lessons learnt, across the range of such industries, to be further examined might include:

- the importance of a healthy safety culture when setting goals for the regulatory regime;
- the need for a means to assess safety culture and benchmark against other organisations;
- the alignment of the organisation's behaviours with its espoused values;
- the need for a strong drive for learning and continuous improvement, based on internal assessments;

- the need for successful integration between regulatory and non-regulatory functions;
- the development of non-technical skills for regulatory staff;
- the need for policy to promote an open, constructive organisational culture in non-nuclear sectors;
- the general importance of human, organisational and cultural factors in the feedback on concerns.

The NEA Working Group on Safety Culture (WGSC) is continuously striving to ensure that the safety culture of the regulatory body and the wider, interconnected system has a positive impact on overall safety.

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Annex A: Catalogue of methods for safety culture competence and awareness building

An overview of all the methods for safety culture competence and awareness building is provided in Table 3.1 of this report. Further details on a sample of methods can be found in this annex.[1]

Chapter 3 of this report summarises the triggers reported by member countries of the Nuclear Energy Agency (NEA) for carrying out safety culture competence and awareness building activities, including:

- Articulate leadership commitments and desired behaviour at all levels of the organisation.
- Better alignment of individually-held, personal values with those of the organisation to enhance sustainable performance and development.
- Incorporation of lessons learnt, for example from:
  - accidents and events; or
  - revision of the management system of the regulatory body.
- Need to improve ways of working and individual behaviours, e.g. due to:
  - The varied educational backgrounds and different experience levels of new recruits in nuclear safety and radiological protection.
  - The use of generalist inspectors to integrate consideration of safety culture in their inspections.
  - The feeling of site inspectors that findings of their inspections are not always taken into account or effectively followed up by the organisation.
  - Poor or inadequate communication among departments of the regulatory body leading to reduced efficiency and increased competition, which adversely affects the objectives and subsequent results of work.
  - Miscommunication and misunderstanding between supervisors and subordinates regarding their respective expectations, objectives, missions and individual roles in work.
  - Lack of prioritisation of tasks and shortfalls in the execution of duties by staff.
  - Graded approach is stated but not embedded in everyday work.
  - Low quality and/or inconsistent work processes that do not deliver the expected results, and/or gaps, as identified during normal operations or after a safety review.
  - Reactive rather than proactive behaviour of staff or a strong reluctance to foresee challenges and make improvements to prevent emerging risks and adapt to the changing environment.
  - Lack of awareness of the consequences of decisions made and their impacts on safety.
  - Challenging staff to synergise in order to deliver better results and resolve all independent expert judgements before they are submitted to high levels in the organisation.

1 More detailed information regarding the activities collected in the catalogue are available by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

  - Low involvement of staff in the organisation's work, lack of trust in and by the decision makers.
  - The distributed nature (geographical and organisational) of the regulatory structure in some countries (e.g. some countries have a federal structure with several regulators operating at different levels in the system. Hence, a need exists to exchange information to support a state-of-the-art approach to safety culture within the system).
- International incentives or pressure, for example:
  - Developments in international standards and good practice.
  - Observations from IAEA International Regulatory Review Service (IRRS) missions.

Category A methods:

- Overall objective: to share knowledge and information on safety culture.
- Target audience: experts in human and organisational factors (HOF).

Method A1: Workshop on safety culture in the regulatory approach	
Overall objective	Share knowledge and experience of safety culture.
Specific objectives	• Exchange experience. • Share information on new developments. • Discuss questions, methods and regulatory approaches.
Target audience	All experts in the field of HOF, especially from the regulatory body, but also from technical support organisations and universities. The workshop is voluntary and addresses all levels in the organisation, from technical staff to senior management.
Frequency	One-time-activity.
Duration	Two days.
Steps and activities	The workshop comprises four topics: • Concepts of safety culture – what is our understanding of safety culture? • Methods for the assessment of safety culture – how can we assess safety culture? • Regulatory oversight of safety culture – how do we regulate safety culture? • Possibilities for influencing and improving safety culture – how can safety culture be improved? Each topic starts with an introductory presentation, followed by discussions in small groups. The composition of the discussion groups changes in each topic to enhance the discussion among different experts. These groups exchange views and discuss approaches and methods while answering lead questions. The discussions are moderated by one facilitator per discussion group, who also presents the results afterwards in plenary. The team organising the event consists of two safety culture experts and two administrative assistants. The format of dynamic small groups fosters intense exchange of knowledge and the possibility to ask open questions.
Outcomes	The workshop helps to facilitate and promote exchange of knowledge and experience, and networking, among experts from the regulatory body and with experts from other institutions such as technical support organisations and universities. Numerous in-depth technical and wide-ranging points are exchanged and worked out for all the topic blocks. The participants were very committed to the exchange and discussions.
Pros	The exchange between experts across different organisations promotes thinking outside the box, mutual support and getting new insights. The format allows in-depth discussions in small groups with changing composition and also experience exchange in the plenary discussions.
Cons	One challenge was to get participants from all targeted organisations. Another was the very high workload for the organisational team, which also performs the facilitator's job.
Other information	It takes approximately half a year for planning, information and implementation of the workshop. There are approximately 30 participants in the workshop.

Category B methods:

- Overall objective: To raise knowledge and awareness of safety culture and build competence in regulatory oversight of safety culture.
- Target audience: Inspectors.

Method B1: Internship by licensees during the initial training programme for new inspectors	
Overall objective	To better understand the oversight activities and the licensee's constraints.
Specific objectives	• Create an immersive experience in the regulated activity. • Understand the operational worker's culture, environment and constraints. • Create different communication conditions from an inspection. • Increase technical knowledge.
Target audience	Compulsory for all staff (including technical staff) before they can be nominated as inspectors and be given authority to exercise the powers of an inspector.
Frequency	Between 30 and 40 internships are planned nationwide every year.
Duration	Between one and two weeks.
Steps and activities	Planning: The internship is planned after completion of the initial training programme and a few months of professional experience to have sufficient knowledge to benefit from the internship. Groups of 2 or 3 inspectors with similar expectations are constituted. Site choice: For regional offices, the site must be chosen outside of the overseen territory (except for unique facilities, such as fuel cycle facilities). The site must perform activities relevant to the intern's portfolio. Sites facing difficulties with safety or radiological protection, or lacking resources, are avoided. Participation: Licensees are free to refuse. If they agree to participate, a convention is established. It is made clear for the licensee that the internship will not be used for control/oversight purposes. Programme: The programme is established with the licensee to give interns a large overview of activities. It is key for interns to participate in operational tasks (spending a night shift in the control room of a nuclear power plant, watching a full surgical operation, etc.), even if they are not directly connected with safety and radiological protection. Evaluation: An informal feedback is provided.
Outcomes	• Helps understand the licensee's culture, constraints and environment for a more practical and graded oversight. • Improves technical knowledge. • Increases inspectors' self-confidence.
Pros	The targeted objectives are fulfilled to a large extent. Extremely positive perception by the trainees. Good acceptance by the licensees. Aids in assimilating the regulator's culture.
Cons	Resource-consuming. Attention must be paid to create the conditions for a non-dissimulative dialogue during the internship.
Other information	New internships can be planned in the same conditions after a few years of experience to increase inspectors' knowledge on specific topics.

Method B2: In-house seminar with national and international HOF experts	
Overall objective	To increase knowledge and raise awareness of safety culture and build competence in regulatory oversight of safety culture.
Specific objectives	• Refresh knowledge and promote individual and group experiences of safety culture. • Communicate, discuss and share experience of interactions between the different elements of the human, technology and organisation (HTO) model. • Increase awareness of generalist inspectors in specific HOF topics, e.g. human performance optimisation tools and leadership for safety.
Target audience	Inspectors.
Frequency	Every two years.
Duration	Two days.
Steps and activities	The majority of inspections in the area of safety culture are performed by generalist inspectors, i.e. professionals from varying fields with supplementary competences in the areas of HOF and safety culture. To regularly raise awareness of these topics, the regulator invites HOF experts from nuclear energy or other safety-critical domains to provide training on a selected area or issue, e.g. understanding of safety, in-depth event analysis, human performance optimisation (HPO) tools, and leadership for safety. As an example, in one biannual training event, the focus was on HPO tools and their application in a simulation of a rail network. The task within the training event was to ensure safe and efficient traffic of different trains. Participants were asked to collaborate, to apply pre-job-briefings and to communicate efficiently. The training involved the preparation and execution of the rail network task. Activities of the participants were video recorded and observed by other participants. Afterwards, there was an extensive debriefing of the performance and of individual and group-based experiences and difficulties arising during the task. The scope of the events is the communication, discussion and self-experience of the systemic interactions between technical, organisational and human factors. The event includes a concrete scenario that questions or challenges and highlights the benefits of acting professionally (e.g. by applying HPO tools) in such a situation. A chosen HOF expert facilitates the seminar in-house. The entire authority, especially the inspectors, is invited on a voluntary basis. The expert gives a presentation for all participants in the plenum and initiates additional discussions, exercises and activities in smaller subgroups. The planning phase for the biannual training event involves consideration of an appropriate focus topic that is potentially novel, contacting a possible HOF expert, and the agreement with him/ her on the concrete scope and content of the seminar. The invited expert facilitates the seminar and provides adequate handouts and an evaluation sheet. Senior management is responsible for the relevant regulation on the training of HOF competencies in the management system. They are involved in ensuring the necessary financial resources for the seminar. Management also participates (in part) in the seminar.
Outcomes	In general, the seminar refreshes knowledge and promotes both individual and group experiences concerning safety culture. For instance, in the realistic simulation in the above-mentioned task, participants had trouble acting as planned because of situational stress. The importance to stop when unsure or in critical situations became clear. The group as a whole internalised that it is important to have a common understanding of the task and efficient communication with each other.
Pros	Performing the seminar with a wide range of experts provides learning opportunities across different perspectives and industries. The cross-cutting nature and overriding relevance of HOF and safety culture become clear in this way. The self-experience and group discussions enhance the effectiveness of the learning. Prerequisites are an openness to this type of learning and a credible, convincing expert. The realistic tasks or scenarios require (safety-relevant) acting within the group. The debriefing after the task execution deals with the "why" of certain activities and actions that the group showed. The discussion encourages reflection on underlying attitudes, values, group dynamics, etc.
Cons	n/a
Other information	The external experts involved so far had experiences from different industries, e.g. nuclear industry, aviation and medicine. Usually, approximately 15 inspectors (approx. one-third of the staff) participate, especially those who are involved in HOF supervision.

Method B5: Site inspector training course	
Overall objective	To provide delegates with an understanding of the key operational areas of activity for the function of nuclear safety site inspection.

Specific objectives	• Understand the expected behaviour of a site inspector.
	• Understand the role of the site inspector in overseeing safety culture in licensees, specifically:
	  ○ Understand organisational and cultural causes of accidents.
	  ○ Be able to identify "weak signals" of organisational dysfunction.
	  ○ Understand the regulatory approach to safety culture.

Target audience	Site inspectors.
Frequency	Twice per year.
Duration	Three days overall, with 75 minutes on leadership and management for safety, including safety culture.
Steps and activities	The modules of the training course comprise: • Introduction, aims and objectives • So you're a new site inspector – handover requirements • Planning and conducting interventions, including a planning exercise • Reporting and follow-up • Site meetings • Response to incidents on-site – what do you do? • An appreciation of permissioning and the role of the site inspector • Emergency exercises and the role of the site inspector • Invited speaker – a duty holder's perspective • Managing information: incident reports and regulatory issues • Leadership and management for safety (including safety culture) • Communications, freedom of information requests, parliamentary questions and the press. The module on leadership and management for safety covers: • Learnings from major events • Characteristics of high reliability organisations • Regulatory approach, expectations and guidance on leadership and management for safety, including safety culture • "Weak signals" of organisational dysfunction • Sources of specialist help and advice. The course covers the main processes and procedures of which a site inspector needs to be aware. However, the real purpose of the course is to get "under the skin" of the role of the site inspector in being the "eyes and ears" of the regulator while maintaining an open and effective relationship with the licensee in the interests of safety.
Outcomes	The outcome of the training is that inspectors have sufficient understanding of the key operational areas of activity for the function of nuclear safety site inspection.
Pros	The section of the course on leadership and management for safety is well received and integrates well with the other modules. The course considers oversight of safety culture by the regulatory body but also reflects on the regulatory body's own culture and the impact (positive or negative) this may have on licensees. The module on the duty holder's perspective is highly valued by participants and is usually given by a senior member of a licensee, e.g. a site director of a nuclear power plant. There is opportunity for question and answer. The course is led and presented by experienced inspectors in the regulatory body.
Cons	There is some overlap between this course and other courses on specific topics. The section on leadership and management for safety is short but references a separate, more detailed course on HOF.
Other information	The course comprises in-house, classroom training for up to 20 delegates who are new or prospective site inspectors.

Method B7 Safety culture competence and awareness building of inspectors	
Overall objective	To build safety culture competence and awareness of the inspectors.
Specific objectives	• Study the basis of safety culture. • Understand the contents of the regulator's "Safety Culture Guideline", including evaluation of a licensee's activities to foster a safety culture. • Prepare a "Safety Culture General Evaluation Form".
Target audience	Inspectors.
Frequency	Twice per year.
Duration	Two days.
Steps and activities	Since the late 1990s, accidents have happened due to degradation of safety culture and organisational factors. To improve the level of safety in nuclear power facilities, thorough corrective action programmes were considered to be very important. This training course on safety culture for inspectors, which has been run since 2008, comprises the following elements: • Lecture (~5 hours). • Group drill (~7 hours). • Presentation by each group and summary (~30 minutes).
Outcomes	As a result of the training, inspectors have a deepened understanding of perspectives on examining licensees' approaches and measures for safety culture according to regulatory guidelines. Through practice, inspectors become more aware of their own safety culture.
Pros	n/a
Cons	n/a
Other information	The content of this method was based on the old "Safety Culture Guideline", which was abolished in March 2020. Since a new inspection system was started in April 2020, inspectors conduct a safety culture inspection based on the newly established "Ordinance Prescribing Standards for System Required for Quality Control Concerning Operational Safety of Nuclear Facilities", its guides and a new guide on fostering and sustaining a healthy safety culture, referring to IAEA GSR Part 2. The content of this method will be updated according to the new inspection system.

Category C methods

- Overall objective: Share knowledge and experience of safety culture inspection practice.
- Target audience: Inspectors.

Method C1: Annual workshop on safety culture oversight	
Overall objective	To share knowledge and experience of safety culture inspection practice.
Specific objectives	• Exchange experience. • Reflect on concrete inspection scenarios. • Establish a common understanding of an inspector's role and activities. The workshop also promotes harmonised implementation of management systems regulations across organisational units responsible for different plants.
Target audience	Inspectors.
Frequency	Once per year.
Duration	Half a day.
Steps and activities	The motivation for introducing this method was to supplement and enrich training for inspectors through realistic examples of on-site situations. All inspectors mandatorily participate in one of three identical workshops. Participants must master one or two concrete on-site inspection cases with respect to the "most proper" oversight actions. The initial step is preparation of an example, e.g. a certain rule violation or deviation by the licensee, the licensee's reactions and further boundary conditions on-site. During the workshop, the participants' task is to elaborate an approach and concrete oversight actions with the help of some leading questions. Participants also have to evaluate potentially relevant aspects of the licensee's safety culture. Two or three small subgroups (approximately five participants) are created to discuss the cases, share relevant experiences and write results on a flipchart. Afterwards, in the plenum, each subgroup presents its proposed activities. All participants are invited to reflect on respective advantages and disadvantages of the presented activities, particularly how they influence the safety and safety culture of the licensee. Finally, the facilitator presents the sample solution and asks for final feedback. An internal team of two people including one manager (i.e. a senior inspector), prepares the scenarios. In sum, around 30 inspectors participate in one of the three workshops. Some employees of the technical support organisation (TSO) also participate.
Outcomes	Participants get insights into their colleagues' experiences, approaches and opinions, as well as the pros and cons of the different steps of acting. During discussion, they reflect on the licensee's safety culture issues. Participants also become aware of their own role as inspectors. The event highlights safety issues occurring in practical work and fosters mutual understanding of the inspector's influence on the licensee.
Pros	The effectiveness and acceptance of the workshop are high because the training content is closely connected to the everyday work and challenges of the inspectors. The intensive exchange among participants and the final feedback concerning the solution support the mutual understanding of "proper" behaviours and the underlying values.
Cons	n/a
Other information	The participating TSO members gain insight into the decision-making process of inspectors, which increases mutual understanding and co-operation.

Category D methods:

- Overall objective: Raise knowledge and awareness of safety culture.
- Target audience: All staff.

Method D4: Safety culture training	
Overall objective	To raise knowledge and awareness of safety culture and to study the effects of safety culture and leadership aspects on catastrophic events.
Specific objectives	• Deepen understanding of cultural and leadership aspects and their connection with past catastrophes. • Discuss and reflect on the cultural characteristics of the regulatory body in the context of real-life accidents.
Target audience	The target audience is the entire staff; however, staff actively participating in the oversight activities are the main focus group.
Duration	Variable.
Steps and activities	The training series studies accidents in safety-critical (including non-nuclear) industries. It explores the "anatomy" of the accidents, and discusses and reflects on cultural aspects behind the events. It also reflects on which aspects and characteristics are universal and thus something to consider in the regulator's daily work. When conducting training events (e.g. on accidents/events in nuclear power plants), various experts are involved. Typically, technical experts provide information concerning the technical events, issues and failures. Organisational and safety culture experts explain and present information and lessons learnt from the organisational and cultural perspectives. These presentations are used to provoke discussion and self-reflection. Members of senior management are present in the events and take part in the discussion and reflection. It is important to have them present and actively participating with an open, humble and questioning attitude.
Outcomes	The outcome varies according to the goals set for each event. In some cases, the workshop has sparked discussions that needed to be continued later. The general outcome is an enhanced ability and awareness (among participants) to understand and analyse the organisational and cultural aspects affecting operational aspects. Also, understanding and identification of the regulator's own blind spots is supported.
Pros	The training events/workshops provide a good platform for open and honest discussion on safety culture and leadership aspects. The discussions and self-reflection are valuable. Examining real-life accidents/events provides an interesting context to reach the deeper layers of safety culture. The analysis of the events and reflection of the regulator's operations provide a good framework for exploring the intangible elements of safety culture.
Cons	n/a

Method D5: Training in concept of safety	
Overall objective	To raise knowledge and awareness of safety culture.
Specific objectives	• Enhance awareness of staff on safety. • Understand safety culture and how to apply it in daily activities.
Target audience	All staff.
Frequency	Ad hoc.
Duration	Two days.
Steps and activities	This course aims to enhance awareness of safety among regulatory body staff members. Through deep discussions, it provides staff with an opportunity to understand safety culture in ways that will help in daily activities. The training comprises: • A site visit to the Fukushima Daiichi nuclear power station (NPS) and the former off-site emergency response centre. • A workshop on safety, including exchange of opinion between staff of the regulator's regional office and of the licensee.
Outcomes	Almost all participants responded positively to this course. Visiting the Fukushima Daiichi NPS site has a very big impact and is a cornerstone for them to understand the identity of the regulator. As time passes since the accident, it is vital to maintain the lessons learnt through site visits.
Pros	n/a
Cons	It has been difficult to accommodate as many staff members as the regulator expects to have participate at the same time due to capacity limits.

Method D6: Safety culture of the regulatory body training	
Overall objective	To raise knowledge and awareness of safety culture.
Specific objectives	• Provide an overview of the meaning and concept of safety culture to build a common understanding. • Introduce key elements of safety culture assessments and results. • Provide a forum for questions and discussion on safety culture. An additional objective is to promote participation in the future safety culture self-assessment of the regulatory body.
Target audience	All staff.
Frequency	Up to four seminars per year.
Duration	Four-five hours (one morning).
Steps and activities	The training programme includes seminars for commissioners and senior management (small groups of 15-20 people) and seminars for all personnel including technical and non-technical people (50-60 people). The seminar has an interactive format, allowing the exchange of experiences, points of view, doubts, etc. The format is classroom training and discussion around a table, with presentations and examples from other industries. The seminars are introduced by senior management and conducted by an external expert with wide experience in the field.
Outcomes	The seminars have achieved a positive exchange of points of view and experiences.
Pros	Acceptance of the seminar has been very high, with a very positive feedback from both senior levels and across the rest of the organisation.
Cons	n/a

Method D7: Behaviour and communication training course	
Overall objective	To improve awareness on how behaviour and communication of individuals influences the learning abilities and safety culture of the organisation.
Specific objectives	Non-violent communication can impact personal development, relationships and social change. Appreciative inquiry is a strengths-based, positive approach to leadership development, behaviour and organisational change. Reflecting in action supports "double-loop" learning. This enables organisations' creativity and innovation, going beyond adapting to change to anticipating or being ahead of change. These methods support inspectors to be more aware of ways in which their behaviour and communication (interaction with others) influences their own learning abilities as well as those of the organisation and its safety culture.
Target audience	Inspectors.
Frequency	Once per year/on demand.
Duration	42 hours training over a period of approximately 6 months.
Steps and activities	A practical training programme for inspectors on: • Non-violent communication (also called compassionate communication or collaborative communication). • Appreciative inquiry. • Reflecting in action.
Outcomes	Inspectors improved their communication skills. Most were positive about their newly acquired skills, even those who were sceptical in the beginning.
Pros	A noticeable, recent development is the need to discuss substantive topics, which can then be supported by agreements on manners and awareness of group dynamics.
Cons	Some experienced safety-related cases turned out to be an insufficiently safe context for some inspectors.

Category E methods:

- Overall objective: To demonstrate leadership in fulfilling the regulatory mission.
- Target audience: All staff.

Method E1: Leadership model	
Overall objective	To provide a roadmap to communicate how staff, individually and collectively, demonstrate leadership in fulfilling the regulatory mission.
Specific objectives	A leadership model has the following specific objectives in relation to safety culture: • It complements the agency's mission, vision and values; these elements interact to help explain the organisational culture. • It elaborates upon six fundamental characteristics: participative decision-making; receptivity to new ideas and thinking; empowerment and shared leadership; diversity in thought; innovation and risk tolerance; collaboration and teamwork. • It describes specific leadership behaviours associated with these characteristics that are expected from individuals, supervisors and team members.
Target audience	All staff including individuals, supervisors and executives.
Frequency	Continuous.
Duration	Integrated into daily activities.

Steps and activities	The leadership model aims to positively influence an activity or group of people. Leaders are expected to apply conscious, balanced effort and behaviours across three core categories: people, processes and partnerships.
	• People – develop and maintain our workforce through:
	  ○ Learning and development.
	  ○ Nurturing diversity of viewpoints and backgrounds.
	  ○ Applying individual performance management and performance appraisal systems.
	  ○ Demonstrating recognition and appreciation.
	• Processes – establish goals and systems to execute plans via:
	  ○ Strategic planning.
	  ○ Management system.
	  ○ Organisational performance management and quarterly performance reviews.
	  ○ Strategic workforce planning.
	  ○ Corporate support.
	• Partnerships – engage stakeholders to inform our plan of work and decision-making via:
	  ○ Communications and information sharing.
	  ○ Partnerships, collaborations, networks and councils.
	  ○ Safety culture.
	• The module on leadership and management for safety covers:
	  ○ Core values and behaviours resulting from a collective commitment by leaders and individuals to emphasise safety to ensure protection of people and the environment.
	  ○ Support values and traits of a healthy safety culture on a daily basis.
	  ○ Expressing and resolving differing views are available to all employees whenever needed.

Outcomes	This model allows a work environment that focuses on safety and security, and encourages all employees to raise concerns and listen to concerns of others.
Pros	The section that focuses on partnerships ensures the practice and promotion of safety culture values and traits in interactions to demonstrate respect and co-operation, and to set the tone for good decision-making for all activities including safety decisions related to licensing and oversight.
Cons	There is some overlap between this model and other courses on specific topics.

Annex B: Catalogue of methods for self-reflection and self-assessment

An overview of all the methods of self-reflection and self-assessment, as well as their specific objectives is provided in Table 4.1 of this report. Further details about the methods can be found in this annex.[1] Allocation to categories is indicated in the title row by the relevant numbering, i.e. Fx for self-reflection and Gx for self-assessment.

Category F methods: Self-reflection (understanding)

Overall objectives:

- Foster self-reflection of individuals, groups, units or the entire organisation.
- Increase overall awareness and understanding of safety culture within the organisation.

Method F1; Update and revision of the organisation's mission statement	
Objective	To reflect the authority's organisational culture with broad participation of all employees and to foster common views and values.
Context of use	An existing mission statement was discussed and updated.
Steps and activities	1. Planning by a project team. 2. Performing workshops with a facilitator. 3. Evaluating and summarising the results by the project team.
Frequency	Intended to be applied once (a similar process can be applied after several years).
Involved parties	All employees.
Involvement of senior management	• Take up the need for further development and improvement. • Provide resources. • Send invitation letter to the launch event, signed by the department head. • Participate during workshops. • Express thanks to the project group and appreciation of the results. • Take decision on the new mission statement and ensure its integration into the management system.
Outcomes/products	Updated mission statement (statement on the organisational culture).
Pros and cons	The product, i.e. the mission statement, is of great value. However, the participatory process of developing the product, which led to a common understanding and identification, is the main benefit.
Suitability to reach deeper layers of culture	If workshop participants feel open to talk and discuss, the group process promotes reflection and assessment of individual, as well as underlying (shared) organisational values.
Additional information	The mission statement is available in English by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

1 More detailed information regarding the activities collected in the catalogue is available by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

Method F2: Development of a common understanding on safety culture of the regulatory body consisting of different authorities	
Objective	To develop of a common understanding among different organisations of the regulatory body and fix it in a policy document.
Context of use	Common preparation for an upcoming International Regulatory Review Service (IRRS) mission of different authorities forming the national regulatory body.
Steps and activities	• IRRS self-assessment. • Launch event and discussion meetings among the organisations. • Communication and discussions within the organisations. • Enactment of the policy paper. • Discussion during the IRRS mission.
Frequency	Once.
Involved parties	A few people of each organisation were involved in preparing the policy document. They communicated the intermediate results within their organisations, collected feedback and provided it for the next step.
Involvement of senior management	Support for the project and final adoption of the policy document.
Outcomes/products	Safety culture policy document for the whole regulatory body based on and firming up the five principles of the NEA Green Booklet (NEA, 2016).
Pros and cons	The chance and the challenge of this process is to integrate and discuss the viewpoints of different authorities that partly cover different tasks in the area of nuclear safety to find a common understanding. A challenge is to sensitise and involve the staff in the project and give it due priority.
Suitability to reach deeper layers of culture	The method mainly deals with the layer of values. It helps to make implicit values more explicit.
Additional information	The policy document is available in English by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

Method F3: Seminars for reflection on leadership and management	
Objective	To improve and develop leadership by giving and receiving feedback within a management group or to develop a working group by doing the same among colleagues. • Direct feedback on leadership in a management group or on each person as a colleague within a section.
Context of use	• Management groups. • A section with their manager.
Steps and activities	• Performed in management meetings and/or in section meetings (check-in or check-out). • One person at a time in focus. • The person in focus makes a brief description of no more than a few minutes according to the sentences below. *1. What do I think my colleagues think my best strength is to be a good colleague?* *I think my colleagues think my strength is …* *2. What I think my colleagues think is my need for improvement to be a good colleague?* *I think my colleagues think I should improve…* *3. What do I think my best strength is to be a good colleague?* *My best strength is …* *4. What do I think I want to improve to be a good colleague?* *I need to get better at ...* – All members in the group then give feedback to the person in focus to reflect the image that each presenter has.
Frequency	Carried out at every management check-in or check-out section meeting, ideally when all are together, without the presence of external participants. It will be continuous until all staff members have been in focus.
Involved parties	Managers for leadership feedback and in small groups as colleague feedback.
Involvement of senior management	All types of management.
Outcomes/products	No products, only an exercise in courage to give and receive feedback.
Pros and cons	Pros: Openness and transparency into the management group, learning to know each other and getting closer, as well as direct feedback on your own leadership. Cons: Needs time for this kind of exercise.
Suitability to reach deeper layers of culture	Provide an opportunity to reflect and learn about your leadership and/or as a colleague in order to develop your leadership or your role in a group. Also to get a deeper understanding of how you affect and are perceived by the group.

Method F4: Department-specific activities of organisational climate	
Objective	To improve transparency and openness in the department.
Context of use	A workshop in sections and departments within an organisation.
Steps and activities	– After identifying a culture weakness in a department (e.g. could be identified in an external assessment of safety culture), work within the department in several steps, such as: – Group discussion on what the weakness means. This was done in small groups and then presented in plenum. – Build dilemma exercises around the identified weakness: i.e. construct a written potential scenario/problem and give four response options that each person has to decide on. There are no correct answers, only four ways to handle the situation. – Each person in the group will have four colours (coloured paper) corresponding to the four answers. At the same time, every person holds up a colour to show their answer. – The different colours show how the problem can be handled in different ways in the organisation. When people with different answers are encouraged to elaborate about their thinking, it will open up good and interesting discussion. – Before and after one can do a very simple activity with basic software (e.g. Kahoot is a simple tool to measure answers to questions from a large group with their cell phones), to see more specifically what the department thinks (how many agree with the weakness and how many do not) in this specific question. After 1-2 years, the same activity can be carried out to see if things have changed.
Frequency	Every time the whole department is together and there is time for exercises.
Involved parties	All staff.
Involvement of senior management	Managers within departments are of course included.
Outcomes/products	No specific products other than the results from the group exercises. However, since this activity was a part of a programme to address identified weakness within the organisation, designated people documented it. These people were continuously documenting, informing and introducing activities within this programme to improve safety culture within the department.
Pros and cons	Pro: All can be involved to build transparency and openness; everybody involved hears the same things. It is a very fun, team-building activity. Cons: Difficult to find time and have the whole department available.
Suitability to reach deeper layers of culture	It has a potential to reach deeper layers of the culture. Since everyone in the department is hearing the same things and is able to reflect and be involved in discussions about weakness, they can all help to understand and develop improvements and a way forward. It is a very open and transparent activity, which helps to understand and reflect on the culture within the organisation and what can be done to change it.

Method F5: Regulatory nuclear interface protocol	
Objective	To improve the efficiency and effectiveness of working relationships between the regulator and stakeholders.
Context of use	All interactions between regulatory body and stakeholders are considered.
Steps and activities	1) Development of a mutual framework for more effective ways of working (shared set of values/behaviours). 2) Each party gathers feedback on their own and the other party's compliance with the desired ways of working (including preparation of overview reports). 3) Meetings between the regulatory body and stakeholders for strategic dialogue.
Frequency	Continually, six-monthly meetings.
Involved parties	Regulatory body and licensees.
Involvement of senior management	The process is overseen by senior representatives from the regulatory body and from the stakeholders.
Outcomes/products	Local improvement actions, six-monthly overview reports.
Pros and cons	It is a simple system of reflecting on the "health" of regulator/licensee interactions, capturing both good practices and areas for improvement.
Suitability to reach deeper layers of culture	Six-monthly overview reports provide a mechanism to ensure up-take of wider opportunities for continuous improvement.
Additional information	English information is available by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

Method F6: Discussion during periodic meetings	
Objective	Promotion of self-reflection and self-assessment. Promotion of safety culture, as well as good communication and co-ordination among a department's units.
Context of use	Periodic meetings of the whole staff at which aspects of safety culture are discussed.
Steps and activities	With no special methodology. One external workshop with a psychologist to stimulate openness and frank discussion with staff.
Frequency	Monthly.
Involved parties	All staff.
Involvement of senior management	Support by directors of departments who are personally involved in these discussions.
Outcomes/products	Positive feedback from participants. Involvement of inspectors. Internal communication enhanced.
Pros and cons	The periodic meetings help to raise safety culture aspects and promote better communication with the staff about general assumptions of safety culture. The most important issue is to have openness and strong involvement of top management.
Suitability to reach deeper layers of culture	This method is rather indicated for regulatory bodies that start to develop and implement a safety culture programme.

Method F7: Metaphor workshops	
Objective	• To prompt the group (e.g. organisational unit) to reflect about their own safety culture by finding a metaphor of their way of working and the values to which group members attach particular importance in their oversight work. • To prompt collective reflection on subcultures within the organisation.
Context of use	The method was used within the frame of an organisation-wide project on oversight culture.

Steps and activities	• Instruction to each group to answer the following questions:
	  ○ *What are our main values/principles and goals for oversight?*
	  ○ *How do we perceive the licensees and our relationship to them?*
	  ○ *What is our image of our role in oversight?*
	• Select a metaphor, using free choice of the form (e.g. paintings, drawings, handicraft works, texts, plays) and materials (e.g. coloured paper, pencils, scissors, glue, Lego bricks, cotton wool, modelling clay). Approximately 1.5 hours to complete the work in the group; approximately 0.5 days including discussion.
	• Presentation of each group's metaphor to the greater organisational unit; collective discussion of commonalities and differences of subcultures within the unit.
	• Possibly, further analysis and interpretation of all metaphors by a dedicated group, and derivation of conclusions for the overall organisation.

Frequency	One-time application.
Involved parties	• All members of the groups (e.g. organisational unit), including leaders. • Facilitation by project team and/or external expert.
Involvement of senior management	• Senior management support and engagement before and during the workshops is crucial; motivation of staff to participate. • Participation by senior management and heads of organisational units in the workshops.
Outcomes/products	Rather than in the concrete outcomes (the materialised metaphors), the value of the metaphor workshop lies in the process of developing them within each group and in discussing them with the greater organisational unit.
Pros and cons	• Positive reception by participants; positive atmosphere with amusing elements. • Preservation of metaphors (e.g. as photographs) for later reuse in the organisation and continuation of self-reflection within groups during daily business. • Interpretation and derivation of conclusions was challenging. • Considerable amount of human resources needed. • Clear communication about confidentiality issues and further use of metaphors needed beforehand.
Suitability to reach deeper layers of culture	• Potential to reach deeper levels of culture through reflection and discussion about values, norms and basic assumptions. • Depending on openness and trust existing within the groups.
Additional information	More information (in English) is available by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

Method F8: World Café	
Objective	• Practising interdisciplinary reflection and collaboration among staff of different organisational units and hierarchical levels. • Participative development and consolidation of a policy (or other) document (e.g. new mission statement) or other product.
Context of use	• The method was used within the frame of an organisation-wide project on oversight culture. • Iterative procedure: The World Café was performed over five workshops in total. • Method can be used with groups of varying size, even large groups. • Interdisciplinary groups of staff from different organisational units and hierarchical levels.
Steps and activities	• During the first workshop, small mixed groups begin discussing one excerpt of the policy document in question and revise the text in written form. • After ~45 minutes, remixing of groups so that each participant changes table and works in the new group on a different excerpt of the document. One participant per table remains as a "host" and explains the results of the previous group to the newcomers. This procedure is repeated three times (or more). • At the end of the workshop, the project team processes and edits the outputs as an input to the next World Café workshop with new participants. • Over five workshops, the policy document is finalised by the responsible project team; it includes the iteratively formulated and consolidated inputs from all participants.
Frequency	The procedure is meant to be used once to accomplish a specific task (e.g. revision of the mission statement).
Involved parties	Ideally, the entire staff to ensure inclusion of diverse viewpoints and build broad support of the output within the organisation.
Involvement of senior management	Support and active involvement of senior management is paramount, especially in case of developing policy documents.
Outcomes/products	Consolidated version of the document in question (e.g. mission statement). Improvement of overarching collaboration and mutual understanding by fostering exchange, discussion and reflection among employees of different organisational units and hierarchical levels.
Pros and cons	• The interdisciplinary setting helps foster overall co-operation and exchange within the organisation, across organisational units and hierarchical levels. • Significant amount of human resources needed (in particular extensive work by the project team).
Suitability to reach deeper layers of culture	Potential to reach deeper levels of culture, depending on the topic chosen, through reflection and discussion about values, norms and basic assumptions. Depending on openness and trust existing within the groups and the organisation.
Additional information	More information in English is available by contacting the WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

Method F9: The "Serious Game"	
Objective	Start and maintain a dialogue on safety culture and collect ideas from employees about what is necessary to improve it. Present an overview, to both management and employees, about this reflection and increase awareness of safety culture. The ideas will be used support further steps on this topic.
Context of use	The method was comprehensive in that it was extended to all employees via small groups.
Steps and activities	Employees were asked to pick from an array of toys and random objects that had been placed on a table. Employees were then asked to free associate the object with an aspect of safety culture. The objects were not intended to have a particular meaning, but rather served as sort of Rorschach inkblot. The exercise was meant to be fun, like a game, but with a serious intent, namely to generate reflections and insight about the organisation's safety culture. This activity was developed by newly hired employees to gain a fresh perspective within the organisation. A prototype was tested and then the activity was repeated with the entire organisation.
Frequency	This activity was performed once in several groups, so everybody could participate.
Involved parties	It can involve everyone in the organisation.
Involvement of senior management	All of senior management sponsored the activity.
Outcomes/products	Increased awareness and more common understanding of safety culture through an activity that was highly entertaining. A list with ideas for improving safety culture and the establishment of a working group tasked with assessing these ideas and the possibilities to translate them into practical measures.
Pros and cons	Pro: Great fun, people enjoyed doing it. Good results and practical ideas for further action. Con: Takes time to organise and play the game (approximately half a day). Is not something that can be repeated often for the same group of people.
Suitability to reach deeper layers of culture	No, it is not suitable. It is meant to start the conversation but not reach a deeper/causal level.

Method F10: Self-reflection on regulatory approaches	
Objective	To identify examples (both successful and unsuccessful) of different regulatory approaches used in the regulatory body. To provide input for a series of workshops (within the graded approach initiative) with personnel to reflect on the role of the regulatory body and the different regulatory approaches, their limits and advantages. Ultimately, to identify recommendations and improvements.
Context of use	The regulatory body representative in the NEA working group initiated the analysis, and selected the regulatory body staff responsible to analyse each topic proposed (around ten people). The work was co-ordinated with the five other countries participating in the study; every country analysed the same topics identified by the group.
Steps and activities	Steps: 1. Identify examples (both successful and unsuccessful) of different regulatory approaches used for each topic defined by the NEA group. 2. Assign each topic to two people. 3. Classify examples according to the different regulatory approaches represented. 4. Analyse results: after completing the work with the NEA group, the regulatory body performs further analysis to gain better understanding of the advantages and disadvantages of each approach, and to develop recommendations for their use. 5. Communication phase (seminars). Currently, results of this analysis are part of the initial training of new technical staff. For the future, there is the intent to use the results as an input for a series of workshops with regulatory body personnel, which will reflect on the role of the regulatory body and the different regulatory approaches.
Frequency	One-time method that resulted in information to be used in both initial training and in future seminars.
Involved parties	People related with the NEA working group and those interviewed by them, in the identification phase.
Involvement of senior management	Activity was led by senior management.
Outcomes/products	The regulatory body intends to use results of this review as an input for a series of workshops (within the graded approach initiative) with regulatory body personnel, to reflect on the role of the regulatory body and the different regulatory approaches, their limits and advantages. Ultimately, they can be used to identify recommendations and necessary improvements.
Pros and cons	Pros: The review gave senior management a better understanding on the options available to the regulator to develop its role. The results now need to be disseminate across the organisation to build a common understanding and improve regulatory effectiveness. Cons: This approach consumes a very high amount of resources.
Suitability to reach deeper layers of culture	This method help us to understand our role as regulator and ultimately how we can impact safety by using different regulatory approaches. It also helps to identify areas for improvement.

Method F11: Guidelines "Pot of Safety Culture"	
Objective	To gain a deeper understanding of safety culture and act according to it.
Context of use	Safety culture brochure as an educational material for all staff.
Steps and activities	1) Project group developed first edition. 2) Distribution of brochure to all staff. 3) Further workshops and questionnaires to collect comments.
Frequency	The brochure may be revised periodically (without specific frequency).
Involved parties	Young staff members formulated content in collaboration with experienced staff members.
Involvement of senior management	Senior officials involved from the beginning; reporting to commissioners/senior officials when established/revised.
Outcomes/products	The brochure is a compilation of guidelines, tips, specific examples and tangible elements of safety culture.
Pros and cons	The main benefit was for those individuals who prepared the brochure or who participated in the workshops. It has not yet received much attention from other people. It may be necessary to include more detailed and substantial examples or to find ways to encourage staff members to elaborate their own thoughts of safety culture and discuss with each other using the brochure.

Method F12: Seminars with regional offices	
Objective	Exchange across the different hierarchy levels of the regulatory body. Common identification of actions for improvement.
Context of use	One-day meeting of the entire regional office staff with the department supervisors, the director generals and two commissioners.
Steps and activities	Agreed meeting agenda including the opening speech of the Director General, presentations and panel discussions. A summary record is issued to keep track of the discussions.
Frequency	Every two years per regional office.
Involved parties	The entire regional office staff (including administrative staff), the department supervisors (or their deputy), the director generals and two commissioners.
Involvement of senior management	The senior management participates in all meetings.
Outcomes/products	Identification of an action plan on different topics.
Pros and cons	Pros are the direct connection and information flow between senior managers and operational staff, opportunity to discuss issues that senior staff do not usually deal with, and the freedom of speech. Cons are the extensive travel effort and a lack of concrete, short-term results.
Suitability to reach deeper layers of culture	It helps to question, define and share a common strategy.

Method F13: Behaviour framework	
Objective	To support creation of a more open and inclusive culture.
Context of use	• Whole organisation.
Steps and activities	Publication of a behaviour framework containing expected behaviours of staff aligned to the strategic themes of the regulator. The behaviour framework promotes regular conversations between staff and their line managers on the behaviours relevant to a specific context, how to achieve the behaviours in practice and personal development needs. Staff performance is formally rated at mid-year and end-of-year.
Frequency	Continually.
Involved parties	All staff.
Involvement of senior management	Use and promote effective use of behaviour framework and performance management process; lead moderation exercises; leadership by example.
Outcomes/products	One-to-one conversations on behaviour; personal development plans; coaching and mentoring.
Pros and cons	Key lessons learnt: • Need to link expected behaviours to organisational values. • Need for clarity and simplicity in behavioural expectations.
Suitability to reach deeper layers of culture	The behaviour framework promotes regular one-to-one conversations with staff in support of the organisational drive for a more open and inclusive culture.

Category G methods: Self-Assessment (Evaluation)

Overall objectives:

- To obtain an overall picture of the SC within the organisation by:
  - Assessing against existing principles/norms.
  - Comparing with previous results/other organisations.
  - Identifying areas for improvements and strengths.

Method G1: Self-assessment (SA) to measure employee motivation, satisfaction, attitudes based on total quality management (TQM) system	
Objective	To evaluate and map the actual state of the safety culture against existing principles/norms and identify areas for improvements and strengths.
Context of use	The questionnaire is distributed to all regulatory body staff except for the top management.
Steps and activities	Four phases for this activity included: • Preparation for the SRSA. • Conductance of SRSA. • Evaluation of the results, approval of improvements of leadership for safety and of safety culture. • Recording and records keeping.
Frequency	The evaluation is performed regularly in three-year period.
Involved parties	Internal staff of regulatory body (inspectors) were questioned and interviewed. An external psychologist was contracted for updating the questionnaire and conducting interviews. They also participated in evaluating the results.
Involvement of senior management	Senior management members were questioned and interviewed.
Outcomes/products	This activity provides: • A mapping of the actual status of leadership for safety and of safety culture at regulatory body. • Suggested improvements of leadership for safety and of safety culture.
Pros and cons	Pros: The most beneficial, regarding in order to strengthen the safety culture within the regulatory body, is the implementation of the standardised and internationally accepted management system and its further development. Cons: Self-evaluation results including interviews are considered as indicative. Frequent self-assessment at the regulatory body has led to an unwillingness to self-assess and thereby to distort the results obtained.
Suitability to reach deeper layers of culture	Results, including interviews, are considered as indicative.

Method G2: Self-assessment (SA) to measure employee motivation, satisfaction, attitudes – based on self-assessment methods described in IAEA SRS-83 Performing safety culture self-assessment	
Objective	To identify various aspects of regulatory body behaviour focusing on safety culture and leadership. The results from questionnaire will be transferred into the scoring system and evaluated.
Context of use	The scope of this activity included the regulatory body staff with primary focus on inspectors.
Steps and activities	The four phases for this activity included: • Preparation for the SRSA. • Conductance of SRSA. • Evaluation of the results, approval of improvements of leadership for safety and of safety culture. • Recording and records keeping.
Frequency	This activity was intended for use as needed and thus irregularly scheduled.
Involved parties	Internal staff of the regulatory body (inspectors) were interviewed. An external psychologist was contracted to update the questionnaire, conduct interviews and participate in evaluating the results.
Involvement of senior management	Senior management members were questioned and interviewed.
Outcomes/products	This activity provided: • a mapping of the actual status of leadership for safety and of safety culture; • suggested improvements of leadership for safety and of safety culture; • fulfilment of international obligations.
Pros and cons	Pros: The most beneficial to strengthen the safety culture within the regulatory body is the implementation of the standardised and internationally accepted management system and its further development. Cons: Self-evaluation results, including interviews, are considered as indicative. Frequent self-assessment has led to an unwillingness to self-assess, which can distort the results obtained.
Suitability to reach deeper layers of culture	Results from interviews are considered as indicative.

Method G3: Self-review of safety culture based on specific events	
Objectives	Identify actions for improvement by reviewing events. Increase safety culture awareness.
Context of use	An ad hoc team reviews a specific current event with respect to the regulatory body's safety culture.
Steps and activities	1) The chronology of the event is traced (Who was informed when and by whom? What actions were undertaken by each interested party?). 2) Each step of the chronology is evaluated by the team (e.g. Did we react in a timely and adequate manner? Did we apply a graded approach?). 3) Drawing conclusions, lessons learnt and actions for improvement.
Frequency	Two to four reviews/year (each review consists of approximately two meetings of two hours).
Involved parties	The team is composed by the safety culture co-ordinator, and typically involves two to four people who were directly involved in the event and one to three people who were not, but have sufficiently broad knowledge. (Additionally, external people could be involved).
Involvement of senior management	Outcome of the review is communicated to senior management.
Outcomes/products	Conclusions, lessons learnt and actions for improvement.
Pros and cons	The review is very flexible, and applicable at any time with little or no formalism. The quality of the review, however, depends on the competence level of participants, as well as on their questioning attitude.
Suitability to reach deeper layers of culture	The method needs to be completed with other tools, such as observations and interviews, to reach deeper layers.

Method G4: Safety culture matrix	
Objective	Provide an overall picture of the organisational culture. Identify maturity levels of different safety culture dimensions and sub-dimensions (rating step). Identify drivers for change. Foster awareness of staff.
Context of use	The self-assessment is conducted by means of workshops involving a group of seven staff members belonging to different departments and with different functions or level of experience.
Steps and activities	A first application of the tool has been conducted over a two-month period. Operationally speaking, each workshop session has been dedicated to assessing one or two key safety culture dimensions. As a first step, each staff member proposes their view regarding good practices, weaknesses and opportunities for improvement, and selects a rated level (individual phase). Then, supported by a moderator, the group challenges the different positions through questions and enters in a debate mode (collective phase).
Frequency	The method was applied in 2016. It is scheduled to be applied again over the coming years (as of 2019).
Involved parties	Mainly the assessment group and the moderator for the assessment phase; management board and staff during the communication step.
Involvement of senior management	The assessment results have been discussed with the management board.
Outcomes/products	Maturity models are highly flexible and could be tailored to the requirements of a specific regulatory body.
Pros and cons	• In terms of "usability" – application of the model does not represent significant difficulties. • In terms of "relevancy" – the list of sub-dimensions could be fine-tuned to match specific regulatory issues. • In terms of "diagnostic capability" – the tool exposes deep-seated cultural assumptions that impact on safety oversight practices. • The model can be applied to both large and small groups.
Suitability to reach deeper layers of culture	The method needs to be completed in conjunction with other tools, such as observations and interviews, to reach deeper layers.

Method G5: Independent assessment of safety culture (internal)	
Objective	• Illuminate all aspects of safety culture within the organisation. • Focus on weaknesses identified from the results of internal survey and department-level inputs. • Find further insights and improvement areas.
Context of use	First attempt for self-assessment of safety culture within the organisation. Individual and group interviews were conducted with approximately 10% of the staff. Interviewees were selected considering departments, job positions, ages and gender.
Steps and activities	1) Plan the assessment and get the approval. 2) Distribute questionnaire survey to all the staff. 3) Department-level self-reflection. 4) Independent assessment by ad hoc team. 5) Develop action items and feedback.
Frequency	Every two years.
Involved parties	All staff of the organisation. Seven members, with one team leader, participated in the ad hoc team. Additional administrative assistants were provided from the department in charge of safety culture.
Involvement of senior management	Top management approved the activity plan and supported the process of assessment. In particular, self-assessment by each department was carried out by the management's leadership.
Outcomes/products	An official assessment report was prepared and shared within organisation, with core insight reported to top management. The report was circulated through the intranet. Based on the report, the department in charge of safety culture set up an implementation plan to address the findings and seek approval of management.
Pros and cons	Pros: The assessment experience itself is a small victory as it increased safety culture awareness among involved staff. Cons: The resource to conduct the whole cycle of assessment is quite large. Huge organisational change during the assessment can hinder progress. Possible Con: Development of survey items, self-assessment forms and interview questionnaires, and interpretation of the answers relied on the personal expertise individual team members.
Suitability to reach deeper layers of culture	It is not plausible to know whether the activity reached the deeper layer. This is revealed only when the behaviour changed in real actions, conversations, decisions, etc. However, the assessment team members revealed their understanding on the meaning of safety culture principles and the overall view on our safety culture in epilogue.

Method G6: In-depth survey and follow-up focus group interviews with licensees	
Objective	To understand the main causes of complaints raised by licensees. To have licensees' view on any good or bad practices and areas for improvement regarding interactions with regulatory staff. To ensure mutual understanding between licensees and regulators by sharing the results.
Context of use	Survey involving staff at nuclear power plants who have contact with regulatory body staff.
Steps and activities	1) Detailed methods were discussed between performance departments of the regulatory body and the licensee. 2) Survey administration in co-operation with the licensee for three weeks. 3) Based on survey results, focus group interviews with the licensee took place. 4) Results were shared within the regulatory body and to the licensees.
Frequency	This activity was intended for use as needed.
Involved parties	Two internal members of the regulatory body conducted the interviews. Employees of licensees who work closely with regulators.
Involvement of senior management	Focus group interviews with licensees were conducted with the support of top management.
Outcomes/products	Based on the report, an ad hoc education course on inspector attitude was prepared and conducted. In general, licensee staff appreciated the activity. However, there were gaps between the perceptions of staff the regulatory body and the licensees.
Pros and cons	Licensees' answers were based on the motivation to make their work easier. Some regulatory body staff expressed dissenting opinions with a number of the improvement items based on the expectation on the regulatory body to help licensee to operate safely. Approximately 20 man-days to conduct the online survey and analysis.
Suitability to reach deeper layers of culture	The emergence of gaps between the perceptions of inspectors and licensees provided opportunity to understand and reflect deeper layers.

Method G7: Safety culture external evaluation	
Objective	To have a baseline measure of the organisation's safety culture. To focus an independent measure on our own safety culture within the regulatory body. To compare with previous results/other organisations. To identify areas for improvements and strength.
Context of use	In all organisations for independent baseline or other measurement.
Steps and activities	Interviews and focus groups, document reviews of parts of the management system, survey to all employees. Interviews with ten people (mainly managers). Interviews/discussions in four focus groups (two consisting of section supervisors, two consisting of staff), in total 26 people. Observations at an all-managers meeting – workshop on the five principles. Questionnaire sent to all employees at the regulatory body (response rate 65%). Analysis of some regulatory documents and related material.
Frequency	Every third year.
Involved parties	All employees in the organisation, including management.
Involvement of senior management	Senior management should lead and support this work. The outcome should be presented by senior management, who should also point out actions put forward to address findings that needs to be improved.
Outcomes/products	Final report with recommendations, seminar on the results and DG communicated the three most important recommendations for improvement, reflecting variations in the climate within the organisation (e.g. openness and the possibility to raise issues; weaknesses in the management system; variations in understanding of the concept of safety culture and what it means for the regulatory body). Several activities done concerning one of the most important issues. Senior management has work with external consultants in this matter.
Pros and cons	Pros: The result led to several other activities and actions. All employees in the organisation are able to answer questions and raise awareness of weaknesses in the organisation and in the leadership. Management will get a picture about weaknesses in the organisation and in the leadership that need to be improved. It is easy to manage using an external company and a questionnaire. Cons: It is hard to get a 100% response rate. The interviews may be time-consuming.
Suitability to reach deeper layers of culture	The outcome is only information. Then it is up to the organisation decide what to do with the outcome and how to proceed with actions related to strengths and weaknesses.
Additional information	Have led to local initiatives for self-reflection.

Method G8: Staff survey	
Objective	To provide staff with the opportunity to express their views on the regulator and its future. To find out about the performance of the organisation. To assess the ability to retain and develop staff, resources and capabilities.
Context of use	The whole organisation was invited to participate.
Steps and activities Concrete activities, steps/phases from planning to analysis and action plan	The regulator has undertaken full staff surveys in 2013, 2016, 2017 and 2018. The survey uses an anonymous, standardised approach and is administered through a third party. Comparison companies include over 80 public sector organisations. The survey themes are: managing change; systems tools and resources; communication and voice; views of the regulator and its culture; leadership, performance and accountability; learning and development; working for the regulator; your manager; and health, safety and wellbeing. Examples of specific statements in the survey relevant to safety culture are: • "I am committed to helping the regulator achieve its goals". • "I understand the standards of behaviour expected of me". • "I feel able to approach my Career and Development Manager regarding any concerns". • "The work of the regulator impacts positively on public safety". • "I know how to report accidents and incidents within the regulator". • "I am satisfied that my personal safety is treated seriously at work". • "The regulator effectively captures and retains the knowledge of staff that leave the organisation". • "I think the regulator is doing a good job of retaining its most talented people". • "The management manage change well". • "I feel comfortable expressing views that contrast with the management team". • "The integrity and independence of the regulator has improved over the past 12 months".
Frequency	Every one to two years.
Involved parties	Administered and supported by third-party organisations.
Involvement of senior management	Promoted use of survey and addressed findings.
Outcomes/products	The regulator has developed local and organisation-wide action plans in response to the findings of staff surveys. The most recent action plan shows what work has been completed to date, and what's left to do before the next survey. The Executive Management Team agreed on four key themes: feeling valued; leadership and management; behaviours; and managing change. These are areas of focus for improvement.
Pros and cons	Key lessons learnt: • Timely analysis and follow-up of survey findings. • Frequent communication. • Use of measures to increase staff confidence in how the survey is conducted and followed up. • Open and transparent publication of survey findings and progress in implementing improvement actions.
Suitability to reach deeper layers of culture	The regulator followed up the staff survey with focus groups to understand the reasons behind the answers to the survey, analyse themes and propose improvement actions.

Method G9: External stakeholder survey	
Objective	To better understand how we are regarded by those we work with.
Context of use	Stakeholder survey across a wide range of stakeholders such as licensees, duty holders, government, academics, international regulators and interested parties.
Steps and activities	1) Survey. 2) In-depth interviews with a sample of respondents. 3) Analysis and conclusions.
Frequency	Annually.
Involved parties	Administration and support by third-party organisation.
Involvement of senior management	Management promoted use of survey and addressed findings.
Outcomes/products	Refinement of communications to stakeholders, among others.
Pros and cons	Survey provides direct view of stakeholders on the regulatory body's performance in regulating the nuclear industry. Senior management commitment to follow up on the findings in a timely manner is key.
Suitability to reach deeper layers of culture	The in-depth interviews with a sample of stakeholders help explore the factors underlying the survey responses.
Additional information	More information (in English) is available by contacting the CNRA-WGSC Secretariat via the NEA website: www.oecd-nea.org/wgsc.

Method G10: Regulatory assurance activities	
Objective	To provide assurance of the adequacy and effectiveness of the regulator's risk management, control and governance processes.
Context of use	Whole organisation.
Steps and activities	Tiered system of assurance: • Tier 1: Regulatory oversight including observation of inspections carried out by inspectors. • Tier 2: Risk-informed compliance assessments and strategic reviews including assessment of topics such as enforcement management, internal capability and capacity, knowledge management etc. • Tier 3: Government internal audit agency delivers priority, independent internal audits.
Frequency	Continually.
Involved parties	Assurance teams (internal and external).
Involvement of senior management	The system of assurance is overseen by the Board and other senior committees.
Outcomes/products	Individual assurance reports, annual report, good practices, etc.
Pros and cons	Key lessons learnt: • Use of a tiered system of assurance. • Use of competent resource to support assurance activities. • Introduction of the Regulatory Oversight Manager (Tier 1 assurance). • Publication of assurance reports.
Suitability to reach deeper layers of culture	The method provides in-depth assessment against relevant good practice.

Method G11: Self-Assessment of safety culture using a questionnaire	
Objective	To assess the current level of the organisational safety culture, thereby discovering weaknesses and potential areas for development. To evaluate and compare with the results of the subsequent self-assessments.
Context of use	This group was heterogeneous with representatives from major organisational units, because everyone can interpret the questions and answers differently. The questionnaire was distributed electronically to all staff including management and high-level management.
Steps and activities	1. The head of the organisation established a five-member project group of that accompanied and organised the entire self-assessment process. 2. The questionnaire was distributed electronically. 3. Participation in the questionnaire was anonymous. 4. Collection, assessment and evaluation of the results by an evaluation group, which had a heterogeneous composition. 5. An evaluation based on the survey results was performed. The group elaborated results in a report and submitted a summary to management. 6. A discussion among management was held concerning the results and development/ explanation of the action plan to improve the safety culture inside the organisation.
Frequency	The authority applied a similar process of self-assessment of safety culture in the organisation in 1997 and 2000. The most recent self-assessment process was conducted in 2018.
Involved parties	All the staff of the organisation participated. The project group consisted five members from several parts of the organisation.
Involvement of senior management	Senior management was involved with the following activities: • Taking up the need for further development of the safety culture. • Making available resources to conduct the self-assessment process. • The Deputy Director general discussed the results and decisions on the action plan. • The Director General approved the action plan.
Outcomes/products	Using the questionnaire, the outcomes were: • The questionnaire should be updated with more relevant questions. • The self-assessment should be conducted more often. • The employees will be more familiar if the questionnaire were conducted more frequently; in turn, the answers would be more comprehensive and honest.
Pros and cons	Pros: • The participants gave their opinion honestly in comments. Cons: • The process should involve more members of the organisation. • The assessments are conducted infrequently.
Suitability to reach deeper layers of culture	This method was definitely suitable for communicating the importance of safety culture, and of the contributions of employees.
Additional information	Promoting participation in the assessment can result in development of safety culture.

Method G12: Federal Employee Viewpoint Survey (FEVS)	
Objective	The FEVS serves as: • A tool for employees to share their perceptions of whether, and to what extent, conditions characterising successful organisations are present in their agencies (allowing managers to see where improvements within work units are necessary). • A way to provide valuable insight into the challenges that the agency's leaders face in ensuring that the federal government has an effective civilian workforce.
Context of use	The entire organisation is invited to participate.
Frequency	Annually.
Involved parties	The FEVS is administered electronically by the Office of Personnel Management (OPM) to all federal agencies and departments. The OPM is a separate government agency than the regulatory body.
Involvement of senior management	All staff, including senior managers, are asked to participate in the survey. The Office of the Chief Human Capital Officer, in co-ordination with the Office of the Executive Director for Operations, handles the agency-wide dissemination of FEVS results.
Outcomes/products	Each year, the offices and regions use the new FEVS data to refine and recalibrate their action plans to ensure that action items reflect necessary changes or improvements. In addition, the regulatory body creates several action items from an agency perspective, which apply to all staff members.
Pros and cons	Offices are able to use this information to examine what areas were most impactful to them, in particular by looking at the survey feedback on a more granular level and identifying action plans that would be most relevant to their local organisation.
Suitability to reach deeper layers of culture	Because of the breadth and depths of both the safety culture climate survey (SCCS) and the FEVS, the regulatory body is able to build an extensive database of perceptions and behaviours that indicate the health of safety culture.

Method G13: Safety culture climate survey (SCCS)	
Objective	To measure safety culture and climate to identify areas of strength and opportunities for improvement. To compare results of the SCCS against survey results reported previously. To provide, where practical, benchmarks for the findings against other similar organisations and high-performing companies. To understand key drivers to engagement. In response to the SCCS results, the staff develops and implements action plans to improve safety culture within the organisation.
Context of use	The safety culture climate survey is administered electronically to the entire organisation and completed on a voluntary basis.
Steps and activities	The most recent SCCS included 132 questions grouped into different categories such as job satisfaction, empowerment, leadership and communication. This SCCS also included a category to support the agency's desire to better understand and support improvements in its environment for raising concerns – a key component of safety culture. This category included questions related to elevating issues up the chain of command and communication of concerns and differing views, perceptions about expressing differing views, and processes for raising differing views.
Frequency	The SCCS is administered every three years. As such, the offices/regions are expected to create new action plans every three years, identifying action items from the SCCS to focus on during the subsequent three-year period.
Involved parties	Questionnaires and surveys: The SCCS is administered by an independent and objective unit with expertise in the field. This ensures that the methodology used is valid and objective in relation to three aims: to conduct and supervise audits; to conduct investigations relating to the agency's programmes and operations to prevent and detect fraud, waste, abuse, and mismanagement; and to promote efficiency and effectiveness in the agency's programmes and operations.
Involvement of senior management	Surveys are heavily supported and encouraged throughout the agency and at all organisational levels. Each office/region has an assigned Culture Champion (typically a senior manager) as well as a Culture Analyst (supports the Culture Champion). The Culture Champions are high-level office managers who have been identified to lead results-driven actions in their respective offices. The Culture Analysts are staff members responsible for analysing the survey data and supporting office actions.
Outcomes/products	The agency uses the SCCS results to develop action plans. Each department or office creates an action plan that identifies two to three action items that will help to improve or sustain a positive work environment. In addition, the agency creates several action items from an agency perspective that apply to all staff members. These are reassessed yearly led by senior staff.
Pros and cons	The survey methods were the most beneficial as they provided employees with opportunity to share confidential feedback on safety culture-related areas. Furthermore, offices are able to use this information to examine what areas were most impactful to them, by looking at the survey feedback on a more granular level and identifying action plans that would be most relevant to their local organisation. The SCCS is conducted every three years and complements the Federal Employee Viewpoint Survey (FEVS), which is conducted every year across all federal government agencies. This dynamic process produces a constant feed and refresh of data that the staff incorporate into agency and office action plans. Keeping this a seamless process to ensure that momentum and progress on action items are not lost can be challenging. In addition, responding to these surveys and developing continuously revised action plans can be resource-intensive. Still, It is important to do so that staff can see survey results to build engagement, morale and trust.
Suitability to reach deeper layers of culture	Because of the breadth and depth of the SCCS and FEVS surveys, the department or agency can build an extensive database of perceptions and behaviours that indicate the health of safety culture. Further, the surveys allow the department or agency to see changes over time and react appropriately to downward trends.

Method G14: Assessment of systems, programmes and processes: assessment of non-concurrence process and differing professional opinion programme	
Objective	To assess and optimise existing programmes and processes. To identify areas for improvements and strength.
Context of use	Studies investigating potential improvements of the regulatory body processes, e.g. process on raising concerns.
Steps and activities	1) Employee surveys. 2) Further detailed information through interviews and targeted surveys. 3) Analysis of results and identification of improvement recommendations for senior management. 4) Decisions on and initiation of improvement actions.
Frequency	Overall assessment of processes approximately every three years.
Involved parties	Special working group responsible for the projects; involvement of staff, including management, in the assessments.
Involvement of senior management	Support and recognition by management for the assessments; further study was a directive from senior management.
Outcomes/products	Outcomes for the raising concerns programme include: 1) Revisions of the management directives. 2) Set of recommendations for fostering a climate of trust; strengthening the positive environment for raising concerns; promoting a culture of fairness, empowerment, and respect; and establishing clear expectations and accountability for managers. 3) Concrete improvement action, such as a campaign to increase awareness for the raising concerns process and to affirm management commitment.
Pros and cons	Responding to the surveys and interviews is voluntary, potentially limiting the data.
Suitability to reach deeper layers of culture	Combination of methods allows reaching different levels.

Method G15: Safety culture self-assessment	
Objective	To gain information concerning the status of safety culture within the organisation. To increase overall awareness and understanding of safety culture within the organisation. To provide valuable input for various improvement actions (e.g. revision of safety culture programme).
Context of use	Self-assessments require a core team responsible for conducting and steering the safety assessment activities. They also involve various individuals and groups from different parts of the regulatory body.
Steps and activities	After initial planning, a core team responsible for the self-assessment is appointed. The planning encompasses: • Data capturing. • Data analysis. • Communication of results. The planning results in an action plan with defined steps, methods, responsibilities and time frames. The self-assessment process takes total of 2-4 months, depending of the scope and chosen methods.
Frequency	The frequency of self-assessments is based on the safety culture programme and the planned cycle of different assessment methods. Also, the need to initiate a new self-assessment may arise (e.g. from real-life events taking place in the regulatory body).
Involved parties	Safety culture self-assessments require internal resources as the work is carried out internally. The amount of resources is determined by, for example, the scope and the selected methods of the assessment.
Involvement of senior management	The initiation of self-assessment, allocation of adequate resources, and importance of safety culture and safety culture self-assessment must be highlighted by senior management.
Outcomes/products	Previous self-assessments of the regulatory body's safety culture have provided detailed information regarding its status in different parts of the organisation. This information is a valuable asset when revising development activities and programmes.
Pros and cons	Pro: • Self-assessments are effective in evaluating the status of safety culture in the regulatory body.
Suitability to reach deeper layers of culture	When properly conducted, self-assessment is an effective method for attempting to reach the deeper layers of safety culture as it promotes genuine self-reflection and evaluation of underlying cultural factors.

Method G16: In-house questionnaire on safety culture	
Objective	To determine the status of 1) individual awareness; 2) current activities on safety culture; and 3) institutional awareness. To identify areas for improvement and consider specific activities.
Context of use	The questionnaire was distributed via the intranet to all the staff; participation was encouraged but on a voluntary basis. Over 70% of >1 000 staff members responded. This method is based on lessons learnt from the accident at the Fukushima Daiichi nuclear power plant.
Steps and activities	Approximately 70 questions, referencing the traits in IAEA GS-G-3.5, covered each of the eight action items in the Statement of Nuclear Safety Culture. The questions were designed to target specific perspectives in two areas: • Questions using "you" as the subject, meaning centred on each individual staff member). • Questions using "the division you belong to" as the subject, meaning each division, focusing on the state of the organisation. Responses were aggregated and analysed. Additionally, response rates were compared according to the grade (level in the organisation) and experience of the staff. Through analysis of responses and correlation among questions, the issues of interest identified were strongly associated and correlated with the levels of understanding, as were the actions taken to implement two statements: one on nuclear safety culture, and the other, a code of conduct on nuclear security culture.
Frequency	Conducted annually.
Involved parties	Relevant divisions and offices in the regulatory body, including the Management System Office, were involved in this activity. The questions were reviewed in collaboration with the Safety Research Department at the design phase. A consulting firm was contracted to gain the viewpoint of a third party on the survey and to tally its analysis.
Involvement of senior management	A report on this questionnaire on safety culture, prepared by the Management System Office, is submitted to commissioners/senior officials. It is also posted on the intranet to share information with every staff member.
Outcomes/products	The questionnaire survey functioned as a first step of a reflection activity to understand and begin monitoring the general status of safety culture in the regulatory body. The consulting firm analysed the data from the viewpoint of a third party and gave the regulatory body advice and recommendations on how to further promote safety culture. The regulatory body plans to refine survey items and interview each staff member and institution as a more intensive, in-depth approach.
Pros and cons	Pros: These results aided in the understanding of: • Attitudes of average staff members. • The strengths and weakness regarding how well and how thoroughly desired safety culture behaviours have permeated the regulatory body. • How the safety culture slightly differs according to the division, position, job categories, length of career and age of staff members in the regulatory body. Cons: Generally, the responses have not changed very much over the past three times the questionnaire was administered. Thus, at this periodicity, no new insights were gained from each set of responses.
Suitability to reach deeper layers of culture	It is not suitable as the survey does not necessarily help comprehend underlying factors at deeper layers that determine the status of safety culture articulated in the survey.

Method G17: Safety culture assessment	
Objective	To evaluate the actual state of safety culture against principles and attributes set in the NEA Green Booklet (NEA, 2016) and to identify the factors that contribute to or compromise its robustness.
Context of use	The main approach used during the safety culture self-assessment was a questionnaire developed to collect responses from staff of the technical support organisation. The method was used to randomly select 60 participants — in an organisation with 350 people – to take part in the assessment.
Steps and activities	A number of tasks was undertaken within this activity: A. Justify the need to perform self-reflection and self-assessment (SA) of safety culture. B. Analyse the current environment and conduct extensive research into SC elements. C. Develop the assessment tool and questionnaire. D. Conduct the safety culture self-assessment. E. Finalise results and develop recommendations.
Frequency	It is the first time this method has been used in the organisation.
Involved parties	In total, approximately 65 people participated in the method. Five were in charge of developing this method, organising and conducting the self-assessment, and reporting on the outcomes. So far, 60 people have taken part.
Involvement of senior management	The heads of the organisation took part in SCSA, thereby ensuring the leadership role and communicating to participants the importance of this work, its expected results, code of conduct, etc.
Outcomes/products	A broad range of recommendations emerged, with proposed action focused on six areas: 1. Devise and better articulate a safety culture strategy. 2. Develop a set of lectures on safety culture management. 3. Improve communication within the organisation. 4. Improve internal control systems and reporting mechanisms on possible risks related to work. 5. Propose better use of resources, depending on the safety significance. 6. Develop a plan on safety culture self-assessment in the regulatory body.
Pros and cons	Pros: The activity was valuable in that it: • Accurately reflected the current status of safety culture in the organisation. • Provided comprehensive insight into safety culture elements and allowed to compare them with the current environment. • Increased staff awareness of safety culture-related issues.
Suitability to reach deeper layers of culture	This method could partially access deep layers of safety culture but can also demonstrate the weaknesses of elements that constitute safety culture. Interpretation of the outcomes could partially touch deep layers.
Additional information	The safety culture questionnaire should be accompanied with a glossary, a list of acronyms or any other relevant information that could help respondents to understand the terms and questions.

Method G18: Regulatory Safety Culture Self-Assessment (RSC-SA)	
Objective	To improve the regulatory body's awareness and understanding of safety culture and associated expectations.
Context of use	Includes a representative sample from the entire regulatory body.
Steps and activities	A. Preplanning phase of the assessment, followed by information gathering and normative framework discussions via the Regulatory Safety Culture Working Group (RSC-WG). B. Data gathering of plans and priorities in workplace governance. C. Descriptive then normative analysis of documentation, surveys, town hall reports, an RSC survey, and focus groups producing collaborative and iterative interpretations of the data. D. Assessment report drafted by the assessment team in consultation with independent experts. E. Management action plan collaboratively developed based on the RSC assessment final report. F. Presentation to Management Committee and the Commission to obtain approvals and buy-in of methods, approach and improvement measures.
Frequency	Every three to five years.
Involved parties	• Staff and managers during the data gathering. • RSC-WG is responsible for execution and project management. • RSC management oversight group, including a few senior and middle managers, to provide oversight of the assessment. • External safety culture expert and an external organisational development consultant contracted to provide feedback and independent perspective on the assessment, to prepare final report and actions, and to present to the Commission. • Commission members via a public meeting format (with open access via webcast) and documents made available online.
Involvement of senior management	Senior management provided oversight throughout the assessment. The president shared the assessment report with all staff; it was then discussed openly through a manager's forum, at a subsequent safety culture town hall meeting, and at team meetings.
Outcomes/products	• Final report including corporate strengths, opportunities for improvement and recommendations. • A management action plan to document, address and track the completion of resulting actions.
Pros and cons	Pros: • Used existing data from surveys, town halls and working groups. • Third-party expert oversight provided additional robustness. • Reduced burden on staff (e.g. sampling) and management (e.g. consulted only to address remaining gaps). • RSC-WG execution of the assessment improved the regulatory body's understanding of safety culture and associated expectations. • The final report and management action plan were shared with all staff. Cons: • Did not use interviews for data collection during the first self-assessment. • Use of dated information may weaken the validity of the data sample. • Potential for reduced openness during focus group sessions conducted by colleagues.
Suitability to reach deeper layers of culture	• Using a range of complementary data collection methods allowed a focus on perceptions and group dialogue (e.g. focus groups, questionnaires) while balancing these with more typical artefact-level methods (e.g. analysis of reports, processes and procedures). • Integrating considerations for deeper levels of culture was deemed to be implicit throughout each stage of the assessment, and explicit in the principles outlined in the final report. The assessment should be completed according to the organisation's readiness level: the manner in which it is conducted should be commensurate with the organisation's level of understanding of RSC and the resources available. The resultant findings and recommendations must resonate with staff and management to produce the required changes. • Every subsequent RSC-SA will provide opportunities to reflect on deeper layers of safety culture and greater awareness of RSC through lessons learnt, supporting activities and experiences.

Method G19: Multi-method self-assessment	
Objective	To gain understanding of the status of the regulator's safety culture and valuable input for various improvement actions.
Context of use	Various activities within the regulatory body are used to gather information such as interviews, panel discussions, observation, questionnaires, topical workshops and document analyses.
Steps and activities	1) A core team plans data capturing, data analysis and communication of results, leading to an action plan with defined steps, methods, responsibilities and time frames. 2) Data capturing by using various methods. 3) Data analysis and identification of key findings and areas for improvement actions. 4) Writing of final report. 5) Communicating and discussing results and development needs (e.g. meetings, discussion groups, workshops, training). 6) Development of action plan(s). 7) Safety culture training before, during and after the process.
Frequency	Frequency of self-assessment is based on the safety culture programme. Additional need can be triggered by specific events in the regulatory body. Self-assessment takes two to four months depending on chosen assessment methods.
Involved parties	The internal core team, various individuals and groups from different parts of the regulatory body, and safety culture experts.
Involvement of senior management	Initiation of self-assessment, allocation of adequate resources, communication of importance of safety culture and safety culture self-assessment, participation in workshops and discussion groups: such engagement highlights the importance of improvement actions based on the self-assessment results.
Outcomes/products	Detailed information regarding the status of safety culture in different parts of the organisation. Input for revising the development activities and programmes.
Pros and cons	Self-assessments are effective in evaluating the status of safety culture. The process involves and activates most of the staff. Use of independent assessments is similarly beneficial as the approaches (self-assessment and independent assessment) and their results (with pros and cons) complement one another. Use of multiple methods requires a good understanding of each. The multi-method assessment is demanding and time-consuming for safety culture experts and members of the core team.
Suitability to reach deeper layers of culture	When properly conducted, self-assessment is an effective method for attempting to reach the deeper layers of safety culture as it promotes genuine self-reflection and evaluation of underlying cultural factors.

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Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body

It is essential that organisations in the nuclear community maintain a healthy safety culture to achieve common goals regarding the safe operation of nuclear facilities and the safe use of nuclear material. Regulatory bodies are no exception, as a key element of the interconnected system which includes licensees, research institutions, technical support organisations, as well as governmental organisations and other stakeholders. By their very nature, regulatory bodies deeply influence the safety culture and the safety of the organisations they regulate and oversee. Based on their regulatory strategy, the way they carry out their daily oversight work, the type of relationship they cultivate with licensees, the values they convey and the importance they give to safety, regulatory bodies profoundly impact the licensees' safety culture, their sense of responsibility for safety and, by extension, the safety of their installations.

Regulatory bodies apply a number of methods, practices and approaches to foster and sustain a healthy safety culture. This report provides an overview and practical examples to build the regulatory bodies' safety culture competence and to perform self-reflection and self-assessment with regard to their own safety culture and its impact on the safety culture of the organisations they oversee. Drawing directly from the experiences from OECD Nuclear Energy Agency member countries, the report discusses effective methods to disseminate safety culture throughout the regulatory body, to build competence in safety culture, and to develop self-reflection and self-assessment activities. Finally, the report presents ten conclusions based on lessons learnt and best practices to inspire managers to continuously develop their regulatory body's safety culture.

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