Country-Specific Safety Culture Forum

Finland

WANO

stuk
RADIATION AND NUCLEAR SAFETY AUTHORITY

NEA
NUCLEAR ENERGY AGENCY

Country-Specific Safety Culture Forum: Finland

NEA No. 7488

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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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Foreword

William D. Magwood, IV
Director-General, NEA

Since the first nuclear power plants entered operation more than 60 years ago, nuclear regulators and operators around the world have made continuous improvements to the safety of nuclear power plants by ensuring adaptations based on lessons learnt. This work has received vastly more attention in recent years, and as a result, nuclear power plants are safer, more resilient to extreme events and better prepared for a wider range of possible contingencies than they have ever been in the past. Such improvements are reflected, for example, in the many physical enhancements at power plants, major improvements in emergency and severe accident response infrastructure and significant changes in terms of training and procedures.

Despite such advances, more remains to be done, particularly in the area of the human aspects of nuclear safety. This latter area has become a central part of the work of the OECD Nuclear Energy Agency (NEA) in recent years, led by its Division of Radiological Protection and Human Aspects of Nuclear Safety (RP-HANS). Activities include work by the NEA Working Group on Safety Culture, which facilitates the exchange of best practices and shared challenges between experts and senior level managers across member countries. Work being carried out under the aegis of the NEA, alongside that of other organisations, has helped to strengthen the understanding of a nuclear safety culture around the world. Joint efforts currently being undertaken by the NEA and the World Association of Nuclear Operators (WANO) has also helped regulators and the industry to explore the impacts of local contexts on safety culture, which is proving to be a valuable addition to global endeavours.

The present report, *Country-Specific Safety Culture Forum: Finland*, will help to deepen our understanding of how the national context can influence nuclear safety culture and day-to-day operations. Experience has shown that the manifestation of cultural aspects – such as communication styles, the importance of hierarchy or of individuality – in organisational behaviours are important to the development of a healthy safety culture. Realising the goal of an optimal safety culture requires an appreciation and consideration of national context. This

appreciation requires considerable introspection into such issues, and the NEA is pleased to provide a framework to facilitate these important considerations.

I hope that the results of the Country-Specific Safety Culture Forum (CSSCF) on Finland will stimulate regulators and operators to explore their national contexts so as to enhance activities that lead to substantive improvements in safety culture. As this activity is a joint endeavour, many individuals contributed to making the forum a success. This accomplishment was only possible as a result of the outstanding contributions of our partners at WANO and the excellent support of the host organisation, the Finnish Radiation and Nuclear Safety Authority (STUK). It was also made possible by the committed contributions of many people from the Finnish nuclear community who participated in this project. The team that developed, organised and co-ordinated the multitude of elements associated with this forum worked intensively to achieve the outcome and should be proud of their contributions.

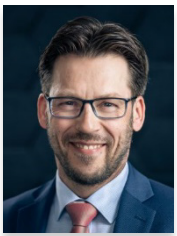
Peter Prozesky
Chief Executive Officer, WANO

This is the second, successful CSSCF in which WANO has had the pleasure of participating, and it has reinforced our belief on the importance of understanding the meaningful influence that regional, national and enterprise-level cultures can have on the way in which nuclear facilities are managed and operated.

WANO's experience continues to strengthen our conviction that there are nevertheless a number of fundamental principles that must be present in the behaviours 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. We acknowledge that there is not a single, universal recipe that can be applied across our more than 30 member countries, but that these fundamental behaviours, which are based on a deep respect for this technology and the individual's role in its safe custodianship, are globally applicable. These behaviours are documented in WANO's report titled *Traits of a Healthy Nuclear Safety Culture*.

A sound understanding of the interplay between local influencers and these fundamental behaviours is important in the delivery of a safety mission. It is vital that we engage with the nuclear industry's supply chain, operators and regulators to explore these factors and continue to work with personnel at all levels in those organisations to ensure that we are successful.

WANO continues to be delighted to work with the NEA in this endeavour.



Petteri Tiippana
Director-General, STUK

It is well known that human and organisational factors have been significant contributors to all major accidents. After the Chernobyl accident, the nuclear community highlighted the importance of the licensee's safety culture and its evaluation and oversight. During the past ten years or so, more focus has been placed on how regulators perceive their own safety culture and its influence on licensees' activities. Observations from the Fukushima Daiichi nuclear power plant accident have broadened interest in the topic of examining the possible impacts of national culture and traditions on safety culture.

Finland is a country with a small population and a fairly homogeneous culture. Being of small size and homogeneous culture is particularly true of the Finnish nuclear community, where there is an emphasis on the importance of understanding the impacts of national traditions and culture on the safety culture. Having the CSSCF in Finland was therefore of great interest and importance to Finland. Focusing the discussions on national traditions and culture, the forum enabled open and frank discussion between the regulator and the licensees in a safe atmosphere, outside of the regulator-regulated setting.

The forum resulted in many useful findings. A generic observation was that cultural strengths can also be regarded as weaknesses or at least as blind spots. One example for us Finns has to do with our strong trust in individuals, expertise and organisations. While trust is a great enabler for many things, having too much trust in an individual or an institution may also create challenges. It may for instance result in less vigilance among individuals or within the organisation as a whole. Another Finnish feature that we have discussed at STUK is the tendency to avoid conflicts. This tendency combined with a culture of strong trust may result in the lack of a healthy, questioning attitude. To tackle this blind spot, efforts are being taken to establish a safe communication and interaction culture at STUK, in which it is perfectly fine and encouraged for anyone at any level in the organisation to ask questions. This and other measures are being developed and implemented in STUK's safety culture programme, which should be operational in early 2020. All findings and insights from the CSSCF have been valuable inputs into the programme.

I would like to thank the NEA and WANO for developing the CSSCF and for all of the support we have had in conducting the forum. I encourage all nuclear countries to invite this forum to their own countries. I would also like to thank STUK's staff for their hard work in making the forum happen, and Finnish utilities for their frank, open and committed participation.

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List of abbreviations and acronyms

CSSCF	Country-Specific Safety Culture Forum
IAEA	International Atomic Energy Agency
INSAG	International Nuclear Safety Advisory Group (IAEA)
NEA	Nuclear Energy Agency
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment (OECD)
STUK	Finnish Radiation and Nuclear Safety Authority
TVO	Teollisuuden Voima Oyj (Finnish electricity generating company)
WANO	World Association of Nuclear Operators

Executive summary

Background

Throughout the nuclear energy community, organisations strive to achieve and maintain high levels of nuclear safety as a first priority. Years of experience and examination have revealed and continue to confirm that a healthy safety culture is necessary to achieve optimal safety performance in any organisation. As organisations around the world consider how best to improve safety culture, it has become increasingly apparent that many factors affect safety culture, including the characteristics that are demonstrated by the people carrying out nuclear activities within a national context. This national context is how the cultural attributes in a country can interact to frame and influence safety culture within that country's nuclear community. It is thus imperative that the nuclear community take the time to identify what influences exist and consider their potential impacts so that these can be addressed appropriately.

The Country-Specific Safety Culture Forum (CSSCF) – a process of contemplation and reflection on the influences arising from national contexts – was developed jointly by the OECD Nuclear Energy Agency (NEA) and the World Association of Nuclear Operators (WANO) and provides an important step in an ongoing process towards enhanced nuclear safety culture.

The influence of national attributes can contribute to a healthy safety culture when they are recognised by the nuclear community and reflected in various organisational tools such as programmes, workshops, communication plans, procedures and training. Alternatively, ignoring these influences can impact efforts to develop and maintain a healthy safety culture. The CSSCF exercise seeks to cultivate awareness of how national attributes influence organisations through the behaviour of the people who work at these organisations. The ultimate objective of the CSSCF is not to compare national contexts, but to enable countries hosting the forum to gain awareness of national attributes and their potential effects, which can be considered when developing methods for sustainable improvements in the nuclear safety culture.

Work to plan, assemble and implement the CSSCF was carried out by a joint team comprised of expert staff from the NEA, WANO and the Finnish Radiation and Nuclear Safety Authority (STUK).

Methodology

The CSSCF methodology is comprised of multiple, reflective dialogues designed to gather information and identify broad and relevant characteristics of national attributes and demonstrate how these attributes relate to a healthy safety culture.

The first step of CSSCF Finland was to capture and identify relevant Finnish attributes that combined illustrate a national context which frames the nuclear community. The joint NEA/WANO/STUK team held interviews with Finnish experts and leaders. The team conducted focus groups with people at various levels within Finnish organisations in the nuclear community, including multiple licence holders, owner organisations, licence applicants and STUK. Several key national attributes were identified from the analysis of this information, and this information was used to inform the remainder of the CSSCF exercise. This work is not designed to serve as a rigorous sociological study of Finnish culture, but is rather intended to provide a collection, and reflection, of views from within various elements of the Finnish nuclear energy sector. Throughout this report, the part of the process involving the interviews and focus groups will be referred to as "the snapshot study".

The CSSCF included a two-day programme where participants came together to discuss and reflect upon the ideas and perspectives shared over the two days. A key element of this programme was the engagement of participants in a role-playing exercise, which comprised a script provided by the CSSCF team and based on a WANO-generated scenario that reflects an actual incident at a commercial nuclear power plant. The CSSCF team adapted the role-play script by incorporating information gathered from the snapshot study, thus infusing the scenario with aspects of the Finnish national context. The role-play exercise is designed to facilitate a dialogue among forum participants on the influence of their national context on nuclear safety culture.

More than 50 participants from various Finnish nuclear organisations joined in the two-day programme, including nuclear operations licence holders and licence applicants – Fortum Power and Heat Oy (Fortum) – the licensee of Loviisa 1 and 2, Teollisuuden Voima Oyj (TVO) (licensee of Olkiluoto 1, 2 and 3), Posiva (licensee of the spent fuel repository), and Fennovoima (licence applicant for a new nuclear power plant). In addition to industry participants, the exercise included staff from Finland's nuclear regulator, STUK, and from the country's Ministry of Economy and Employment. Perspectives and observations were also shared by seven international guests in the concluding sessions of the forum. The programme included break-out group and plenary discussions that were designed to facilitate analyses and discussion. The resulting interactions provided rich discussions on the Finnish national attributes and how they affect organisational behaviours and safety performance.

During both the snapshot study and the two-day forum, the CSSCF team took extensive notes, which were used to complete a summarising, qualitative and thematic analysis that is central to this report. The goal of the present report is to encourage continued dialogue and exploration of how the Finnish national attributes that were identified and examined through the entire process contribute to the organisational behaviours that may influence nuclear safety.

A key attribute of the CSSCF process is that it brings together the perspectives of the entire nuclear community in a given country, including nuclear plant operators, industrial companies and nuclear safety regulators. Doing so highlights the common responsibility that all actors have to pursue enhanced nuclear safety.

Overview of outcomes

This present report captures the process, outcomes and observations generated in the course of the snapshot study and the two-day forum. These exercises highlighted Finnish cultural attributes that the participants felt influenced organisational behaviours, which could in turn affect nuclear safety culture. Because improving safety culture is an ongoing process, this report is not intended to provide comprehensive conclusions, but is designed to provide Finnish nuclear organisations with additional tools to further enhance their safety cultures.

The Finnish nuclear community is invited to discover and investigate the best ways for the cultural features identified during the process of the forum to be used to ensure nuclear safety. While some of these features may lead to positive contributions to safety, others may to be reflected upon in future training to ensure a healthy safety culture. The report provides a matrix with exploratory questions to prompt continued dialogue and lead to improvements.

As noted above, various Finnish national attributes were identified during the CSSCF. The attributes that were considered to be the most significant according to the discussions and subsequent analysis are as follows:

1. trust (credibility and the expectation of honesty);
2. technical rigour (emphasis on pragmatism, facts and science);
3. solution-oriented approach (emphasis on efficiency and proactive planning);
4. personal responsibility (desired autonomy and Finnish pride in quality work/integrity).

Other Finnish national attributes were also discussed because they interact with the four principal attributes above to influence the behaviour of people within nuclear organisations. These attributes are as follows:

1. equality (*solidarity and low emphasis on hierarchy*);
2. adherence to logical rules (need for clarity and order);
3. Finnish communication style (tacit, straightforward, transparent, quiet, honest).

The national attributes listed above are expressed through various organisational behaviours associated with a healthy safety culture. The discussions in CSSCF Finland identified the following relevant areas:

- decision making;
- freely raising concerns (*exercising questioning attitudes and providing feedback*);
- responsibility for safety (*senses of ownership/accountability*);
- control and follow-up;
- work planning;
- leadership.

Feedback from the CSSCF participants indicates that they found the exercise to be informative and valuable. The CSSCF facilitated exchanges that provided insights into national attributes and demonstrated how they may impact organisational behaviours. These insights can be applied in future to stimulate activities at the organisational level in Finland in order to further understanding regarding the relationship between national attributes and safety culture.

The NEA and WANO encourage other countries to start their own journey of discovery. As indicated in the first edition of the CSSCF in Sweden, and during the process of the CSSCF in Finland, the national context clearly does have a powerful impact on nuclear safety. All organisations involved in nuclear activities should therefore attempt to gain awareness and understanding of such factors and consider them as they seek to improve nuclear safety.

Safety culture in a national context

Background on nuclear safety culture

In our society, nuclear safety issues, whatever their significance, receive wider attention than that received for the more frequent accidents that occur in other industries. This increased attention has led to societal expectations for continuous efforts to be made by the nuclear community to improve nuclear safety. Because of the tremendous, successful efforts that have been made over the years to improve the safety of facilities, the focus has become increasingly placed on the human aspects of safety – particularly the nuclear safety culture.

The evaluation of nuclear accidents at Three Mile Island, Chernobyl and Fukushima Daiichi illuminates the importance of human and organisational factors as these issues were significant contributors in the case of each of these events. The relationship between the human element, the technical aspects of nuclear operations and the organisations in which they reside has been acknowledged as key to any effort to improve safety. The cultural context influences the environment in which human and organisational factors exist, and thus the way in which they may affect nuclear safety. People make decisions, create procedures, develop policies, direct and manage activities, write laws and rules, design and engineer technical components and perform various functions within organisations. It is therefore essential to include perspectives that focus on human, organisational and cultural factors when ensuring safe nuclear operations.

The broad concept of "nuclear safety culture" emanates from the international analysis of the Chernobyl nuclear accident in 1986. The International Nuclear Safety Advisory Group (INSAG) of the International Atomic Energy Agency (IAEA) found that the accident had not been caused by technical factors alone, but by problematic behaviours on the part of the operations staff who failed to ensure that safety was the top priority. INSAG thus coined the term "safety culture" to describe the set of behaviours necessary to ensure nuclear safety (IAEA, 1986).

Since that time, many organisations, including the World Association of Nuclear Operators (WANO), have developed written frameworks that describe the kinds of behaviours, attitudes and principles that are necessary for safe operation (see WANO, 2013). Globally, the nuclear industry has spent ample time considering optimal frameworks for defining safety culture as organisations seek to sustain high levels of safety and continuously improve the safety culture. The nuclear energy sector is at the forefront of understanding the importance of culture and its influence on nuclear safety, and the tenets described above have become commonly understood across the sector.

The Fukushima Daiichi accident in 2011 sharpened the focus on safety culture. In the past, the assessment of safety culture had been focused almost entirely on nuclear operators. However, the 2011 accident highlighted the fact that the safety culture of the nuclear safety regulator was at least as important to sustained safety as that of nuclear operators. It thus became evident that a better understanding of the regulators' role in safety culture was essential, and includes not only the interaction between the regulating body and licence holder but also the safety culture within an effective regulating body (also see NEA, 2016b).

As this focus on the safety culture increased, the Nuclear Energy Agency (NEA) developed several reports – or "green booklets" – within the series of regulatory guidance documents. Included among these green booklets is The Characteristics of an Effective Nuclear *Regulator* (NEA, 2014), *Implementation of Defence in Depth at Nuclear Power Plants* (NEA, 2016a), and *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016b), which focuses on the importance of safety culture. The latter of these reports provides significant insights into the importance of the national context, which is made up of a country's cultural attributes, and how it can frame, support and influence an organisation's safety culture. The report highlights that, as national cultures continue to evolve, so must the perception of the context in which the nuclear community operates. Moreover, understanding of the multi-layered facets of safety culture, such as the nuanced and exact ways that values and assumptions influence individuals and organisational behaviours, has significantly evolved in the eight years since the accident.

Safety culture and national culture: Applying lessons learnt

In Finland, nuclear safety regulation places great emphasis on safety culture. The Finnish Radiation and Nuclear Safety Authority (STUK) regulation Y/1/2018 25§ states the following:

> When designing, constructing, operating, and decommissioning a nuclear power plant, a good safety culture shall be maintained. Nuclear safety shall take priority in all operations. The decisions and activities of the management of each organisation participating in the abovementioned activities shall reflect its commitment to operational practices and solutions that promote safety. Personnel shall be encouraged to perform responsible work, and to identify, report, and eliminate factors endangering safety. Personnel shall be given the opportunity to contribute to the continuous improvement of safety.

The requirement on good safety culture is expounded upon in the regulatory guideline of STUK entitled "Guide YVL A.3, Leadership and management for safety" (STUK, 2019a). The organisation shall have a good safety culture:

- Nuclear and radiation safety take priority in decision making.
- The safety significance of issues is considered holistically.

- Work activities are conducted in a professional manner and individuals take responsibility.
- Working conditions are well-organised.
- Mutual respect and trust permeate the organisation.
- The atmosphere is open, blame-free and vigilant in order to identify, report, investigate and resolve factors endangering safety.

The management demonstrates the importance of safety and their commitment to its continuous improvement in the work practices. The management system shall support the development of a good safety culture.

In carrying out these imperatives, STUK seeks to draw from lessons learnt in the course of global operating experience. As noted above, there has been considerable analysis and discussion about nuclear safety over the last three decades. Continued experience, however, has pointed to the need for a further refinement on how to ensure a healthy nuclear safety culture.

Analyses of the Fukushima Daiichi accident, such as that undertaken through the National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission Report (NAIIC, 2012), has helped to bring focus to the influence of national attributes on organisational behaviours and safety culture. This report led to active discussions in meetings under the auspices of the NEA. As work progressed, and other incidents occurred – particularly, the fires that broke out in the US Waste Isolation Pilot Plant in 2014 (Amalberti, 2013) – the NEA and other organisations recognised that all areas of the world have national contexts that include different attributes and nuances that can support or detract from nuclear safety. By being aware of such attributes and nuances, each country would ensure that its approach to enhanced nuclear safety culture reflects an understanding of the cultural contexts in the given country.

Examining national culture to determine how different attributes influence behaviours, attitudes and beliefs that constitute safety culture is not a matter of comparing countries. Exploring the relevant aspects of national culture and how they can enhance safety culture is merely one of the factors that should be considered when developing activities to increase competency or ways to assess safety culture. The Country-Specific Safety Culture Forum (CSSCF) was developed with a focus on this objective. It was for this reason that STUK expressed an interest in conducting a CSSCF in Finland.

International normative frameworks

The international nuclear sector defines healthy safety culture based on multiple normative frameworks. WANO, the IAEA and the NEA have each contributed to the global understanding of what is necessary to sustain a healthy safety culture. WANO developed their *Traits of a Healthy Nuclear Safety Culture* (WANO, 2013), with ten traits, along with their corresponding attributes and behaviour examples. The IAEA has arranged similar standards into a framework of 5 characteristics

and 37 underlying attributes (IAEA, 2006). The NEA has developed a normative framework for an effective safety culture in a regulatory body as described in its green booklet *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016b). This NEA framework is organised into 5 principles and 21 attributes.

These international normative frameworks provide a foundation upon which countries can build to develop a healthy safety culture. However, the national context has to be considered. Some may be tempted to judge the value of various national cultures and behaviours against the accepted, "positive" characteristics of one culture (Amalberti, 2013). It has been demonstrated, however, that there are no "ideal" national cultures, but simply various sets of behaviours that are suitable for each situation. For example, in countries where the culture has a more collective nature, combined with a high regard for hierarchy, there are higher rates of passenger aircraft accidents (Helmreich, 1993). While the initial approach was to compare these cultures to a western standard, it was discovered while analysing different conditions that this complex system was in fact designed by a different culture than those who were operating the system.

The designers of the system had a specific level of collaboration and emphasis on hierarchy within their culture. The transfer of this complex system to operators with different cultures, could create a disconnection between how it was originally conceived and how it would be intuitively perceived by other cultures. This example demonstrates the importance of considering the specific attributes of a given culture when operating complex systems in the nuclear energy industry. Ultimately, it is not a comparison of one set of national attributes to another, but a consideration that systems, both technical as well as organisational, will be used in places that are influenced by national culture. This consideration lends itself well to the idea that more than one safety model is acceptable, reflecting differing benefits and compromises between such aspects as flexibility, competitiveness and adaptability (Amalberti, 2013). At the same time, normative frameworks applied globally can provide sound criteria that describe an effective safety culture. It is imperative therefore to develop approaches that permit the application of these frameworks within the context of local national cultures, rather than moving contrary to these cultures. It is in this spirit that the CSSCF was developed by the NEA and WANO to be held in countries around the world.

The NEA Director-General, William D. Magwood, IV, and the WANO Chief Executive Officer, Peter Prozesky, agreed that the sensitive and important issue of national context needed to be addressed. As a result, the decision was made to create the CSSCF in support of member countries and with the objective of viewing members' own local cultures and national contexts through the perspective of the nuclear safety culture. The NEA Division of Radiological Protection and Human Aspects of Nuclear Safety (RP-HANS) is the designated lead in this effort.

General considerations related to culture in a national context

Exploring behaviours and how they relate to national culture is not an exact science. It is challenging to determine which behaviours are typical for various reasons across an entire country. Behaviours may differ between geographical regions within a country and between rural and urban environments. There may be indistinguishable boundaries between cultural aspects on the national (macro), organisational (meso) or group (micro) levels even when considering them within the culture of a specific industry. There may also be cultural differences between various sub-groups in society, e.g. based on social class, economic income, ethnicity, political preference or profession.

Another consideration related to culture is that it can be situational in that people behave differently according to the circumstances and environments within the cultural context. A person may or may not handle risks in the same manner when in a non-professional setting, where he or she may be very easy-going, as when the person is working in a formal capacity, where he or she may, on the contrary, be extremely conservative as a nuclear reactor operator. In most cases, people are unaware that they are adapting to the cultural context. Because of these complexities, it is often challenging to precisely define national culture. The snapshot study and the analysis of information gathered from the two-day forum in Finland do not aspire to define or represent Finnish culture. Nevertheless, the analysis of data that was captured throughout the process shows that there are some common cultural aspects that can be called national attributes, as identified by Finnish participants. The information gathered was sufficient to support the CSSCF exercise and provide a framework for discussion and reflection.

The Finnish cultural context

This section of the report intends to give some context to the reader by providing a brief glimpse of Finland and the history of its nuclear industry.

Facts and figures

As of 2018, Finland has a population of 5.5 million, with a total surface area of 303.8 km² Life expectancy in 2018 was almost 82 years with 84 for Finnish women and 79 for Finnish men. This is two more years than the average life expectancy of member countries of the Organisation for Economic Co-operation and Development (OECD) (Statistics Finland 2019; OECD, 2018).

Finland declared its independence in 1917 and defended this independence during World War II. Invasions by the Soviet Union were also thwarted during this period, although some territory was lost. In the second half of the 20th century, Finland progressed from an agricultural economy to a diversified, modern industrial economy with a per capita income among the highest in western Europe. Finland has been a member of the European Union since 1995.

Currently, some of the integral features of Finnish society include a high regard for education, notable advancements in technology and science, an interest in the promotion of gender equality and in social cohesion, and an inherent trust in interactions with others and in organisations, including government entities. Trust in the social environment in Finland is evident in the results of the Corruption Perceptions Index, which lists Finland as third out of 180 countries in its 2018 analysis (Transparency International, 2018). The aforementioned characteristics are also illustrated in Finnish culture through public investment in educational systems, a comprehensive national welfare system, and economic and social advancements related to science and technology.

The importance of quality education in Finland is evident in the high level of respect given to educators and the competitiveness in the selection of teachers. It is also reflected in the provision of resources given to education, from the primary to the tertiary level. Finland is the fourth highest among OECD member countries in terms of resources, with 5.6% of gross domestic product allocated to education (OECD, 2016a). Additionally, Finland is consistently among the highest performers in the OECD Programme for International Student Assessment (PISA), as illustrated in Table 1.

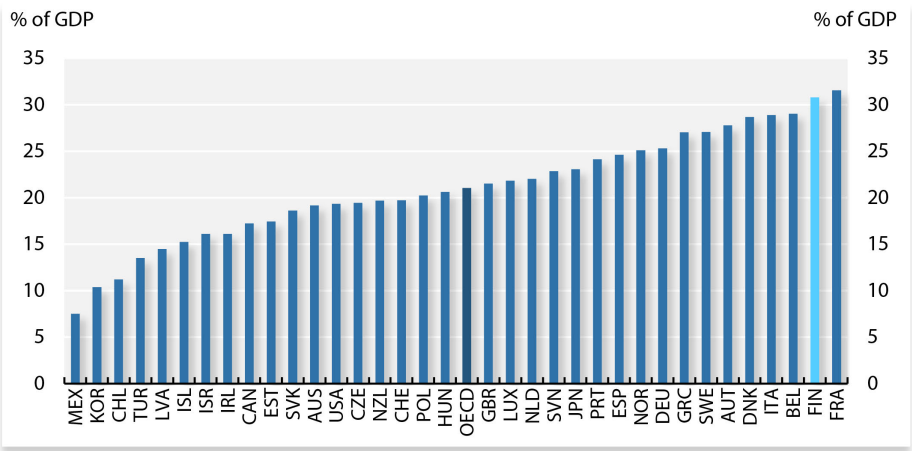
Table 1: **Student performance in PISA 2015 – top ten performers**

	Science	Reading	Mathematics	Science, reading and mathematics	
	Mean score in PISA 2015	Mean score in PISA 2015	Mean score in PISA 2015	% share of top performers in at least one subject	% share of low achievers in all three subjects
Singapore	556	535	564	39.1	4.8
Japan	538	516	532	25.8	5.6
Estonia	534	519	520	20.4	4.7
Chinese Taipei	532	497	542	29.9	8.3
Finland	531	526	511	21.4	6.3
Macao (China)	529	509	544	23.9	3.5
Canada	528	527	516	22.7	5.9
Viet Nam	525	487	495	12.0	4.5
Hong Kong (China)	523	527	548	29.3	4.5
B-S-J-G (China)	518	494	531	27.7	10.9
OECD average	493	493	490	15.3	13.0

Source: OECD, PISA 2015 Database, Tables I.2.4a, I.2.6, I.2.7, I.4.4a and I.5.4a.

Finland invests in the social well-being of its citizens through various goods and services targeted to groups of individuals with special needs, such as the unemployed, young persons, the sick or the elderly. The contributions to social programmes are significant among OECD member countries as shown in Figure 1.

Figure 1: **Social investments**

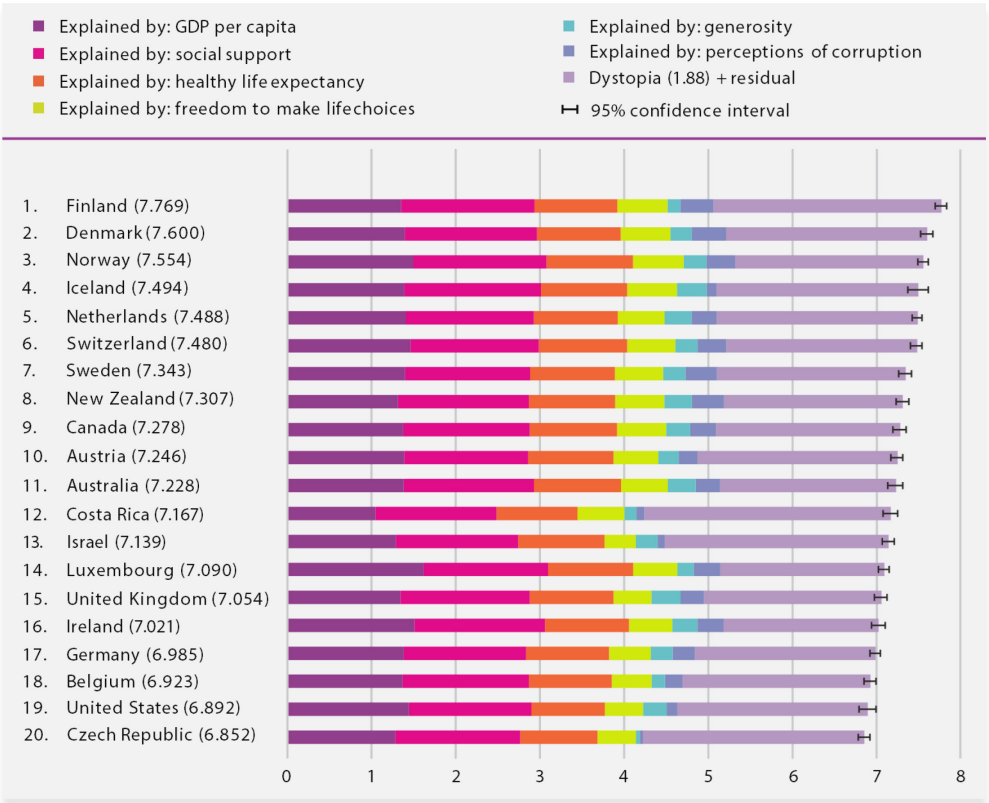


Source: OECD, 2019d.

Overall happiness can be measured by considering one's perceived satisfaction in life and the amount of positive experiences and feelings, as well as the lack of negative experiences. In the Gallup seventh World Happiness Report, Finland was ranked as the happiest country in the world.

Community interactions can also be an indicator of the quality of life, and as such it was reported that 95% of Finnish people believe that they could rely on someone they know. The OECD average is 89%. Finland's social and health services, combined with a good work-life balance, are thought to contribute to the reported happiness in Finland. Less than 4% of Finnish employees engage in a work schedule that would constitute long work hours. This is less than the OECD average of 11% (OECD, 2019a; Gallup, 2019).

Figure 2: **Gallup Happiness Survey**



Source: Helliwell et al., 2019.

History of the Finnish nuclear industry

The start of the Finnish nuclear programme can be traced to the "Atoms for Peace" era in the 1950s. An expert group called the Energy Committee prepared studies and reports on the feasibility of nuclear energy in Finland. The first atomic energy law was written in 1957. Students were sent to other countries through exchanges and the Fir-1 reactor, a TRIGA (training, research, isotopes, general atomics) research reactor, was built in 1962. A radiation safety authority was founded in 1958, which later evolved into today's Finnish Radiation and Nuclear Safety Authority (STUK). The first Finnish nuclear safety regulatory guides were drafted in the early 1970s (Sandberg, 2004).

In 1970 and 1971, a state-owned company, Imatran Voima (IVO, and today called Fortum), made a contract with a Soviet vendor to build two VVER 440MW plants in Loviisa. However, multiple design changes were implemented, many of which involved western technology and suppliers. The beginning of the Loviisa project opened the way for another Finnish nuclear project: a company formed by large electricity users of the Finnish industry. The new company, Teollisuuden Voima Oyj (TVO), started a project to build western-designed nuclear power plants in Finland. Asea-Atom (now part of Westinghouse) from Sweden was selected in 1974 as the turn-key supplier of the two boiling water reactors in Olkiluoto. The Loviisa units 1 and 2 were commissioned in 1977 and 1980, and the Olkiluoto units 1 and 2 in 1978 and 1980, respectively (Reiman et al, 2011).

The pioneering work in the construction of the Loviisa nuclear power plant in the 1970s built strong nuclear engineering competence into the IVO construction company and started nuclear related projects in the VTT Technical Research Centre of Finland and in other industrial organisations in Finland (Sandberg, 2004).

The new Nuclear Energy Act, which included high-level safety rules for nuclear power plants and a strengthened legal status for the independent safety regulator, was published in 1987, ten years after the start of the first commercial nuclear power plants (NEA, 2008). Application of the nuclear law established a practice of continuous improvement of safety, including technical safety modifications of the four operating nuclear units in Finland. Severe accident management strategies and technical and procedural improvements were implemented, for example, and validated into the enhanced design basis of Finnish operating units in the 1990s, well before the accident at the Fukushima Daiichi nuclear power plant (STUK, 2019b).

Finnish operating units are widely considered to perform well. High load factors have been achieved and few significant operating events have occurred (STUK, 2019b).

Recent developments in the Finnish nuclear domain

After starting the four operating nuclear power plants between the years 1977 and 1981, the two Finnish operators started to work together on the joint nuclear projects for Finland 5 (the fifth nuclear power installation in Finland). These projects were stopped first after the Chernobyl accident in 1986, and a second time in 1993 because of a loss in the final voting on a Decision in Principle in Parliament.

However, in May 2002 the Finnish Parliament voted and approved the government proposal to issue a positive Decision in Principle for a new nuclear power plant to be built by TVO. TVO thus began the Olkiluoto 3 project (STUK, 2019b). TVO initiated a contract for the European pressurised reactor with the Framatom-Siemens (Areva) consortium in 2003, and the construction licence of Olkiluoto 3 was issued in February 2005. The lack of recent construction experience on the part of all the parties involved and the inadequate maturity of the detailed design when starting the construction made the Olkiluoto 3 project challenging from the beginning, with the project now more than 10 years behind its original schedule. OL3 was granted an operating licence in 2019 but the date for starting the commercial operation has, as of the release of this report, yet to be determined (also see Ruuska et al., 2009).

Fennovoima is a new company established in 2007 with its partner of early years the German utility E.On. In 2009, Fennovoima submitted an application to the government for a Decision in Principle, seeking a decision on a power plant with 1-2 reactors and naming Toshiba or Areva as the plant suppliers. The company has faced many changes throughout the years. In 2014, a supplemented Decision in Principle was approved in Parliament, granting Fennovoima a licence to proceed with Rosatom as a plant supplier. Fennovoima submitted an application for a construction licence in 2015, and the licence application is being supplemented in the years following this application (Fennovoima, n.d.).

Low electricity prices in the Nordic market have put pressure on nuclear power companies to strive for even further efficiency in operations. At the same time, ongoing organisational challenges continue to exist, including struggles with knowledge transfer to a new generation of workers, with managing the multinational supply chains of large projects and ramping-up the entire Fennovoima Hanhikivi Unit 1 project organisation (see STUK, 2019b). Challenges have sparked conversations about regulatory approaches and the financial viability of the nuclear industry.

Nuclear waste management

Finland has a well-developed system and infrastructure for nuclear waste management. Licensees are directly responsible for the planning, implementing and financing of waste management, including disposal. In practice nuclear power generation sites have radioactive waste conditioning, storage and disposal facilities in operation. For spent fuel, interim storage capacity at nuclear sites is

adequate until the end of the planned lifetime of the facility. Posiva, a venture jointly owned by TVO and Fortum, is now on the way to constructing the first operating, deep geological disposal facility in the world for high-level waste. (STUK, 2019b).

Preparations for waste management began in the 1970s during the construction of the first Finnish nuclear power instillation. The main principles for waste management (responsibility, financing, R&D) were decided by the government in 1978. The Loviisa site had an agreement to export spent fuel to the Soviet Union. Olkiluoto did not have a similar export option, and the government decided to grant the first operating licence in 1978 to Olkiluoto for only five years because TVO did not have an adequate plan for spent fuel management. This laid the bases for the 1983 government Decision in Principle for a waste management strategy. Through that decision, the government set the policy, strategy for progression and the timetable for waste management. In practice, the decision required licensees to construct low- to intermediate-level waste (LILW) disposal facilities and set time schedules for the development of spent fuel disposal facilities. In accordance with this decision, TVO and Fortum constructed LILW disposal facilities that began operating in 1992 and 1998, respectively (Sandberg, 2004).

As indicated above, Posiva has been responsible for the development of a spent fuel disposal solution. The disposal concept is originally based on the Swedish design (KBS-3) and later Posiva and the Swedish Nuclear Fuel and Waste Management Company (SKB) continued developing the design. The site selection process was started in the 1980s through nationwide screening. The screening progressed in sequences, ending with a Decision in Principle application proposing Olkiluoto as the disposal site. Posiva has, in parallel been progressing in disposal development in accordance with the 1983 government decision. The disposal site was selected in the year 2000, and the construction licence application was submitted at the end of 2012. After receiving the licence from the government in 2015, Posiva, as mentioned above, is constructing the first operating disposal facility for spent fuel. The goal is to start operations for both the encapsulation and disposal facility in 2024.[1]

1. See www.posiva.fi/en/final_disposal#.XckkFOQ7Y2w.

The methodology of the Country-Specific Safety Culture Forum

Purpose of the forum

The concept of the Country-Specific Safety Culture Forum (CSSCF) was developed jointly by the Nuclear Energy Agency (NEA) and the World Association of Nuclear Operators (WANO). The CSSCF was created to provide countries with a platform that would allow their nuclear communities to exchange on how national attributes can influence nuclear safety culture. This exchange takes place in an environment where experienced individuals from the country's current licence holders, licence applicants and regulators can discuss and assess which national attributes can influence safety culture.

The CSSCF is designed to be tailored to each country's needs, practices and circumstances and is generally expected to be conducted in co-operation with the nuclear safety regulator of the host country, which bears the costs associated with the exercise. The forum is designed to create an informal atmosphere, and this approach contributes to the open dialogue.

CSSCF Finland was held in Helsinki in March 2019. Participants had clear instructions to share information in their personal capacity rather than as a representative of their organisation or of their position. It was important to underline that although participants were not contributing on behalf of their current organisations, the character of this forum was nonetheless devised to bring together the Finnish nuclear community – including nuclear plant operators, industrial companies and nuclear safety regulators – in one place to exchange ideas, perspectives and experiences. Doing so in effect highlights the common responsibility of all actors to pursue enhanced nuclear safety.

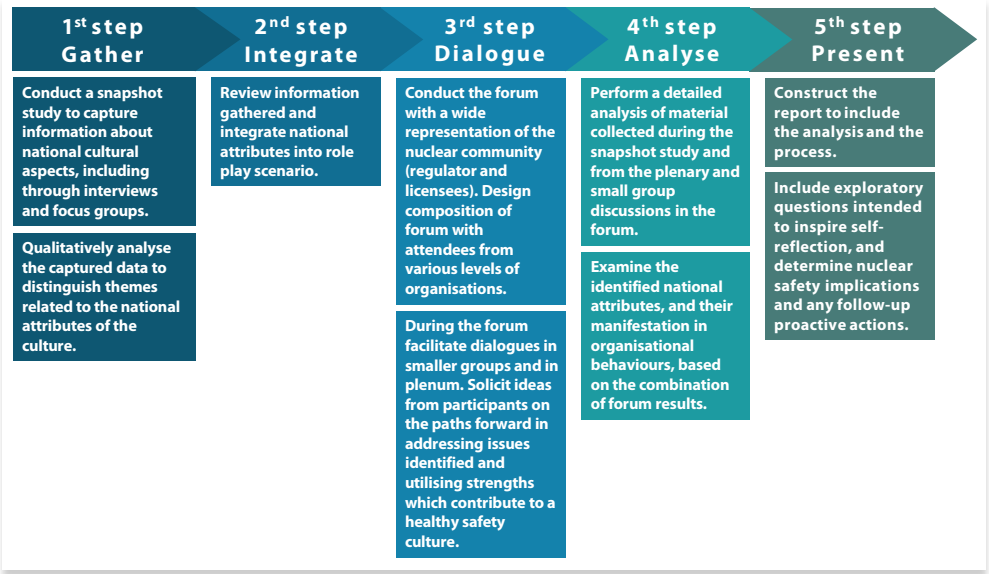
The organisers have noted that conveying the relationship between the national attributes to the [safety?] culture of an organisation is not an exact science. As such, there may be major cultural differences even within a country, which may be related to geographical locations, social-economic class, ethnicity, political orientation or profession. A CSSCF is not an exercise intended to reach rigorous conclusions about the given culture, but a platform for discussion and reflection for the participants and a reference for organisations that wish to take further steps to improve their nuclear safety cultures.

Conducting CSSCF Finland

The programme for CSSCF Finland was developed by a team consisting of representatives from the NEA, WANO and the Finnish Radiation and Nuclear Safety Authority (STUK).

The structure of the CSSCF methodology consists of six steps (as shown below in Figure 3).

Figure 3: **Structure of the CSSCF methodology**



The CSSCF team conducted multiple interviews with experts and leaders in several nuclear organisations and held focus groups comprised of individuals from various levels of organisations within the Finnish nuclear community. This process is known as the CSSCF "snapshot study". This data gathering effort was performed in 2018 to develop and gather insights into Finnish national attributes relevant to the nuclear safety culture. Finnish nuclear organisations that participated in the snapshot study included:

- Fennovoima Oy, a consortium of industrial and energy companies, which has initiated a nuclear new build project for a new nuclear power plant at the Pyhäjoki site in Finland.
- Fortum Power and Heat Oy (Fortum) was included via separate focus groups between the plant operation organisation at the Loviisa site and the internal engineering expertise organisation that supports Loviisa operations, as well as the co-owned units in Sweden.

- Posiva Oy, which is an expert organisation responsible for the final disposal of spent nuclear fuel.
- Teollisuuden Voima Oyj (TVO), a non-listed public limited company, which owns and operates two nuclear power plant units, Olkiluoto 1 and 2, and is building a new unit, Olkiluoto 3, in Eurajoki, Finland.
- STUK, the national nuclear safety regulatory authority of Finland, with responsibility for ensuring the safety of nuclear activities, including the construction and operations of nuclear power plants, and radioactive waste disposal.

In each organisation, the groups interviewed included non-management employees, mid-level managers and some mixed groups. In addition, senior level managers from the four participating organisations were interviewed individually. Interviews and focus groups included questions about what behaviours are generally considered "typically Finnish", and the facilitator or interviewer subsequently narrowed the focus gradually over the duration of the discussion from the national to industry level, and then to the organisation level and ultimately to the level of individual behaviours within a working-unit/micro-group.

The results of the snapshot study were used to adapt a role-play script based on a WANO-generated scenario of an operational event. The event is based on an actual nuclear power plant incident, and the CSSCF team infused the scenario with Finnish attributes that were identified in the course of the snapshot study.

The programme ran over a period of two full days. Approximately 50 individuals from the Finnish nuclear sector participated, including staff and management from licence holders and licence applicants in Finland – Fortum (licensee of Loviisa 1 and 2) TVO (licensee of Olkiluoto 1, 2 and 3), Posiva (licensee of the spent fuel repository), Fennovoima (licence applicant for a new nuclear power plant), as well as staff and leaders from the regulator, STUK, and Finland's Ministry of Economy and Employment. In addition, seven international guests were invited to contribute their perspectives. The forum was held in Finnish with simultaneous interpretation in English.

The forum began with observations provided by author and lecturer Andre Noël Chaker, who provided a humorous and culturally insightful monologue. Participants were then separated into six break-out groups, each consisting of representatives from participating organisations. Each group included a designated participant as facilitator and a note-taker from STUK.

Finnish cultural aspects were interspersed in the context of nuclear safety through a presentation made by Pia Oedewald, Principal Advisor from STUK. This context provided insights into Finnish perceptions and behavioural patterns and their role in the establishment of laws, organisational structures, education and technology. The presentation set the stage for the subsequent role-play exercise.

Several participants took on the roles of the characters in the scripted role play, which was set at the offices and facilities of a nuclear power plant. The role play, which was conducted in the plenary sessions of the forum, consisted of seven scenes organised into three acts. The scenes present the story of how decisions made by the company head office and how projected attitudes impact actions taken during a power plant refuelling outage, which, ultimately, result in a significant nuclear event. The scenes were designed to highlight the Finnish context and stimulate discussion.

After each act, the participants joined assigned break-out groups to discuss and consider the influence Finnish national attributes may have on the events that occurred in the play. The break-out sessions were designed to encourage reflection and cross-organisational dialogues and were guided by a series of questions prepared by the CSSCF team. The questions were intended to extract perspectives on the national context without leading participants to any designated conclusions.

The break-out dialogues held after each act were recorded by the note-takers. These recorded notes, as well as information provided through the focus groups and interviews conducted prior to the two-day forum, provide the basis for this report.

The feedback received from participants indicate that the forum was generally a positive experience and that it prompted contemplations on the national context in a more precise manner, stimulating discussions among all forum participants and role players. The participants were willing to engage in discussions that reflect on the safety culture from the Finnish perspective notwithstanding their different positions and organisational affiliation. Focus group participants and management interviewees were fully engaged in providing answers. The same level of interest was demonstrated during the two-day forum. The forum attendees were open in sharing their reflections on both positive and negative experiences related to safety culture within the Finish nuclear community.

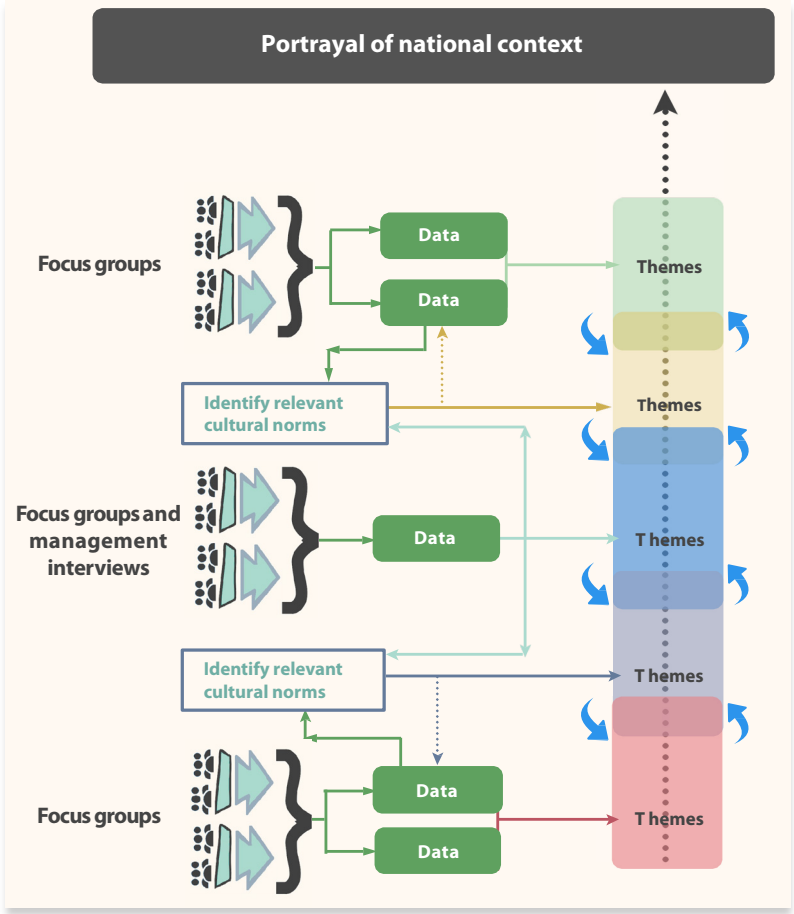
Analysis

The information gathered via the snapshot study and the forum was used to perform a qualitative thematic analysis. The following three iterative steps made up the analysis, as described in Figure 4:

- collection of material from interviews and focus groups, examination of data and identification of cultural traits;
- thematic analysis of cultural facts;
- design of an overall illustrative picture of the national context that may influence safety.

Figure 4: **Snapshot study analysis process**

Through interviews and focus groups



When collecting the information, the observations shared during interviews and focus groups were not ranked or compared but rather examined to identify trends and themes, and to gather perspectives. The two-day forum yielded more data, which was also analysed in the same manner. The combination of the analysis of data gathered and the process of conducting the snapshot study represents what this report will refer to as the "Finnish context".

It is important to not only focus on the national attributes and observations identified during the CSSCF Finland, but also to provide the inspiration for future dialogue and discoveries. The present report therefore includes a matrix of questions to help explore further how the national attributes correlate with and influence organisational behaviours.

Safety culture in the Finnish context: Observations from CSSCF Finland

Introduction

The snapshot study and the two-day forum provided insights and details regarding Finnish national attributes. These national attributes are common themes that may manifest in various organisational behaviours.

The outcomes of Country-Specific Safety Culture Forum (CSSCF) Finland do not represent a comprehensive study of the Finnish culture., The main goal of the CSSCF is to start a continued national dialogue on how the cultural features identified can influence nuclear safety.

The role play enacted by participants during the forum fuelled conversations during which participants asked themselves what behaviours are common in the Finnish nuclear community. The conversations during the forum were limited to the context of normal operations and day-to-day management, and did not cover accident conditions.

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

Participants in CSSCF Finland also expressed that organisational culture may differ significantly within the Finnish nuclear community and even within the same a nuclear organisation depending on the part of the organisation or possibly the geographical location.

Finnish national attributes highlighted during CSSCF Finland

In elucidating the subtle and explicit ways that behaviours and the underlying attitudes of a national culture can influence organisational behaviour, it is important to identify cultural features and explain how they manifest.

The material gathered during the snapshot study of operators, licence holders, licence applicants and regulators highlighted themes relevant to nuclear safety and core values in Finnish society. These core values were

> The cultural background and nationality of the personnel and management has a great effect into the organisational culture, and into decision-making and communication models as well as into trust and autonomy levels.

repeated in the majority of the conversations, and they manifested in various ways in different organisations. Many of these core values and basic assumptions are linked to each other.

Trust (credibility and expectation of honesty)

A fundamental value of being Finnish is the intrinsic practice of believing others without complete verification that it is indeed a true statement, which is the basic definition of trust. This can, however, place one in a vulnerable state since it runs the risk of the trustee being unreliable. Finns commonly have the assumption that other Finns are trustworthy by default. The snapshot exercise highlighted that a verification/monitoring of daily work may not be a formal or structured practice because everyone is trusted to give their best effort and carry out their work in a way that meets the set targets and requirements. Specialists are trusted in their areas of expertise. It was already known that there is generally a high level of trust in governmental authorities, but a great deal of credibility is given to colleagues, co-workers, managers, processes, rules and systems. Accompanying this trust of others is the desire of Finns to be trustworthy.

One example that was given that illustrated how trust affects the environment in the Finnish culture was the fact that when someone needs to take sick leave, it is unnecessary to provide proof of being sick. Typically, Finnish people have great trust in others – ranging from their neighbours to Finnish institutions. A statement by a well-known, honourable person also carries importance as it relates to trust. It is expected that if someone promises to do something, because of the degree of honesty he or she will keep the promise to maintain trust.

It was also recognised in the snapshot study that even foreign workers in the Finnish nuclear community recognise that the Finnish value placed on trust is higher than in many other societies. During the discussions, it was suggested that due to the population of Finland there are small networks in which honesty is valued so much that actions are based in the desire to not lose trustworthiness.

During the two-day forum, break-out groups discussed the subject of trust, and the fact that it is not dependent on the position or title of a particular person within an organisation. Participants of the forum shared that although generally thought of as a strength, it can also be considered a weakness since there is often a “blind trust” in experts and in processes, which results in a lack of curiosity and of a questioning attitude. Some of the concerns that were associated with “blind trust” were that it may result in a limitation to a single viewpoint. Although it is apparent that the importance of trust is prevalent, it was also revealed that it takes very long to earn trust and that the work history of someone may affect how much trust they should garner. In dealing with an international workforce, it was also shared that the trust of Finns can also be abused. There may be an expectation of honesty that accompanies trust, but this can create a situation where this tendency to trust can be taken advantage of, particularly by those who are not from the Finnish culture. Participants generally agreed that verification and oversight are necessary for ensuring a healthy safety culture.

Technical rigour (emphasis on pragmatism, facts and science)

Often repeated throughout the snapshot study and the forum break-out groups was the value placed on the ability to understand and present facts and theories in technological areas of expertise. This attribute was also related to trust in the discussions during the forum. CSSCF participants stated that presentations that relied heavily on facts garnered trust. Participants also noted that to engender confidence and respect from the audience, a presenter should be clear that the views expressed are based upon facts rather than on opinion. Respect for engineers and investment in their education gives historical and social context when examining the respect for technical rigour within the Finnish culture. Along these same lines, trust in Finnish engineering skills and technology is high in the nuclear community because of the reverence for technological competence. General optimism prevails concerning the evolution of technology and continuous improvement as a source of new solutions for potential problems.

In Finnish society, there is an emphasis on fact-based argumentation . The expression of emotions in the work context is not encouraged so as to focus on logic and factual statements. It is common for the Finnish to strive for understanding the big picture before going into details. This is driven by a general expectation of success from the very beginning. There is also a need to ensure that the views expressed by a person are steeply based in fact and not emotion. This is also related to the importance of logic and reason.

Another related theme that arose during the forum was that of rigour and thoroughness. Closely tied to the emphasis on technology and facts is the importance of rigour as it pertains to accuracy. Participants discussed how the approach to tasks and problem-solving should be as thorough as efficiency allows. It was noted that the typical Finn works thoroughly and ensures that no technical mistakes are made in his or her area of responsibility.

Solution-oriented approach (emphasis on efficiency and proactive planning)

It was noted during the forum that the pervasive manner of working throughout Finland was with a focus on being solution-oriented. The discussions during the break-out groups in the forum repeatedly noted that Finns do not easily give up when working to solve a problem Finnish people do not often raise a problem without having previously considered the solution to the problem. It is a common perception that Finns enjoy tackling problems and attempting to fix them, although issues are not commonly raised simply for enjoyment.

From the snapshot study, it was found that problems addressed in nuclear business are approached with the same drive for a solution, which should be worked out collaboratively, although not always by complete consensus. The attitude is focused on finding a solution, even in political settings.

As challenges often require planning in order to achieve a solution, the characteristic of planning has been paired with that of being solution oriented. Challenges that occur in the nuclear industry are often resolved or prevented by proactively planning a solution. The Finnish cultural feature of having a tendency

to plan and be proactive is evident in the nuclear energy context, which is reflected in early annual maintenance planning. Planning and preparedness are a national trait: first make a plan and then progress, or advance, according to the plan.

While it was expressed during the forum that Finns are solution and performance oriented, performance is considered in the guise of efficacy. In the nuclear industry, this includes the way that risk analyses are used to determine the optimal decision in terms of efficiency and effectiveness. It is common practice when considering alternative options to use risk analyses, which inevitably factor into nuclear safety, not only to come to a decision but to come to the best solution. Additionally, precision and rigour, as discussed above, are prevalent and can be seen in the maintenance schedules, which are once again tied to the cultural value of keeping one's promise – a foundational aspect of trust.

Personal responsibilities (desired autonomy and Finnish pride in quality work/integrity)

Similar to the relationship that Finnish people have with rules and regulations, their appreciation for autonomy has also been shown to be important and is related to the notion of trust. Autonomy requires trust and competency. Finns appreciate overall guidelines and a specific target, but they also desire autonomy when making operational decisions regarding their work and execution of the tasks that they are entrusted with. Finnish organisations are structured to grant staff freedom to plan, execute and manage daily work in their area of expertise, because staff are trusted in their areas of expertise.

It is common in Finnish society for people to achieve their goals and completely address their challenges alone, preferring not to ask for help. It could be perceived as a weakness if an individual does not have enough patience, courage, power and endurance – in Finnish "sisu" – to overcome obstacles on their own. This has an effect on workplaces in Finland, including those within the Finnish nuclear community. It was expressed during the snapshot study and the forum that experts commonly take holistic ownership of their job. It was also revealed that managers do not always consider it necessary to check the work of the experts and examine how they complete their tasks. This would be considered micro-managing and overbearing, and it would result in demotivation on the part of staff. If managers engage in this kind of behaviour, it would be considered impolite and convey a lack of trust to employees. Likewise, people are unwilling to intervene in someone else's work, especially if it does not take place within their own area of core competence as it is important to avoid overstepping boundaries as this would upset colleagues. It was reiterated by forum participants that responsibility is an important personal matter in Finland. It is felt that there is no need to intervene if the area of responsibility lies with someone else.

Based on discussions in the snapshot study, it is apparent that if people are willing to take on responsibility and do take this responsibility seriously then they generally set high expectations for themselves. For example, they may take on additional responsibilities when they see an opportunity to improve a skill or

gain knowledge. According to the forum participants, there is a strong sense of constancy when it comes to safety in Finland, and people take their personal responsibilities seriously in relation to their work. The perspective shared by participants was that in practice individuals are able to sort things out and investigate without turning to others for help.

Equality (solidarity and low emphasis on hierarchy)

Another aspect of Finnish culture that was discussed during the snapshot study and the forum was the equality of people on a team regardless of position or background. Age or gender does not determine career opportunities or the value of opinions in meetings. People even address senior executives by first name all the while respecting each other. It was mentioned by CSSCF participants that nuclear organisation managers are completely accessible to workers on a social and professional level. It was repeatedly said that managers eat lunch with everyone and generally welcome those at various levels in the organisation bringing them questions, advice or concerns. Professional competence is valued over other personal factors and empowers people to provide suggestions to managers.

Participants highlighted that appreciation should be earned, and managers should show competence and capability to work hard for shared results. In Finland, people expect managers to treat their subordinates equally and respect their privacy and personal space in order to maintain credibility and respect. A key aspect of solidarity and equality in Finnish culture is that people are appraised for their personal performance and acknowledged for achievement of shared goals regardless of their background or position/title within the organisation.

During the snapshot study and the two-day forum, it was stated that it was not a cultural norm in Finland for someone to act as if they are better than others. Touting one's value or expertise is unwelcomed and considered rude in the Finnish tradition. Modesty is a virtue in Finland, and according to an old Finnish proverb: "Being modest makes you beautiful." This type of norm contributes to a level playing field and to solidarity among people. It was reiterated among participants in the forum that hierarchy is not emphasised as important to a healthy organisational atmosphere. An example given in relation to equality in Finnish society is that in 2018 Finnish president sat in the stairs of a conference room during a literature panel discussion because all of the seats in the large room were already reserved.

This low emphasis on hierarchy and unofficial connections make it possible for informal professional networks to exist in the Finnish nuclear community. These networks are based on trusted relationships between small groups with commonalities, such as people who may have studied together and started work together even though they may not be at the same level within their respective organisations. These networks contribute to a collaborative atmosphere within Finnish organisations.

Respect for and adherence to logical rules (need for clarity and order)

Another deep-rooted national attribute in Finland is the reverence for and adherence to rules. Finns respect the authorities and trust that they work with good intentions and serve the overall good. The perception is that Finnish authorities are open to discussion and approachable, and yet they remain strongly independent in their operations and decision making.

The general perception is that Finnish laws and regulations are reasonable and have a clear purpose. Although it was emphasised in the focus groups and interviews that doing the right thing is valued in Finnish society, the discussions uncovered that this is applicable because the laws and rules are considered logical, and not just because Finns like to follow rules. The existence of these logical rules is also related to trust in that people generally trust those who make the rules and regulations. It was mentioned in the snapshot study that Finns don't like unclear or illogical rules. This attribute is also related to the emphasis on facts and pragmatism. For example, a Finnish person is likely to be upset if repeatedly urged to follow a rule that is illogical in his or her mind, even if that person continues to adhere to this rule.

Finnish communication style (tacit, straight forward, transparent, quiet, honest)

During the break-out discussions at the forum, as well as during the snapshot study, people acknowledged that the manner of communicating in the workplace is generally concise and tacit in Finland. The discussions provided valuable insights into the different aspects of this communication style in the context of the nuclear sector. These discussions touched upon how the combination of this concise and tacit communication style alongside other relevant cultural traits may influence behaviour in the nuclear community. For example, because people strive to relay information succinctly and directly based primarily on facts, these people feel that they can trust that they are not getting information which has been influenced by emotions.

The communication style in Finland is also related to the solution-oriented attribute of Finnish culture in that the desire is to be efficient on all aspects of behaviour in the work environment. During the focus groups, it was stated that the value of efficiency when conversing is so high in social and business settings that it is common practice to attempt to save time when communicating. It was also shared during the forum that this more reserved way of communicating can lead to people not expressing all of their thoughts on a topic, and the recipient of the communication not being fully aware of the other person's perspective. This was mentioned in relation to the decision-making process and to communication that may occur from management to technical specialists. It was shared by participants that the management may not feel as if they need to share more information than necessary with others in the organisation, and this could lead to a misunderstanding about the exact basis of the decisions made. Communication of decisions and the logic behind them is considered weak and lacking by employees if it does not include facts. Arguments may start when issues are not

discussed properly with ample facts and logic. On an organisational level, when the communication is terse, it may cause what participants described as a "tall poppy syndrome", in which rumours begin to circulate indicating that those in the upper management levels of the organisation are not well aware of what is occurring in the lower levels of an organisation.

As stated above, the communication style in Finnish culture avoids overly emotional expressions. Although most interactions are informal, forum participant shared that Finns do not typically engage in conflicts, especially emotional ones. Forum participants described a tendency to withdraw from the conversation if tempers flare since it is not considered to be efficient. Someone losing their temper may be considered unprofessional and discussions would not continue in this case.

The communication culture in Finland may also be influenced by local geography. An example given during the forum, in the focus groups and managerial interviews, is that the eastern areas in Finland have a more open social atmosphere, and occupational competence is seen to be based on formal communication skills. In western Finland, competency may be shown by waiting until there is something substantial to add to the discussion and sticking only to verified facts.

Manifestation of Finnish culture through the organisational behaviours in nuclear organisations as identified during CSSCF Finland

The following six, principal areas, reflected in discussions during the CSSCF Finland process, are explored in the present report to demonstrate the manifestation of national attributes via organisational behaviours concerning:

- decision-making;
- freely raising concerns, exercising questioning attitudes and providing feedback;
- responsibility for safety (sense of ownership/accountability);
- control and follow-up;
- work planning;
- leadership.

A description of how these national manifestations appear in Finnish nuclear organisations follows, but it should be kept in mind that these reflections are not absolute truths and should rather be viewed as inspiration for further reflection.

Decision making

Decision making in Finnish nuclear organisations was described from several perspectives during this project, including technical experts, managers and high-level directors participating in the forum and the snapshot study. The decisions

described during the snapshot study were portrayed as straightforward, and any challenges associated with the decisions were explored with the time allotted for open discussions relative to the importance of the challenge. This may present a challenge when the decision is time sensitive. It was recognised by the CSSCF participants that the varying approaches to decision making are determined by the maturity of the organisation and the influence of the national traits.

The values of honesty and truth also have an influence on the decision-making processes as described by CSSCF participants. Participants indicated that the abundance of trust and confidence among people who are involved in a decision-making process may result in the creation of cliques and factions where each group believes in its "truth". Since truth, honesty and trust are a cornerstone of the Finnish culture, people are trusted, and various versions of the truth are trusted. Despite an initial agreement to come to a consensus, if everyone is confident that they are presenting the most accurate and truthful perspective, it can result in a delay of the decision-making process. It was expressed during the forum this example is perceived as an abuse of everyone receiving a high level of trust.

The low emphasis on hierarchy also had a pervasive influence on the decision-making practices within the Finnish nuclear community. When a decision is required and an expert has input, the decision does not need to be escalated through the management chain. Additionally, it was noted from forum participants that instead of only high-level management making technical decisions, operating facilities have meetings with various levels of employees, including subject matter experts not in leadership positions. It was mentioned in the snapshot study that decisions are sometimes taken outside the official decision-making setting, for example in preliminary meetings, at the coffee corner or in other informal situations. Although the traditional practice of negotiating and making difficult decisions in sauna meetings is no longer carried out, possibly because many managers and directors in nuclear industry are now women, the spirit of having open discussions without external pressure and symbols of power remains. It was pointed out in the snapshot study that that some decisions are prepared based on conversations taking place in unofficial meetings of the previously described informal networks. Sauna meetings were also mentioned during the snapshot study as an example of informal interactions, although they are rarely practised in modern times.

Decisions in Finnish organisations are expected to be based on facts and to be in alignment with technological proficiency. Everyone is encouraged to present facts based upon their specialty, and the views of experts are taken into consideration while preparing decisions. During the snapshot study, participants stated that decisions should be based on accurate knowledge, taking into account a comprehensive perspective of the issue. This focus on technology and facts has been integrated into the decision-making processes developed in various organisations as stated during the forum. When discussing the scenario presented during the forum, it was noted by the participants that decisions related to the operating mode are not easily changed before emerging issues are resolved. The practice is to consider the facts as they unfold and to take actions in parallel and not to make irrevocable decisions in haste. This reflects the

importance of fact-based behaviour and not making decisions until credible facts are discovered and verified. This fact was further illustrated by forum participants describing the environment in Finnish organisations as a safe space to solve topical issues because the focus is on strong facts. However, it was also mentioned in several organisations that high-level safety responsibility issues are managed and decided in one part of the organisation, but which departments were involved in the decision was not always clearly communicated, nor whether a comprehensive approach was taken. This may result in the decision made not being based on the "big picture" based on facts gathered from the entire organisation but instead on the facts deemed most important in the select and sometimes unknown departments and not throughout the organisation.

Forum participants revealed that it is typical to consider multiple alternatives when making decisions instead of quickly going with the initial option without thoroughly discussing all options. Alternatively, it was also expressed that in efforts to achieve efficiency, the first few initial steps towards a solution are taken quickly before a thorough analysis is complete. Decisions involve examining possible consequences, as well as exploring the background and the reasons behind the decision and an explanation for why the decision has been taken. This approach may be the influence of not only the solution-oriented characteristic of Finnish people but also of the importance of logic in Finland as described by participants in the forum. It was also noted many times that Finns are not easily deterred from finding a solution such that in a decision-making process the search for the best solution may delay the decision without exact procedures or parameters.

Freely raising concerns, exercising questioning attitudes and providing feedback

In an organisation with a healthy safety culture, there should not be a great deal of trepidation associated with raising concerns. Information gathered from the snapshot study and the forum indicate that people within the Finnish nuclear community are comfortable saying that something does not make sense. This behaviour is the manifestation of the traits of trust, and the emphasis of adherence to logical rules.

Discussions during the forum confirmed that hierarchy is not a hindrance for people voicing a perceived problem at any time. Forum discussions revealed that not only would it be common for people to voice their opinion but to defend their views without fear of retribution. Participants maintained that this is evident throughout the various levels of organisations, adding that people are not "sheep" who blindly follow their leaders. It was agreed by forum participants that issues would be raised by people even if they were contradictory as long as they had a technical or fact-based foundation. This was linked to the sense of solidarity among workers and the strong job security typically found in Finland. The forum discussions also revealed that such issues are typically not treated with indifference. It was stated during the forum that the Finnish communication style and tendency to avoid conflict would keep the discussion short, direct and objective – and the discussion would likely stop if emotions flared up.

It was stated in the snapshot study that the feedback given in the Finnish nuclear community could be perceived as very critical and negative. The desire for autonomy manifests in the perception of how well feedback is given and received in the Finnish nuclear community. During the forum, some participants expressed the view that it is difficult for feedback to be given freely. Because the low emphasis on hierarchy in the national context makes it easy to call things into question when interacting with managers at all levels, feedback is often phrased in the form of a question to gain more details and understanding. It was stated during forum discussions that national pride manifests in how feedback is received from external sources. This commonly facilitates an attitude that the Finnish "know better" in terms of what works in the national context, than the feedback and insights presented by an international organisation such as the World Association of Nuclear Operators (WANO), for example.

Forum participants expressed that it is difficult in the Finnish nuclear community for people to analyse their own actions. This was explained during forum discussions as stemming from a strong desire to be absolutely sure of one's perspective based on fact, as facts and science are tied to the level of expertise. When feedback is given, therefore, instead of the person receiving the feedback analysing his or her actions it could be perceived as a negative judgement concerning his or her level of expertise. The person receiving the critique may thus not judge their actions constructively. Comparably, it was also stated that it is difficult at times to give feedback.

The input from forum participants illustrated a concern that misunderstandings could arise and a person could be put in an unpleasant position, and so the solution is sometimes to abstain from giving feedback. The example of a technical presentation was given during the forum, where it may be difficult for presenters to receive constructive criticism since it could be taken as an accusation that the content and perspective was not fact-based. There may also be a desire to avoid conflict at times. This is a reflection of the communication style prevalent in Finnish national context at the workplace, along with the national trait of emphasising facts and technology. Such challenges in receiving and giving feedback could create an environment where there is an absence of debate or questioning, and where people may not be challenged enough.

Responsibility for safety (sense of ownership/accountability)

It has been agreed in the international normative frameworks referenced previously in this report that personal accountability is essential for an effective safety culture. As with many other behavioural artefacts, language is an important cultural vehicle, and it should be noted that there is no direct translation for accountability in Finnish. As described by forum participants, it could be challenging to communicate the concept of being held accountable as a result of this language barrier. At the same time, it was shared that behaviour does demonstrate the practice of accountability although the verbiage used is different. It was shared during the snapshot study, that a strong sense of responsibility and accountability exists without explicit requirements. Forum participants shared that it is difficult to recognise how and when accountability relates to a person's authority. The manifestation of national traits is thus

presented in this report with nuance, focusing on how the participants of the forum and the snapshot study described the associated sense of ownership, which is a much clearer concept in Finnish culture.

Behaviours associated with a low emphasis on hierarchy and autonomy are major influences on the sense of responsibility that permeates the Finnish nuclear community. The effect that equality has on responsibility was evident in the interactions and experiences that forum participants had with plant supervisors. More specifically, this was noted in the descriptions of a typical shift supervisor of an operating plant. Participants indicated that a typical shift supervisor would personally consider the facility as his or her own domain, and that it was important that everything go well. Additionally, forum participants also described the staff of the regulatory body as having individual responsibility and accountability for exhibiting behaviours that set the standard for safety.

The national trait of autonomy in Finland includes professional pride and the sense of being confident in one's abilities to perform tasks independently with ample expertise. This sense of autonomy and pride sometimes leads to people feeling an excessive amount of competency to complete the tasks in one's area of expertise and take care of all responsibilities safely. The forum participants shared that it is usual typical for Finnish employees to take responsibility for their own area of work, including experiencing guilt for mistakes. Although a sense of guilt may be common, the snapshot study and the forum generally described the environment as one where mistakes are perceived as learning opportunities. However, some thought that the attitude in which human errors are communicated could use some improvement. It was expressed during the snapshot study that it is not common place to perform investigations with the main objective of pinpointing a person as the source of a problem. According to information gathered during focus groups and the management interviews for the snapshot study, managers strive to ensure an environment without blame. People still blame themselves, and typically in Finland, because of pride, making a mistake can still feel as if you are being blamed since everyone wants to be an exceptional expert. Another perspective shared during the snapshot study was that the way a person perceived the consequences of a mistake depends on the severity, criticality and the importance of the issue.

Control and follow-up

As described in the snapshot study and during forum discussions, it was clear that the practice of following up on decisions and the assignment of tasks was one that exists in a small nexus between effective leadership and individuals' sense of responsibility. Although there is no issue with people taking responsibility, there is a resistance to conflict and awkward situations, as described during the forum. As previously stated in this report, there appears to be an underlying reluctance to engage in emotional conflict in the Finnish workplace, which may affect the frequency of following up after a decision is made or after tasks have been assigned. The national traits of expecting honesty/trust and autonomy/pride manifest themselves in this behaviour. Responsibility is preferably taken individually and independently. Additionally, it was shared that the default of trusting that tasks will be completed may hinder

follow-up actions. Forum participants also said that there is no need for a manager to follow up since this would be perceived as micro-managing. In Finland, it is generally considered unnecessary to intrude into another person's area of responsibility and expertise.

The decision to follow up was described in the forum as a manager's prerogative and not uniform across organisations. Although follow-up actions may not always be carried out, the trait of respecting rules does manifest in the practice of follow up mainly because of an awareness of the influence of autonomy in organisational behaviour. It seems that the way to ensure work is completed after the assignment of tasks, while at the same time avoiding awkward situations, is to have a formal system in place. The processes for follow up that are in place at some organisations are based on the results of the work assigned and organised according to the subject areas. In some organisations, as a result of procedures, meetings are summarised and everyone agrees and understands what is supposed to be done, with a task list and time scheduling for the next round of meetings provided – all of which is revisited. An example of a formal process was given via the description of the internal inspection system within the regulator, which has follow-up actions incorporated into the processes. Even with rules in place, there remains a challenge in having immediate conversations after decisions and how to be clear in communications concerning the progress of tasks over time.

Work planning

As outlined in International Atomic Energy Agency (IAEA), Nuclear Energy Agency (NEA) and WANO frameworks and publications, it is paramount that the management of work is proactively planned in a deliberate manner while incorporating techniques so as to ensure that nuclear safety is maintained. In contributing to a healthy safety culture, a work management process should include identifying, scheduling, executing and critiquing the actions completed. It is also essential that the entire organisation works systemically to support the work management process. Multiple national traits in Finland manifest in the behaviour associated with this area, including a respect for rules, autonomy and the proactive planning nature of being solution oriented.

During the forum, participants noted that once a decision is made, and once tasks and the associated responsibilities are assigned, all involved have a commitment to the decided direction. Once taken, a decision also creates a common understanding, in that everyone knows what has been determined. It was described as typical that the choices made are clear, and it is uncommon that issues will be left unresolved with no decision taken. Commitment to the decision is expressed through the planning of the necessary tasks in accordance with the common understanding established by the decision taken.

As stated repeatedly throughout the forum and the snapshot study, the tendency in the Finnish nuclear community is to proactively and rigorously plan. As these plans often reflect a fact-based logical approach, they are a manifestation of the national trait of proactive planning and being solution oriented. It was expressed by forum participants and during the snapshot study

that a healthy safety culture was observed during annual maintenance. The planning process allows for open discussion and typically includes production risk and people proposing solutions for any issues that they may have discovered.

It was mentioned during the forum that there is a chance that every aspect within the scope of the discussion may not be addressed. In order to avoid this situation, it is imperative to record alternatives and risks. In a related observation, it was expressed during the snapshot study that since decisions were typically made after discussions, historically people may remember what was decided but people may not recall the origin of the decision. Without an initial logic, there is a challenge in leaders expressing to their departments why they should adhere to certain procedures without documentation.

Having a strict schedule was credited by forum participants as creating a positive safety culture. It was explained that because Finland is a small country with few resources, the precise and rigorous minute-by-minute annual maintenance planning was perceived as having a positive effect on organisations.

Leadership

The snapshot study and the two-day forum demonstrated that the dynamics and interactions among people in the nuclear community illustrate well these national attributes. It was shared during the snapshot study that in Finland a good leader should employ a rigorous approach and proactive planning to reach a goal that has been properly prioritised. It is expected that leaders will not emphasise the minor details and normative methods to reach this goal, which is a means of earning respect as a leader in Finnish organisations. It was also stated that this respect or authority was earned through a demonstration via actions that the technology was understood and key factors have been identified in any given situation.

It was reiterated during discussions at the forum that leaders should be among their workers, and it is imperative that they trust their workers. An example of the relationship with authority, leadership and regulations given during the snapshot study and during the forum was a reference to the novel *The Unknown Soldier* by Finnish author Väinö Linna in which fictional the leader, Akseli Koskela, used a participative management style. It was repeated throughout the CSSCF that workers never feel a need to kowtow and that "yes men" are rare in Finnish organisations within the nuclear community. This is where the cultural characteristic of solidarity and a low emphasis on hierarchy are quite evident. Generally, people respect the leadership/management position without their personal demographic mattering. Another illustration of how a manager should interact with their workers was that managers should be like a lumber jack – "tukkijätkä", who is looking after and helping logs, which are not rolling in the right direction. This idea contributes to a sense of equality because visually a tukkijätkä is also a worker and not a management figure. This was further illustrated when it was noted that if a disagreement arises, the responsibility is not placed solely on the manager to make an operational decision. Instead, there would be a facility meeting at which time the decision would be made.

It was also mentioned that that in Finland the culture does not support leadership by fear, and that over the years the leadership continues to improve, which is greatly appreciated. It was stated that managers should show their skills in work and set a good example in their day-to-day activities. Another illustration of a low emphasis on hierarchy in nuclear organisations was the use of a matrix management structure, depending on the area within the organisations.

The importance of facts and technology described previously are also important factors in leadership in the Finnish nuclear community. During forum discussions, it was revealed that challenges may arise for leaders when organisational changes focused on the human element need to be made. The difficulty stems from situations where facts and technology cannot be directly applied. Several managers in the snapshot study stated that being a manager can be stressful in Finnish expert organisation because of this fact. Additionally, it was noted that a good manager in Finnish culture should also be understanding and empathetic on a human level, but not cross boundaries into the personal life of the worker.

Snapshot study participants said that they valued good communication skills and the social sensitivity of the personnel's expectations vis-à-vis Finnish managers. During the snapshot study, it was expressed that many times a Finnish manager will endeavour to find a good solution and communicate this decision to workers. As discussed in the previous section about the communication style in Finland, if the reasons for the decision are not clearly expressed it could affect the way the manager is perceived. For example, if the decision involves taking specific risks into account, but in conveying the decision these risks are not explicitly stated, it may be interpreted in the rest of the organisation as management acting against the common values previously stated regarding risk and safety.

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

Characteristics of national attributes

National attributes in a vacuum are merely facets of a society, which, when combined constitute the local culture. These traits are neither good nor bad, but their influence could have benefits or challenges to the maintenance of a healthy safety culture depending on the context. An attribute has the potential to manifest in an organisational behaviour in a way that leads to a strong safety culture, but it also has the potential to weaken safety culture. Insight from the Country-Specific Safety Culture Forum (CSSCF) process showed that national attributes generate organisational behaviours that can strengthen safety culture and that may require attention to ensure that the detractions to safety culture are minimised.

International normative frameworks illustrate what is needed to ensure a healthy safety culture. These frameworks can be used as references to frame the national context, but they need to be interpreted and imbedded with respect to the national context, and used as guidance, as opposed to expecting complete conformity without deviation.

This report could be used to further explore how the identified Finnish attributes and their influences on organisational behaviours affect nuclear safety. Table 2 below provides a sample of the various positive and challenging influences that these attributes, individually or combined, have on nuclear safety as discussed during the CSSCF Finland process. The nuances to the influences are discussed in the subsequent sections. In these sections, questions are provided in Table 3 below to support the examination of both the associated strengths and the attributes that require attention in order to ensure safety.

Table 2: **Attributes and influences**

Single attribute	Positive impact	Challenge requiring attention
Trust (*credibility and the expectation of honesty*)	Trust creates an environment of mutual respect within an organisation.	Trust may be extended to parties who are *not* credible, specifically when working with international parties.
Technical rigour (*emphasis on pragmatism, facts and science*)	This attribute provides a thorough approach to problem solving.	This attribute does not yield an optimal approach to addressing challenges presented by the human element.
Finnish communication style	This communication style supports gathering the exact information required to move forward without taking more time than necessary.	With an international workforce, this could cause a misunderstanding as to when there is acceptance or agreement if there isn't prodding for explicit clarification.
Attribute combinations		
Trust + Equality	Candid communication is accepted throughout the organisation.	This combination could possibly lead to subversion of leadership/management direction.
Trust + Technical rigour	The work practices are efficient. An environment is created where people actively seek continuous improvement through technical proficiencies.	
Technical rigour + Adherence to logical rules	The environment has a high procedural adherence.	
Finnish communication style + Personal responsibility		Conflict avoidance may be prioritised, and this could present an obstacle repeatedly questioning when there are unresolved issues.
Technical rigour + Personal responsibility	Competency in various technical areas are easily developed throughout an organisation. Perspectives of experts are highly valued.	

Positive influence of Finnish national attributes on nuclear safety

Trust, equality, strong reverence for logic and autonomy appear to be traits with significant influence on behaviours, according to the discussions during the CSSCF snapshot study and forum discussions.

The CSSCF participants seem to support the view that trusting expertise, voice and work from those across the organisation regardless of their bureaucratic position is acceptable at macro (societal/national), industry-wide, meso (organisational) and micro (group) levels as long as there exists a foundation rooted in fact. The positive aspects from a safety culture perspective could be a freedom to raise and address issues, a rigorous approach to problem solving, which is shared through the organisation, transparency in the decision-making process and high procedural adherence. Problems tend to be addressed by solution-oriented approaches. It also seems that the low emphasis on hierarchy opens communication such that information is shared openly and freely within organisations, as well as between operators and the regulatory body. There is also evidently a strong individual sense of responsibility for nuclear safety. The existence of trust throughout the Finnish nuclear community contributes to an atmosphere of mutual respect of individuals and groups in the various organisations.

The relationship between trust, expected honesty and belief manifests in behaviours in the Finnish nuclear community to create positive aspects of nuclear safety culture. This is not an oversimplified concept of trust in Finnish society, which manifests as people trusting without any further exploration of founding factors. It was stated during the forum and the snapshot study that trust may be the default; however, just like in many other cultures it is easily lost and extremely difficult to rebuild after it has been violated. The expectation of honesty yields a basic belief in how people within this community function; this makes it an environment where people can easily trust each other.

There is a belief that rules and procedures should be, and commonly are, based on scientific facts and sound logic. This encourages procedural adherence and a willingness to follow the rules. There also exists a trust in one's self and in thorough technical competence, which allows pride and autonomy to remain abundant in organisations. It is the trust in science itself and this being the basis for what is and is not a fact that facilitates easily measured competence as it concerns technology. Most trust that plans have considered various inputs, such that the result is accurate and developed with a solutions-oriented approach, which has historically been prevalent through the Finnish nuclear community. It is also important to recognise that the desire for autonomy that exists can be combined with a reverence for facts and technology to contribute to building competency throughout the organisation, such that the perspectives of everyone are valued, especially when it concerns nuclear safety issues.

All of the above aspects promote a sound safety culture in accordance with what the World Association of Nuclear Operators (WANO), the Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA) normative frameworks prescribe. Other aspects of Finnish culture that should be analysed

with caution are the traits of autonomy and pride, which can isolate people during the decision-making process and could affect the efficiency and merit of decisions.

These multiple values may manifest themselves in a willingness to become involved, to take individual responsibility concerning problems and to examine the motivations behind decisions. These values form a good basis for a sound safety culture, by creating opportunities for open-minded group discussions about self-reflection. The forum discussions were a perfect example of this openness.

Potential challenges to enhancing safety culture

A theme that emerged from the snapshot study and forum was that the expectation of honesty, which is the foundation of trust, is evident throughout the behaviours and actions of Finnish people on an individual and organisation level. Over time, it may cause an opportunity for trust to be misplaced in various instances. If there is an overestimation of technical competency, this can lead to trusting in work without follow-up. Without compensation for this lack of follow-up, there could be negative consequences.

Further examination should be focused on how the combination of these traits with the prevalent communication style could also affect the way feedback is given and if follow-up actions are taken because it might result in an awkward situation or in conflict. Therein lies the possibility that although people are free to voice their opinion and questions are not withheld due to hierarchy, because of the reluctance to cause conflict where emotions could flare, direct challenges may be lacking when feedback is given.

As described during the forum, it may be common for a person to state openly that something is not logical, however they would not likely directly challenge the person with the opposing views via constructive feedback. Related to this theme was the concept that emerged from the snapshot study of the desire to maintain a respectful and balanced workplace without conflicts, where everyone is heard and has his or perspective valued. This is an overall positive contributor to a healthy nuclear safety culture. However, the combination of the desire to avoid conflict, along with a taciturn communication style, could be problematic. Although people may not be discouraged from raising safety issues for fear of retribution, the combination of these two traits manifests through a rarity of people repeating their issues, if they are not addressed initially, and not directly challenging others.

Interestingly, it was also expressed as a challenge from a leadership perspective that the low emphasis on hierarchy presents specific difficulties in giving positive feedback and reinforcing good practices. Combining the low emphasis on hierarchy, the communication style and autonomous pride also presents a challenge from a managerial perspective in terms of how best to give feedback without disturbing the solidarity and equality so evident in the national traits. As mentioned, too much interference into someone else's work area from a manager can be perceived as micro-managing if the message is not conveyed in such a way as to highlight that the manager is not imposing his or her position

via a status of "better than" the individual receiving the feedback. This could also exemplify a lack of trust from the manager, which could negatively affect all the various aspects of the Finnish nuclear community benefitting from a strong sense of trust.

Because of the importance of trust and autonomy, avoidance of follow-up can thus become a norm without any further thought. One option to ensure use of the proactive planning trait and respect for rules is to deploy training based in social science and respected studies covering non-confrontational follow-ups and other methods in order to chart the progress of tasks as they are completed. This can also be done concurrently with gathering information via self-reflection activities to gain insight into how best to augment behaviours within the organisation. In this particular case, procedures that outline a schedule and methods for follow-up could be explored.

It is of the utmost importance to always remember that a national attribute is not inherently good or bad. The challenge of examining attributes in a specific cultural context is to be aware of and handle such those that might negatively affect a sound safety culture, while at the same time preserving and encouraging the more positive ones.

Further considerations

It is important to emphasise that the Finnish nuclear programme has shown positive results regarding the management of safety and the capacity to take proactive safety decisions.

The Finnish nuclear community and the relationship between operators, licence applicants and the regulator were discussed during the forum by design via the scenario. The national trait of solidarity combined with respect for facts and technology that exists within the Finnish nuclear community allows the regulator (STUK) to have an open and transparent relationship with operators, allowing for a flow of information between the organisations. It was noted during the snapshot study that STUK has a flexible approach to interactions and applies the necessary level of prescriptiveness considering the regulations, ultimately giving the responsibility of safe operations to the plant operators while providing authoritative oversight. The working communities are small, and there are many unofficial relationships between utilities and the regulator, which assist in information flow. An example given in relation to communication with the regulator was that it was common for local regulatory inspectors and plant staff to communicate very directly. Although issues can be discussed informally with the authorities, regulators remain in their roles as authorities during their interactions.

Since there are more international players in nuclear communities, there may be an opportunity to develop similar relationships and build trust with various entities throughout the supply chain. This includes an international workforce working in Finland, as well as global suppliers, contractors and vendors who interact with the Finnish nuclear community. As a part of the

snapshot study, those who are currently a part of the Finnish nuclear community, but are not native to Finnish culture, shared their perspectives, which were in agreement with the national traits and manifestations presented in this report. It was also shared that there was a tendency to assume that those who are not Finnish would function in similar ways although it was not always common to initially have the same level of trust. Some deliberation was undertaken on how to build trust with those new to the community, considering that traditionally trust has been established through experts demonstrating technical competency and honesty over time.

Suggestions for paths forward

There is an opportunity for nuclear organisations in the Finnish nuclear community to build on the findings of the CSSCF and explore ways to support continuous improvements in safety culture. Exploratory questions could help pave the way forward to take into account opposing views and thus provides a better understanding of different perspectives, all the while encouraging organisational learning. In this spirit, a set of exploratory questions is proposed in Table 3 to inspire the Finnish nuclear community for further reflection, discussion and employee engagement activities. Future activities could focus on how national attributes positively impact safety and should be reinforced, as well as on finding ways to work with attributes that may distract from safety and ways to work with or around them. The questions presented in Table 3 are high level and are not intended as a comprehensive checklist to address the ideas and discoveries explored in this report. These questions are simply meant to prompt the development of more detailed exploration in each organisation, with input from personnel. The table presents interactions between the national attributes and the organisational behaviours, which have significant and distinct interactions. The national attribute of communication style and the organisational behaviours of work planning and leadership are not explicitly categorised in this table as their interactions overlap with multiple attributes and organisations; therefore, they are included in the questions presented in the table.

Since international frameworks emphasise the importance of clarity in leadership in relation to decision making and responsibilities, the attributes associated with leadership and management could also be further explored.

Table 3: **Exploratory questions and practical examples**

National attributes		Organisational behaviours			
		Decision making	**Freely raising concerns**	**Responsibility for safety**	**Control and follow-up**
	Trust *(credibility and the expectation of honesty)*	How does the default of expecting trustworthiness affect decision making? What can be done to ensure clarity when communicating decisions? (between departments, individuals or organisations)	How can honesty and credibility enhance constructive feedback on safety? How can this contribute to maintaining open lines of communication on an ongoing basis?	How can people be held accountable appropriately without eroding the individual/personal responsibility for safety?	How can granting credibility (by default) contribute to ongoing two-way communication without creating a sense of encroachment or micromanagement?
		Examples of practical questions to spark further exploration			
		Does your organisation have validation processes to ensure that the basis of the decisions are valid such that the trust is not being exploited or eroded?	Has your organisation augmented its training programmes for management/leaders to focus on techniques and methods that prompt open communication?	Does your organisation have a process that facilitates check-ins between experts within the same technical area? If so is this process informative for managers and others?	Does your organisation have record-keeping practices embedded in work plans that inform managers at key milestones of achievement? Is the mechanism initiated/triggered by the experts/ specialists?
	Technical rigour *(emphasis on pragmatism, facts, and science)*	How can the positive effects of pragmatism on decisions be preserved and enhanced continuously?	How can the reverence for facts and science be used to facilitate feedback concerning safety?	What does the reverence for pragmatism contribute to the sense of responsibility held for individuals, groups and organisations concerning work planning?	How can the quest for technical rigour affect the development of follow-up actions by management?
		Examples of practical questions to spark further exploration			
		Does your organisation examine the decision-making process to ensure that the balance between timeliness and the pursuit of the most factually and scientific option is held intact?	Does your organisation facilitate open dialogues with experts to encourage feedback and suggested improvements in nuclear safety processes?	Does your organisation currently solicit ideas on how best to preserve and enhance the practices associated with the assignment of safety related tasks?	Currently, are experts encouraged to identify and document milestones associated with their tasks?

Table 3: **Exploratory questions and practical examples** *(cont'd)*

		Organisational behaviours			
		Decision making	**Freely raising concerns**	**Responsibility for safety**	**Control and follow-up**
National attributes	**Solution-oriented approach** *(emphasis on efficiency and proactive planning)*	What safety implications can efficient solution-oriented planning have on the decision-making process?	How can solution-oriented planning be used to co-ordinate feedback on actions, tasks and decisions concerning safety?	How can efficient planning be used to maintain a sense of responsibility for tasks related to safety?	How can follow-up activities be encouraged to support work control?
		Examples of practical questions to spark further exploration			
		Which aspects of your organisations decision-making processes ensure that the goal of efficiency has no detrimental effects on safety?	Are there dedicated steps that prompt feedback in your work plans? How can they be enhanced?	Does your organisation involve relevant specialist staff in the planning process to encourage a sense of ownership?	Does your organisation have activities embedded in work plans that facilitate periodic check-ins?
	Personal responsibility (*desired autonomy and Finnish pride in quality work*)	Does the desire for autonomy and pride while decision making influence safety?	How can the desire for autonomy affect the distribution of feedback?	How can autonomy affect how a sense of responsibility is communicated between individuals within a group or organisation?	How might desired autonomy affect how follow-up questions/communications are received and how does it affects safety?
		Examples of practical action items to spark further exploration in these areas			
		Is there something in place to prevent taking decisions without relevant, multiple inputs while not diminishing the sense of integrity of the decision maker?	Has your organisation examined the system in place for feedback, taking into account: *- competency building* *- avoiding complacency* *- maintaining integrity?*	Does your organisation have a mechanism to ensure alignment between personal responsibility (desired autonomy) and the organisations' overall responsibility for safety?	Are there measures in place to prompt specialists to give follow-up information to their immediate supervisors?

Table 3: **Exploratory questions and practical examples** *(cont'd)*

		Organisational behaviours			
		Decision making	**Freely raising concerns**	**Responsibility for safety**	**Control and follow-up**
National attributes	**Equality** (*solidarity and low emphasis on hierarchy*)	How might equality affect the decision-making process when safety issues are considered?	How can the low emphasis on hierarchy be used to encourage feedback concerning safety?	How do aspects of equality affect the sense of responsibility for safety?	How can low emphasis on hierarchy affect how follow-up actions are received?
		Examples of practical questions to spark further exploration in these areas			
		When making a decision and considering multiple perspectives, does discretion dissipate?	Does your organisation use the attribute of equality to promote multi-directional (lateral and vertical) communication?	Do you have a programme that monitors how people are held without blame?	Are there methods made available to managers that equip them with the tools to maintain control over projects and request follow-up actions without causing conflict or negatively impacting solidarity?
	Adherence to logical rules *(need for clarity and order)*	Should procedures be implemented to enhance decision making?	Should guidelines be developed to facilitate constructive feedback?	Is there a relationship between the respect for logical rules and the sense of ownership?	Can follow-up activities be proceduralised with a focus on safety?
		Examples of practical questions to spark further exploration in these areas			
		Are organisational values integrated into your organisation's decision-making process?	How can your organisation encourage raising a concern when the logic may not be so apparent, i.e. is there room for instinct to be taken into account when there is a grey area concerning the application of rules?	What is your organisation's approach to managing situations in the absence of structure to ensure continued sense of responsibility for safety?	Do people complete follow-up activities? If no, why not?

Conclusions

As indicated from the feedback received during and following the Country-Specific Safety Culture Forum (CSSCF) in Finland, the forum was considered to be a helpful exercise that was appreciated by the participants and even exceeded their expectations. The message received by the organisers – the Nuclear Energy Agency (NEA), World Association of Nuclear Operators (WANO) and the Finnish Radiation and Nuclear Safety Authority (STUK) – was that the spirit of this event remained intact in that people from the various organisations – government agencies, regulators, operators implementers and applicants – within the Finnish nuclear community came together and openly shared their perspectives. The commitment, contributions, interest, openness and flexibility of Finnish participants was evident and valued throughout the process. Participants in the snapshot study and in the forum were highly engaged and active contributors to the process.

The feedback from participants conveyed appreciation for the role play and the informal setting, which allowed people to converse freely on shared challenges across organisational boundaries. Participants thus discussed Finnish attributes without self-censoring, and regardless of whether the different attributes needed additional attention to avoid challenges or of whether they were considered strengths that contributed to nuclear safety.

Discussions during the snapshot study, taking place during the first steps in the CSSCF, prompted contemplation as to how national attributes may be reflected in organisational behaviour, which can in turn influence safety culture. Some national attributes such as trust, the low emphasis on hierarchy, autonomy, a focus on technology and solution-oriented planning may reinforce a sound safety culture. Remaining questions that arose concern cordial methods of giving feedback and managers following up on tasks while maintaining a good relationship with those under their leadership. Additionally, in an effort to maintain and continuously enhance safety culture, the question arose as to how organisations within the Finnish nuclear community can ensure that the positive aspects of national attributes are taken into account and not lost in the quest for continuous improvement.

Research shows that socio-technical systems are complex and that collaboration, good relations, trust, openness and the desire for common understanding are decisive in preventing risks. This seems to be in alignment with much of the behaviour in the Finnish nuclear community. The complexity of these systems and the behaviours within them are amplified during emergent crisis situations, and thus it is important to maintain strengths and address weaknesses on an ongoing basis so as to minimise the risks that could exacerbate circumstances during an emergency.

An organisation invested in continuously improving safe operations and maintaining a healthy safety culture should regularly undergo self-reflection and assess activities so as to continually update insight into organisational behaviours, as well as into the underlying core values and deeply rooted assumptions that accompany these behaviours. It is the objective of the CSSCF to inspire continued conversations and to stimulate countries into starting their own journeys into better understanding national context and its relation to overall safety culture.

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BETTER POLICIES FOR BETTER LIVES

Country-Specific Safety Culture Forum

Finland

One of the many important lessons learnt about nuclear safety over the years has been that human aspects of nuclear safety are as important as any technical issue that may arise in the course of nuclear operations. The international nuclear community can work together to identify and address issues associated with components and systems and compare operational experiences, but identifying how human behaviour affects safety and the best approaches to examine this behaviour from country to country remains less common.

Practical experience has nevertheless shown that there are important differences in how people work together and communicate across borders. People's behaviours, attitudes and values do not stop at the gate of a nuclear installation, and awareness of the systemic nature of culture and its deeper aspects, such as the dynamics of how values and assumptions influence behaviours, continues to evolve.

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, with the goal to ensure safe nuclear operations. The second NEA safety culture forum – a collaborative effort between the Nuclear Energy Agency (NEA), the World Association of Nuclear Operators (WANO) and the Radiation and Nuclear Safety Authority in Finland (STUK) – was held in Finland in March 2019. 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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