Country-Specific Safety Culture Forum

Japan

WANO
GLOBAL LEADERSHIP IN NUCLEAR SAFETY

NEA
NUCLEAR ENERGY AGENCY

Country-Specific Safety Culture Forum: Japan

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The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally sound and economical use of nuclear energy for peaceful purposes;
- to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the sustainable development of low-carbon economies.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management and decommissioning, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

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Forewords

William D. Magwood, IV
Director-General, NEA

Of the many lessons learnt about nuclear safety over the years, among the most difficult to address and to communicate has been that human and organisational aspects of nuclear safety are as important as any technical issue. Fortunately, it is now widely accepted by the international nuclear community that human and organisational aspects, as well as safety culture, all require substantial attention. Indeed, the accidents that have occurred in the nuclear sector and in other areas over the years remind us of just how important it is to take into account the women and men and the organisations in which they work.

The Nuclear Energy Agency (NEA) has carried out significant work and analysis in this area over the years and one key conclusion it has reached is that safety culture is influenced substantially by national culture. In other words, the manifestation of cultural traits in an organisation has a critical impact on its safety culture.

With this in mind, the NEA, in co-operation with the World Association of Nuclear Operators (WANO), developed a framework for advancing dialogue and for offering an introspective analysis on this topic. This framework, entitled the Country-Specific Safety Culture Forum (CSSCF), has held events so far in Sweden (2018), Finland (2019) and Canada (2022).

Each CSSCF starts out from the respective country's cultural realities and involves a fulsome and in-depth assessment of its cultural assets and challenges, as well as of the measures that may be taken to strengthen the safety culture in the regulatory bodies and operators. CSSCF Japan provides the opportunity to identify and understand elements of the national traits and attributes in the Japanese culture that could either enhance safety and day-to-day operations or provide challenges that should be addressed across the nuclear community.

CSSCF Japan has been made possible by the commitment of Japan's Nuclear Regulation Authority (NRA), the Federation of Electric Power Companies of Japan (FEPC) and all affiliated Japanese nuclear operators and organisations that have joined the NEA and WANO on this journey. We hope that the results of the CSSCF presented in this report will stimulate the Japanese nuclear community to explore its national context so as to enhance its safety culture and nuclear safety overall.

The NEA team along with our colleagues from the WANO Tokyo Centre have worked intensively to develop, organise and co-ordinate the many elements associated with this CSSCF. All should be proud of their contributions and of their collective mission of assuring high levels of nuclear safety.

Dr Naoki Chigusa
Chief Executive Officer, WANO

The World Association of Nuclear Operators (WANO) has on four occasions had the privilege of participating in the Country-Specific Safety Culture Forum (CSSCF). I was particularly pleased to attend the fourth CSSCF meeting in 2023 in my home country of Japan.

WANO has long held the belief that a strong safety culture is essential to the ongoing safe and successful operation of nuclear power facilities. Recognising the importance of safety culture to all nuclear facilities, WANO's report entitled *Traits of a Healthy Nuclear Safety Culture* acknowledges that a number of fundamental principles must be present in the behaviour of leaders and workers in the nuclear power sector if we are to collectively deliver our mission of ensuring the safe and reliable operation of nuclear facilities.

Although *Traits of a Healthy Nuclear Safety Culture* was written by an international team with the goal of applying its conclusions broadly across the global membership of WANO – a "think globally" philosophy – we also recognise that local factors may influence how individuals interact in their specific situation. We must therefore acknowledge the necessity of being prepared to "act locally."

The CSSCF provides this "act locally" opportunity. Through role-playing and related discussions, the CSSCF helps its participants gain a deeper and broader understanding of how regional and national culture influences the way individuals interact in the performance of nuclear operations.

For the CSSCF in Japan, the strong participation by the Nuclear Regulation Authority representatives and Japan Nuclear Operators staff allowed a transparent and effective interaction. This was a positive step in promoting understanding and a synergistic relationship that can provide great benefits for nuclear safety and the performance of Japanese nuclear power plants.

The CSSCF in Japan also benefited from the participation of regulators and nuclear energy experts from several other countries, providing an international perspective to complement the discussion of Japan-specific cultural attributes.

WANO continues to appreciate its collaborative effort with the Nuclear Energy Agency to sponsor the Country-Specific Safety Culture Forum.

Kingo Hayashi
Chairman, Federation of Electric Power Companies of Japan

The 13 years since the accident at the Fukushima Daiichi Nuclear Power Plant have been a time of unprecedented difficulty and change for the nuclear industry in Japan. The high level of concern and anxiety from the public is directly related to the loss of trust in the nuclear industry. We have been working to restore this trust and to improve safety based on the consensus that such an accident must never happen again.

The discussion at the Country-Specific Safety Culture Forum (CSSCF) examined the possible influence of national culture and traditions on safety culture, which was a new approach and a very important input to the efforts that we have been making.

In particular, the fact that light was shed on issues that had been implicitly present among organisations, such as authority gradients and communication, and the mutual recognition of the need for operators and the regulatory body to face and discuss common issues, were the most important outcomes of this forum.

In the future, it will be important to continue these discussions, not only within each organisation and across the nuclear industry, but also with the regulatory body, based on a thorough understanding of the contents of the report. This will lead to further fostering a culture for safety and restoring public trust in nuclear energy.

Finally, I would like to thank the NEA and WANO for planning and hosting the CSSCF in Japan. I would also like to express my sincere gratitude to the many people involved in the preparation and organisation of the Forum, and to the participating local governments, national governments and operators for their open and dedicated discussions.

We encourage all countries with nuclear power plants to host Country-Specific Safety Culture Forums.

Shinsuke Yamanaka
Chairman, Nuclear Regulation Authority

Over the years, it has been widely recognised that human aspects such as safety culture, human and organisational performance and communications are as important for nuclear safety as material conditions and engineering aspects.

Following the successful Country-Specific Safety Culture Forums (CSSCF) in Sweden (2018), Finland (2019) and Canada (2022), the fourth CSSCF took place in Tokyo, Japan, on 14-15 December 2023. It was the first opportunity for operators, regulators, local governments and international observers to come together and discuss how nuclear safety culture can be influenced by the domestic cultural context of a country and how operators and regulators perceive these effects in their day-to-day activities. This made it an extremely valuable forum, providing a unique opportunity to deepen our understanding of our own safety culture. The participants gave their personal insights and shared their collective experience throughout the forum on the importance Japanese culture places on nuclear safety. It is important to make use of this awareness and the other gains from the forum in the future.

It is also the responsibility of the participants to share their experiences to further expand the discussion throughout their communities. This will provide a valuable opportunity for colleagues to ensure that their daily activities provide an even stronger culture for safety in Japan.

Finally, I would like to express my gratitude to the NEA and WANO Tokyo for the excellent preparations and organisation of the Forum.

Acknowledgements

The NEA thanks the Federation of Electric Power Companies (FEPC) and the Japan Nuclear Regulation Authority (NRA) for their valuable contribution to the realisation of the Country-Specific Safety Culture Forum (CSSCF) Japan, as well as all the affiliated Japanese nuclear operators and organisations that joined the NEA and WANO on this journey. The NEA is also grateful to the Japan Atomic Energy Agency (JAEA) senior experts who acted as facilitators during the Forum alongside the NEA staff.

Finally, thanks are due to the NEA and WANO team that worked hard to complete this project, particularly Nobuhiro Muroya, Anaïs Nouailles Mayeur, Minori Kato, Ursula Diffu, Yuji Kumagai, Keiko Chitose, Joji Kohara, and Gabrielė Gedvilaitė of the NEA and Isao Sugawara and Paul James of the WANO Tokyo Centre.

Table of contents

List of abbreviations and acronyms

CSSCF	Country-Specific Safety Culture Forum
FEPC	Federation of Electric Power Companies
GDP	Gross domestic product
IAEA	International Atomic Energy Agency
INPO	Institute of Nuclear Power Operations (United States)
JAEA	Japan Atomic Energy Agency
JAPC	Japan Atomic Power Company
JNFL	Japan Nuclear Fuel Limited
JPDR	Japan Power Demonstration Reactor
LNG	Liquefied natural gas
NEA	Nuclear Energy Agency
NUMO	Nuclear Waste Management Organization of Japan
NRA	Nuclear Regulation Authority (Japan)
OECD	Organisation for Economic Co-operation and Development
RP-HANS	Division of Radiological Protection and Human Aspects of Nuclear Safety (NEA)
WANO	World Association of Nuclear Operators

Units of measure

TWh	Terawatt-hour

Executive summary

Background

Throughout the history of nuclear energy, one of the common objectives and absolute priorities of both nuclear operators and the organisations that regulate them has been to achieve and maintain high levels of safety. For several decades, a healthy safety culture has been considered essential to the overall safety performance of any organisation. Although the safety goals in countries with nuclear power programmes are similar, the operational realities vary due to a range of factors including national cultural contexts. Those national cultural characteristics can have a positive impact on a healthy safety culture within nuclear organisations or present notable challenges. For this reason, it is essential for the nuclear community to identify what influences are present within their individual cultural contexts and to reflect on how these influences may have an impact on their overall nuclear safety culture. A clear understanding of these impacts can lead to the strengthening of safety culture through, for example, having open and transparent communication, having explicit responsibility and accountability, or ensuring that safety is considered a priority in all decision-making.

The Country-Specific Safety Culture Forum (CSSCF) is a programme established by the Nuclear Energy Agency (NEA) and the World Association of Nuclear Operators (WANO) to provide host countries and their principal nuclear institutions and organisations an opportunity to reflect on national characteristics and engage in exercises to assess the influence those characteristics could have on the overarching nuclear safety culture.

Since its inaugural event in 2018, the CSSCF has proven to be a valuable tool and approach in raising awareness in a country's nuclear community of the attributes that can influence their organisations and the safe operation of its nuclear facilities. This process does not strive to make a comparative analysis of national contexts. Instead, it offers an opportunity for a given country to reflect and assess the influence of its national culture on the nuclear safety culture and to consider, within the national context, methods (where applicable) for sustainable improvements to its safety culture. In this regard, across a range of nuclear activities in a given country, the CSSCF analyses the cultural traits of the country's nuclear sector and identifies how they might influence assumptions, values, beliefs and behaviours within nuclear organisations. To achieve this, the CSSCF comprises a series of steps: data gathering and analysis, development of a scenario script, the conduct of a two-day Forum, detailed analysis, and development of the final report containing findings and, most importantly, country-specific recommendations for continuous improvement in enhancing the safety culture across the nuclear community.

With the conclusion of the CSSCF Japan, it is the responsibility of each participating organisation to determine its next steps by reflecting on the present report. Without prescribing any specific follow-up activities, the NEA does recommend the use of this report as the basis for further exploration of the principal cultural traits and attributes through various introspective exercises and training activities.

Conducting CSSCF Japan

CSSCF Japan was initiated in late 2022 with the NEA, WANO, the Federation of Electric Power Companies (FEPC) and the Nuclear Regulation Authority (NRA) agreeing on the basic framework for the project and then planning the initial step for the data-gathering exercise. Consistent with the previous CSSCF activities, substantive work began with the data collection effort. The NEA travelled to many Japanese nuclear organisation offices and facilities and a data collection team held 91 interviews and focus groups across the nuclear operations community and the NRA, gathering perspectives and information from 368 participants. The organisations included all 11 nuclear power plant operators in Japan, a fuel reprocessing company, and the Japanese nuclear regulator. The participants interviewed were specifically chosen from various levels and across diverse operational units within the organisations, ranging from CEO/CNO level to middle managers to operational staff.

The data collected across all activities resulted in an overview of specific national characteristics, themes and relevant concepts in safety culture reflective of the Japanese nuclear context. These findings supported the development of a scenario script that was used as a basis for discussion at a two-day forum held on 14-15 December 2023 in Tokyo, Japan. The Forum was attended by a large and diverse group (more than 100 participants) representing very senior to more junior levels of the national nuclear organisations that took part in the data collection exercise, including international guests and local government representatives. The Forum allowed for an in-depth exploration of the Japanese national characteristics and themes and their potential impacts on nuclear safety culture.

Overview of outcomes

This report is based on views of representatives of the Japanese nuclear community, as expressed during interviews, focus groups, and at the 2023 CSSCF held in Tokyo, Japan.

After three highly successful CSSCFs, in Sweden in 2018, in Finland in 2019, and in Canada in 2022, CSSCF Japan was the first Forum conducted in Asia. This report documents the background, method, outcomes, observations and self-reflections collated throughout the process, including the conclusions of the two-day Forum held on 14-15 December 2023 in Tokyo, Japan.

CSSCF Japan outlined several noteworthy national characteristics that are reflected in the Japanese nuclear

sector. The following eleven traits were found to be the most significant, based on the discussions and resulting analysis:

- **Peer pressure** – implicitly encourages people to conform to the opinions of the majority and to be hesitant to speak up.
- ***Majime* (diligence)** – prompts honesty, diligence and hard work to achieve goals and objectives, which leads to a great respect for rules and deadlines. It also sometimes encourages the search for an excessive level of perfection or to apply rules without questioning.
- **Fear of failure** – is due to strong peer pressure and because it can be hard to have mistakes forgiven. The fear to fail or to make mistakes can lead to highly risk-adverse organisational cultures.
- ***Hoshu-teki* (conservativeness)** – means that precedence is not broken and a guarantee of success is needed before trying new ways of doing things. The pursuit of perfection sets the bar very high and, coupled with a strong tendency towards risk aversion, makes it difficult to be proactive. This is perhaps especially true in the nuclear sector.
- ***Wa* (harmony)** – implies a peaceful unity without conflict and conformity within the group in which members prefer the continuation of a harmonious community over personal interests. Achieving *wa* can be so important in Japan that people distinguish between *honne* (a person's true feelings or real intention) and *tatemae* (the face borne in public or a stance/political statement).
- **Don't speak out** – can be due to peer pressure and the *wa* described above, meaning individuals can tend to align themselves with the majority and, as a result, be reluctant to speak up and express divergent opinions.
- **Collectivism** – creates a strong sense of social cohesion and national commitment, the needs of the group being more important than those of the individuals.
- **Ambiguity** – can describe the way leaders and workers in Japanese organisations sometimes make decisions or communicate. As far as communication is concerned, they rarely express their thoughts directly using unequivocal language, and sometimes imagine or surmise what others are thinking.
- **Consideration** – means Japanese tend to be prize benevolence and showing respect and politeness to others in all aspects of social and professional life.
- ***Nenko-joretsu* (respect for seniority)** – allows a seniority-wage system where, because of age, the longer a person has worked in a company, the more power and salary they have compared to others.
- ***Okami-ishiki* (obedience to superiors)** – leads to a strong emphasis on hierarchy and respect for authority figures, particularly those working for the government.

The broad national characteristics outlined above play out in a variety of individual and organisational behaviours associated with a healthy safety culture.

The discussions held during CSSCF Japan identified the following safety culture dimensions:

- accountability and responsibility for safety;
- clearly defined roles and responsibilities on safety;
- continuous learning and improvement around safety;
- importance given to safety in decision-making;
- human resource allocation, effective competencies and training management to ensure safety;
- open and transparent communication on safety.

The observations outlined in this report highlight Japanese cultural attributes that the participants recognised could influence assumptions, values and organisational structures and processes, and consequently impact nuclear safety performance. The objective of CSSCF Japan and this report is to offer the Japanese nuclear community tools they can use to continue to strengthen safety culture in their nuclear organisations and collectively throughout the nuclear sector in Japan. This report can be used by the host country to reflect on national attributes and to consider any potential "blind spots" within their organisational behaviour and to address these through further dialogue, training and safety management processes improvement, when appropriate.

The findings from CSSCF Japan demonstrate the strong emphasis that the Japanese nuclear community places on safety and the robust progress made by the Japanese nuclear community since the Fukushima Daiichi Nuclear Power Plant accident in terms of maturity in safety culture. The data identify national characteristics of Japanese culture that contribute positively to operational safety and promote a strong nuclear safety culture, but also reveal areas in which the national safety culture could be further strengthened.

The discussions and reflections in the study (the findings from the interviews and focus groups identifying national characteristics), as well as the two-day Forum, resulted in a substantial amount of data, which the NEA team collected and analysed. The qualitative and thematic analysis encompasses the core of this report. The wide representation of the Japanese nuclear sector in this process highlights the commitment of the country to the improvement of nuclear safety culture.

Direct feedback from CSSCF Japan participants highlighted the positive impact of the exercise in encouraging open and constructive dialogue, particularly across divisions and organisations, as well as between the license holders and the regulatory body. The Forum enabled exchanges among regulatory officials and industry representatives and stimulated reflections. Within the individual Japanese nuclear organisations, these discussions raised new perspectives and prompted actors to consider advancing the conversation on how national attributes influence nuclear safety culture.

The report's authors invite the Japanese nuclear community to contemplate the CSSCF Japan findings and determine the most effective way to apply them to further enrich their national nuclear safety culture. To assist in this, the report offers a matrix of exploratory questions that can help prompt dialogue and support measures that might lead to improvements.

Safety culture in a national context

National culture

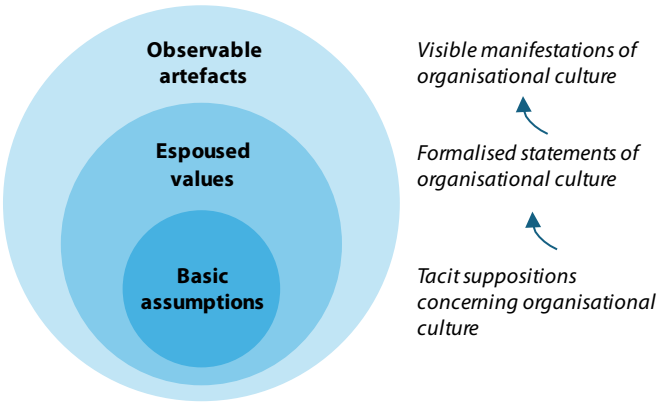
Experience in the nuclear sector has shown that the dominant cultural context in which facilities are operated in a host country is not disconnected from the national cultural context (NEA, 2016b). In the prevailing academic literature exploring this link, Guldenmund notes that: "Culture emerges at places where people live and work together. Living and working together requires a certain degree of shared understanding – e.g. about daily reality, about work and its context, and so on – and it is this (shared) understanding that a culture provides" (Guldenmund, 2018: 21). The actual essence of national culture is hard to define, but it embodies norms, behaviours, beliefs, customs and values shared by the population of a sovereign nation, which in turn influence individuals' behaviour and social relationships by enabling people to make sense of their society and perform in it as well as to make sense of other people's behaviours (Hofstede, 2001; Guldenmund, 2018).

Culture emerges spontaneously, even unintentionally, even if we would prefer otherwise. Edgar Schein, a pioneering researcher on organisational culture, proposed a model of culture that provides some grip on a culture's elusiveness (Schein, 1985). The deepest level of an organisation's culture is composed of implicit, tacit and basic assumptions that are taken for granted (strongly held beliefs, values, norms, etc.). This level is not directly visible but can be uncovered by observing how people interact and inquiring as to the reasons why things are done in certain ways and the perceptions of what is appropriate behaviour in different situations. This inner level is surrounded by two more tangible layers. "Observable artifacts", the external layer, is clearly visible but not directly convertible to an underlying culture although it might be an expression of it. Artifacts are most easily acquired and can function as a façade rather than a cultural expression (Guldenmund, 2018). The same goes for the second layer, the "espoused values". These are publicly stated and shared principles, rituals, standards of behaviour and goals, which, again, are tangible but do not necessarily translate directly into underlying basic assumptions.

Influential research by Geert Hofstede studied the impact of national culture on values in the workplace, based on the analysis of a large database of employee value scores collected at IBM, a multinational computer manufacturing company, between 1967 and 1973, across 50 countries (Hofstede, 2001). Hofstede's work found large differences between countries along the following five dimensions: power distance, uncertainty avoidance, individualism-collectivism, masculinity-femininity, and short vs. long-term orientation. For instance, the power distance

index shows that in countries where power distance is high, people may find it difficult to express disagreement with their superiors. This situation can prevent the adoption of a questioning attitude and lead people to give in consistently to group pressure, even when doing so undermines effective teamwork. Later, other researchers added restraint vs. indulgence to this list. Some research has attempted to determine whether these different dimensions lead to variability in the level of risk behaviours and safety performance at a national level and has shown that other factors such as management's perceived commitment to safety and the effectiveness of safety measures have a greater impact (Mearns and Yule, 2009).

Figure 1: **Schein's "onion layer" model of organisational culture (adapted from Schein, 1985)**



Culture influences, but is also influenced by, the structure and formal part of an organisation as well as the daily execution of its processes. Indeed, organisational cultures depend on the structures that organisations put in place to achieve desired outcomes. These structures reflect the priorities of top leaders, who in turn may depend on factors outside the organisation, such as regulatory pressure and public opinion (Hopkins, 2016). If safety is an integral part of the organisation's primary aim or mandate, the resulting culture is called "safety culture" (Guldenmund, 2018).

In the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission (known as the Diet Report), the reader's attention is specifically drawn to the subject of how national culture might influence the organisational and safety culture (The National Diet of Japan, 2012). These concepts of national culture and safety culture became an active area of discussion in fora associated with the NEA. While the conversation emerged from considerations made after the Fukushima Daiichi Nuclear Power Plant accident, it was quickly recognised that no culture is superior to another when it comes to achieving a high level of nuclear safety. In fact, different characteristics or attributes may, at times, reinforce or weaken safety performance.

Nuclear safety culture

Safety culture is one of the toughest topics in nuclear safety because it is a matter of improving human functioning in a very technical and regulated industry. Nonetheless, it is today a well-established view that nuclear installations can be seen as systems influenced by humans, organisations and technology. The relationship between the human element, the technical aspects of nuclear operations and the organisation in which they reside has been acknowledged as key to any effort to improve safety (NEA, 2022). It is also now well established that the cultural context influences the human and organisational factors: it is therefore essential to include perspectives and elements that focus on cultural attributes that may affect the conditions for the human and organisational factors that contribute to nuclear operations.

The idea of safety culture emerged after Chernobyl, in the late 1980s, as described in many writings (e.g. Cox and Flin, 1998). Since then, safety culture, used as a social construct, has been prominent as a root cause for both occupational accidents and process-related events and as a concept needing continuous attention, evaluation and reinforcement (Cooper, 2018). As such, the concept has been the subject of numerous publications, which proposed new definitions, ways of evaluating it and levers to enhance or maintain it, but also criticisms regarding the fuzziness of the concept and the simplistic vision of mechanical links between management actions and culture (Marsden, 2020). In the end, everyone agrees that safety culture cannot be imposed: it is built, reinforced and put to the test each day through words and actions.

Over the past thirty-plus years, in an effort to support institutions seeking to sustain high levels of safety and continuously improve their safety culture, a number of organisations and the academic world have developed normative frameworks that describe the kinds of behaviours, attitudes and principles necessary for the safe operation of nuclear facilities (IAEA, 2006; WANO, 2013; INPO, 2012). The World Association of Nuclear Operators (WANO) has developed its ten *Traits of a Healthy Nuclear Safety Culture,* with corresponding attributes and examples of behaviour. The International Atomic Energy Agency (IAEA) has arranged similar standards into a framework of 5 characteristics and 37 underlying attributes. Also, the Institute of Nuclear Power Operations (INPO) released in 2012 the *Traits of a Healthy Nuclear Safety Culture*, which sets out a framework for open discussion and enhancement of safety culture within the industry. Countries can use these international normative frameworks to build the foundation of a healthy and effective safety culture.

Before the Fukushima Daiichi Nuclear Power Plant accident, safety culture focused almost entirely on nuclear operators. Investigation of the accident in Japan highlighted the importance also of a healthy safety culture within the nuclear safety regulator. This revealed the need to better understand the regulator's role in the safety culture of a given nuclear community, acknowledging that it includes both the interactions between the regulating body and licence holders as well as the safety culture within an effective regulating body. In response to this increased focus on the regulator's role in safety culture, the NEA developed and published several reports within its series of regulatory guidance documents:

- *The Mutual Impact of Nuclear Regulatory Bodies and License Holders from a Safety Culture Perspective* (NEA, 2024) explores interactions between nuclear regulatory bodies and licensees and how each influences the safety culture of the other.
- *The Characteristics of an Effective Nuclear Regulator* (NEA, 2014) describes the characteristics in terms of roles and responsibilities, principles and the attributes of an effective nuclear safety regulator that can be applied to both mature regulators as well as those of countries that are new to nuclear energy.
- *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016b) outlines five principles and their associated attributes that underpin and support the safety culture of an effective nuclear regulatory body. This report highlights the importance of the national context – including a country's cultural attributes – and how it can frame, support, and influence an organisation's safety culture.
- *Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body* (NEA, 2021) 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.

NEA work in particular has emphasised the importance of the national context when considering the foundation for an effective safety culture. As highlighted in the NEA report *The Safety Culture of an Effective Nuclear Regulatory Body* (2016), distinct national characteristics can serve as strengths to be leveraged and further developed and should not be considered a barrier to safety culture. It is in this spirit that the NEA and WANO developed in 2017 the CSSCF process, aiming for it to be carried out in countries around the world. The NEA and WANO agreed on the need to address the sensitive and important issue of national context in relation to safety culture. The CSSCF methodology was developed to help organisations reflect on their national attributes and identify what could be done to enhance safety culture. The NEA Division of Radiological Protection and Human Aspects of Nuclear Safety (RP-HANS) leads in this effort.

Policy on safety culture in the Japanese nuclear context

The Nuclear Regulation Authority (NRA) has set five principles as its core values to which all NRA employees must adhere at all levels in the organisation (NRA, 2013):

- independent decision-making;
- effectiveness when taking action;
- open and transparent organisation;
- improvement and commitment;
- emergency response.

Establishing and fostering a healthy safety culture within the Japanese nuclear community is one of the NRA's top priorities, as specified in the *Statement of Nuclear Safety Culture*, published in 2015 (NRA, 2015). The Statement reflects the lessons learnt about safety culture from the Fukushima Daiichi Nuclear Power Plant accident and includes the following eight traits:

- giving priority to safety;
- taking into account risks during decision-making;
- fostering, sustaining and strengthening safety culture;
- maintaining a high level of expertise and organisational learning;
- communicating effectively;
- developing a questioning attitude;
- taking rigorous and prudent decisions and being agile when taking action;
- harmonising with nuclear security.

The *NRA Ordinance Prescribing Standards for System Required for Quality Control Concerning Operational Safety of Nuclear Facilities* (NRA, 2020), called *Regulations for Quality Control Standards*, incorporates requirements from the IAEA Safety Standard GSR Part 2, *Leadership and Management for Safety* (IAEA, 2016a), and requires the license holders to foster a healthy safety culture. NRA inspectors use two NRA guides (*Quality Management System Operation Guide* [NRA, 2023] and *Guide for Fostering a Healthy Safety Culture* [NRA, 2019a]) to assess the operator's safety culture. The latter guide describes four major categories, 10 traits (personal accountability; questioning attitude; communication; leadership; decision making; respectful work environment; continuous learning; problem identification and resolution; work processes; and environment for raising concerns) and 43 safety culture attributes to be referred to when conducting a comprehensive safety culture assessment (NRA, 2019a). For example, the attributes relating to the "personal accountability" trait are "adherence", "ownership" and "collaboration".

All licensee organisations participating in CSSCF Japan have reported a significant strengthening in their policies supporting safety culture. Their policies include elements that were formulated in accordance with the NRA regulatory documents presented above as well as the ten *Traits of a Healthy Nuclear Safety Culture* from WANO (WANO, 2013). Also, according to the interviews, over several years, operator CEOs and/or CNOs clarified their safety messages to emphasise the importance of safety culture, more specifically on the two points described below.

- Eliminating the culture of blame: It was reported that while in the past there were cases where individuals were identified and denounced for mistakes, the intention was to stop blaming individuals. This is in line with the NRA's requirements in terms of having a "just" culture as described in the *Cause Analysis Guide* (NRA, 2019b).
- Providing psychological care for depressed individuals: After making a mistake, Japanese workers would often blame themselves and experience psychological stress; at some sites, psychological care seems to be provided by the organisation to these individuals.

These two objectives aim at supporting Japanese staff in speaking up and raising issues or concerns in order for the organisation to effectively and continually improve.

CSSCF framework relating to safety culture in a national context

The framework used for the CSSCF draws from the frameworks described above and an understanding reached in the nuclear community since the Chernobyl accident on what constitutes a sound safety culture. While attempting to make the concept of "safety culture" or "culture for safety" less vague, these frameworks:

- affirm the fact that risk management approaches are embedded at all levels of the organisation whereas, until recently, attention was principally focused on workers, particularly through the prism of "human error"; and
- emphasise the more informal dimensions of the organisation (values, habits, professional standards, local contexts, etc.) in addition to the technological and procedural dimensions which have so far been predominant.

Safety culture reflects the importance that the organisation gives to safety in all decisions, departments and professions and at all hierarchical levels. Safety culture also involves understanding the characteristics of the organisation that positively or negatively influence the relationship of employees to safety (clarity of procedures, dialogue with management, shared vigilance, relations with sub-contractors, reporting and processing of alerts, policy of recognition/sanction, etc.). During the CSSCF in Japan, the following safety culture dimensions in particular were discussed:

- Accountability and responsibility for safety: In an organisation with a healthy safety culture, all individuals should be personally accountable for safety and comply with regulations and procedures, while being fully informed of the safety risks and requirements relevant to their job. They also demonstrate a questioning attitude by examining and challenging safety policies, procedures and behaviours.
- Clearly defined roles and responsibilities on safety: From a healthy safety culture perspective, the roles and responsibilities should be clearly defined and assigned for all levels and positions in the organisation. This important safety culture dimension also implies that the scope of everybody's decision-making authority related to safety is clear.
- Continuous learning and improvement around safety: Lessons learnt from experiences both internal and external to the organisation are used as a basis for continual improvement and employees are encouraged and recognised for reporting concerns, are free from reprisal, and feel that they

have been heard when they voice issues. Also, organisational silence[1] being one of the most important enemies of safety, information from the field during normal operations doesn't stay in the field and, therefore, is taken into account in strategic decisions.

- **Importance given to safety in decision-making**: From a safety culture perspective, safety must be given importance in the decision-making process in the organisation, and all workers, including the front-line workers, should be involved in risk assessment and decision-making processes.
- **Human resource allocation, effective competencies and training management to ensure safety**: One of the ways of showing that safety is a clearly recognised value is to allocate human resources as necessary to ensure safety, to systematically develop individual competencies and to use various training methods to maintain and improve the professional and technical competencies of members of the organisation.
- **Open and transparent communication on safety**: Communication on safety is open and transparent through official channels as well as via respectful dialogue between individuals.

1. "Organizational silence is a situation where important information, for example regarding safety, is available in the field but stays there, and cannot be taken into account in strategic decisions" (Daniellou, 2017).

Japanese cultural context

The societal context and the history of nuclear development in a country impact nuclear operations in a deep way. After presenting a few facts on the geography of Japan, this section provides a broad overview of the societal and historical backdrop of Japan and its nuclear sector.

Geography of Japan

Japan is a verdant and mountainous island country with a total surface of 377 973 km² with a population of 125.3 million as of 2022 (SBJ, 2023). Approximately 80% of the land is covered by forests, fields and farmland, and only 5.2% is built-up. Therefore, cities like Tokyo are densely populated with 6 410 persons per square kilometre (SBJ, 2023). Japan is composed of 4 main islands (Hokkaido, Honshu, Shikoku and Kyushu), and of more than 14 000 small islands spread from north to south over 3 000 km (SBJ, 2023; MLIT, 2023). Climate conditions are highly diverse, from subarctic in the north to subtropical in the south.

Japanese historical and societal context

Situated in the east of Eurasia, on the border between the continent and the Pacific Ocean, Japan cultivated its traditions and distinctive culture of isolation by adopting isolationist foreign policies for nearly 300 years, severely limiting contact with the wider world. This explains how even today Japan is nearly homogenous in its ethnic and linguistic characteristics. After 1868, in little more than a century, Japan moved from total isolation to extensive modernisation and westernisation. Nearly everything, including administration, education, transportation, industry, infrastructure and business has changed through this evolution, leading Japan to become a modern great power with strong industry and technology.

In Japan's recent past, the unconditional surrender at the end of World War II became a turning point in the country's history. The new Constitution, which included renunciation of war, national sovereignty, respect for fundamental human rights, and a number of reformed democratisation policies, brought the postwar Japanese economy back into the global economy. The economy capitalised on factors such as the introduction of new technologies, effective capital investment, and an increase in young workers to achieve decades of incredibly rapid growth. Indeed, as Kissinger said, Japan is demonstrating great: "*resilience sustained by*

an indomitable national spirit based on a distinctive national culture" (Kissinger, 2015:189). This resilience was also demonstrated by Japan during the triple disaster of 11 March 2011, when the Great East Japan Earthquake struck, creating a tsunami and resulting in the Fukushima Daiichi Nuclear Power Plant accident. The country has the fourth largest economy in terms of gross domestic product (GDP) after the United States, the People's Republic of China and Germany (World Bank, 2023a). Japan's economy is one of the most prosperous in the world and the country is a member of the Organisation for Economic Co-operation and Development (OECD) and the Group of seven (G7), an organisation of leaders from the world's largest economies.

Political life in Japan is governed by a central government and local governments, themselves composed of prefectures and municipalities. Prefectures and municipalities are local public entities of equal status that co-operate to govern locally. Japan is made up of 47 prefectures and 1 718 municipalities, the latter composed of 792 cities, 743 towns and 183 villages (TMG, 2023; MIC, 2023). Municipalities are local public entities that have a strong and direct relationship with local residents.

The Japanese average life expectancy is the highest among the OECD countries at 84.5 years in 2022 that being 87.6 years for Japanese women and 81.5 years for Japanese men (OECD, 2023a). With these averages, Japan is ranked first in the world for women and second for men (OECD, 2023a). Meanwhile, the birth rate has declined dramatically in recent decades: 1.22 births per woman in 2022 marked the lowest birth rate on record. Only 12% of the population are aged 0-14 years old, while nearly 29% are aged 65 or older as of 2022 (OECD, 2023b; OECD, 2023c).

Some of the integral features of Japanese society include a high regard for education and support for research and development. Japan invests in the social well-being of its citizens through various goods and services targeted at groups of individuals with specific needs, such as the unemployed, young persons, the sick and the elderly. The state's contributions to social programmes are significant, as demonstrated by the social expenditure of JPY 136 360 billion (Japanese yen), which was 25.46% of GDP in the fiscal year 2020 (IPSS, 2022). Also, Japanese expenses for education grew from USD 14 700 (US dollars) in 2005 to USD 19 700 per student in 2020 (OECD, 2023d), while the population of school-age children shrank from 21.2 million in 2005 to 18.3 million in 2020 (UNICEF, 2023). Also, a large proportion of the investments made by the government and companies are allocated to research and development. Japan remains one of the world's most dynamic innovation hubs, as demonstrated by Japanese R&D spending, which was 3.27% of GDP in 2020 (World Bank, 2023b).

Education is highly valued in Japan, and the country consistently ranks high in global education rankings. The OECD's Programme for International Student Assessment (PISA), a periodic testing programme of student performance, showed Japanese students excelling in mathematics and sciences (OECD, 2023e). Another characteristic of Japan is its safety standards, as Tokyo is ranked the 5th safest country in the Economist Safe Cities Index, with one of the lowest crime rates in the world. For instance, the homicide rate per 100 000 individuals was 0.23% in 2021, which is the fourth lowest number in the world (UNODC, 2023).

Regarding gender balance, Japan fell in 2023 to a record low 125th place in world rankings for gender equality published by the World Economic Forum, as the country was less successful in improving female representation in politics and economic activities (World Economic Forum, 2023). This represents a drop of nine positions from the previous year's ranking among 146 countries. With its low percentage of female Lower House members and Cabinet ministers, Japan placed 138th in the world in terms of female representation in the political sector. Indeed, women in politics represent 9.9% of the population, whereas the OECD countries' average is 33.8%. The rate of women in politics in Japan is the lowest in the OECD countries (OECD, 2023f).

Overall happiness can be measured by considering perceived satisfaction in life and the number of positive experiences and feelings, as well as the lack of negative experiences. In the Gallup World Happiness Report, Japan's rank is 47 out of 137 countries (Helliwell et al., 2023).

History of the Japanese nuclear sector

Nuclear issues have played a key role in Japanese politics, society, and culture for the past seventy years (Nelson, 2011). Japan imports more than 90% of its primary energy from abroad and, as a result, has made power generation a priority for the health of its economy (FEPC, 2024a). Japan has considered nuclear energy as the only viable long-term option for production of sufficient electricity for the country since 1973. This came under review following the 2011 Fukushima Daiichi Nuclear Power Plant accident, but has then been confirmed, even though nuclear energy remains a sensitive issue and the public has long expressed ambiguous feelings and concern towards it.

Japan's history with nuclear energy started in the 1950s with what some observers have called a "nuclear allergy" (*kaku arerugi*) (Nelson, 2011; Aldrich, 2012). Japan is indeed the only country to have experienced the non-peaceful use of nuclear weapons on its territory: The first uranium bomb exploded over Hiroshima on 6 August 1945, and a second plutonium bomb razed Nagasaki three days later. In addition to the number of deaths (140 000 estimated in Hiroshima and 74 000 in Nagasaki by the end of 1945), the discrimination felt by survivors from Hiroshima and Nagasaki in many parts of the country caused additional suffering (MHLW, 2024). From 1946 to 1958, hydrogen bomb tests conducted by the United States in the Marshall Islands also caused extensive damage to the islanders as well as to neighbouring countries and regions. In Japan, sailors of the Lucky Dragon No. 5 fishing boat were covered in ash, while tuna unknowingly contaminated by radioactivity was sold on markets. The reaction of panicked people in Japan gave the opportunity to victims from Hiroshima and Nagasaki to finally talk about their experiences of the atomic bombings, triggering a nationwide and global campaign in the 1950s-60s against atomic and hydrogen bombs that gathered over 32 million signatures in Japan (Aldrich, 2012). To calm the anger and fear from the Lucky Dragon incident, the United States offered to establish an agreement which was quickly accepted by Japanese politicians to share nuclear technology and radioisotopes with Japan.

After US President Dwight Eisenhower delivered his famous "Atoms for Peace" speech at the UN General Assembly in 1953, research into nuclear energy began in earnest in Japan. In 1955, the first Atomic Energy Basic Law was enacted and allowed the creation of the Atomic Energy Committee (Yamashita, 2015). Additionally, the Japan Atomic Energy Research Institute (JAERI) and the Atomic Fuel Corporation were established in 1956 (both organisations were merged into the JAEA in 2005). The JAEA and its predecessors were designated as "nuclear power development organisations" by Chapter 3 of Atomic Energy Basic Law and carried out research and development of this field. What is known today as Japan Atomic Power Company (JAPC) was newly established as a private company specialising in nuclear energy generation. The first reactor to produce electricity in Japan was a prototype boiling water reactor, the Japan Power Demonstration Reactor (JPDR) which operated from 1963 to 1976. The first commercial nuclear power plant, which had a British-designed nuclear reactor and was called the Tokai Nuclear Power Plant, was built and generated power from 1966 until its decommissioning in 1998.

With the start of the Tokai Nuclear Power Plant's operation, the transfer of nuclear power technology to Japan began, and domestic power plants were gradually developed, including the boiling water reactors (BWRs) and pressurised water reactors (PWRs) designed by General Electric and Westinghouse that are the norm today. By the end of 1970, the Japanese industry had largely established its own domestic nuclear energy production capacity. In 1973 and 1978, the turmoil caused by the oil crisis led to the recognition of a "stable energy supply" as an important issue. Re-evaluation of domestic energy policy resulted in diversification and a major nuclear construction programme. Japanese leaders saw nuclear energy as the only viable long-term option for Japan to produce enough electricity for its double-digit post-war growth. In 2010, there were 54 operational nuclear reactors supplying 280 TWh of electricity in Japan (NEA, 2011), providing roughly a third of the country's electricity, with plans to increase that contribution to 40% over the following decade.

Japan has opted for a closed fuel cycle to gain maximum benefit from imported uranium and has been working towards its establishment for many years. The Rokkasho Reprocessing Plant is the first commercial reprocessing plant in Japan, and it is being constructed by Japan Nuclear Fuel Limited (JNFL) to produce MOX fuel from spent nuclear fuel in the near future.

In March 2011, the Great East Japan Earthquake and a subsequent tsunami hit the northeastern part of Japan, triggering the accident at the Fukushima Daiichi Nuclear Power Plant. It led to the shutdown of all nuclear power plants in Japan for the first time in 42 years. To meet the electricity demand without nuclear power, the Japanese government shifted to relying on thermal electricity generation by increasing the thermal power energy production and imports of liquefied natural gas (LNG) (JAEC, 2022).

Recent developments in the Japanese nuclear sector

After the devastating disaster in 2011, the Japanese government reformed the nuclear regulatory structure and governance (Andrews-Speed, 2020). The aim was to reflect what had been learnt through the Fukushima Daiichi Nuclear Power Plant accident and what was lacking in the rules and governance before 2011 to restore domestic and international confidence in Japan's nuclear regulatory organisation, and to rebuild nuclear safety management and safety culture with the safety of the public as the top priority. Previously, the Nuclear and Industrial Safety Agency (NISA), established under the Agency for Natural Resources and Energy, itself under the Ministry of Economy, Trade and Industry (METI), was responsible for both promoting and regulating nuclear energy in Japan. To solve the problem of having both "promotion" and "safety regulation" under the same organisation, the two mandates were structurally separated in September 2012. While the METI is still in charge of national energy policy, including the promotion of various regional development measures to support the use of nuclear energy, the Nuclear Regulation Authority (NRA) was established as an independent organisation from the METI. This gave the NRA a much higher degree of independence than any other government agency in Japan. The NRA aims to perform its duties related to nuclear safety regulation independently and based on expert knowledge. Finally, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) is responsible for nuclear research and development.

Beyond the federal level, nuclear energy in Japan is managed at a more local level through the prefectures and municipalities. The prefectures are involved in disaster prevention measures, including emergency preparedness and response drills in co-operation with the government, relevant municipalities, and police and fire departments. The prefectures are also involved in monitoring the operational status of the nuclear power plants and radiation levels in the environment, in accordance with the agreements concluded with the nuclear operators. Finally, they are responsible for disseminating information to the public on periodic inspections and operating conditions (JAEC, 2022). The local governments are also empowered to influence the decision related to the restart of the nuclear power plants shut down following the Fukushima Daiichi Nuclear Power Plant accident.

Since the Fukushima Daiichi Nuclear Power Plant accident, the first two PWRs restarted in August and October 2015, with a further nine PWRs restarting since then. No BWRs have restarted yet. Including all 6 reactors in Fukushima Daiichi, 24 reactors across Japan are under decommissioning, 12 reactors have restarted, 5 reactors have been approved to restart and are waiting to resume operations, and the remaining 10 reactors are under review (some of them are still under construction). Among other measures taken after the Fukushima Daiichi Nuclear Power Plant accident, countermeasures against severe accidents were reinforced and are now subject to regulation by law. Various systems for nuclear power generation have also been reviewed to enhance safety. For plants that are shut down, it was decided they would be reviewed based on these new regulatory standards.

In 2023, the release into the sea of the ALPS treated water, in which water contaminated during the accident at the Fukushima Daiichi Nuclear Power Plant is treated by the Advanced Liquid Processing System (ALPS), began. The contaminated water generated by the accident and collected from groundwater passing through the contaminated area since the accident has been treated to significantly reduce the concentrations of radioactive substances and then stored on-site in about 1 000 tanks (TEPCO, 2024). The government concluded that the most appropriate policy for dealing with the accumulated water at TEPCO's Fukushima Daiichi Nuclear Power Plant was to discharge it into the sea after thorough treatment and dilution. The approach and activities for this discharge were considered by the IAEA as consistent with relevant international safety standards and as having a negligible radiological impact on people and the environment (IAEA, 2023). The first discharge of treated water into the sea was successfully completed in August to September 2023 and the treated water releases are to continue for decades.

Radioactive waste in Japan is classified into two main categories according to its level of activity, namely high-level radioactive waste (HLW) and low-level radioactive waste (LLW). The disposal of LLW from nuclear reactors has taken place since 1992 at the Low-Level Radioactive Waste Disposal Center of Japan Nuclear Fuel Limited (JNFL) in Rokkasho village, in Aomori Prefecture. The Radioactive Waste Final Disposal Act sets out the overall scheme for implementing disposal of vitrified HLW. In accordance with the act, the Nuclear Waste Management Organization of Japan (NUMO) is responsible for planning and conducting site selection and characterisation of a HLW disposal facility. Indeed, some 60 years after the start of nuclear power generation in Japan, there is still no long-term solution for the final disposal of nuclear waste, and it has been pointed out that this is the biggest challenge in Japanese nuclear energy policy (NHK, 2023). Three municipalities are at the initial stage of site selection and literature review is being conducted (NUMO).

With the renewed Basic Policy on Green Transformation (GX) approved by the cabinet in December 2022, the Japanese government has changed its policy from stating that it "does not envision" the construction of new nuclear power plants or their reconstruction" (in place since 2011), to clearly stating that nuclear power "will be used sustainably into the future." This decision signalled a significant change for Japanese energy policy and the future of the Japanese nuclear energy sector (METI, 2023; Nihon Keizai Shimbun, 2022).

The methodology of the Country-Specific Safety Culture Forum

Conducting a Country-Specific Safety Culture Forum

The Country Safety Culture Forum (CSSCF) offers a structured framework enabling the themes of national culture and safety culture to be addressed and is designed in such a way that it can be tailored to a country's specific needs and circumstances. As designed, the Forum also facilitates dialogue and enables license holders and the regulatory body to jointly examine which Japanese national characteristics can influence safety culture.

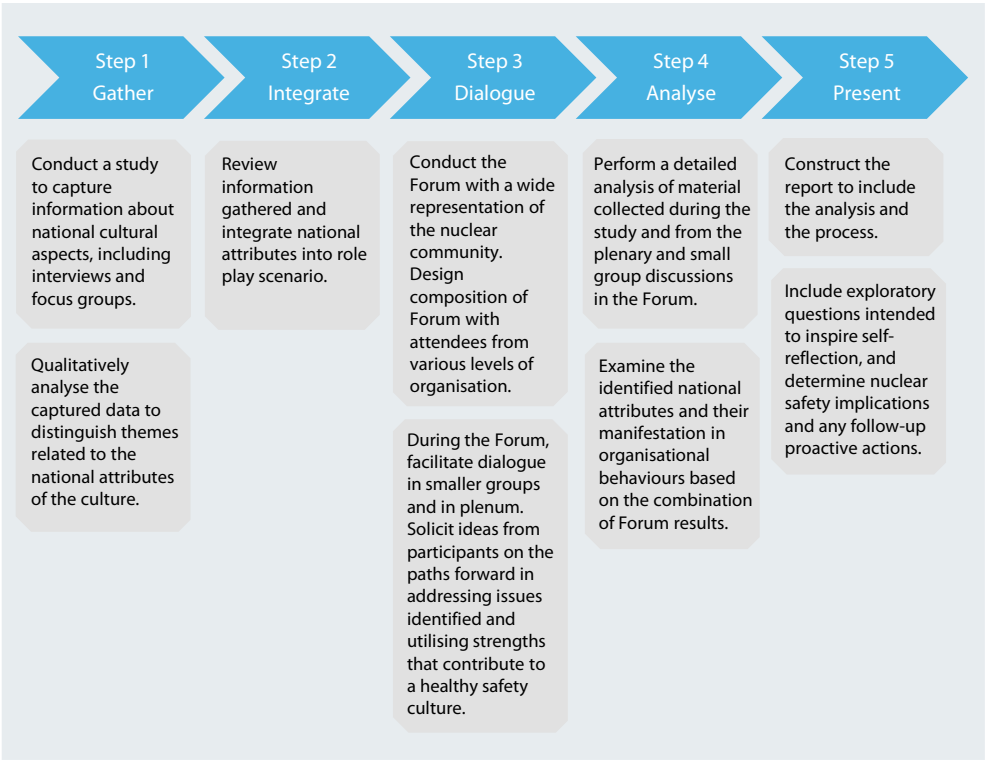
The general structure of the CSSCF methodology consists of five steps, as displayed in Figure 2 and described below.

The first step is designed to collect insightful information about underlying characteristics of the national culture. This is how the NEA undertook a study to gather initial data on the Japanese cultural context and how national attributes interact to frame and influence safety culture within the Japanese nuclear community. Data was collected both virtually and in-person from 12 Japanese licensees and from the NRA. The data gathered were then analysed to propose initial findings regarding identified national culture characteristics relevant to nuclear safety culture attributes in the Japanese context.

As part of step 2, the study results were used to inform the scenario script and to direct the development of the event's content and the discussion questions to be used at the Forum in step 3. The observations gathered at the Forum constitute the second round of data-gathering and analysis validation (step 4), which leads to the development of the CSSCF report, as the final step of the CSSCF structured framework.

With national culture and safety culture being qualitative phenomena, the data collection methodology chosen for the CSSCF is composed of qualitative methods (interviews and focus groups for the study; observations and focus groups for the forum) and it follows the recommendations put forward by the NEA and the IAEA regarding the methodologies deployed to analyse culture and safety culture (NEA, 2021; IAEA, 2016b). It is worth noting that the methodology chosen for the CSSCF offers the opportunity for the Japanese nuclear community to provide self-reflection feedback and express its own views on Japanese national cultural characteristics.

Figure 2: **Structure of the CSSCF methodology (5 steps)**



Study

Data collection methodology

The nuclear organisations that participated in the study included all the Japanese companies operating nuclear facilities and the regulatory authority. They are listed below.

- All the public and private companies operating nuclear power plants:
  - Chubu Electric Power Co., Inc.;
  - Electric Power Development Co., Ltd. (J-power);
  - Hokkaido Electric Power Co., Inc.;
  - Hokuriku Electric Power Company;
  - Kyushu Electric Power Company, Inc.;
  - The Chugoku Electric Power Company, Inc.;
  - The Japan Atomic Power Company;

- The Kansai Electric Power Company, Inc.;
- Tohoku Electric Power Co., Inc.;
- Tokyo Electric Power Company Holdings, Inc.;
- Shikoku Electric Power Company, Inc.

Except for the Japan Atomic Power Company, all these companies play a more or less important role in the thermal and renewable energy sectors, heat supply, telecommunications, or gas supply, in Japan but also sometimes abroad.

- The Japan Nuclear Fuel Limited. This company deals with uranium enrichment, reprocessing of spent nuclear fuel, temporary storage of wastes returned from overseas reprocessing plant, disposal of low-level radioactive waste, MOX fuel fabrication.
- The Nuclear Regulation Authority (NRA). This is the national nuclear safety regulatory authority of Japan, with responsibility for ensuring the safety of nuclear activities.

The nuclear facilities that took part in the study are in bold in Table 1, which presents all Japanese nuclear operators and facilities.

Data collection for the study was conducted through 91 semi-structured individual and group interviews, including 32 individual interviews and 61 focus groups from all 12 Japanese licensees and from the Japanese nuclear regulator (NRA), ultimately gathering perspectives and information from 368 participants. More precisely, the discussions were composed of:

- 28 virtual interviews with licensee CEOs, CNOs and management at the organisation headquarters;
- 4 virtual interviews with NRA senior management (Chairman, Commissioner, Secretary General and Councillor);
- 59 on-site focus groups at 12 licensee facilities across Japan (workers, managers and NRA site inspectors) and 2 focus groups at NRA headquarters (managers and directors).

The participants of the semi-structured interviews were drawn from various levels of the nuclear power plant operators, a fuel reprocessing company, and the NRA. These included senior management (CEO, CNO, Chairman, etc. as mentioned above) as well as managers from quality assurance, operation, maintenance, engineering, radiation and chemistry control, nuclear fuel, decommissioning, environment, and general affairs; and workers from the same departments as listed for the managers.

Table 1: **Presentation of all Japanese nuclear power plants and reprocessing facilities**

Company name	Facility name	BWR					PWR					GCR	Reprocessing facility
		Resumed	Stopped	To be decommissioned	Approved	Under review	Resumed	Stopped	To be decommissioned	Approved	Under review		
Hokkaido	**Tomari**										Unit 1, 2, 3		
JNFL	**Rokkasho**												X
Tohoku	Higashidori					Unit 1							
	Onagawa		Unit 3	Unit 1	Unit 2								
J-Power	**Ohma**					Unit 1 (under construction)							
TEPCO	Higashidori												
	Fukushima Daiichi			Unit 1, 2, 3, 4, 5, 6									
	Fukushima Daini			Unit 1, 2, 3, 4									
	Kashiwazaki-Kariwa		Unit 1, 2, 3, 4, 5		Unit 6, 7								
JAPC	Tokai											Unit 1	
	Tokai Daini				Unit 1								
	Tsuruga			Unit 1							Unit 2		
Hokuriku	**Shika**		Unit 1			Unit 2							
Chubu	**Hamaoka**		Unit 5	Unit 1, 2		Unit 3, 4							
Kansai	**Mihama**						Unit 3		Unit 1, 2				
	Takahama						Unit 1, 2, 3, 4						
	Ohi						Unit 3, 4		Unit 1, 2				
Chugoku	**Shimane**			Unit 1	Unit 2	Unit 3							
Shikoku	**Ikata**						Unit 3		Unit 1, 2				
Kyushu	**Genkai**						Unit 3, 4		Unit 1, 2				
	Sendai						Unit 1, 2						

Note: Participant facilities are in bold.

The purpose of the interviews was to capture information about national cultural aspects relevant to nuclear safety culture attributes. Using the same approach as for individual interviews, the objective of the focus groups was to allow collective conversations on cultural topics. In this report, the term "interview" is used to refer to the one-on-one interviews with senior management and the term "focus group" is used for to collective interviews conducted at the 12 facilities (licensees and NRA regional offices).

Based on the questionnaires used for previous CSSCFs – for Sweden, Finland and Canada – a questionnaire was developed for CSSCF Japan. The following topics were addressed:

- national cultural characteristics;
- nuclear community cultural characteristics;
- organisations' cultural characteristics (leadership, decision-making, roles and responsibilities, learning organisation, and other topics such as just/blaming culture, etc.).

Interviews and focus groups included questions about what behaviour, values or assumptions are considered typically Japanese, and the interview team subsequently narrowed the focus gradually over the duration of the discussion from the national industry level to the organisation's level, and ultimately to the level of individuals in working units.

The interview team was comprised of a lead specialist with a background in safety culture and human and organisational factors (HOF) complemented by a cross-functional team with expertise in the areas of nuclear science and operations, radiological protection, nuclear engineering, and communications and stakeholder engagement. All interviews and focus groups were conducted in Japanese by NEA staff and were audio recorded. The interviewees were reassured that there were no right or wrong answers to the questions as it was not a test of their knowledge. Indeed, this report discusses overall cultural and organisational characteristics, not individual or even organisational-level responses. Also, especially since they were recorded, all interviews and focus groups were conducted in accordance with an ethical framework to protect the anonymity and confidentiality of the interviewees and the information provided.

All interviews were transcribed to provide the basis for the analysis.

Data analysis

The total data set, including all focus groups and interviews, underwent a thematic data analysis, followed by a reflection on the influence of the national context on safety culture. This means that once the data collection for the study was complete, the responses given by participants were analysed to identify repeated phrases, similar statements, and dominant characteristics. Particular attention was paid to examples of behaviours, customs and values cited by the participants. Finally, relevant information from a literature review on Japanese culture supplemented or clarified the findings from the thematic analysis.

Forum

Preparation of the role-play scenario

The study highlighted the characteristics that were identified in the interviews and focus groups and outlined potential areas in which those traits can influence organisational behaviour. The results of the studies were used to adapt a role-play script, which was based on a WANO-generated scenario of an operational event that occurred at a commercial nuclear power plant. The event scenario consists of 4 principal acts and a total of 10 scenes. Each act represents a sequence of meetings and dialogue, including interactions within the NRA and the licensee, and between the operator and NRA. Although information gathered during the data-capturing process was used to inform the scenario, it should be noted that some details in the scenario did not attempt to reflect precisely the reality of the Japanese nuclear sector.

Aligning the scenario script (prior to the Forum) to correspond with the national context of the country, and tailoring it to prompt reactions for discussion, facilitated lively and informative exchanges around the safety culture themes that came to light through the role-play activity.

Holding the two-day Forum

For CSSCF Japan, 107 participants from the various Japanese nuclear organisations participated in the Forum and contributed to the discussions. All nuclear power plant license holders and fuel reprocessing companies sent 5 to 7 participants, including staff and management. The Federation of Electric Power Companies (FEPC)[2], the Nuclear Waste Management Organization of Japan (NUMO)[3], and the local governments of Shizuoka, Fukui and Kagoshima were also represented.

Four non-Japanese participants, representing the nuclear regulatory and operator organisations of China, Korea, the United Kingdom and the United States also joined the Forum as observers. These international observers were present at the plenary discussions and observed the dynamic exchanges between participants on what they were seeing on stage and how that translated into both national cultural traits and safety culture issues.

During the two-day Forum, the plenary dialogue was facilitated by a moderator from the NEA. The Forum began with keynote speeches that framed the exercise, followed by a presentation by Dr Robert Campbell[4] that included insightful views on culture. Participants were then separated into break-out groups, each consisting of representatives from the various organisations to reflect on five

2. FEPC is a professional organisation whose aim is to promote the development of the nuclear industry in Japan.
3. NUMO's mission is to implement safe geological disposal of radioactive waste in Japan.
4. Dr Robert Campbell is an American-born Japanese literature scholar and university professor at Waseda University, whose frequent media appearances have made him a well-known public figure in Japan.

key words they remembered from the social commentator's talk on typical Japanese cultural traits through a "yellow post-it" exercise.

Following this opening session, the role-playing of the scenario began. Several participants took on the roles of characters and played their roles by reading dialogue from the scenario script and acting out their parts. After each Act (within which there were 2 to 4 scenes), the participants were divided into seven groups with around 12 participants per group. Groups were asked to reflect on the aspects of safety culture embedded into the scenes and how the Japanese context influenced those aspects. Notably, the participants were instructed to participate as individuals, and not according to their respective positions within their organisations, that there was no hierarchy within the Forum, and that all views and opinions were encouraged. The international observers were placed in an eighth group and discussed their views on the safety culture-related challenges that they observed in the scenes and compared them to their own national perspectives and processes. Each group included a designated facilitator and note taker. Four Japan Atomic Energy Agency (JAEA)[5] senior experts acted as facilitators alongside the NEA staff. In addition to facilitating the flow of the discussion, posing questions and provoking reactions, the role of the facilitator was to create a safe and relaxed environment conducive to sharing opinions, to be cognisant of any perceptions of power dynamics within the group, and to take steps to encourage openness and equality of voices within the room. After each break-out session, all participants gathered in the main plenary to address findings from group discussions to highlight national characteristics and their influence on safety culture.

Towards the end of the Forum, a final group discussion brought participants together into groups based on the organisations in which they work to discuss how any lessons might be addressed in their home organisations. After the group discussions, the participants had the opportunity to openly report their observations in a plenary session. Additionally, the international participants served on a final panel providing insights and observations from their unique international perspectives.

Data analysis

Throughout the two-day Forum, note takers were assigned to capture the exchanges and reflections made among the participants, during both the separate group discussions and the plenary. This information was then collected by the NEA team, which conducted a final comprehensive review of the qualitative data in its entirety for use in producing this report. The information collected through the study and the Forum was used to undertake the extensive qualitative thematic analysis as described previously.

"Culture" is not considered by the NEA as an immediate and exclusive whole. The results of the data analysis presented hereafter aim to avoid, as much as possible, any amplification (situation in which a detail, a case, a singular example is raised to the level of generality), homogenisation (i.e. that Japanese society is

5. JAEA is a Japan's national research and development organisation for nuclear energy.

considered as uniform) or overarching simplification. In addition, the culture within the Japanese nuclear community is not synonymous with the broader Japanese culture. CSSCF reflects an understanding that the Japanese nuclear culture can be regarded as both a part of the prevailing Japanese cultural context as well as the culture of the broader nuclear community that extends beyond Japan.

Safety culture in the Japanese context: Observations from CSSCF Japan

Introduction

The study and the two-day Forum yielded a broad range of insights on various facets of Japanese national characteristics. These national traits are general themes that may manifest through a range of organisational behaviours specific to the nuclear sector and its organisations.

CSSCF Japan should be considered as a catalyst for further reflection and subsequent actions and not as definitive conclusions

CSSCF Japan does not represent a comprehensive study of the Japanese culture.

The discussions during the study and the Forum were limited to the context of normal operations and incident management and did not explicitly cover nuclear emergency management aspects.

Japanese national cultural characteristics

Applying a label to a cultural phenomenon means making basic assumptions explicit and conscious (cf. Schein model presented previously). To help make this explicit, an open question was asked during the study to encourage interviewees to spontaneously express their views on the typical behaviours, beliefs, customs and values of Japanese culture. During the Forum, the same theme was discussed at the first break-out session following the social commentator's speech. These discussions at the Forum confirmed the results of the interviews and focus groups held as part of the study.

Based on observations, it was found that the Japanese participants tended to be quite self-critical, highlighting challenges but rarely citing some of the positive aspects of their cultural traits. This is reflected in the results presented below.

Analysis through the quantitative lens

Nine national cultural characteristics emerged that are important not necessarily to Japanese culture as a whole, but in the context of the Japanese nuclear community. These traits are repeated in the data from the study and from the discussion that took place during the first break-out session at the Forum, as presented in Table 2.

Table 2: **Number of times each national cultural characteristic was expressed during the study and the first break-out session at the Forum**

National cultural characteristics expressed by the interviewees and participants	Study *(Number of times according to interviews/focus groups)*					Forum *(Number of times according to groups)*
	Licensees Total: 76			NRA Total: 15	Total: 91	Total: 7
	CEO/CNO Total: 28	Managers Total: 24	Workers Total: 24			
Majime (diligence)	7	18	16	5	46	7
Hoshu-teki (conservativeness)	3	11	13	3	30	4
Wa (harmony)	8	5	7	7	27	5
Don't speak up	6	8	6	5	25	6
Collectivism	3	5	2	6	16	3
Ambiguity	3	3	5	1	12	6
Fear of failure	1	2	6	1	10	2
Consideration	4	1	2	1	8	1
Okami-ishiki (obedience to superiors)	4	0	0	0	4	1

No statistical treatment has been applied to these figures; nevertheless, a descriptive analysis shows that:

- The cultural characteristics the most frequently expressed during the study and the Forum are *majime* (diligence), followed by *hoshu-teki* (conservativeness), *wa* (harmony), and "don't speak up":
  - During the study, *majime* (diligence) is the prevalent characteristic among licensees' managers and workers with approximately 75% and 67% expressing it. This importance has been confirmed during the Forum, with all the groups stating that *majime* was a Japanese cultural trait;
  - *Wa*, *majime*, and "don't speak up" are the prevalent characteristics expressed by CEOs/CNOs.
- Ambiguity emerged as an important Japanese cultural characteristic at the Forum, but less so during the study;
- Managers and workers at the licensees are quite consistent in the national cultural traits they voiced;
- *Okami-ishiki* (obedience to superiors) is a characteristic raised only by CEOs/CNOs during the study, and later by a few groups during the Forum.

Description of the national cultural traits

Many of the cultural characteristics presented in Table 2 are interlinked, as will be explained below. In addition to the open question about the typical behaviours, beliefs, customs and values of Japanese culture, a specific question related to the influence of *nenko-joretsu* (respect towards seniority) was asked. *Nenko-joretsu* was not included in Table 2 as it was not always spontaneously expressed by the interviewees during the study. However, if not already expressed during the interview, it was generally recognised by participants in response to the related question as being part of the Japanese national cultural traits and as a result *nenko-joretsu* is presented in this section. Also, during the Forum, the concept of *nenko-joretsu* was voiced by five out of seven groups during the first break-out session. Finally, "peer pressure" is another characteristic added here because it is transversal to several others, such as "don't speak up" and "fear of failure". It increases the number of Japanese characteristics presented in this report to eleven.

Note that most of Japanese words can be used with both positive and negative meanings. Some of the keywords used by the interviewees to describe national cultural characteristics that were used referred to both their positive and negative meanings. This was particularly true for the first national characteristic, *majime* (diligence).

Peer pressure

The Japanese society has a strong tendency towards peer pressure, which implicitly encourages people to conform to the opinions of the majority. This characteristic is deeply ingrained in Japanese culture, where group co-operation and harmony often take precedence over individual expression, and as such is strongly related to the "don't speak up" and "fear of failure" characteristics.

Majime (diligence)

Majime (diligence) means someone who is hard-working, diligent and honest. It is not easy to precisely translate the word in English as it has several meanings depending on the context, but in most cases it refers to someone who is earnest, truthful and always tries to do the right thing. In the workplace, this means that individuals are working hard to achieve their work objectives and respect the rules and deadlines. It also means that once a target has been set by management, people in Japanese organisations will work hard to achieve it, which reinforces the notion that since the 1930s-40s work is, in a sense, defined in Japan as a kind of patriotic duty.

Sometimes *majime* (diligence) has a negative meaning to describe a person or group of people who take everything too seriously and without understanding jokes. It is also related to the notion that Japanese people tend to be risk averse, which makes it difficult to try new things. When encountering unexpected issues, people in Japan can find it difficult to adapt and find alternative solutions. In the workplace, it also means that Japanese people can pursue an excessive level of perfection or take instruction as it is, without questioning the rationale behind it. As a result, workers in Japanese organisations can sometimes force themselves to carry out tasks, which can lead to going to extremes and making mistakes.

Hoshu-teki (conservativeness)

Hoshu-teki (conservativeness) was mainly used by interviewees and participants to describe a negative cultural trait. It means that many Japanese don't tend to break precedence and need a guarantee of success before trying new ways of doing things. As a result, Japanese people can be uncomfortable responding to changes, even minor ones, and can tend to be bystanders. This national characteristic is linked to the national characteristic *majime* (diligence) given that the pursuit of perfection sets the bar extremely high and is also linked to the "fear of failure" and the tendency to be risk averse, which makes it difficult to try new things. Japanese people interpret the word risk (*risuku*) as something dangerous that will lead to a negative outcome and not as a calculated act that will be a success if it goes well and if managed appropriately. This helps explain why Japanese society has a tendency to avoid risk, which is especially true in the nuclear sector. Public opinion on nuclear energy is highly risk-averse, with many citizens believing that zero risk is the only appropriate outcome. This has a major influence on relations between the public and operators, as well as between the regulatory body and the operators.

According to some interviewees, the lack of positive Japanese public opinion on nuclear energy has a negative impact on this national cultural trait and makes it even more distinctive in the nuclear community compared to Japanese society in general, which can be explained by the history of Japan with nuclear.

Wa (harmony)

Wa is usually translated in English as harmony. It implies a peaceful unity without conflict within a social group, in which members prefer the continuation of a harmonious community over their personal interests. *Wa* is thus a guiding principle in all interactions in Japanese society, whether in a family, social or business context. *Wa* stresses interdependence over independence, co-operation over dissent, and patience over resistance. It should be mentioned that living in harmony doesn't mean living in conformity. There is a proverb that says: 君子は和して同ぜず、小人は同じて和せず, which means that a wise man maintains harmony but doesn't blindly follow the crowd. An unwise man blindly follows the crowd but doesn't maintain harmony.

This national characteristic could be related to the tendency of many Japanese people to avoid conflict. Individuals who break the ideal of *wa* to further their own purposes could be brought in line, either overtly or covertly, by reprimands from a superior or by their family or colleagues' tacit disapproval (peer pressure). Japanese businesses encourage *wa* in the workplace, with employees typically given a career for life in order to foster a strong association with their colleagues and their organisation.

Even though Japanese people can act and speak to preserve *wa*, it doesn't mean they don't have dissenting thoughts or get frustrated. It's just that achieving *wa* can be such an important social value that people distinguish between *honne* (true feelings or real intention), and *tatemae* (the face worn in public or a political statement/stance). While Western culture may view *tatemae* as hypocrisy or deceit, in Japan there is a tendency to wrap up real intentions, such as what you want and how much you want to ask for, in a complex and formal manner and proceed

with dialogue in a *tatemae* manner. This comes from the notion that, when negotiating for example, it is not considered a virtue to fight with one's true feelings. Japanese people tend to understand that rising above one's personal feelings for the good of society is its own virtue.

Don't speak up

Japanese people tend to stay quiet and not share their opinions, especially during meetings at the workplace. They can be sensitive to the gaze of others, modelling their behaviour accordingly. Japanese people can tend to feel that when they speak up in a meeting, they will be judged. Because of this feeling of peer pressure and fear of failure, they can be afraid of reputational damage, of becoming a minority within the group or even being separated from the group. There is a tendency to align with the majority or to follow the loudest voice within the group, i.e. the person or group that is able to be assertive, and even to expect to be told what to expect. It should be noted that the larger the group, the less the Japanese will tend to speak up. Some people, regardless of rank or station, are assertive enough to speak up without fear of failure or reputational damage, but they might then dominate discussions, making the other participants in the discussion even less likely to speak up. Another reason for not speaking up mentioned during the interviews is related to *wa*. It was raised during the focus groups and interviews that the educational system implicitly encourages people not to disagree or to speak up. Japanese people also sometimes don't speak up because they don't want to extend the duration of meetings or tasks.

Collectivism

The notion of the group is important in Japanese culture, so much so that it has been described as a sense of national commitment (Kissinger, 2015). The history of Japan shows that, in all social classes, the basic unit of society was the household as a hierarchical unit under the leadership of a male leader, not the individual. Social cohesion and a sense of national commitment can enable Japanese people to respond to difficult situations, such as the 2011 earthquake, tsunami and nuclear accident, with a display of mutual assistance and national solidarity. One CEO and CNO used the term *hyakuman issin* (coined by the feudal lord Motonari Mouri in the 16th century), which means "one million but one heart", to describe how great things can be accomplished. People in Japan tend to want to belong to groups or companies, to avoid arguing and to co-operate with each other. Once a decision is made, they are likely to move forward and implement the decision together. Group responsibility therefore tends to be stronger than individual responsibility, which is inspired by Confucianism, similarly to other traits such as self-control and respect for hierarchy, which are taught and reinforced to this day through the school system.

The notion of collectivism can lead to what a CEO called a "lenient unity", where unity becomes uniformity. Japanese people are often trained not to be different from others and not to challenge anything and as a result, healthy debate and exchanges of opinion can be difficult. Individuals often make decisions and act based on the logic of the group. The expression of uniformity can be seen at the workplace in the fact that employees often wear uniforms (Bernier, 2009).

Ambiguity

Leaders and workers in Japanese organisations can sometimes be ambiguous in the way they make decisions or communicate. As far as communication is concerned, Japanese people tend to not express their thoughts directly using unequivocal language, but rather convey them in a roundabout way, taking care not to hurt the other person through their actions or words. In the workplace, they show agreement, but do not always indicate the level of agreement. According to one CEO in the interviews, Japanese people have a fuzzy middle ground between absolute opposition and absolute approval, and at certain times can swing between them. The Japanese language is also sometimes ambiguous: the subject in sentences is not always specified. Also, because the Japanese have a similar background, they tend to assume that they have a common understanding and sometimes use short-cuts to get straight to the point.

In relation to the *wa* cultural trait and in an environment where ambiguity is high, Japanese people can look at the expression on senior peoples' faces, surmise the feelings of others (*sontaku*), imagine what others are thinking, act upon these implicit desires of another person and do not always use words to communicate to each other. *Honne* and *tatemae,* as explained previously, can also lead to a certain level of ambiguity in the way some Japanese people communicate and make decisions.

Fear of failure

In Japan, failure is generally difficult to forgive. In many cases, a second chance is rarely given. According to the interviewees, many people in Japan sense a strong fear of failure and could become very emotional or depressed if faced with failure. Peer pressure is strong in Japan, as respecting the harmony within the group is paramount, as explained below. If one individual is judged as unrespectful, they would be side-lined from the group which, given that the group is more important that the individual, would be for him/her very difficult to live with. This national characteristic explains why Japanese are conservative (see *hoshu-teki,* or conservativeness) and are not inclined to try new things or new ways of doing things.

Considerate

In association with *wa*, Japanese people tend to place a strong emphasis on showing respect, being polite to others and being careful not to inconvenience, cause issues or harm others. Formalities and greetings are essential in social and business settings and Japanese people use very polite language. Also, they will tend to express humility and avoid criticising others face-to-face.

Nenko-joretsu (respect for seniority)

In Japan, workers tend to want to stay for life in the companies that they join after graduating from college. This lifetime employment, or *sararîman*, is generally found in both the public and private sectors, particularly in large companies or organisations. It is a notion that's been in existence in the workplace in Japan since the 1950s. In general, the longer a person stays in a company, the more they will be promoted and the more power they will have over more junior staff. As a result, between two people who are in the same position, the person who has been there the longest will usually be given more consideration during a discussion. Even just a year can make a difference.

Nenko-joretsu (respect for seniority) is a significant part of communication between people and the Japanese language has layers of politeness built into it depending on the age of the speaker and listener. Younger people will generally use politer terms with older people and neutral terms with people of the same age. Older people, meanwhile, can use rough, coarse language when talking to younger people. At the workplace, the person who has been there the longest or is the oldest will usually get to speak first and be able to act more boldly. Those with less seniority will usually act more politely, using softer words if they have to pose a counterpoint to their superior. According to interviewees, the *nenko-joretsu* (respect for seniority) system still exists in Japan, especially at the licensees and at the NRA, but less than before.

Okami-ishiki (obedience to superiors)

In relation with *nenko-joretsu* (respect for seniority), *okami-ishiki* (obedience to superiors) means that Japanese civil servants, as they represent the government, have a tendency to consider themselves as an elite corps and to impose their viewpoints on their private sector counterparts as well as on the public. This, combined with the emphasis that the Japanese tend to place on hierarchy, title, and respect for authority figures, can lead to an even more formal and distant relationship between civil servants and the private sector, where the latter is likely to show deference and the wider public expects these private sector entities to act with a sense of responsibility and authority.

National culture as an influence on safety culture in the Japanese nuclear community

By using the CSSCF framework previously presented, the following section outlines how the national characteristics can manifest themselves via individual and organisational behaviours. The above-mentioned national characteristics retain their nuance but are grouped to construct thematic narratives around safety culture in the Japanese context. National attributes are neither good nor bad but could have positive or negative implications depending on the context. An attribute has the potential to manifest itself in an organisational behaviour in a way that leads to a stronger safety culture, but it also has the potential to undermine a sound safety culture.

The following safety culture dimensions in particular were discussed:

- accountability and responsibility for safety;
- clearly defined roles and responsibilities;
- continuous learning and improvement around safety;
- importance given to safety in decision-making;
- resource allocation, effective competencies and training management to ensure safety;
- open and transparent communication on safety.

Before presenting in detail the results related to these dimensions, it should be noted that what safety culture means in general terms is well understood by the Japanese nuclear community and that the promotion of a healthy safety culture is prevalent at all sites and at the NRA, even though it was pointed out on several occasion during the focus groups that the vision, strategy, and operational objectives related to safety culture are not always clearly communicated to the workers in the field or are not received/well understood at their level.

Accountability and responsibility for safety

The safety culture dimension "accountability and responsibility for safety" is influenced by the following national cultural traits: ambiguity; collectivism; don't speak up; fear of failure; *majime* (diligence); *hoshu-teki* (conservativeness); peer pressure; and *wa* (harmony).

Taking responsibility refers to a list of things to which a person is obliged to respond, either through word or action. The obligation weighs on individuals, the group, or the company. Accountability goes beyond the strict legal obligation because the individual voluntarily chooses to become the "go-to" person for the things for which he or she is responsible. It is a willingness to be accountable for one's actions and to take specific actions where no obligation previously existed. In summary, responsibility may be shared, but accountability is not, and safety should be seen as a shared responsibility, with each individual being accountable for their actions. Being accountable also means to take personal ownership for safety and as such, demonstrate a questioning attitude by examining and challenging safety policies, procedures, behaviour and norms. It should be noted that a misunderstanding of responsibility and accountability can increase the tendency within a given organisation to look for the causes of an adverse event in individual behaviour and avoid analysing root causes, particularly organisational ones. Also, when individuals are held responsible, especially after they admit to an honest mistake, it should be done in a fair way, with open and transparent arrangements. In other words, the culture of the organisation should be "just" and aim to eliminate the fear of blame by ensuring that everyone is clear on the boundary between acceptable and unacceptable behaviour (Dekker, 2012).

It emerged from the discussion during the study and the Forum that responsibility in the Japanese nuclear community is always collective, rarely individual, and as such when a mistake is made, the manager will take the blame

for his/her employee. Put another way, the individual responsibility is not so important compared to the collective one, and front-line workers are never officially blamed for their mistakes or failures. As one worker said during the interviews: "*We may get angry, but there is no punishment, no impact on the individual's performance evaluation*". This is consistent with the "collectivism" cultural trait, as Japanese people tend to put the group before the individual and co-operate with each other, which is positive from a safety point of view. The tendency to not blame front-line workers is not considered as representative of national Japanese behaviour, but as specific behaviour of the nuclear community. Even if the workers aren't directly or formally blamed by their managers or colleagues, they would likely nevertheless still blame themselves, which can be explained by the influence of several national cultural characteristics such as *majime* (diligence), fear of failure and *wa* (harmony). As Japanese people can tend to be serious, afraid of failure, and hesitant to break the harmony of the collective, they can feel responsible to such an extent that they sometimes blame themselves even when they should not.

The discussion during the focus groups revealed that the licensees' safety policies held workers accountable for adherence to established policies and procedures. Nevertheless, the discussions and exchanges during the study and the Forum revealed that the terms "responsibility" and "accountability" are not well understood or seem to be confused in the Japanese nuclear community. Language is an important cultural vehicle, and it should be noted that there is no direct translation for accountability into Japanese; as a result, communicating the concept of being accountable can be challenging. Concerns were expressed about the possibility of the Japanese being individually accountable. It was reported that workers in Japan have a strong sense of responsibility but at the same time tend to avoid being in a position where they must take responsibility, which is consistent with the "ambiguity" cultural trait. Some of the interviewees also said that the responsibility is collective because in case of failure, Japanese staff members don't want themselves or their colleagues to be held accountable, which is their way of preserving themselves. It was also reported at the Forum that the highly pyramidal organisational structure and top-down decision-making process typical in Japan does little to place individuals in a position to be fully accountable.

The data collected led to the conclusion that the high level of compliance with regulations and procedures in Japan is facilitated and even supported by the major Japanese cultural trait of *majime* (diligence), as Japanese people, especially in the nuclear field, have a strong tendency to follow procedure or not take short-cuts. It has even been reported on several occasions that workers in Japanese nuclear organisations try excessively to follow procedures, especially young workers with less experience because they can't rely as much on skills that haven't yet been fully developed. However, questioning the safety policies, procedures and behaviour, and avoiding complacency (cf. questioning attitude) could be impeded by the Japanese tendencies to be *hoshu-teki* (conservative), to not speak up, and to work as part of a group (collectivism). Yet this attitude of continuously questioning helps to prevent "groupthink". Groupthink arises when the desire for conformity and cohesiveness in a group leads all members to minimise conflict and critical evaluation of ideas, and to discourage diversity of thought and curiosity.

Table 3 summarises the link between several Japanese national cultural traits, the safety culture dimension of responsibility and accountability, and some individual and organisational behaviours.

Table 3: **Link between Japanese national cultural characteristics, responsibility/accountability as a safety culture dimension, and individual and organisational behaviours**

National cultural characteristics	Safety culture dimension	Individual and organisational behaviours
Ambiguity Collectivism Don't speak up Fear of failure *Hoshu-Teki* (conservativeness) *Majime* (diligence) Peer pressure *Wa* (harmony)	→ Responsibility and accountability →	High level of compliance with regulations and procedures Collective responsibility, no formal blame directed at individuals Still, sometimes individuals blame themselves Difficulty challenging directives and orders from superiors, and safety policies, procedures, behaviour and norms

Clearly defined roles and responsibilities on safety

The safety culture dimension **"**Clearly defined roles and responsibilities on safety" is influenced by the following national cultural traits: ambiguity, collectivism, fear of failure, and *nenko-joretsu* (respect for seniority).

In an organisation with a healthy safety culture, roles and responsibilities are clearly defined, assigned and understood for all levels and positions in the organisation. The scope of decision-making authority related to safety is also clear.

Having clearly defined roles and responsibilities is a safety culture dimension that is related to the Japanese cultural characteristic of ambiguity and collectivism. Several interviewees, regardless of their hierarchical level (CNOs, managers or workers), expressed the view that Japanese people are not always adept at clarifying responsibilities, both for individual responsibilities but also responsibilities between departments or sections for cross-functional activities or for a problem that falls into a grey area. During one of the break-out sessions of the Forum, it was also acknowledged that there is a tendency in Japan for discussions to end vaguely, without clear roles being assigned in terms of responsibilities, and that it might be explained by the fact that many Japanese people are afraid of making mistakes or are afraid to fail. Also, because the importance placed on finishing a meeting on time can hinder attempts to clarify decisions on roles and responsibilities, ambiguity is often reinforced. "Who will do that" is always a question, as one worker said, and usually the person who raises his hand first will have to do the work. This doesn't mean that people don't know what they have to do on a daily basis, as it is important for Japanese staff members

to stay within the scope of their team's overall mission; it means their roles and responsibilities are not completely described in the management system and can remain vague. Also, in general, employment contracts in Japan never specify details and in many cases employees do not have job descriptions. The lack of individual job descriptions didn't seem to be considered as problematic by the interviewees, as Japanese people praise the notion of collectivism. The sense of teamwork is strong and performance evaluations tend to be collective rather than individual. To some extent, this may challenge human resources management as people may lose motivation unless a system is put in place whereby motivated and skilled young people can efficiently move through the ranks to become section managers through clarification of the performance objectives and their individual performance evaluations and fit.

The data collected also show that nuclear Japanese organisations are very pyramid-shaped, with all decisions made by senior people (*nenko-joretsu*): as a result, a lack of horizontal co-operation was raised as an issue during the Forum and by the interviewees, especially the workers. The interviews also revealed that the principle of subsidiarity[6] does not fit well with the Japanese culture. One worker said that: "In the area of safety and quality assurance, there are many cases that need to be brought up to the director's office, which is difficult to do". Most of the decision are done from the top of the hierarchy and relatively few responsibilities are transferred to lower levels.

Table 4 summarises the link between some of the Japanese national cultural traits, the safety culture dimension of clear roles and responsibilities on safety, and some organisational behaviours.

Table 4: **Link between Japanese national cultural characteristics, clear roles and responsibilities as a safety culture dimension, and organisational behaviours**

National cultural characteristics	Safety culture dimension	Organisational behaviours
Ambiguity Collectivism Fear of failure *Nenko-joretsu* (conservativeness)	Roles and responsibilities	Reluctant to clarify individual responsibilities Lack of individual job description Lack of clarity in performance evaluation and promotion Most of the decision are taken top-down within the organisation (principle of subsidiarity rarely applied)

6. "The principle of subsidiarity holds that decision-making authority is best placed (a) where responsibility for outcomes will occur; and (b) in the closest appropriate proximity to where the actions will be taken that will produce the outcomes" (Wolf, 2001).

Continuous learning and improvement around safety

The safety culture dimension "Continual learning and improvement around safety" is influenced by the following national cultural traits: being considerate; not speaking up; fear of failure; *hoshu-teki* (conservativeness); *majime* (diligence); peer pressure; *wa* (harmony).

In a healthy safety culture, employees demonstrate proactiveness by pointing out dangerous situations and suggesting technical or organisational improvements to management. Also, internal and external lessons learnt from experience at the organisation, including successes and challenges, are used as a basis for continual improvement. Processes exist to identify and correct problems in a timely manner and to develop, implement and measure the effectiveness of corrective and preventive actions. Employees are also encouraged and recognised for reporting concerns and suspicions, are free from reprisal, and feel that they have been heard when they voice concerns. Finally, the nuclear community has a positive attitude towards new ideas, listens to various opinions, is exposed to new ways of thinking, and encourages open dialogue.

Many interviewees, especially the CEOs/CNOs, voiced the notion that many people in Japan need external pressure to change because people tend to refer to precedents. A CEO even said that: "Japanese cannot take initiative in earnest unless they really suffer". As explained earlier, Japanese people are often *hoshu-teki* (conservative), risk averse and have the tendency to follow precedents. It was voiced that, even if the nuclear operators have been implementing the Corrective Action Program (CAP) system from the United States for a few years and have made significant progress, the concept of continuous improvement is still challenging in the Japanese context as people do not typically prioritise the need for ongoing, incremental change.

That can make change difficult in Japan, especially when everyone is afraid of failure and reluctant to speak up. Indeed, the Forum and study participants all agreed that it is very difficult, and sometimes impossible, for Japanese staff to speak up. And yet, continuous improvement implies the need to identify and correct safety problems in a timely manner. Identification means workers and managers will routinely raise their concerns on any issues discovered. Several reasons have been put forward to explain why workers in Japanese organisations won't easily speak up and participate in continuous improvement:

- People in Japanese organisations don't want to be criticised or condemned. It was highlighted that even if in reality they would not be criticised, Japanese staff might be afraid to be and out of a sense of self-preservation, they are unlikely to speak up to raise issues in the spirit of continuous improvement.
- Japanese workers are often wary of having their workload increased as it seems that having new ideas means more work. The person who raises an issue is often the person who will have to implement the corrective action plan, which confirms the previous discussion on the lack of clarity for roles and responsibilities. Clear roles and responsibilities ensure that corrective actions are allocated to the right people according to their nature and scope.

- People in Japan generally avoid causing trouble for other people because again, they are considerate and they want to preserve *wa* (harmony).
- Japanese staff members are driven to develop a strong loyalty to the company. In this way they find it difficult to raise objections regarding ways of thinking within the company.

Because of a fear of failure, aversion to risk, and *hoshu-teki* (conservativeness), Japanese people will often need the potential reward of an action or decision to significantly outweigh its risks before acting, implementing any corrective action plan, or trying new ways of doing things. Trying something new to see if it works or if the organisation would gain from it is not the normal way of doing things in Japan. Once approved, the corrective actions consist sometimes in adding a check or a new procedure/rule without cancelling the previous one, and once implemented, these corrective actions tend to remain, whether efficient or not. This means having to manage an ever-increasing number of procedures or checks without their risk benefit always being quantified and periodically verified. It was raised by a worker that "To reduce the amount of procedures, a decision has to be made to do so, but there is no one who can make this decision", which raises the question related to roles and responsibilities as presented earlier. Because of the strong sense of *majime* (diligence), *hoshu-teki* (conservativeness), and the fear of making mistakes, Japanese people tend to want to avoid being put in a position of not being able to justify why a rule or procedure should be removed. As described in the presentation of the *wa* national cultural trait, *tatemae* (the face one wears in public or a stance/political statement) can be actioned to develop rules. Making the rules explicit or justifying their deletion would force a person to be *honne* and unveil their real intention. Because of a fear of failure, it can be difficult to see the process of *honne* through the end. Also, it is not the practice to check the effectiveness of corrective actions after they have been deployed, especially if they follow top-down decisions. As a result, the old and new ways of doing things can remain in place and complicate the work of those who have to implement both.

As already discussed in the previous section on responsibility and accountability for safety, all focus groups, from workers to managers, expressed that there is no blaming culture at their site. The majority of the CEOs/CNOs said that they regularly emphasise the no-blame policy for employees who make mistakes or raise issues. Also, having to preserve *wa* and to be considerate might explain why Japanese people do not in general blame co-workers, which is an important condition to support continuous improvement. The implementation of safety culture policies developed by WANO specifically since the Fukushima Daiichi Nuclear Power Plant accident has amplified the positive tendency for people in Japanese organisations to not blame the individual.

Table 5 summarises the link between some of the Japanese national cultural traits, the safety culture dimension of continuous learning and improvement, and some organisational behaviours.

Table 5: **Link between Japanese national cultural traits, continuous learning and improvement as a safety culture dimension, and organisational behaviours**

National cultural characteristics	Safety culture dimension	Organisational behaviours
Don't speak up Fear of failure *Hoshu-teki* (conservativeness) *Majime* (diligence) Peer pressure *Wa* (harmony)	→ Continuous learning and improvement →	No-blame culture Unmotivated by the need for continuous improvement Need for external pressure to change Add corrective actions without eliminating previous practice

Importance given to safety in decision-making

The safety culture dimension "Importance given to safety in decision-making" is influenced by the following national cultural traits: ambiguity; don't speak up; fear of failure; *majime* (diligence); *nenko-joretsu* (respect for seniority); peer pressure and *wa* (harmony).

In an organisation with a healthy safety culture, safety is a visible criterion in all strategic and operational decisions and must be granted significant weight in the decision-making process. Leaders support conservative decisions and the ability to recover quickly from unforeseen circumstances and all workers, including the front-line workers, are involved in risk assessment and decision-making processes.

All interviewees, whether from the operators or the NRA, expressed the view that safety is granted significant weight in decision-making, and that the Japanese tendency to be conservative means that they take decisions carefully. However, decision-making in Japan is generally slow since, in many cases, it involves asking everyone informally about a topic before asking formally, which means that decisions are made before the formal meeting even takes place. This organisational behaviour is called *nemawashi*, which literally translates as "turning the roots" and is an informal Japanese business process of quietly laying the foundation for some proposed change or project by talking to the people concerned and gathering support and feedback before a meeting is convened to reach a formal agreement. Successful *nemawashi* enables changes to be carried out with the consent of all sides, avoiding embarrassment and preserving *wa* (harmony). People expect to be let in on new proposals prior to an official meeting. If they find out about something for the first time during the meeting, they will tend to feel that they have been ignored and may oppose the decision for that reason alone. It is therefore important to approach people individually before the meeting. Decision-making in Japan is highly collective, which supports a healthy safety culture, but can sometimes be a too collective, according to several interviewees, since many layers of the organisation must be involved and agree. The term "stamp rallies culture"

was used several times by interviewees and the example of having to give 100 stamps a day was provided by one interviewee, indicative of the weight and burden of the review and approval process. Meetings are held according to a script, and they typically involve extensive preparation: anticipated questions are prepared, and roles and responsibilities are predefined. Some of the interviewees noted that the fact that employment in the nuclear sector in Japan is a lifetime engagement might have an impact on the decision-making duration: because a person can't be fired, they might not be motivated to be more efficient at work.

As previously mentioned, reaching a consensus, even tacitly by sensing the views of others (*sontaku*), is important. Many people in Japan rarely allow their emotions to have an impact on their discussions at work and in the decisions made as they are *majime* (diligent): they tend to think hard before speaking and try to do everything right. Also, decision-making is strongly related to the cultural traits of not speaking up, fear of failure, *nenko-joretsu* (respect for seniority), and *wa* (harmony): if the manager or a senior person talks first or if someone with a loud voice speaks up, Japanese people will tend to agree with that person, as they can be easily influenced by others and do not feel comfortable disagreeing or being in the minority. On this subject, one CEO recognised that: "True harmony does not mean keeping quiet and avoiding arguments. It is important to share opinions based on mutual respect".

As a result, there is a lot of discussion before a decision is taken, but as soon as it is made, companies demand everyone's acceptance. The decision-making process is based on all those consulted being given the opportunity to give their opinion frankly, which can lead to fundamental changes to initial suggestions. Some people may disagree with the final decision, but they must support it and work as hard as anyone else to implement it.

Table 6 summarises the link between some of the Japanese national cultural traits, the safety culture dimension of decision making, and some organisational behaviours.

Table 6: **Link between Japanese national cultural traits, decision-making as a safety culture dimension, and organisational behaviours**

National cultural traits	Safety culture dimension	Organisational behaviours
Ambiguity Don't speak up Fear of failure *Majime* (diligence) *Nenko-joretsu* (conservativeness) Peer pressure *Wa* (harmony)	→ Decision-making →	Taking decisions carefully *Nemawashi* (quietly laying the foundation for decision-making) Importance of reaching a consensus, even tacitly or by sensing others' views Slow and collective decision-making: Asking everyone informally before asking formally during meetings

Resource allocation, effective competencies and training management to ensure safety

The safety culture dimension "Resources allocation, effective competencies and training management" is influenced by the following national cultural traits: ambiguity and *nenko-joretsu* (respect for seniority).

One of the ways of showing that safety is a clearly recognised value is to allocate human resources as necessary to ensure safety, to systematically develop individual competencies, and to use various training methods to maintain and improve the professional and technical competence of members of the organisation responsible for safety.

Important human resource (HR) allocation and competencies issues were raised by all interviewees, from both the licensees and NRA. Because some of the plants have been shut down for more than a decade, some of the employees don't have any experience in operating plants, which represents a huge challenge in terms of competencies and training management. The licensees and the NRA have set up training courses (using simulators), on-the-job training, and send employees to other companies for training and development. They also try to hire mid-career professionals, which is a paradigm shift as, traditionally, lifetime employment favoured employees joining the company immediately after graduation and remaining until retirement.

The data collected during the study show that Japanese culture may influence the way in which competence is gained, as well as how competency development and management is integrated into the management system. As presented earlier, roles and responsibilities are not always clearly defined at an individual level, and by extension, individual competencies don't seem to be clearly defined either. The Japanese education system insists on conformity and on a high average quality of students. Historically, Japanese workplaces have tended to prefer workers with a broad skillset instead of highly specialised employees, as a balanced mind-set was appreciated; this is particularly true for executives. Once in the workforce, Japanese people are not typically hired to fill a specific position, but rather to join the company in a general capacity and to remain for the long term. Once workers are in their post, criteria to assess their job performance (and by extension competencies) are usually not made clear. As expressed by several workers, this topic is taboo and is not discussed among them as it is a virtue to not be individualist in motivation. Finally, not being assessed against clear and explicit criteria is coherent with an HR system that is still strongly based on *nenko-joretsu* (respect for seniority). A number of workers said that all they had to do was wait until they were old to get promoted and paid a better salary.

It was expressed during the interviews and focus groups that the workload/human resource balance is not optimal as licensees have recently been more prudent financially and both licensees and the NRA have had difficulty recruiting skilled people and in keeping younger workers. As previously mentioned, the nuclear sector is traditionally a sector which provides lifetime employment, and it is (or was) rare for employees to resign; the Japanese nuclear sector is currently witnessing a slow change in mentality. The workload is so high that most employees do overtime. The time devoted to the interviews did not, however, allow

the NEA to explore whether doing overtime was in fact necessary or due to the fact that workers think it is what is expected of them (cf. peer pressure). At one site, there is a policy explicitly prohibiting overtime (except if duly justified) and asking employees to end their working day at 5:00 p.m.

Table 7 summarises the link between some of the Japanese national cultural traits, the safety culture dimension of resource allocation, competencies and training management, and some organisational behaviours.

Table 7: **Link between Japanese national cultural traits, resource allocation and effective competencies and training management as a safety culture dimension, and organisational behaviours**

National cultural traits	Safety culture trait	Organisational behaviours
Ambiguity *Nenko-joretsu* (conservativeness) →	Resource allocation Training management →	Ineffective implementation of a systematic and formalised training management system Little identification of required competencies Preference for generalised vs. specialised competencies

Open and transparent communication on safety

The safety culture dimension **"**Open and transparent communication on safety" is influenced by the following national cultural traits: ambiguity; being considerate; *nenko-joretsu* (respect for seniority); and *wa* (harmony).

In a healthy safety culture, communication on safety is open and transparent through official channels as well as via respectful and open dialogue between individuals. Multiple mechanisms are used to clearly communicate the value of safety in the organisation. The expectations and policies to support open communication are explained to all workers and managers clearly communicate the expectations for performance in areas that affect safety.

Japanese people can be experts at labelling: they love to classify, number and arrange. One of the first things workers in Japanese organisations do when meeting each other for the first time is to exchange business cards. This gesture is a practice of etiquette (professional, social, etc.) to ensure that social norms are in place and respected (level of politeness, language, intimacy, etc.), as well as a way for individuals to clearly indicate the organisation they represent. Once the person has been correctly labelled, and to be considerate and not offend, Japanese people will use the appropriate language and behaviour, which is generally very polite, bearing in mind that Japanese language includes different levels of politeness. Regarding communication on safety culture within organisations, some interviewees noted that they are sensitive to the tone of the messages communicated from top management. A safety message communicated in a positive way would have a greater impact compared to a safety message communicated in a negative tone. Also, one interviewee suggested that communication among Japanese people should shift from a passive to an active communication approach.

In relation to the national cultural characteristic of ambiguity, Japanese communication is sometimes vague or indirect as people don't usually express their thoughts in clear and unambiguous terms. To understand each other or to understand the situation in relation to the *wa* cultural trait, a lot of Japanese people do not always use words but read the atmosphere or surmise other people's feelings or intentions (*sontaku*). If the goals and objectives are clearly set up among people who are used to working together, this way of communicating could be efficient in time of peace, but in time-sensitive or critical situations it can become a weakness. That being said, even during normal operations that are not time-sensitive, due to the generation gap between younger and older workers, some interviewees wonder if sometimes people really understand each other.

As already explained above in relation to the *wa* characteristic, Japanese people are not in the habit of debating as they don't consider it a virtue to overtly challenge their co-workers. This cultural trait doesn't always nurture the diversity of opinion that supports healthy debates on safety issues.

Table 8 summarises the link between some of the Japanese national cultural traits, the safety culture dimension of open and transparent communication, and some individual and organisational behaviours.

Table 8: **Link between Japanese national cultural traits, open and transparent communication as a safety culture dimension, and organisational behaviours**

National cultural traits	Safety culture dimension	Organisational behaviours
Ambiguity Considerate *Nenko-joretsu* (conservativeness) *Wa* (harmony)	Communication	Using polite language Vague and superficial communication Not engaging in debates or exchanges of differing opinions

National culture as an influence on the relationship between the NRA and the licensees

The relationship between the licensees and the NRA is influenced by many factors, national culture being only one of them, as discussed below. Japan's recent nuclear history, particularly the Fukushima Daiichi Nuclear Power Plant accident, has shaped much of the current relationship between nuclear operators and the regulatory body. Official reports have identified significant weaknesses in the country's nuclear management structure and systems as one of the root causes of the accident (see for example the National Diet Report, 2012) particularly as it applies to nuclear safety regulation. Reviews of the former regulator, NISA, outlined a range of structural, management and cultural deficiencies.

The Japanese government put considerable effort in the year after the accident into consult with global experts and internal stakeholders to establish a path to greatly improve the nuclear safety regulatory infrastructure and regain the trust of the public. The key initiatives taken by the government were to establish the Nuclear Regulatory Authority (NRA) in 2012 and grant it a high degree of independence and authority, which has given the NRA the opportunity to take a robust approach to reviewing safety and security standards in plants seeking approval to restart (Andrews-Speed, 2020). At the same time, local communities have become more vocal and less trusting of central government and the industry, and increasingly demanding of transparency.

NRA leadership, from the first day of its operations, emphasised the vital need to rebuild public credibility and trust. In the aftermath of the Fukushima Daiichi accident, this was always likely to be a significant challenge. With this focus, the NRA set about crafting regulatory approaches and practices that were at once very conservative (in comparison to most peers around the world) and unrelentingly transparent. Given the scale and impact of the accident, it is not surprising that the NRA's approach was tough and uncompromising. Predictably, these circumstances have had a major influence on the working relationship between the NRA and its licensees.

While the focus of this report is not on the quality of the relationship between the licensees and the NRA, the rich data collected during the interviews and focus groups have demonstrated that this relationship is an important factor in Japan's overall nuclear safety culture. As was noted by international observers in the course of the Forum, regulators in many countries view their relationships with licensees as one that balances independence and oversight with mutually respected roles to assure safety. For example, head regulators in many countries meet periodically with senior licensee officials in private to facilitate a frank exchange of views. In Japan, senior level meetings are far more often held in public.

Based on the data collected, it was observed that the relationship between the Japanese operators and the NRA differs depending on whether it is a question of regulatory oversight (which is mainly managed by the regional offices), or licensing, (which is mainly managed by the NRA's head office). Site interviewees at various levels, both from the licensees and the NRA regional offices, were almost unanimous in stating that relations had improved over the last 10 years. In particular, licensee interviewees consider site inspectors as strict but reasonable, and communication as honest and respectful. Since the Fukushima Daiichi Nuclear Power Plant accident, the licensees see themselves as more proactive and more transparent, which was confirmed by several NRA regional office representatives during the interviews. Interviewees from the licensees and from the NRA consider the implementation of the Reactor Oversight Process (ROP) as positive as it allows site inspectors to be closer to plant operations and more focused on performance.

The relationship and communication between the licensees and the NRA are also considered as complex by the licensees, especially on licensing. Licensee managers view frank and open discussions as impossible since by law all such discussions need to be fully disclosed to the public. Further, interviews with licensees highlighted that they view the NRA's attitude towards them as too

okami-ishiki" (obedience to superiors) and to the extent that they clearly characterised the relationship and communication, voiced that they see themselves as subordinate to the NRA. The licensees interviewed expressed a strong feeling of perceived unfairness as they have had difficulties in engaging effectively with the NRA considering *okami-ishiki* and, given that all discussions are public, they need to take into consideration the negative public attitudes towards the industry after the accident.

The tendency to keep formal meetings and discussions open to the public also means that changing one's mind or acknowledging that other arguments are relevant is difficult because, in the Japanese culture, it could be taken as public humiliation. Japanese culture places a high value on reputation and public perception and because of the fear of failure, decision-making may be influenced by the public and the media, which can affect the way the NRA and the licensees interact. In addition, expressing concern or disagreement openly might be challenged by the tendency to not commonly debate and exchange competing views; communication tends to be indirect and to rely heavily on non-verbal cues. This can be problematic as a high value is placed on consensus and group decision making and can influence how agreements between the licensees and the NRA are reached to ensure that decisions are well supported.

The licensees' CEOs/CNOs also expressed a feeling of there being a profound misalignment between their organisations and the NRA on the key safety goals and how to appropriately interpret safety regulations, which can also lead to difficult or untenable discussions. From the interviews and focus groups, as well as the literature review (see for example, Andrews-Speed, 2020), it appears that a fundamental discussion has not taken place between the licensees, the NRA and the public over "how safe is safe enough" when it comes to nuclear power in Japan. Discussions of safety philosophy and approach would benefit from open exchanges and would be difficult to hold in public meetings. This is especially true as people in Japan are largely *hoshu-teki* (conservative) and risk averse.

In conclusion, since 2011, dialogue and trust between licensees and the regulatory authority in Japan have gradually increased but still not reached a level that strengthens the safety culture in both the licensee and industry. This could be problematic, as a minimum level of trust is necessary to facilitate effective communication and achieve consensus and decision-making that satisfies as many people as possible and is appropriately risk-informed, two qualities that are important in Japanese culture. Recent work by the NEA Working Group on Leadership and Safety Culture (WGLSC) shows that the licensees and the regulatory body influence each other's safety culture through communication, relationships and the behaviour of staff between the two sides (NEA, 2024). According to the study, the nature of the interaction between the regulatory body and the licensees that produces a positive effect on each organisation's safety culture is a reciprocal, co-operative style of interaction, characterised by respect, openness and trust, with a shared focus on safety and learning. The WGLSC recognised that the safety culture maturity of each party determines how they can implement these characteristics. Even though the regulatory body can adopt a more prescriptive style according to the circumstances (called "responsive regulation"), it should, according to the WGLSC, foster the licensee's accountability

for safety, enabling continuous improvement and growth in the licensee's safety culture. This is called "accountability-oriented, enabling regulation" and emphasises a less formal approach, with a more dialogue-based style of interaction that leads to a positive reinforcing relationship between the regulatory body and the licensees, and overall supports an increase in public trust. That said, this type of regulatory approach should be carefully applied to Japan while considering certain forms of communication such as *tatemae* (the face one wears in public or a stance/political statement) and *honne* (one's true feelings or real intentions), which could potentially hinder the development of a relationship of trust and allow some sort of regulatory capture.

As expressed earlier, national culture is just one of many factors that influence the relationship between the NRA and the licensees. Table 9 summarises the potential impact of the Japanese national cultural traits on the NRA/licensees relationship.

Table 9: **Potential impact of the Japanese national cultural traits on the NRA/licensees relationship.**

National cultural traits		NRA/licensees relationship
Ambiguity Don't speak up Fear of failure *Hoshu-teki* (conservativeness) *Okami-ishiki* (obedience towards superiors) Peer pressure *Wa* (harmony)	➡	High value placed on reputation and public perception => influences discussion and decision making Strong emphasis on hierarchy and respect for authority figures => formal, respectful communication, even deference from licensees to NRA Indirect and non-verbal communication => potential challenges in expressing concerns or disagreements openly High value placed on consensus and group decision making => influences how mutual agreements are reached to ensure that decisions have broad support

Reflections on safety culture in the Japanese context, and paths forward

Summary of Japanese national attributes and their potential influence on safety culture

As detailed in the previous section, the national context influences certain principles that are integral to safety culture in a variety of ways. The influence of the national cultural characteristics on individual and organisational behaviours related to safety culture is listed and summarised in Table 10.

Table 10: **List of the eleven Japanese national cultural characteristics according to their positive or negative influence illustrated through individual and organisation behaviours**

Japanese national cultural characteristics	Positive influence	Challenge requiring attention
Majime (diligence, seriousness)	High level of compliance with regulations and procedures Attention paid to details	When encountering unexpected issues, difficulties to adapt and respond effectively Pursuing an excessive level of perfection Taking instruction for granted, not always questioning their rationale/justification
Hoshu-teki (conservativeness)	Decisions not made "on the fly"	Avoiding risk to achieve zero risk Not taking for granted the fact of having to progress on a regular basis External pressure is needed to change Not breaking precedence, needing a guarantee of success before trying new ways of doing things Following precedent, resulting in lost opportunity for continuous improvement Adding corrective actions without eliminating former ways of doing things
Wa (harmony)	Interdependence, co-operation and patience *Nemawashi* (quietly laying the foundation for decision-making) Collective decision-making process Giving importance to reaching consensus	Slow decision-making process (due to necessity for extensive pre-consultation prior to meeting)

Table 10: **List of the eleven Japanese national cultural characteristics according to their positive or negative influence illustrated through individual and organisation behaviours** *(cont'd)*

Japanese national cultural characteristics	Positive influence	Challenge requiring attention
Don't speak up		Difficulty challenging safety policies, procedures and behaviour Tendency to align with the majority or to follow the loudest voice within the group
Collectivism	Once a decision is made, moving forward and implementing as one Collective responsibility, no formal blame on individuals	Individuals making decisions and acting based on the logic of groups (peer pressure) Difficulty to have healthy debates and exchanges of opinion Tendency for individuals to still blame themselves
Ambiguity		Thoughts are not expressed with clearly articulated words or attitudes, but rather conveyed in a roundabout way Consensus can be reached tacitly or by gauging the mood of colleagues Reluctance to clarify responsibilities Fragile implementation of a systematic and formalised training management system The emphasis on generalised competencies over specialised competencies undermines the need for role differentiation in a complex sector such as the nuclear sector
Fear of failure		Fear of reputational damage and of becoming a minority within the group Tendency to be emotional or depressed if mistakes or errors happen
Considerate	Showing respect and being polite to others	Lack of willingness to challenge and offer opposing views
Nenko-joretsu (respect for seniority)	Layers of politeness built into the language depending on the age of the speaker and listener	The longer a person is in the company, the more power they gain, which does not support promotion based primarily on skills and competencies (it should be noted that the current trend is to give less weight to this phenomenon) Most of the decision are take at the top of an organisation, which does not respect the principle of subsidiarity
Okami-ishiki (obedience to superiors)		Strong emphasis on hierarchy and respect for authority figures, especially in and from governmental representatives, which can hinder openness and dialogue
Peer pressure		Conforming to the opinions of the majority, which can lead to fear of failure or mistakes and not speaking up

Positive influence of Japanese national attributes on nuclear safety

The study and the two-day Forum showed that due to the Fukushima Daiichi Nuclear Power Plant accident and lessons learnt, the Japanese nuclear community has a better understanding of safety culture and is implementing policies to enhance and maintain it.

The attributes referred to as *majime* (diligence) and *hoshu-teki* (conservativeness) emerged from the discussions as fundamental and major driving forces. The CSSCF participants support the view that Japanese people are hard workers who strictly comply with regulations and procedures, and that they are very detail oriented. Decisions are never taken on the fly, but rather after lengthy discussions involving a large number of stakeholders. In that sense, the decision making is always collective. It is essential for many Japanese people to reach a consensus before making any decision, and they are prepared to spend the time and energy it takes to achieve this. Once a decision is made, Japanese people tend to not balk or try to undermine the decision, but rather move forward and implement it as one. If the decision is collective, so is the responsibility in the Japanese nuclear community. The participants acknowledged that this is not the case in Japanese society in general, but in the nuclear sector, individuals are not officially blamed for their mistakes and errors, which is in line with a healthy safety culture. Japanese people tend to be considerate, polite and show respect to others when communicating, with different layers of politeness built into the language, mainly depending on the age of the speaker and listener. Patience and co-operation are also viewed positively.

Again, it is important to bear in mind that a national attribute is not intrinsically good or bad. The challenge of examining individual and organisational dimensions in a specific cultural context is to be aware of and manage aspects that may negatively affect a healthy safety culture, while preserving and encouraging the more positive aspects.

Potential challenges to enhancing safety culture

The tendency to not speak up was a recognised characteristic that emerged from the study and the Forum. Peer pressure and *nenko-joretsu* (respect towards seniority) are highly evident in the Japanese nuclear community and partly explain why individuals tend to align themselves with the majority and, as a result, are reluctant to speak up and express diverse opinions (a tendency which is not unique to Japan but is perhaps more salient in the Japanese context). This could make it impossible to have healthy debates on safety or difficult to challenge safety policies, procedures or behaviour. Hierarchy is important, and the traditional Japanese approach of lifetime employment, with great loyalty to one organisation, leads to an extreme level of conformity at work. This reluctance to challenge authority or dissent from the consensus promotes groupthink. This lack of questioning attitude can lead to individuals taking instructions for granted without questioning their rationale or relevance. Also due to peer pressure, individuals tend to blame themselves and can be very emotional or depressed if mistakes or errors are made, even if this is not what the organisation and its leaders would like.

Risk avoidance is deeply rooted in Japanese society. This leads many people in Japan to be conservative and to have the tendency to wait for external pressure before initiating changes of any kind. Continuous improvement as a proactive way of progressing and learning is not seen as a goal to be pursued; instead, it is preferred to continue doing what has always been done.

Safety doesn't rely only on the collective, but also on individuals. As described during the Forum, Japanese society tends to praise collectivism to such an extent that individual responsibilities are somewhat unclear. Added to this is the tendency for highly pyramidal organisational structures and top-down decision-making, meaning that individuals are not typically in a position to be held to account. These characteristics can create challenges in understanding who has the authority to make decisions and to take action in response to rapidly changing situations that may have implications for nuclear safety.

The challenge of examining characteristics in a specific cultural context is to be aware of and highlight those that might challenge a healthy safety culture, while at the same time preserving and encouraging those that benefit safety.

Further considerations

Importantly, the Japanese nuclear community seems to have made considerable progress in its understanding of safety culture since 2011 even though it was recognised during the Forum that safety culture can still be a difficult concept for many to grasp. One of the reasons is the difficulty in translating the concept into Japanese, just like the concept of accountability. Even if the final objective is the same, i.e. to support a strong nuclear safety programme, the means of achieving it from an organisational point of view may differ slightly from one culture to another. In this respect, the transfer of concepts from Western cultures to Asian cultures deserves particular attention and should lead to the development of customised comprehensive policies on safety culture which could contain Japanese proverbs or examples. This would make it possible to examine safety culture from a perspective other than the Western cultural one.

Findings from the interviews and discussion groups reveal that psychological safety is an important subject for the Japanese nuclear community, given the tendency for organisations to be very hierarchical and national characteristics such as the "fear of failure" and "don't speak up". Given these cultural characteristics, care should be taken to ensure that the organisation reduces anxiety and allows openness and a psychologically safe environment so that employees are more inclined to share their ideas and concerns about safety and to provide feedback on safety management (Edmondson, 2018). It was discussed at the Forum that the Japanese nuclear community could consider putting in place a strategy to monitor the mental health of staff, ensuring the optimal conditions for effective safety culture enhancements and safe operations in general.

The relationship between operators and the regulator was discussed during the study and the Forum by design via the questionnaire and the scenario. Difficulties were expressed, more by the operators than by the NRA, but both agreed that the quality of their communication should be improved and that mutual efforts must be made to ensure that both parties better understand one another.

Suggestions for paths forward

The opportunity exists for nuclear organisations in Japan to build on the findings of CSSCF Japan and to reflect upon actions that could support continuous improvements in safety culture. Acting on the influence of the national culture on safety culture means questioning and changing the bases from which both cultures originate. It is impossible, for instance, to improve the reporting of potentially dangerous situations by workers without modifying the formal or informal sanction policy which hinders reporting, or if positive contributions to safety are not more clearly and overtly recognised. In the case of Japan, this would lead to recognising the influence of certain national traits, such as "fear of failure", "don't speak up" and *hoshu-teki* (conservativeness), which can hinder workers from feeling confident about reporting any issues, whether safety-related or not. In relation to decision-making, improving its efficiency and allowing everyone to express themselves without fear would lead to recognising the influence of the same Japanese cultural characteristics. It could be useful to consider having a completely neutral person/organisation facilitating meetings, whether these are meetings within each organisation, or meetings involving both licensees and the NRA.

If it is considered that "organisations have it within their power to ensure that organisational culture over-rides national culture" (Hopkins, 2016:38), organisational change should encourage meaningful dialogue and discussion, not only vertically along the managerial line, but also horizontally at the boundaries between departments, groups and trades. The process of change should also seek to respect differences in perspective and strive to reconcile the differences between teams or group by providing a common vocabulary and representations that help to overcome boundaries, while accepting a certain degree of ambiguity and lack of clarity. It should also prioritise changing practices rather than values, as the values will follow, while ensuring compatibility with the organisation's overall values and strategic directions. Ultimately, this should be based on an existing mechanism within the organisation, the aim of which is to assess whether management processes are exhaustive or over-reaching, to the point of impacting safety.

A set of exploratory questions is proposed in Table 11 to inspire the Japanese nuclear community to further reflect, discuss and employ engagement activities.

Table 11: **Exploratory questions**

Accountability and responsibility for safety	
Ambiguity Collectivism Don't speak up Fear of failure *Majime* (diligence) *Hoshu-teki* (conservativeness) Peer pressure *Wa* (harmony)	How can you improve the way your organisation operates by taking into account the fact that ambiguity and other characteristics can prevent people from feeling responsible and accountable?
	How do you ensure that your organisation supports teamwork and collective responsibility?
	What mechanisms could you put in place to enable people to feel psychologically safe at meetings and to raise any difficulties or problems they have observed, even though their intervention could implicate fellow co-workers and lead to more work for others or for themselves?
	How could you improve your policy to support safety culture and practices in order to eliminate formal blame directed at individuals?
	What could you put in place to enable people to challenge safety policies, procedures, behaviour, and norms?
Clearly defined roles and responsibilities on safety	
Ambiguity Collectivism Fear of failure *Nenko-joretsu* (respect for seniority)	How to ensure roles, responsibilities and authorities are clearly defined and described in the organisation's management system?
	How to evaluate the relevance of the fact that decision-making authority is concentrated at the top, and not always best placed where responsibility for outcomes will be assumed or in the closest appropriate proximity to where the actions will be taken to produce results?
	How to guarantee that roles and responsibilities are not allocated solely on the basis of how long someone has worked for the company or organisation (seniority)?
Continuous learning and improvement around safety	
Considerate Don't speak up Fear of failure *Hoshu-teki* (conservativeness) *Majime* (diligence) Peer pressure *Wa* (harmony)	How to ensure that politeness and *wa* don't keep people from raising concerns?
	How to ensure that staff are encouraged and acknowledged for asking challenging questions?
	How do you encourage and engage those of differing professional/technical backgrounds and make sure the opinions of technical staff and junior staff are reflected and addressed?
	How can the lack of direct engagement from top management affect workers' ability and motivation to perform and report?
	How to break past the conservative barriers to support changes and be more adaptable?
	Are there mechanisms to support managers, but also workers and CNOs, to drive for high levels of safety without affecting the *wa*?

Table 11: **Exploratory questions** *(cont'd)*

Importance given to safety in decision-making	
Ambiguity Don't speak up Fear of failure *Majime* (diligence) *Nenko-joretsu* (respect for seniority) Peer pressure *Wa* (harmony)	How to ensure decisions are being made in an effective and efficient manner?
	How to balance between sound operational procedures and flexibility when certain situations require immediate action?
	Do *nemawashi* and lengthy decision-making processes hinder effective responses meant to support normal operations and unexpected event management?
	Does your organisation have a protocol to ensure that all meeting attendees have a chance to offer their opinions?
Resource allocation, effective competencies and training management	
Ambiguity *Nenko-joretsu* (respect for seniority)	How to ensure that human capabilities are managed in a systematic and formalised way?
	How to ensure that procedures are used as a supportive tool instead of replacing the skills of operational staff?
	How to guarantee that resources are not allocated mainly on the basis of seniority?
Open and transparent communication on safety	
Ambiguity Considerate *Nenko-joretsu* (respect towards seniority) *Wa* (harmony)	How to ensure open communications are nurtured to continuously improve safety?
	How can you maintain politeness while encouraging open communication?
	How can you help staff to feel safe enough to engage in debates or exchanges of divergent opinions?
	How can you ensure that *nenko-joretsu* won't get in the way of open communication?
NRA/licensees relationship	
Ambiguity Don't speak up Fear of failure *Hoshu-teki* (conservativeness) *Okami-ishiki* (obedience to superiors) Peer pressure *Wa* (harmony)	How can the high value placed on reputation and public perception influence discussions and decision making?
	Is it problematic that the emphasis on hierarchy and respect for authority figures (*okami-ishiki*) leads to a formal (albeit respectful) attitude and even deference on the part of licensees towards the NRA?
	How might the strong peer pressure in Japan and the method of communication (indirect with an important element of non-verbal communication) influence the ability of licensees and the NRA to express their concerns or disagreements?
	How might the high value placed on consensus and group decision making influence the way mutual agreements are reached to ensure that decisions are supported?
	Is complete openness of all licensee/NRA interactions to the public problematic and does it influence their ability to have fulsome, open and honest dialogues on complex topics?
	How to establish a communication channel where psychological safety is ensured for an effective discussion on nuclear safety?

Conclusion

Conducting the two-day Country-Specific Safety Culture Forum (CSSCF) Japan provided a valuable opportunity for the Japanese nuclear community to have an open discussion on important aspects of safety culture and to consider how Japanese cultural characteristics influence the national safety culture. The organisers of the Forum – the Nuclear Energy Agency (NEA) and the World Association of Nuclear Operators (WANO) – received positive feedback from the diverse and broad range of relevant stakeholders who participated in the Forum.

The outcomes of CSSCF Japan found eleven key traits to be characteristic of Japanese culture: *majime* (diligence); *hoshu-teki* (conservativeness); *wa* (harmony); don't speak up; collectivism; ambiguity; fear of failure; being considerate; *nenko-joretsu* (respect for seniority), and *okami-ishiki* (obedience to superiors). These national characteristics play out in a variety of safety culture dimensions and contribute to the climate of safety culture in the Japanese nuclear community. The safety culture dimensions that were particularly discussed during CSSCF Japan were: accountability and responsibility; roles and responsibilities; continuous learning and improvement; decision-making; resource allocation and capabilities management; and communication.

The Japanese nuclear community places strong emphasis on nuclear safety and, as such, already manifests many attributes conducive to a healthy safety culture. Notably, the Japanese nuclear community benefits from a high level of attention to detail and compliance with regulations and procedures, a collective decision-making process that tries to get everyone on board, and an explicit non-blaming approach to individual's mistakes or errors. Japanese also tend to be considerate, polite and respectful of others, especially when communicating. Questions that arose during the Forum concern the tendency for individuals to not speak up easily to express diverse opinions or to challenge safety-related decisions. The respect for seniority (*nenko-joretsu*) shapes relationships at work and leads to an unwillingness to challenge authority. Additionally, many Japanese people tend to be conservative, are resistant to the concept of continuous improvement, and praise collectivism to such an extent that individual responsibilities (and authorities) can be somewhat unclear.

Continued reflection within nuclear organisations – focusing on their particular challenges based on deeply rooted assumptions – would be necessary to continue progressing towards a strong and healthy safety culture. Holding periodic group discussions and maintaining direct communication between different departments and between the licensees and the regulatory body would be an effective way to carry this forward.

Enhancing safety culture within organisations is a continuous, progressive process. Rather than providing a conclusive description of Japanese culture or its nuclear safety culture, this report is meant to support the process of enhancing safety culture.

As concluded from the previous CSSCFs carried out in Sweden (2018), Finland (2019) and Canada (2022) and now from CSSCF Japan (2023), the relevance of the national cultural context on nuclear safety culture is incontestable. As such, the NEA and WANO encourage other countries to reflect on how the characteristics of their national culture can influence the nuclear safety culture structures in place within their nuclear institutions and in their nuclear community as a whole. In this regard, all organisations involved in nuclear activities should take concrete action to increase awareness and understanding of how national characteristics impact their day-to-day communications and general operations. Recognising that improving nuclear safety is an ongoing process, the report authors hope the processes and tools outlined will provide support for continuous self-assessment and institutional growth well into the future.

References

Aldrich, D.P. (2012), "Post-crisis Japanese nuclear policy: From top-down directives to bottom-up activism", *AsiaPacific Issues Working Papers*, No. 103, https://ssrn.com/abstract=1982646.

Andrews-Speed, P. (2020), "Governing nuclear safety in Japan after the Fukushima nuclear accident: Incremental or radical change?", *Journal of Energy & Natural Resources Law,* Vol. 38:2, pp. 161-181, https://doi.org/10.1080/02646811.2020.1741990.

Bernier, B. (2009), *Le Japon au travail*, Les presses de l'Université de Montréal, Montreal, https://doi.org/10.4000/books.pum.16380.

Cooper, M.D. (2018), "The Safety Culture Construct: Theory and Practice"in *Safety Cultures, Safety Models – Taking Stock and Moving Forward*, Springer Briefs in Applied Sciences and Technology, Editors: Claude Gilbert, Benoît Journé, Hervé Laroche, Corinne Bieder, Springer Open, pp. 47-61, https://doi.org/10.1007/978-3-319-95129-4_3.

Cox, S. and R. Flin (1998), "Safety culture: Philosopher's stone or man of straw?", *Work and Stress*, Vol. 12:3, pp. 189-201, https://doi.org/10.1080/02678379808256861.

Daniellou, D. (2017), *Organizational Silence is the Best Enemy of Safety*, Institute for an Industrial Safety Culture, Toulouse, www.icsi-eu.org/en/publication/thought-organizational-silence (accessed on 18 January 2024).

Dekker, S. (2012), *Just Culture: Balancing Safety and Accountability* (2nd ed.), CRC Press, London, https://doi.org/10.4324/9781315251271.

Edmondson, A.C. (2018), *The Fearless Organization: Creating Psychological Safety in the Workplace for Learning, Innovation, and Growth*, John Wiley & Sons, Inc., Hoboken, New Jersey.

FEPC (2024a), Japan's Energy Supply Situation and Basic Policy, www.fepc.or.jp/english/energy_electricity/supply_situation/index.html (accessed on 15 January 2024).

FEPC (2024b), 法改正と原子力規制委員会の発足 (Revision of Law and Establishment of Nuclear Regulatory Agency), www.fepc.or.jp/nuclear/safety/kisei/henkou/index.html (accessed on 15 January 2024).

Guldenmund, F.W. (2018), "Understanding Safety Culture Through Models and Metaphors" in *Safety Cultures, Safety Models – Taking Stock and Moving Forward*, Springer Briefs in Applied Sciences and Technology, Editors: Claude Gilbert, Benoît Journé, Hervé Laroche, Corinne Bieder, Springer Open, pp. 21-34, https://doi.org/10.1007/978-3-319-95129-4_3.

Helliwell, J.F. et al. (2023), "World Happiness, Trust, and Social Connections in Times of Crisis", *World Happiness Report 2023*, Sustainable Development Network, New York, https://worldhappiness.report/ed/2023 (accessed on 15 January 2024).

Hofstede, G. (2001), *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*, 2nd ed., Sage, Thousand Oaks, California.

Hopkins, A. (2016), *Quiet Outrage – The Way of a Sociologist*, Wolters Kluwer, Sydney.

IAEA (2023), *IAEA Comprehensive Report on the Safety Review of the Alps-Treated Water at the Fukushima Daiichi Nuclear Power Station,* International Atomic Energy Agency, Vienna, www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident/fukushima-daiichi-alps-treated-water-discharge/reports.

IAEA (2016a), *Leadership and Management for Safety*, *General Safety Requirements,* IAEA Safety Standards Series No. GSR Part 2, International Atomic Energy Agency, Vienna, www.iaea.org/publications/11070.

IAEA (2016b), *Performing Safety Culture Self-assessment*, Safety Report Series No. 83, International Atomic Energy Agency, Vienna, www.iaea.org/publications/10742.

IAEA (2006), *Application of the Management System for Facilities and Activities, General Safety Requirements*, Safety Standards Series, No. GS-G-3.1, International Atomic Energy Agency, Vienna, www.iaea.org/publications/7467.

INPO (2012), *Traits of a Healthy Nuclear Safety Culture*, INPO 12-012, Institute of Nuclear Power Operations, Atlanta, www.nrc.gov/docs/ML1303/ML13031A707.pdf.

IPSS (2022), "Social Expenditure", IPSS Statistical Report No.33, IPSS, Japan, www.ipss.go.jp/ss-cost/e/fsss-20/data/cost2020.pdf.

ITER (2024), JT-60SA International Fusion School, www.iter.org/education/summerschools/JT-60SA (accessed on 15 January 2024).

JAEC (2022), 令和 3 年度版　原子力白書 (Reiwa 3rd years – Atomic Power White Book), Japan, www.aec.go.jp/jicst/NC/about/hakusho/hakusho2022/zentai.pdf.

Kelly, D. (2014), "Ideology, society, and the origins of nuclear power in Japan". *East Asian Science, Technology and Society: An International Journal*, Vol. 9(1), pp. 47-64, https://doi.org/10.1215/18752160-2846105.

Kissinger, H. (2015), *World Order*, Penguin Press, New York.

Marsden, E. (2020), *Safety Culture: A Contentious and Confused Notion*, https://risk-engineering.org/concept/safety-culture (accessed on 4 January 2024).

Mearns, K. and S. Yule (2009), "The role of national culture in determining safety performance: Challenges for the global oil and gas industry", *Safety Science*, Vol. 47(6), pp. 777–785, https://doi.org/10.1016/j.ssci.2008.01.009.

METI (2023), 原子力政策に関する直近の動向と今後の取組 (Recent Developments and Future Initiatives Regarding Nuclear Energy Policy), www.meti.go.jp/shingikai/enecho/denryoku_gas/genshiryoku/pdf/036_01_00.pdf (accessed on 15 January 2024).

MHLW (2024), 原爆放射線について (About Atomic Bomb Radiation), www.mhlw.go.jp/stf/newpage_13421.html (accessed on 15 January 2024).

MIC (2023), 広域行政・市町村合併 (Regional Administration and Municipal Mergers), www.soumu.go.jp/kouiki/kouiki.html (accessed on 6 December 2023).

MLIT (2023), Land and Climate of Japan, www.mlit.go.jp/river/basic_info/english/land.html (accessed on 29 November 2023).

NEA (2022), *Human and Organisational Performance in Nuclear Installations*, OECD Publishing, Paris, www.oecd-nea.org/jcms/pl_73941.

NEA (2021), *Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body*, OECD Publishing, Paris, www.oecd-nea.org/jcms/pl_57211.

NEA (2016), *The Safety Culture of an Effective Nuclear Regulatory Body,* OECD Publishing, Paris, www.oecd-nea.org/jcms/pl_14948.

NEA (2011), *Nuclear Legislation in OECD and NEA Countries*, https://inis.iaea.org/collection/NCLCollectionStore/_Public/47/035/47035875.pdf

Nelson, C. (2011), '*The Energy of a Bright Tomorrow: The Rise of Nuclear Power in Japan'*, Origins: Current Events in Historical Perspective, https://origins.osu.edu/article/energy-bright-tomorrow-rise-nuclear-power-japan?language_content_entity=en.

NHK (2023), 「核のごみ」最終処分地選定　文献調査要件案まとめる　経産省 (Ministry of Economy, Trade, and Industry (METI) summarizes draft requirements for literature review to select final disposal site for "nuclear waste"), https://www3.nhk.or.jp/news/html/20230622/k10014106481000.html (accessed on 15 January 2024).

Nihon Keizai Shimbun (2022), 「原発建て替え・運転延長へ転換　政府、GX 基本方針」(Government's GX Basic Policy to Rebuild and Extend Operation of Nuclear Power Plants), www.nikkei.com/article/DGXZQOUA221FX0S2A221C2000000 (accessed on 15 January 2024).

NRA (2023), 基本検査運用ガイド 品質マネジメントシステムの運用 (Quality Management System Operation Guide), Nuclear Regulation Authority, Tokyo, https://www2.nra.go.jp/data/000442882.pdf (accessed on 15 January 2024).

NRA (2020), *NRA Ordinance Prescribing Standards for System Required for Quality Control Concerning Operational Safety of Nuclear Facilities*, Nuclear Regulation Authority, Tokyo, 原子力施設の保安のための業務に係る品質管理に必要な体制の基準に関する規則 | e-Gov 法令検索.

NRA (2019a), 健全な安全文化の育成と維持に係るガイド (Guide for Fostering a Healthy Safety Culture), Nuclear Regulation Authority, Tokyo, www.nra.go.jp/data/000304077.pdf.

NRA (2019b), 原因分析に関するガイド (A Guide to Cause Analysis), Nuclear Regulation Authority, Tokyo, www.nra.go.jp/data/000304078.pdf.

NRA (2015), 原子力安全文化に関する宣言 (Declaration on Nuclear Safety Culture), Nuclear Regulation Authority, Tokyo, www.nra.go.jp/data/000108960.pdf (accessed on 15 January 2024).

NRA (2013), 組織理念 (Organizational Philosophy), Nuclear Regulation Authority, Tokyo, www.nra.go.jp/nra/gaiyou/idea.html (accessed on 15 January 2024).

OECD (2023a), Life expectancy at birth (indicator), Organisation for Economic Co-operation and Development, Paris, https://data.oecd.org/healthstat/life-expectancy-at-birth.htm (accessed on 28 November 2023).

OECD (2023b), Young population (indicator), Organisation for Economic Co-operation and Development, Paris, https://data.oecd.org/pop/young-population.htm (accessed on 28 November 2023).

OECD (2023c), Elderly population (indicator), Organisation for Economic Co-operation and Development, Paris, https://data.oecd.org/pop/elderly-population.htm (accessed on 28 November 2023).

OECD (2023d), Education spending (indicator), Organisation for Economic Co-operation and Development, Paris, https://data.oecd.org/eduresource/education-spending.htm (accessed on 29 November 2023).

OECD (2023e), Education GPS Japan, Organisation for Economic Co-operation and Development, Paris, https://gpseducation.oecd.org/CountryProfile?primaryCountry=JPN (accessed on 29 November 2023).

OECD (2023f), Women in politics (indicator), Organisation for Economic Co-operation and Development, Paris, https://data.oecd.org/inequality/women-in-politics.htm (accessed on 29 November 2023)

Schein, E.H. (1985), *Organisational Culture and Leadership (1st ed.)*, A Joint publication in the Jossey-Bass management series and the Jossey-Bass social and behavioral science series, Jossey-Bass Publishers, San Francisco.

Statistics Bureau, Japan (2022), *Statistical Handbook of Japan 2023*, MIC, Japan, www.stat.go.jp/english/data/handbook/index.html.

TEPCO (2024), ALPS Treated Water, etc. Conditions, www.tepco.co.jp/en/decommission/progress/watertreatment/alpsstate/index-e.html (accessed on 15 January 2024).

TMG (2023), Japan's Local Government System, www.metro.tokyo.lg.jp/english/about/structure/ (accessed on 6 December 2023).

The National Diet of Japan (2012), *The Official Report of the Fukushima Nuclear Accident Independent Investigation Commission*, https://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/en/report.

UNICEF (2023), UNICEF Data Warehouse (database), United Nations Children's Fund, New York, https://data.unicef.org/resources (accessed on 29 November 2023).

UNODC (2023), International homicide (database), United Nations Office on Drugs and Crime, Vienna, https://dataunodc.un.org/dp-intentional-homicide-victims (accessed on 28 November 2023).

WANO (2013), *Traits of a Healthy Nuclear Safety Culture*, PL 2013-1, World Association of Nuclear operators, London, www.wano.info/resources/traits-of-a-healthy-nuclear-safety-culture.

WEF (2023), "Benchmarking gender gaps, 2023" in *Global Gender Gap Report 2023*, World Economic Forum, Cologny, Switzerland, www.weforum.org/publications/global-gender-gap-report-2023/digest.

Wolf, P.J. (2001), *International Encyclopedia of the Social & Behavioral Sciences*, Elsevier, Amsterdam.

World Bank (2023a), GDP (current US$) (database), https://data.worldbank.org/indicator/NY.GDP.MKTP.CD (accessed on 28 November 2023).

World Bank (2023b), Research and development expenditure (% of GDP) (database), https://data.worldbank.org/indicator/gb.xpd.rsdv.gd.zs (accessed on 28 November 2023).

Yamashita, K. (2015), "History of nuclear technology development in Japan", Advancing of nuclear science and energy for national development: Proceedings of the Nuclear Science, Technology, and Engineering Conference2014 (NuSTEC2014), 11–13 November 2014, Skudai, Johor, Malaysia, https://doi.org/10.1063/1.4916842.

Yomiuri Shimbun (2023), 核廃棄物処分場　候補地は多い方が望ましい (Nuclear waste disposal sites The more potential sites, the better), www.yomiuri.co.jp/editorial/20230928-OYT1T50294, (accessed on 15 January 2024).

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BETTER POLICIES FOR BETTER LIVES

Country-Specific Safety Culture Forum

Japan

A healthy safety culture has long been considered essential to maintaining high levels of nuclear safety. Although safety goals across countries are similar, the operational realities vary due to a range of factors including national cultural characteristics. These traits can have a positive impact on the safety culture or present challenges, so it is essential for the nuclear community to identify what influences are present within their particular cultural contexts and reflect on how these influences may impact their safety culture.

The Country-Specific Safety Culture Forum was created to gain a better understanding of how a national context relates to safety culture and how operators and regulators should think about these effects in their day-to-day activities. The fourth NEA safety culture forum – a collaborative effort between the Nuclear Energy Agency (NEA) and the World Association of Nuclear Operators (WANO) in association with the Japan Nuclear Regulation Authority (NRA) and the Federation of Electric Power Companies (FEPC) – was held in Japan in December 2023. This report outlines the process used to conduct the forum, reveals its findings and hopes to inspire the nuclear community to further reflect and take action.

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