Practices for Enhancing Leadership for Safety in Nuclear Regulatory Bodies

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Human Aspects of Nuclear Safety

Practices for Enhancing Leadership for Safety in Nuclear Regulatory Bodies

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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, 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.

Foreword

With the growing challenge of ensuring energy security in the face of growing demand – while taking action to meet global targets to reduce net carbon emissions to zero by 2050 – many nations around the world are turning to nuclear energy as a key component of their energy strategies. The prospect of many new nuclear facilities being planned – including new technologies such as small modular reactors and microreactors – requires nuclear safety regulators around the world to prepare not simply for new technologies, but new questions and new challenges to how they approach their tasks. Even in those countries not pursuing new or expanded nuclear power generation, stakeholder expectations regarding how nuclear activities such as decommissioning and radioactive waste management are conducted are evolving. This changing landscape will present nuclear organisations – especially regulators – with novel challenges for which past experience may not provide a complete guide. In such cases, excellence in leadership becomes even more important than it has been over the more than 60 years of commercial nuclear energy.

As has been highlighted by recent NEA work, human and organisational factors, including leadership, are a core aspect of nuclear safety. It is, therefore that we ensure that leadership for safety is fully integrated into regulatory activities. However, leadership can be challenging to quantify or examine in isolation. It benefits from a qualitative approach and consideration of its context. Regardless of the country and organisation and the unique cultural traits and behaviours of each, leadership plays a critical role in maintaining healthy safety culture.

This report presents extensive data that support a range of important findings and recommendations that we believe will help regulatory agencies in all countries identify and develop nuclear regulatory leaders and strengthen the safety mission. We greatly appreciate the many nuclear regulatory experts in our member countries who contributed to this collaborative work and hope that this work will serve as a practical guide to leadership for safety in the regulatory body for many years to come.

We believe the world's nuclear regulators are up to the challenges all will face in this new era of technology, policy and evolving priorities. But it is also clear that strong and engaged leadership will be essential for future success and global nuclear safety.

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Acknowledgements

Table of contents

List of figures

List of tables

Executive summary

This document presents Nuclear Energy Agency (NEA) guidance to enhance "leadership for safety" in nuclear regulatory bodies.

The specific objectives are to:

1. Identify effective characteristics, competencies, and behaviours of leaders in regulatory bodies that have a healthy safety culture; and

2. Provide practical guidance in the form of matrices that regulatory bodies can use to identify leadership characteristics, competencies, programmes, and processes needed for safety culture.

The document is intended to be used:

- As a tool that organisations can integrate into management system processes and practices to develop and sustain effective leadership characteristics and competencies that cultivate and embody organisational safety culture.

- By managers and members at all levels who are responsible for, or involved in, regulatory strategies, activities, and interactions to strengthen the safety culture of the regulatory body.

- To support staff in performance of other functions, e.g. training, human resources, self-assessment, and safety culture specialists.

- As a reference for reviewing and improving regulatory body activities to foster and enhance a healthy safety culture.

- To encourage regulatory bodies and licensees to undertake self-reflection, self-assessment, and improvement activities.

This guidance document consists of two matrices. The **first matrix** consists of **twelve characteristics and competencies** that emerged from the data as essential to the development of effective "leadership for safety" in regulatory bodies. These are grouped into three "aspect categories" and are accompanied by examples of good practices for the regulatory body as an organisation and good practices for the individual:

Intellectual aspects:

- knowledge of the operation of the regulatory body;

- identification of critical issues;

- understanding of safety impact; and

- technical competence.

Interpersonal aspects:

- interpersonal competence and relationship management;

- modelling safety leadership;

- active support of staff to enhance a culture for safety;

- self- and social awareness; and

- continuous learning.

Influencing aspects:

- participatory and consultative approach;
- reinforcement of expectations internally; and
- reinforcement of expectations externally.

The **second matrix** focuses on **programmes and processes**. It provides guidance for embedding effective "leadership for safety" in the regulatory body through five steps. The matrix operationalises each step through examples of good practices and practical tools for the organisation as well as for the individual. The five essential steps to develop "leadership for safety" programmes and processes are:

1. Develop a leadership model or framework;
2. Identify leadership characteristics and competencies;
3. Establish leadership expectations and behaviours;
4. Implement leadership for safety training and development programmes; and
5. Conduct safety culture independent and self-assessments.

To gather the data on which this document is based, the NEA carried out a literature review; a survey of 14 nuclear regulatory bodies; and nearly 50 interviews with experienced practitioners and senior leaders in both regulatory bodies and licensees, representing 13 member countries, to gather and analyse their insights and experience. The NEA approach was based on well-established qualitative research techniques, ensuring a high standard of methodological and ethical rigour. A further mapping exercise was conducted to confirm consistency with and establish linkages between existing safety culture models, including *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016) and the IAEA Harmonised Safety Culture Model (IAEA, 2020).

Overview and how to use this document

The Nuclear Energy Agency (NEA) has set out to identify effective leadership characteristics and competencies and then determine how these are exhibited in the behaviour of leaders at all levels of a regulatory body that has a healthy safety culture. The motivation for this task was to build on previous NEA work that examined the impact of leadership on the safety culture of a regulatory body and the assessment of safety culture within the regulatory body. Additionally, the Boeing 737 Max and Fukushima Daiichi Nuclear Power Plant accidents both identified failures in leadership as strong contributory causes that needed to be addressed.

Research was conducted by the NEA Working Group on Leadership and Safety Culture (WGLSC). Details of the scope and methodology are described in Annex A.2. In 2020, a dedicated task group comprised of working group members was formed to gather and analyse insights, experiences, lessons learnt and good practices, as well as key success factors relevant to leadership and leadership expectations for safety. This effort was comprehensive and included a literature review, a survey of regulatory bodies about their leadership programmes, and interviews of leaders at all levels of international regulatory bodies and licensees, including retired staff. The results from these data gathering exercises were analysed in 2022-2023 to distil insights, propose good practices and develop models as presented in Figures 1 and 2 as well as Tables 1 and 2.

The purpose of this document is to present effective leadership characteristics and competencies and then demonstrate how these are exhibited in the behaviour of leaders at all organisational levels in a regulatory body that has a healthy safety culture. This document sets out to capture the knowledge and experience of member countries in regulatory strategy, practice, and relationships that serve to sustain and enhance the safety culture and safety performance of both the regulatory body itself and the organisations it regulates. Specifically, this document attempts to identify those characteristics, competencies, and examples of behaviours that leaders should embody and exhibit towards 1) making a connection between the regulatory function and ultimate safety outcome, and 2) in making and communicating regulatory decisions, especially where there are differences of professional opinion. While there will inevitably be nuances in the regulatory approach taken by each country according to its national culture and context, this document draws out insights and good practices from which all countries can learn. This document also seeks to add value to nuclear safety by capturing key success factors; the aim being to avoid repetition of past regulatory failure and to promote good practice internationally.

This document is intended to be used primarily as a tool that organisations can integrate into management system processes and practices to develop and sustain effective leadership characteristics that cultivate and embody organisational safety culture. This includes use by managers at all levels, and staff members who are responsible for, or involved in, regulatory strategies, activities, and interactions to strengthen the safety culture of the regulatory body. However, it is also intended for staff in other functions, e.g. training, human resources, self-assessment, and safety culture specialists. The NEA encourages regulatory bodies to use this document as a reference for reviewing and improving their activities to foster and enhance a healthy safety culture. More specifically, this document can encourage regulatory bodies and licensees to undertake self-reflection, self-assessment, and improvement activities. Building on the guidance and lessons from *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016) and *Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body* (NEA, 2021), this document can be used to enhance training, development, and guidance of staff as well as help to attract, hire, develop and retain leaders at all levels.

Chapter 1. **"Leadership for safety" characteristics and competencies**

The concept of "leadership" is not limited to senior management but can be demonstrated by individuals of any level to the extent possible under their role responsibilities within an organisation. Leadership can mean many things to many different people in various organisational or cultural contexts. It can generally be described as the ability of an individual or group of people to influence and guide followers.

The focus of this document is on influencing and guiding towards the primary objective of safety within regulatory bodies. The International Atomic Energy Agency (IAEA) defines "leadership for safety" as "the use of an individual's capabilities and competences to give direction to individuals and groups and to influence their commitment to achieving the fundamental safety objective and to applying the fundamental safety principles, by means of shared goals, values and behaviour" (IAEA, 2016).

This document puts forward a new perspective on leadership for safety by organising these characteristics and related competencies into the categories of "intellectual", "interpersonal", and "influencing" factors and linking these factors to effective strategies for development. The categories were developed from the original data using qualitative analysis and are illustrated in Tables 1A to 1C. The methodology for the development of these categories is set out in Annex A.2.

Intellectual aspects refer to the leader's ability to demonstrate knowledge; identify, rationalise, and justify decisions; and to understand complexity in their operating environments. These aspects refer to characteristics and competencies that support decision making in "leadership for safety".

Interpersonal aspects refer to relationship building characteristics and competencies that assist in promoting safety with the regulatory body. Communication, role modelling and actions taken to promote safety are highlighted under this category.

Influencing aspects refer to relationship management approaches to reinforce safety within and external to the regulatory body.

Characteristics and competencies that promote leadership for safety are presented in Figure 1 and Tables 1A to 1C.

Figure 1 below depicts the 12 characteristics and competencies recommended for the development of effective "leadership for safety" in the organisation. For the purposes of this document, **characteristics** are general personal or organisational traits or attitudes that may be inherent or develop through experience, whereas **competencies** represent the knowledge and skills required to perform a task or carry out responsibilities. These characteristics and competencies for leadership are aligned with the practices and conclusions described in the NEA guidance on principles and attributes of a healthy safety culture in regulatory bodies (NEA, 2016).

Tables 1A through 1C also describe good practices for both the regulatory body and the individual for developing and demonstrating the 12 competencies and characteristics recommended for effective leadership for safety.

Figure 1. **Leadership for safety characteristics and competencies**

Source: NEA.

Table 1A. **Leadership for safety characteristics and competencies – *Intellectual aspects***

Intellectual aspects refer to the leader's ability to demonstrate knowledge; identify, rationalise, and justify decisions; and to understand complexity in their operating environments. These aspects refer to characteristics and competencies that support decision making in "leadership for safety".

Leadership for safety characteristics and competencies	Good practices for regulatory bodies *Organisational approaches to cultivate leadership for safety characteristics and competencies*	Good practices for the individual *Leadership for safety characteristics and competencies for staff (individuals)*
Knowledge of the operation of the regulatory body: Demonstrate a holistic understanding of the regulatory body, perspectives of regulatory body staff and external influences on the regulatory body.	Identify leaders and provide opportunities for them to experience different areas of regulation. Offer professional development courses/mentorship in regulation. Offer experiences and opportunities to develop industry knowledge.	Obtain experience in different areas within the regulatory body, within other regulatory bodies and/or as a licence holder. Identify areas for development relating to various facets or areas of regulation. Has a clear understanding of their role (see GSR Part 2, [IAEA 2016]), and the roles/responsibilities of regulatory body staff.

Table 1A. **Leadership for safety characteristics and competencies –** *Intellectual aspects*
(cont'd)

Leadership for safety characteristics and competencies	Good practices for regulatory bodies *Organisational approaches to cultivate leadership for safety characteristics and competencies*	Good practices for the individual *Leadership for safety characteristics and competencies for staff (individuals)*
Identification of critical issues: Leaders use their holistic understanding of the regulatory body to prioritise and differentiate which elements of an issue are important to safety and demonstrate the ability to assimilate a range of information and arrive at decisions based on objectivity and fairness over personal opinion and subjective factors.	Develop governance structure and processes that facilitate discussion of issues from multiple perspectives. Ensure there are opportunities for industry input and independent expertise to comment on issues. Develop supportive policies and work design for workplace communication, raising concerns, problem identification/resolution.	Seek diverse expertise to formulate a holistic understanding of the issue (especially with front-facing regulatory officers). Use knowledge of the regulatory body and licence holder to make strategic decisions. Foster a work environment that values critical thinking in the identification of issues and that values expertise where there is a gap in knowledge.
Understanding of safety impact: Balance different perspectives, stakeholder interests and justification of risks to make safety decisions; consider both immediate solutions and wider, long-term impact of decisions.	See recommendations for *Identification of critical issues*. Ensure change management and work planning policies and processes are in place that consider a systemic approach that emphasises safety for staff and regulated entities. Have a clear organisational approach to regulatory decision making (e.g. independence/safety as priority/balancing private and public interests). Frequently reinforce to staff and external stakeholders the connection between the regulatory body function and the impact on safety (e.g. town hall meetings and forums that highlight specific examples).	Consider the impact of decisions using different time frames (short, medium, long) and various sources of information (e.g. staff, organisational performance metrics). Ensure expectations and reasons for decisions are both communicated and consistent internally and externally. Conduct internal risk assessment and plans for mitigation with subject matter experts to determine solutions for safe outcomes.
Technical competence: Acquire suitable technical knowledge and experience to understand safety issues encountered.	Ensure there are opportunities, time, and rewards for continuous learning. Offer official pathways for increasing technical knowledge, e.g. development programmes, performance reviews. Ensure there are knowledge management and workforce planning strategies to encourage knowledge transfer and learning.	Regularly identify and prioritise technical areas for self-development and find ways to address them. Develop an awareness of expertise within and external to the organisation which could assist in understanding safety issues. Build and lead diverse teams that appreciate and value a multidisciplinary approach. Perform walk downs of regulated facilities; observe and lead field inspections.

Selected 'intellectual aspects' quotations from regulatory body and industry leaders

Note: These quotations were selected from the interviews conducted for this study.

Understanding of safety impact	*Identification of critical issues*	*Technical competence*
"As a director or a manager of a regulatory body, one must be able to address and remind the organisation about the safety significance of oversight work. The challenge is to remind the staff about the importance of their work even if they don't necessarily see the connection between their work and nuclear safety right away."	*"The experts' point of views is often blacker and whiter when compared to directors' ones. The spectra of colours and tones is broader from the director's perspective. Understanding these different shades and their safety relevance is important for the leader of safety."*	*"Being a leader for safety means that you understand legal requirements, e.g. 'as low as reasonably practicable' and 'best available technology' – what that means and how it's interpreted."*

Table 1B. **Leadership for safety characteristics and competencies – *Interpersonal aspects***

Interpersonal aspects refer to relationship building characteristics and competencies that assist in promoting safety. Communication, role modelling and actions taken to promote safety are highlighted under this category.

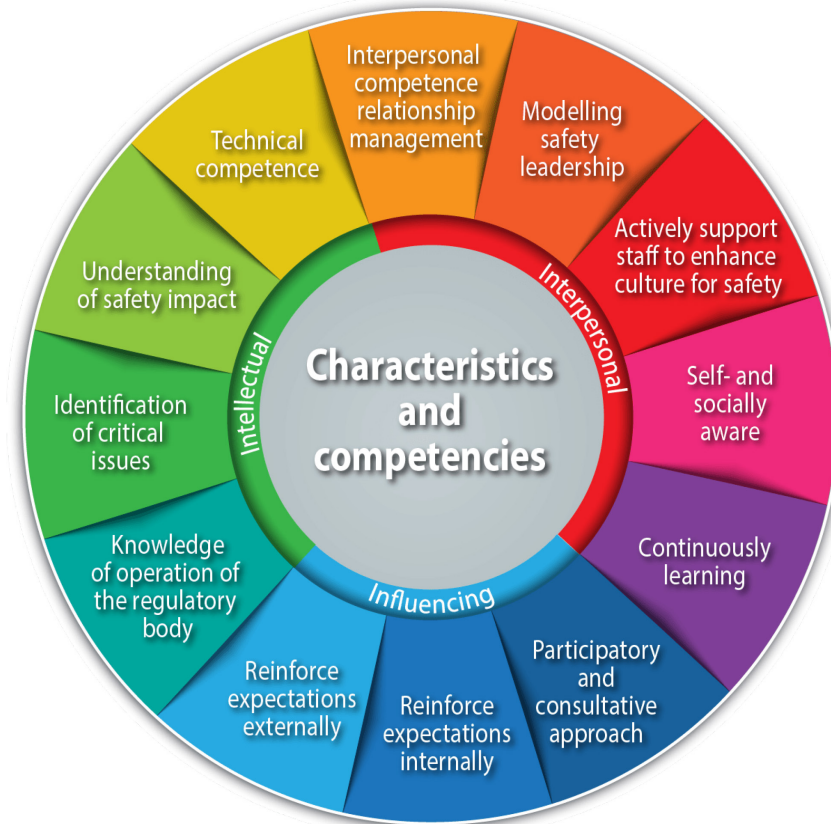| Leadership for safety characteristics and competencies	Good practices for regulatory bodies *Organisational approaches to cultivate leadership for safety characteristics and competencies*	Good practices for the individual *Leadership for safety characteristics and competencies for staff (individuals)*
Interpersonal competence and relationship management: Communicate to internal/external stakeholders with flexibility and an understanding of what approach is required to drive safety outcomes; be an effective active listener (e.g. "open ears"; accepting of constructive feedback, learning, and building upon input).	Have formal and informal opportunities for developing self-awareness, e.g. mentorship, coaching. Offer multiple pathways for feedback to leaders at all levels and formal ways of addressing and communicating feedback. Set clear behavioural expectations and policies for staff communication and work approach.	See good practices under *technical competence.* Regularly identify and prioritise interpersonal areas for self-development and find ways to address them. Maintain relationships and regular communication within and external to the regulatory body. Utilise organisational knowledge and stakeholder interests to motivate and to lead commitment to safety outcomes.
Modelling safety leadership: Prioritise safety through their actions and decision making; demonstrate consistency and positive attitudes relating to safety; behave in congruence with messages; articulate clear visions; understand and promote safety and safety importance of the daily work; demonstrate ability to balance safety and justification of risks related to use of nuclear energy.	Provide formal and informal training and feedback to leaders on how to model and integrate safety conscious behaviours into their teams and leadership style. Regularly review safety decisions and opportunities for improvement. Regularly review organisational strategy and goals (i.e. whether they are in congruence with work activities, what works well, what is sending mixed messages, rewarding safety behaviours).	Lead with behaviour that is to be seen and expected in others. Ensure their individual decisions and their rationale are consistently visible and communicated to stakeholders. Support follow-through and actions from organisational decisions and planning relating to safety. Reinforce and demonstrate positive safety behaviour, including demonstrating accountability. Ensure that their behaviour is in congruence with what they communicate as a leader.
Active support of staff to enhance a culture for safety: Promote an open atmosphere where issues can be discussed; encourage questioning, challenging, and feedback; value expertise; trust and respect staff; continuously remind staff about the importance and safety significance of the regulatory function; facilitate knowledge sharing, openness in sharing opinions (within the organisation); seek feedback, especially from junior staff as they may be less confident or comfortable to share opinions. This has elements of: - Values and ethics; - Integrity; - Inclusion; - Effective verbal and written communication; and - Creating a psychologically safe and trusting work environment.	Design work for collaboration and co-ordination of activities. Develop systems for measuring, monitoring, and reporting safety performance in the regulatory body (e.g. safety culture assessment) and how well the regulator achieves its mission/function. Develop mechanisms and policies for raising differing opinions on regulatory decisions and avoiding complacency (e.g. checks and balances). Obtain regular safety culture assessments and feedback to improve culture for safety.	Be open to providing, seeking, and receiving feedback. Have a personal commitment to transparency of decision making and accountability for safety. Demonstrate trust and respect of others' expertise in a meaningful way (e.g. by taking the time and effort to maintain regular field presence and communication). Advocate for and effectively utilise provided resources to meet the safety mission.

Table 1B. **Leadership for safety characteristics and competencies – *Interpersonal aspects***
(cont'd)

Leadership for safety characteristics and competencies	Good practices for regulatory bodies *Organisational approaches to cultivate leadership for safety characteristics and competencies*	Good practices for the individual *Leadership for safety characteristics and competencies for staff (individuals)*
Self- and social awareness: Possess social competencies to know how to drive safety outcomes; take responsibility, reflect on actions, and demonstrate humility when mistakes are made. This has elements of: - Self-awareness; - Integrity; and - Action management or results achievement.	Create and support formal and informal opportunities for all staff to develop self- and social awareness, e.g. mentorship, coaching. Implement leadership development programmes that provide regular feedback and areas for improvement. Ensure that governance supports transparency and integrity. Utilise tools to understand leadership and organisational performance (e.g. periodic organisational staff surveys, 360s).	Regularly identify and prioritise interpersonal areas for self-development and find ways to address them. Seek feedback from stakeholders at all levels and organisations. Own their actions and decisions, be committed to resolve issues and be willing to admit mistakes. Participate in periodic self-assessment, peer-review, or self-reflective activities regarding their performance.
Continuous learning: Engage in continuous learning to improve knowledge, skills, and abilities, and learn ways to improve the regulatory organisation.	Benchmark organisational performance with industry and cross-industry standards. Develop training and development programmes for staff and integrate with performance development; ensure time/resources for them as part of regular work. Conduct regular safety culture self-assessments. Ensure systems are in place to support staff learning, development, and building institutional knowledge. Ensure leadership training programmes supporting organisational leadership competence are in place.	Actively seek out feedback. Manage their workload and work division to ensure there is time to reflect, obtain feedback and learn from experience. Be proactive in finding opportunities to foster exchanges in order to develop knowledge and to demonstrate continuous improvement as an organisational value. Create feedback loops so that there are learning pathways about their performance as a leader and about organisational performance. Participate in regular leadership training to refine and develop leadership competencies.

Selected "interpersonal aspects" quotations from regulatory body and industry leaders
Note: These quotations were selected from the interviews conducted for this study.

Interpersonal competence and relationship management

"In order to set an example, social competences are important so that the leader is on good terms with the staff and is responsive to different persons and their needs."

Role-modelling safety leadership

"Internalising and practicing what you preach and, by that, acting as an example (even in 'minor' situations and outside the plant, e.g. behaviour in the parking lot)."

"Leaders (for safety) understand and set priorities according to relevance for safety and convey those goals to the organisation, transforming mind sets and behaviours into a shared culture, through communication and role-modelling."

"Leadership for safety is also about understanding the priority and commitment to safety – while understanding the balance between justified and managed risks that will always be present with use of nuclear energy."

Active support of staff to enhance a culture for safety

"Leaders understand where their shortfalls are. They understand how to make up a team to enable something that's going to be successful. So they'll build their skills around the team to drive that success. They'll have a diverse group of people. They'll relish a challenge. Leaders have diversity of thought, but they'll lead and when a decision is made, they make sure the team is aligned and the decision is enacted."

"An important role of leaders is maintaining challenging, interesting work for staff to maintain the skills and knowledge of the regulator."

Table 1B. **Leadership for safety characteristics and competencies – *Interpersonal aspects***
(cont'd)

Selected "interpersonal aspects" quotations from regulatory body and industry leaders
Note: These quotations were selected from the interviews conducted for this study.

Self- and social awareness	***Continuous learning***
"You have to be self-reflective and self-aware of your own capabilities and build on what works for you and your own personality."	*"A leader acts as an example by asking for feedback again and again."*
"There has to be a little bit of humility … that it's actually okay to make mistakes. Don't cover them up, but do a proper lessons learned to see how you can build from this. Delivering a strong safety culture is about being able to learn from those events."	*"You have to learn. You don't have a choice, there is no one who knows everything from the beginning. You can learn different areas. You have to work your way into it."*
"A leader acts as an example and develops him- or herself by questioning oneself, addressing one's own mistakes, and being open for improvements."	*"What do the assessments look like? What do the expectations look like? What are the processes that the licensees are using to make sure that their safety culture is healthy? We have a whole safety culture monitoring panel where we review issue reports or problem identification reports and feedback. I think it's important for the regulator to understand what tools the licensee is using and what they can learn by looking at them."*
	"A leader needs also to look into the future and what are the future challenges coming up. And do we maybe get into small and medium reactors or small modular reactors, so I think that as a leader for the future you need to prepare somewhat for that. So, we as the regulator have some ability to support the industry if they want to go that way. And not hinder the industry. And of course, a leader needs to stand up to the ethical values that we have as an organisation. It's a very big responsibility to be a leader for safety or security or whatever it is, and for non-proliferation. And so, the continuous learning again is very, very essential."

Table 1C. **Leadership for safety characteristics and competencies – *Influencing aspects***

*Influencing aspects refers to relationship management approaches
to reinforce safety within and external to the regulatory body.*

Leadership for safety characteristics and competencies	Good practices for regulatory bodies *Organisational approaches to cultivate leadership for safety characteristics and competencies*	Good practices for the individual *Leadership for safety characteristics and competencies for staff (individuals)*
Participatory and consultative approach: Have regular engagements and attempts to understand and appreciate the expertise of staff (utilise "collective intelligence" within the organisation); have regular engagements and discussions with industry to reinforce and influence safety outcomes (avoid taking extreme positions in regulatory approach, decisions, and positions with regulated entities); demonstrate openness and transparency to support consultations.	Provide formal and informal ways of including staff inputs on regulatory decisions. Encourage and support an organisational participatory approach for internal and external stakeholders. Provide opportunities for formal and informal engagement with industry stakeholders to discuss safety goals.	Be approachable by encouraging and fostering discussion with internal and external stakeholders. Implement and assist in the development of strategies for fostering employee engagement in the regulatory safety mission.

Table 1C. **Leadership for safety characteristics and competencies –** *Influencing aspects*
(cont'd)

Leadership for safety characteristics and competencies	Good practices for regulatory bodies *Organisational approaches to cultivate leadership for safety characteristics and competencies*	Good practices for the individual *Leadership for safety characteristics and competencies for staff (individuals)*
Reinforcement of expectations internally: Provide clear messages on safety to staff; reinforce safety behaviours, safety culture, and safety outcomes through actions; ensure staff understand and accept the regulatory body responsibility for safety**.**	Policies are clear as to expectations, how to resolve issues, and when expectations are not being met. Expectations are formalised (e.g. through an integrated management system) and periodically reviewed and validated. Promote a proactive, adaptable, and holistic approach in regulatory decisions.	Lead by example through their behaviour and communications of expectations relating to safety (e.g. raise safety issues, support others to speak). Make decisions on how work/resources can be managed and designed with teams to meet the safety mission, e.g. sharing of safety related information and facilitating opportunities to work across the organisation to achieve safety objectives.
Reinforcement of expectations externally: Communicate clear goals and expectations; facilitate opportunities for staff and industry to achieve these goals; maintain consistency and clarity in expectations for licence holders.	Establish methods to check alignment of regulatory decisions with communicated expectations. Use varied and scalable regulatory tools to ensure industry is achieving safety goals and meeting regulatory expectations. Policies are clear as to expectations, how to resolve issues and when expectations are not being met. Regulatory officers are supported to reinforce expectations externally.	Provide transparency and clear communication of expectations in all their interactions with industry. Ensure when communicating your expectations in an external forum that they are aligned with the organisation's approach and internal expectations. Prioritise their work with an understanding of the complexity of safety issues and reinforcing external expectations. Create regular opportunities in their work to collaborate with industry to achieve safety outcomes and meet regulatory expectations.

Selected 'influencing aspects' quotations from regulatory body and industry leaders		
Note: These quotations were selected from the interviews conducted for this study.		
Participatory and consultative approach	*Reinforcement of expectations internally*	*Reinforcement of expectations internally and externally*
"It means creating a culture and atmosphere where people understand the importance of nuclear safety and what that looks like for them in their role, that nuclear safety is not something that just happens at the leadership level. Nuclear safety is embodied all through the organisation."	*"If you're really a leader for safety in all aspects of your work, you understand that and you figure out how to reinforce it with your crew or your department or your organisation and how to reinforce it in a way that makes sense to them and that they understand the expectations."*	*"The chairman of the regulatory committee instructed the secretariat to do a more rational review. That is excellent. I felt that he is demonstrating how to be a regulatory leader. As a leader of the operators, I think a leader is a person who can deliver the voices of the field to the regulators. Regulatory agencies may or may not be convinced about the voice of the operators, but it needs to be communicated well. Often regulators try to avoid discussion. I don't know if the regulatory commissioners are aware of this situation, but I would like to see more opportunities to exchange opinions directly with them."*

Chapter 2. **"Leadership for safety" programmes and processes for regulatory bodies**

Programmes and processes that promote "leadership for safety" for regulatory bodies are presented in Figure 2 and Table 2. They indicate the need to develop a clear leadership model or framework, establish leadership expectations and behaviours, implement a programme for "leadership for safety" training and development, and conduct safety culture self-assessments to evaluate the impact on safety of the other activities. The capability of the organisation and individual to focus and develop these good practices are identified as helpful strategies for ensuring that "leadership for safety" is embedded within the regulatory body.

Figure 2 depicts the five steps recommended for the development of effective "leadership for safety" in the organisation of a regulatory body.

Table 2 follows and describes good practices for the regulatory body as an organisation as well as for and the individual for the programmes and processes recommended for effective "leadership for safety".

Figure 2. **"Leadership for safety" programmes and processes for regulatory bodies**

Table 2. **Leadership for safety programmes and processes for regulatory bodies**

Leadership for safety programmes and processes	Good practices and practical tools for the organisation *Leadership for safety programmes and processes for management*	Good practices and practical tools for the individual *Leadership for safety programmes and processes for staff (individuals)*
Develop leadership model or framework	Develop a leadership model or framework that applies to leaders at all levels in the organisation.	Understand and put into practice the leadership model or framework. Initiate and/or participate in leadership development activities aligned with the corporate leadership framework.
	Examples: – **Finland Radiation and Nuclear Safety Authority (STUK):** The STUK "Leadership Framework" consists of policies and practices and sets the requirements and expectations for leadership and managerial work. – **US Nuclear Regulatory Commission (USNRC):** The USNRC "Leadership Model" is a roadmap to communicate how staff at all levels demonstrate leadership to fulfil the organisation's mission. – **United Arab Emirates Federal Authority for Nuclear Regulation (FANR):** The FANR "Leadership Model" is comprised of numerous competencies and is the foundation to develop the skills of employees, managers, and leaders. – **International Atomic Energy Agency (IAEA):** The "Leadership Blueprint" includes a leadership model, values, and explanation of the meaning of leadership.	
Identify leadership characteristics and competencies	Clearly identify leadership for safety characteristics and competencies for leaders at all levels. *(Tables 1A through 1C of this document provide several examples.)*	Understand and put into practice the leadership for safety characteristics and competencies and understand how they apply to their position. Initiate ongoing leadership development programme activities.
	Examples: – **STUK (Finland):** The STUK Safety Culture Programme addresses characteristics for safety and highlights certain focus points for all staff. – **United Kingdom Office for Nuclear Regulation (ONR):** The ONR Academy delivers leadership training against defined competence standards for all grades of regulatory staff. – **USNRC (United States):** The characteristics and behaviours of the USNRC "Leadership Model" align with the traits of the organisation's "Safety Culture Policy Statement" and provide the foundation for developing a strong safety culture. – **IAEA:** The IAEA "Leadership Blueprint" includes leadership characteristics with defined desirable and undesirable behaviours.	
Establish leadership expectations and behaviours	Clearly establish and reinforce "leadership for safety" expectations and behaviours that reflect desired characteristics and competencies for leaders at all levels.	Understand expectations and exhibit behaviours that reflect desired characteristics and competencies relevant to their position.
	Examples: – **Japan Nuclear Regulation Authority (NRA):** Leadership expectations are stated in the NRA "Statement of Nuclear Safety Culture". – **Korea Institute of Nuclear Safety (KINS):** Leadership expectations for management and staff are documented in the "Safety Culture Management Procedure". – **Swiss Federal Nuclear Safety Inspectorate (ENSI):** Leadership expectations are documented within the competence catalogue in which specific expectations are described for different leadership levels. – **ONR (United Kingdom):** The expectations for senior leaders are in the "Management System Manual", "Corporate Governance Manual", "R2A2" documents ("Roles, Responsibilities, Accountabilities and Authorities") and terms of reference for the regulatory leadership team.	

Table 2. **Leadership for safety programmes and processes for regulatory bodies** *(cont'd)*

Leadership for safety programmes and processes	Good practices and practical tools for the organisation *Leadership for safety programmes and processes for management*	Good practices and practical tools for the individual *Leadership for safety programmes and processes for staff (individuals)*
Implement leadership for safety training and development programmes	Develop a "leadership for safety" training programme that aligns with the organisation's leadership model or framework. Include a variety of training activities and methods for management and staff at all levels. The programme may include a process to identify and select high potential individuals for leadership development as well as leadership training opportunities for all staff. The activities and methods to build desired characteristics and competencies include formal training, coaching, and mentoring, and experiential and on-the-job training.	Participate in a variety of developmental training opportunities, including: *Formal training:* Develop desired characteristics and competencies through participation in classroom training (including interactive and immersive training, events, certifications, and courses) to acquire knowledge in technical areas, leadership principles, safety, safety culture, the role of the regulatory body, etc. *Coaching and mentoring:* Identify a mentor, coach, or role model to help build desired characteristics and competencies; serve as a mentor, coach, and role model to others as well. *Experiential:* Develop desired characteristics and competencies through on-the-job training; experiential learning such as holding different positions throughout the organisation and the nuclear sector; participation in a variety of inter- and intra-office working groups, teams, and projects.
	Examples: – **Australian Radiation Protection and Nuclear Safety Authority (ARPANSA):** Leadership training is self-initiated on a voluntary basis and dependent on individual learning needs identified during performance reviews. – **Dutch Authority for Nuclear Safety and Radiation Protection (ANVS):** ANVS supports tailor-made programmes for individual staff members and supports leadership training for staff at all levels. – **Swedish Radiation Safety Authority (SSM):** The SSM "Developing Leadership" programme is mandatory for leaders and a leadership programme is available for employees. – **ONR (United Kingdom):** The ONR "Foundations in Leadership" programme for all staff takes into account industry best practices, IAEA standards and NEA guidance.	
Conduct safety culture independent and self-assessments	Establish a safety culture assessment programme for continuous improvement of "leadership for safety" programmes and processes of the organisation.	Assess and provide feedback on training and leadership experiences to improve their organisation's "leadership for safety" programmes and processes. Engage in safety culture assessment activities and provide honest and constructive feedback. Be involved in implementing solutions.
	Examples: – **STUK (Finland):** Conducts independent safety culture assessments and observation activities, participated in IAEA Integrated Regulatory Review Service (IRRS) missions, and hosted the NEA Country-Specific Safety Culture Forum (CSSCF). – **Slovak Republic Nuclear Regulatory Authority (UJD SR):** Conducts routine self-assessments following IAEA guidelines and managed by an external organisation. – **USNRC (United States):** Conducts periodic safety culture and climate surveys, federal employee viewpoint surveys, and organisational culture inventories to identify themes and make improvements to the USNRC's culture. – **IAEA:** Developed the Independent Safety Culture Assessment (ISCA) peer review programme, and the Integrated Regulatory Review Service (IRRS).	

Table 2. **Leadership for safety programmes and processes for regulatory bodies** *(cont'd)*

Notable quotations from interviewees on "leadership for safety" programmes and processes for regulatory bodies
Note: These quotations were selected from the interviews conducted for this study.

General

"For leaders, we should first define the necessary skills and capabilities that are necessary, and after they are described we can define how these skills can improve. For a leader, it is necessary to have some scientific and technical background, some theoretical background, and also it is needed to have some practical experiences in given areas. Finally, a leader needs to have some other, mainly human skills like the ability of integration – a kind of holistic, integrated thinking on some issues."

"One needs to start looking at potential leaders at an early stage. Although they are not there yet, there might be three to six years until they become leaders, but they should also know that there is a potential for this task for them."

Formal training

"We do a week and then go back to work in practice. They put you in scenarios to put into action what you learn. The next week was around developing a team. The third week was working for an organisation…Good course, you got to immerse yourself. We also looked at the impact on other people when there were poor decisions."

"In my days in the university, the curriculum contained technical topics only. Nowadays, the various education and training programmes include leadership and management, which is a good thing."

Coaching, mentoring and role modelling

"Mentoring is an important way to develop leadership skills. Mentoring should include positive reinforcement in addition to providing alternatives or improvements. It should include direction not only in positive times but also call out when they are not doing this better."

"Leaders are the role models of future leaders. The actions and styles of leaders are followed closely. These actions and leadership styles have influenced me as a leader. It is up to an individual what kinds of influences he/she consciously or unconsciously then adopts."

Experiential and on-the-job training

"The career path supports the growth as a leader. I have worked in many positions and worked my way up to my present position. All the positions have developed my competences in different ways and given me the needed versatility."

"The personal experience of working and having a leadership role in organisations other than public sector may be a good thing, as it may expand the understanding of different dimensions of leadership work."

"I have seen during my time that it is a rather good practice to recruit internally, and have people rotate in organisations. You shouldn't only stay in the same department. It's healthy if you move around a little bit and this is one reason why we have the engineers rotate in the organisation, so that they acquire respect and understanding of other fields."

Glossary

External stakeholders	Regulated entities and members of the public.
Influencing aspects	Relationship management approaches to reinforce safety within and external to the regulatory body.
Intellectual aspects	A leader's ability to demonstrate knowledge; identify, rationalise, and justify decisions; and to understand complexity in their operating environments. These aspects refer to characteristics and competencies that support decision making in "leadership for safety".
Interpersonal aspects	Relationship building characteristics and competencies that assist in promoting safety with the regulatory body. Communication, role modelling and actions taken to promote safety are highlighted under this category.
Leadership	The concept of "leadership" is not limited to senior management, but rather can be demonstrated by individuals of any level to the extent possible under their role responsibilities within an organisation. It can generally be described as the ability of an individual or group of people to influence and guide followers.
Leadership characteristics	Personal or organisational traits or attitudes that may be inherent or develop through experience to support the effective leadership of an organisation.
Leadership competencies	Personal or organisational knowledge and skills required to perform a task or carry out responsibilities to support the effective leadership of an organisation.
Leadership for safety	The use of an individual's capabilities and competences to give direction to individuals and groups and to influence their commitment to achieving the fundamental safety objective and to applying the fundamental safety principles, by means of shared goals, values, and behaviour (IAEA, 2016).
Safety culture of the licensee	The assembly of characteristics and attitudes in organisations and individuals that establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance (IAEA, 2020).
Safety culture of the regulatory body	The regulatory body's strategy, the way it carries out its daily oversight work, the type of relationship it cultivates with licensees, the values it conveys, and the importance it gives to safety (NEA, 2016).
Safety leadership	*See* "leadership for safety" *above.*
Safety management	A formal, authorised function for ensuring that an organisation operates efficiently, and that work is completed in accordance with requirements, plans, and resources. Managers at all levels need to be leaders for safety (IAEA, 2016).
Technical competence	An acquired competence entailing suitable technical knowledge and experience to understand the safety issues encountered.

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Annex A. **Project details and methodology**

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A.1. **NEA Working Group on Leadership and Safety Culture (WGLSC)**

The Nuclear Energy Agency (NEA) Working Group on Safety Culture (WGSC) was formed in 2017 to foster discussion and to exchange information and experiences in practical approaches to developing and sustaining a healthy safety culture within the regulatory body and the wider interconnected system. The 2021 report published by the WGSC, *Methods for Assessing and Strengthening the Safety Culture of the Regulatory Body* (NEA, 2021) provides both an overview and practical information regarding the methods and approaches performed by regulatory bodies to build safety culture competence and awareness and to assess their own safety culture.

In 2021, WGSC members established subgroups to work on two main tasks. The first task addressed the impact of the regulatory bodies on the organisations they oversee (and vice versa) from a safety culture perspective. The second task sought to identify effective leadership characteristics and competencies and then determine how these are exhibited in the behaviour of leaders at all levels of a regulatory body that has a healthy safety culture. While this document reports on the second task of the WGLSC, both tasks are in close alignment with the challenges identified in the NEA Green Booklet, *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016), and in particular Principle 1, which states that "*leadership for safety is to be demonstrated at all levels in the regulatory body*".

Due to the important influence leadership has on the effectiveness of the regulatory body, the WGSC was subsequently restructured as the Working Group on Leadership and Safety Culture (WGLSC) in January 2023. The scope of the WGLSC is to foster discussion and the exchange of information, and to consider various practical approaches to developing and sustaining effective leadership and a healthy safety culture of the regulatory body within the wider interconnected system to ensure safety. The WGLSC is focused on leadership and safety culture related to regulatory activities, while appreciating the mutual impact of the operator and other stakeholders to ensure safety.

A.2. **Methodology: Data collection and analysis**

Information for this document was gathered by the task group from the following data sources:

- Summaries from academic literature, the IAEA, the NEA, the World Association of Nuclear Operators (WANO), and regulatory bodies of leadership characteristics and models. These summaries were collected within an internal literature review report.

- NEA Green Booklet, *The Safety Culture of an Effective Nuclear Regulatory Body* (NEA, 2016), which identifies five principles and their associated attributes that support safety culture within the regulatory body.

- The IAEA's *A Harmonised Safety Culture Model* (IAEA, 2020), which describes overarching principles, traits, and attributes within organisations with a healthy culture for safety.

- Survey feedback from 14 international regulatory bodies on leadership and management approaches. The data was collected in 2021 from WGSC members and participants. The survey consisted of eight questions, and sought feedback on areas related to leadership frameworks, integration of safety into leadership initiatives and competencies, and lessons learnt.

- Interviews conducted with industry and regulatory bodies on effective leadership characteristics and competencies from 13 countries.

The literature review and survey of regulatory bodies were conducted in parallel and constituted the first phase of data collection. The second phase of data collection involved structured interviews. The methodology for the second phase was informed by the first phase. The interview questions focused on identifying effective leadership characteristics and competencies that are exhibited in the behaviour of leaders in a regulatory body that has a healthy safety culture. A total of 49 interviews were conducted with 60 interviewees across 13 countries. The target population was experienced nuclear regulatory or licensee professionals, with a preference for those with significant experience working in a regulatory body, for a licensee and/or related organisations. Interviews typically lasted between 60 and 90 minutes. Interviewees were provided in advance with the questions and information about the data collection's purpose and data usage. To ensure a systematic and consistent approach in the conduct of interviews, a guidance document was adhered to by all interviewers.

To organise and analyse the interview data, a coding template was developed that included coding categories based on the results of the literature review and regulatory body survey. The complete interview data set was coded to the template by the respective interviewer(s) by extracting paragraphs or phrases from each interview and aligning them to the categories. A core team of WGSC members then performed further analysis within each category by looking for themes across all the coded interview datasets, making comparisons and connections, and building models to help interpret and explain the data. This was completed for each of the interview questions.

The initial analysed dataset was presented to the working group in June 2022. After the collection and analysis of additional interview data, further working group discussions were held in the fall 2022 and spring 2023. The objective of these discussions was to assess the data holistically, provide a forum to openly discuss themes within and between the interview questions, and to reach a general consensus on thematic interpretations of the totality of the interview data. At all stages of the data collection and analysis process, the anonymity and confidentiality of the interviewees and the data gathered in the interviews was protected.

Data from the interviews were coded into thematic categories and cross checked with the information from the literature review report and regulatory review report to identify common themes and insight on effective leadership characteristics.

The main themes emerging from the data analysis centred on the intellectual, interpersonal, and influencing leadership characteristics that cultivate a strong culture of safety within regulatory bodies. The key leadership characteristics and competencies are depicted in Figure 1 and described in Tables 1A to 1C. Developmental approaches to embody these characteristics were also identified. The analysed data was organised and developed into tables, each with a demonstration of how the characteristic or competency is exemplified through individual and organisational approaches. The tables are accompanied by selected quotations from countries that further contextualise and operationalise the information provided.

Programmes and processes that promote "leadership for safety" for regulatory bodies are presented in Figure 2 and Table 2. They indicate the need to develop a clear leadership model or framework, establish leadership expectations and behaviours, implement a programme for leadership for safety training and development, and conduct safety culture self-assessments. Figure 2 was developed based on the survey and interview data. This figure depicts the five steps recommended for the development of effective "leadership for safety" in the regulatory body.

As this document is designed to be practical guidance, it was important to demonstrate how "leadership for safety" would be displayed at both micro (individual) and macro (organisational) levels. The presentation of both perspectives side-by-side (as Tables 1A-1C and Table 2) supports a holistic understanding of the impact and practice of leaders and "leadership for safety" within the regulatory body. The tables show individual and organisational approaches to leading for safety and how this may be achieved.

A.3. **Linkages to existing safety culture models**

The NEA Green Booklet (NEA, 2016) and IAEA Harmonised Safety Culture Model (IAEA, 2020) were used as important references throughout the research process. Inclusion of direct cross-references to those models in Tables 1A to 1C was considered, but it was decided that for usability and readability purposes the information would instead be included here.

The NEA Green Booklet (NEA, 2016) identifies and describes five principles and associated attributes that underpin and support the safety culture of an effective nuclear regulatory body. These principles and attributes as outlined in the NEA Green Booklet align with the characteristics and competencies laid out in this document. While each is a necessary feature of the safety culture of an effective nuclear regulatory body, no one element is sufficient on its own. It is the combination of these elements that leads to a healthy safety culture within the nuclear regulatory body.

The five principles identified in NEA Green Booklet (NEA, 2016) are:

- *Principle 1:* Leadership for safety is to be demonstrated at all levels in the regulatory body.

- *Principle 2:* All staff of the regulatory body have individual responsibility and accountability for exhibiting behaviours that set the standard for safety.

- *Principle 3:* The culture of the regulatory body promotes safety and facilitates co-operation and open communication.

- *Principle 4:* Implementing a holistic approach to safety is ensured by working in a systematic manner.

- *Principle 5:* Continuous improvement, learning and self-assessment are encouraged at all levels in the organisation.

A mapping exercise was conducted to confirm consistency with these models and identify areas of overlap. This involved analysing each good practice statement under the organisational and individual columns within Tables 1A, 1B and 1C. They were then matched with principles and attributes from the NEA Green Booklet (NEA, 2016) and the IAEA Harmonised Safety Culture Models (IAEA, 2020). As stated earlier, the activities of this working group build upon, in particular, the first principle of the NEA Green Booklet (NEA, 2016). The outcome of this mapping exercise indicated that the NEA Green Booklet matched more closely with organisational approaches, while the Harmonised Safety Culture Model appeared to match more closely to individual attributes.

NEA PUBLICATIONS AND INFORMATION

The full catalogue of publications is available online at www.oecd-nea.org/pub.

In addition to basic information on the Agency and its work programme, the NEA website offers free downloads of hundreds of technical and policy-oriented reports. The professional journal of the Agency, *NEA News* – featuring articles on the latest nuclear energy issues – is available online at www.oecd-nea.org/nea-news.

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Practices for Enhancing Leadership for Safety in Nuclear Regulatory Bodies

This report presents practical guidance to enhance leadership for safety in nuclear regulatory bodies. It identifies the effective characteristics, competencies and behaviours of leaders in regulatory bodies that have a healthy safety culture and lays out programmes and processes that can continuously improve that safety culture.

Some 12 characteristics and competencies that emerged from the original research underpinning this guide are identified as essential to the development of effective leadership for safety in regulatory bodies. These are grouped into three aspect categories and are accompanied by examples of good practices for the regulatory body as an organisation and good practices for the individual.

A five-step programme to embed effective leadership for safety in the regulatory body are also provided. Each step is operationalised through examples of good practices and practical tools for the organisation and for the individual.