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THE EVOLVING ROLE AND IMAGE OF THE REGULATOR: TRENDS OVER TWO DECADES

In the area of radioactive waste management, the regulator or safety authority has emerged as a principal actor in the eyes of civil society. This study shows how regulators are increasing their interaction with society while still retaining – or reinforcing – their independence, and how they play their role within the stepwise decision making processes now adopted in most countries. Decision-making takes place in a "regulatory system", in which not only the safety authority but a host of other players have a role to play. The regulator has come to be considered as the "people's expert", concentrating knowledge useful to local communities as they deliberate the hosting of a waste storage or disposal facility. The study updates a document first published in 2003. While it focuses on developments in the field of geological disposal, the trends it describes are probably relevant throughout the nuclear field.

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FOREWORD

In the beginning of the new millennium, the recently created "Forum on Stakeholder Confidence" (FSC) of the Radioactive Waste Management Committee (RWMC) of the OECD Nuclear Energy Agency took a step back from its accumulating experience to reflect on the evolving role and image of the nuclear safety regulator in waste management. The resulting study[1] endorsed by both the FSC and the RWMC Regulators' Forum (RWMC-RF) noted that:

> "Institutions involved in…the radioactive waste management are facing a rapidly evolving environment stemming from societal changes, the new information technology, new roles for media, etc. This is taking place at the same time as some national radioactive waste management programmes are in transition from research and development to site selection and implementation of a repository, whilst others are reviewing and defining their policies in the waste management area. As in many environmental areas, a demand for public participation in decision-making leads to a need for new approaches to involving stakeholders."

The study observed that "amongst all the institutional players in the field of long-term radioactive waste management, it was perhaps the nuclear safety regulator that has restyled or is restyling its role most significantly". Key issues on the role of the nuclear safety regulator in modern society's decision making process in radioactive waste management and in building and gaining confidence of the public and other stakeholders, were addressed. The report pointed out among other aspects, that:

> "the regulatory process is part of a broader decision making system, the practical application of which has still to be defined in some cases or to be refined in other cases, taking into account the national institutional framework and culture".

Almost a decade after the compilation of the 2003 study, the RWMC-RF decided to re-examine its messages in light of current experience and update the document.

The new study observes that trends in regulatory role, image and practice that had appeared at the beginning of the 2000s have deepened and spread in the ensuing decade – reflecting similar trends throughout the field of radioactive waste management. This publication focuses, in particular, on the present-day role of the regulatory system in the development of national radioactive waste repository programmes. However, many of the trends are likely to be relevant to broader nuclear regulatory activities.

Acknowledgements

This 2012 update of the original 2003 report relies on discussions and data gathered from the FSC as well as the Regulators' Forum. It is approved and published by the RWMC-RF.

[1] OECD Nuclear Energy Agency (2003) *The Regulator's Evolving Role and Image in Radioactive Waste Management*, NEA Report n° 4428, OECD Nuclear Energy Agency, Paris.

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TRENDS OVER TWO DECADES – KEY OBSERVATIONS

Changes in modern society are shaping the context of long-term radioactive waste management. Values such as health, safety, environmental protection, and sustainable development take on increasing importance. New, more inclusive and decentralised forms of risk governance are demanded for dealing with hazardous activities: broader groups of stakeholders[2] take part in examining the justification of activities, and in decision making.

International legal instruments[3,4] and national legal frameworks highlight the right of citizens to participate in decisions affecting the environment.

Dialogue and stakeholder involvement have become a central part of the radioactive waste management process. A trend can be seen in OECD countries towards implementing forms of public involvement that require new or enhanced dialogue amongst all concerned parties[5].

Amongst all the institutional players in the field of long-term radioactive waste management, it is perhaps the nuclear safety regulators[6] that have restyled or are restyling their roles most significantly. Trends affecting the regulators' role, image and practice that were visible at the beginning of the 2000s have deepened and spread in the ensuing decade. This movement likely concerns the broader nuclear regulatory area as well. The most salient evolutions are:

- The *regulatory system* moves clearly into view. Safety is the result of a system that gives a prominent role to the nuclear safety and environmental protection technical regulatory authorities but also involves, especially at the policy level, other bodies such as Parliament, Government, and regional authorities. Complementary players with a role in the regulatory system have been created or distinguished in some contexts. These include, for example, oversight committees including specialists in various domains and stakeholder representatives, or supporting technical research bodies.
- Most nuclear safety regulators are more clearly separated from the nuclear proponents. Typically, these authorities today are either under supervision of a Ministry (such as Health or Environment) which is not overseeing the nuclear industry, or are formed as independent institutions, often reporting to the country's Parliament, Council of Ministers, or even the President.
- Regulatory practice is adapting to the stepwise decision-making process for radioactive waste management that is now established in most countries.
    - There is more interaction among players in the pre-licensing phase of radioactive waste storage and disposal. The nuclear safety regulator is more likely to provide informal guidance and

[2] The RWMC and its working parties define "stakeholder" as any actor – institution, group or individual- with an interest or a role to play in the process.
[3] Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters.
[4] COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.
[5] NEA RWMC 2008 Collective Statement on geological disposal of radioactive wastes.
[6] "Nuclear safety regulator" refers to the competent authority or authorities with legal responsibility for regulating nuclear safety and environmental protection.

recommendations regarding the technical options selected by the implementer for a storage or repository project.

- As the waste management facility project progresses and depending on the country, the nuclear safety regulator may be increasingly called upon to review preliminary safety cases and supporting assessments information to provide feedback to the implementer both formally and informally.
- Successful experiences in facility siting have shown that active regulatory involvement is needed and is also possible without endangering the independence and integrity of the nuclear safety regulator.

- The nuclear safety regulator has gained increased opportunities for formalized interaction with civil society stakeholders, at the local and at the national level, within the framework of public hearings, enquiries, debates or other legally established – or voluntary – consultation. Various approaches to involve the general public in rulemaking and licensing procedures are now set up or refined.
  - Regulatory actors and stakeholders at the national (and international) level have heightened their dialogue and joint investigations regarding waste management policy and review of experience.
  - Regulatory actors are increasingly called upon as the "people's experts" and in many territorial contexts rise to the challenge of that societal demand, especially concerning local implementation of disposal projects, site-related concerns regarding health and environmental protection, etc.
- The nuclear safety regulators have stepped forward to play an active role in public information.

Overall, the past decade or more has seen a definitive shift in the roles and image of the nuclear safety regulator and also of the other main players involved in the process. Legislated roles and also perceived and practical roles have all evolved.

While technical safety concerns continue to receive highest priority, the new context requires an extended set of attitudes and abilities from every actor in the regulatory system. Organisational ability to communicate with a broader set of partners in multi-level governance has emerged as critical to public confidence in decision making on radioactive waste management. All the relevant regulatory system actors including government need a long-term strategy for public communication as well as for interaction with other stakeholders.

THE REGULATORY SYSTEM

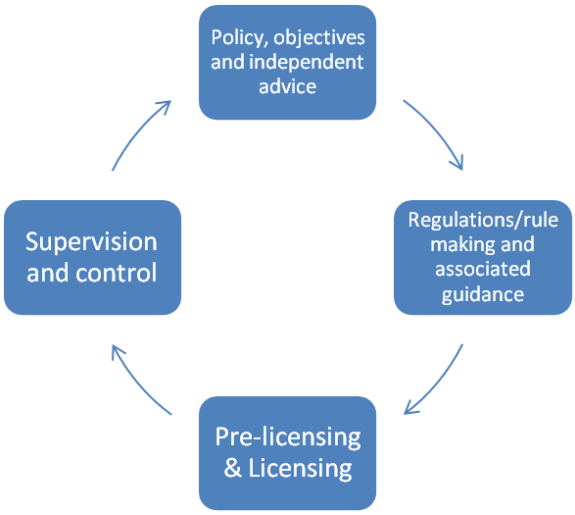
In a broad sense, the regulatory system for radioactive waste management includes the formal licensing and control implemented by the nuclear safety regulatory bodies and also the political and societal decision-making process regarding waste management strategies and projects. Together these activities involve multiple functions and multiple players. The nuclear safety regulators play a central role in achieving the ultimate objectives of ensuring the safety of the public and protecting the environment.

Radioactive waste management: a complex system of players, roles and interactions

Radioactive waste management is now conceived of as a complex system of players, roles and interactions. Decisions are achieved as the result of a regulatory system in which the nuclear safety regulatory bodies have a relevant role in nuclear safety and environmental protection matters but where other bodies, especially at the policy level, such as Parliament, Government, and regional authorities, are involved as well. Furthermore, there may be more than one technical authority issuing guidance, taking part in licensing, and carrying out control and supervision[7]. In the past decade complementary players with a role in the regulatory system have been created or distinguished in some contexts. These include, for example, oversight committees including stakeholder representatives and specialists in various domains, or supporting technical research bodies.

The elements associated with a modern regulatory system are conveniently depicted as a cycle embracing the principle of continuous improvement (Figure 1).

Figure 1. Regulatory cycle (from OECD NEA, 2009).



[7] See footnote 6 and see online the useful table of Regulatory Infrastructure, updated as of 2009: http://www.oecd-nea.org/rwm/Regulat-Infra-NEA-MC-12Apr2010.pdf.

Comparison of the regulation of radioactive waste management in NEA member countries shows that there is no single best way to deliver the various elements of the regulatory cycle. The formal structures and organisational arrangements depend on the national constitutional structure, legal and institutional framework and, to a large extent, on national regulatory culture (e.g., expectations regarding how prescriptive regulation should be). In most cases, major decisions such as the licensing of nuclear facilities are taken by government or by delegation from government only after coordination of a wide range of relevant and authoritative inputs, e.g., from several government departments and other governmental technical authorities, from local communities, and from independent advisory bodies or commissions.

Generally speaking, a nuclear safety regulator's mandated responsibility is (i) to define nuclear safety, radiation protection, and environmental protection requirements, (ii) to issue guidance on safety assessment methodology and documentation, (iii) to review the implementer´s safety analysis as a basis for licensing of waste management and disposal activities and facilities, (iv) to inspect and review construction, operation and closure of nuclear facilities to ensure compliance with licensing conditions; and (v) to provide information to political authorities, the public, and others as needed.

Independence and public accountability

The independence and public accountability of the nuclear safety regulator is crucial to ensure confidence in the quality of the work of the implementer and the credibility of the decision-making process.

Most nuclear safety regulators are now clearly separated from the national ministry in charge of Energy and/or Industry. They are now under supervision of a different Ministry such as Health or Environment, or they are formed as independent agencies, which often report to Parliament, to the country's President, or to the Council of Ministers.

Key safety concepts are the result of societal dialogues

Because decisions in the field of waste management and disposal are taken within a complex national context, which varies from one country to another, it has been observed in recent years that such terms as safety, risk, monitoring, etc. cannot be defined universally. Namely in 2011 the RF agreed "… that these terms are not universally definable and need to be defined in regulations. The definitions by the regulator are meant for the implementer, even if they are a social construct; they are fit-for-purpose and useful for arguing in a licensing procedure; the guidelines have nothing to do with the political sphere."

ALL ACTORS HAVE EVOLVED

The decision-making process in radioactive waste management and disposal should be seen in the context of a well structured dialogue/interaction between implementer, nuclear safety regulator, political decision-maker and the general public. A necessary condition for a successful process is that institutions and decision-makers gain and merit recognition as trustworthy and accountable. Roles and expectations of all actors have evolved in the last decade. The evolving roles and practices do not always supplant traditional activities, but usually complement them.

Changes in modern society demand new forms of risk governance in dealing with hazardous activities characterised by the involvement of concerned stakeholders in the decision making process. Confidence in institutions is seen as a key prerequisite for a successful societal decision making process.

The past decade or more has seen a definitive shift in the roles and image of not only the nuclear regulatory system actors but the other main players as well. Not only legislated roles but also perceived and practical roles thus have evolved.

Table 1 contrasts the traditional expectations regarding the main actors in radioactive waste management, with the roles and responsibilities as they are regarded today. The evolving roles and practices do not always supplant traditional activities, but usually complement them. While safety concerns continue to receive highest priority, the new context requires an extended set of attitudes and abilities from every actor in the regulatory system. Organisational ability to communicate with a broader set of partners in multi-level governance has emerged as critical to public confidence in radioactive waste management arrangements. All the relevant regulatory system actors including government need a long-term strategy for public communication as well as for interaction with other stakeholders.

Table 1: Traditional and evolving roles and responsibilities of main actors in RWM. *Adapted from OECD NEA (2008)*

Stakeholders	Traditional expectations for roles and responsibilities	**Evolving expectations for roles and responsibilities**
Policy-makers	Defining policy options, investigating their consequences under different assumptions, making policy choices.	Informing and consulting stakeholders about policy options, assumptions, anticipated consequences, values and preferences. Setting the "ground rules" for the decision-making processes. Communicating the bases of policy decisions.
Nuclear safety regulator	Defining regulatory requirements and guidance. Defining a regulatory process, making choices regarding regulatory options. Reviewing the implementer's safety options and design and asking for possible complements or modifications. Making decision on the step forward.	Maintaining open and impartial regulatory processes. Providing stakeholders with understandable explanations of the mechanisms of regulatory oversight and decision making, including explanations of the opportunities available for stakeholder participation therein. Serving as a source of information and expert

	Reviewing and validating operational rules. Controlling the compliance of operation with operational rules. Communicating the bases of regulatory decisions.	views for local communities.
Scientific experts, consultants	Carrying out scientific/technical investigations with integrity and independence. Advising institutional bodies such as the nuclear safety regulator, other authorities and implementing agencies on technical issues in relation with safety concerns in view of providing balanced and qualified input for decision making.	Acting as technical intermediaries between the general public and the decision makers within the limits of the mandate that they have received from the organization upon which they depend. Providing balanced and qualified input for all stakeholders and encouraging informed and comparative judgement.
Implementing agencies	Proposing safety options and designs for radioactive waste management solutions, investigating their consequences under different assumptions. Developing a chosen solution, implementing the solution.	Co-operating with local communities in working through proposed options and designs in order to find an acceptable project for radioactive waste management. Co-operating with local communities in implementing the project. Interacting with policy-makers and regulators.
Potential host communities	Accepting or rejecting the proposed facility.	Negotiating with implementers to find locally acceptable solutions for radioactive waste management that help avoid or minimise potentially negative impacts and provide for local development, local control, and partnership. Interacting with policy-makers and regulators.
Elected local or regional representatives	Representing their constituencies in debates on radioactive waste management facilities.	Mediating between several levels of governments, institutions and local communities in seeking mutually acceptable solutions. Interacting with regulators and implementers.

Nuclear safety regulators have a mission in service of the public; their responsibility is to protect public health and the environment. Ideally and subject to any legal constraints, the regulators should be "guarantors" of safety and the "people's expert", acting as an accessible resource to stakeholders addressing safety concerns. The traditional role of a nuclear safety regulator in developing safety standards and guidance, and in evaluating an implementer's safety report for licensing of proposed facilities has evolved. There is now increased attention to transparency in providing information to the public and the stakeholders and in facilitating public understanding of the regulatory process and associated decision-making.

EARLIER ROLE IN THE DECISION-MAKING PROCESS

The traditional position worldwide was that the nuclear safety regulator should not be too intensely involved with the radioactive waste management and disposal programme until the licensing process proper begins, since their independence might be compromised from a legal point of view. In recent years this position has resolutely changed toward a more active and visible role for the nuclear safety regulator in the pre-licensing steps.

Most nations have by now defined and adopted a *stepwise process* for societal decision making about radioactive waste management. A phased process with discrete and easily evaluated steps facilitates the traceability of decisions, accommodates stakeholder needs (opportunities for consultation and feedback, smaller steps in implementation, reversibility, etc.) and promotes public and political confidence in the safety of long-term waste management arrangements. Basic features of any stepwise process include definition of the steps, and clear division and definition of the roles and responsibilities of each stakeholder along the different steps, based on a legal framework. The framework adopted should foster an open, transparent, fair and broadly participatory process.

From a regulatory point of view, a phased approach for implementation of repository programmes allows for evaluation of steps taken so far and to stipulate the conditions under which the next step may be allowed. This kind of process can also be facilitated by the development of regulations in a gradual way, starting from very general principles and ending with the guidance applicable to a licensing review. In this way, the job of regulating becomes intrinsically one of gradual learning and refinement. Accordingly, rules set at one step may be modified or updated at later stage, although in such cases regulators must clarify the reasons and basis for change.

Challenges and opportunities

At present, the NEA member countries show a wide variety of regulations in terms of scope and criteria specified and level of detail set down in regulation. Two philosophies can be distinguished; each of them may have advantages and disadvantages as follows:

- Detailed requirements
    - provide clear messages to both the implementer and the general public;
    - if unduly detailed, may hamper the development of techniques and procedures within the radioactive waste management system.
- An absence of detailed requirements
    - provides more opportunity for a constructive dialogue between regulator and implementer; could be beneficial for the development of technical procedures;
    - leaves much to interpretation and may give the impression of insufficient control by the authorities.

In order to preserve flexibility within a decision-making process that could last decades, nuclear safety regulators typically strive to avoid imposing overly detailed rules too early. This requires a well-structured

and formalised interaction process between an implementer and a nuclear safety regulator that secures societal trust.

An issue that could emerge is whether the level of knowledge is adequate to provide the necessary input for the technical and societal decision at each stage in the stepwise development process. It has been observed that only a decision in principle can be issued. For a decision in principle to progress from one early step to the next, only a preliminary safety appraisal is required stating that nothing had been found that would raise doubts about the possibility to achieve, at term, the required safety level.

Measured participation in this type of long-term process demands that the nuclear safety regulator has a good overview of the whole decision-making process as well as a clear definition, at each step, of what is required or expected. In particular, in areas which are the exclusive responsibility of the nuclear safety regulator, the regulator should determine and inform in advance when, where and how public and other stakeholders' input can be accommodated in decision-making. At a minimum, the regulator should communicate the basis of its decision.

Early involvement for nuclear safety regulators is possible and desirable

An important phase of the stepwise decision-making process is the early period when the "rules of the game" are defined. The process of rule making and its application to facility site selection and licensing should be transparent and comprehensible. This implies an open process in which the public and other stakeholders can comment on the approaches used by the regulators. Accordingly,

- The "rules of the game" for the regulatory process should be known as soon as possible and in any case in advance of a licensing application;
- Ideally the overall system of regulation, including the formulation of relevant policy by government, should be manifestly impartial and equitable.

It is beneficial that the nuclear safety regulator, in its role of representing the interest of public protection, be involved at early steps in the siting process of a radioactive waste disposal facility and that it collaborate with the potential host community/ies to the extent that this is compatible with the statutory regulatory regime. Depending on national legislation and regulations, a radioactive waste management facility licensing sequence may begin with some kind of regulatory decision on the site selection or site authorisation or with the construction permit. However, the stepwise process of territorial siting commences long before that licensing decision and early phases are sensitive for both the emergence of public concerns and the implication of decision-makers at national and local level.

Successful experiences in facility siting have shown that active regulatory involvement is possible without endangering the independence and integrity of the nuclear safety regulator. For instance, thanks to their early involvement and commitment at the local level from the early 2000s, the regulators in the Nordic countries came to be seen by the municipalities as *"the independent expert of the public"* and *"competent and responsible supervisors of safety"*.

The level of involvement of the nuclear safety regulator in pre-licensing activities and its potential influence in a repository programme and a decision-making process is greatly affected by how the role of the regulator is defined in the national legal framework for radioactive waste management. Depending on the country, there may be:

- A legal responsibility for the control of safety of nuclear facilities involved in waste management (e.g., waste package production, interim storage, disposal facilities).
- A legal responsibility for periodic regulatory review of the R&D in relation with radioactive waste disposal projects.

- A legal responsibility to review the site selection and characterisation programme and make preliminary findings early in the process.
- An absence of a legally defined regulatory role regarding the pre-licensing period.

A trend has emerged by 2012 for more interaction among actors in the pre-licensing phase. The nuclear safety regulator is more likely to provide at least informal guidance and recommendations regarding the safety options selected by the implementer for a storage or repository project. This model of "informal" dialogue between implementer and regulator requires a well-defined interaction process that secures public confidence and ensures that regulatory licensing decisions remain independent and unconstrained by early exchanges.

A NEW RELATIONSHIP WITH SOCIETY

Keeping the public informed today is considered a key function of regulators. The goals of a regulatory authority in communicating with the public are to foster public understanding of the regulatory role and activities, to gain public trust as well as to provide national and local decision-makers with the necessary information on relevant matters.

Since the responsibility of nuclear safety regulators is to protect public health and the environment, regulators have a mission in service of the public. Ideally, and subject to any legal constraints, the regulators should be "guarantors" of safety and the "people's expert", acting as an accessible resource to stakeholders addressing safety concerns. Nuclear safety regulators should thus establish and maintain open channels of communication with the general public, implementers, government departments, parliament, concerned action groups and others. Appropriate mechanisms of dialogue must be found with the different stakeholders.

More transparent functioning and stakeholder engagement

A number of nuclear safety regulators assert that, in the years since the publication of the 2003 Regulators' Forum study, there has been a steady movement towards increased transparency. This has been achieved through, for example, improved use of participatory methods and engagement with the stakeholders and the public in the areas of information provision, rule making, and site-related safety assurance. Approaches differ among countries, varying from opportunities for public and stakeholder comments to open licensing meetings and hearings. Overall, the trend in several member countries resembles the longer-established tradition in the Nordic countries and the USA.

When aiming to address issues of real interest, a prerequisite in communication with stakeholders is to listen to their concerns and expectations. In order to increase public confidence in their mandate, the nuclear safety regulators must understand societal concerns and how to address them, as public concerns have turned out, in many cases, to be different from what the technical experts regard as the most relevant concerns. The starting point in addressing regulatory public information and defining communication strategy should thus be studies and research on societal concerns. Risk perception, values and interests of the public and different stakeholders have been areas of research by nuclear safety regulators. In other cases, direct dialogue has afforded the opportunity to refine mutual understanding.

Some nuclear safety regulators have recently created divisions dedicated to "openness to society". The objective is not outreach or "public relations" in the traditional sense, but rather, to build greater awareness within the regulatory body of societal needs and how these can be served. At the same time, the division seeks to make its competences better known among the societal stakeholders who may draw on its expertise. Several dialogue exercises between regulators and stakeholders have been recorded in recent years. Improvements in competence building and understanding of safety issues have been achieved through joint initiatives involving the nuclear safety regulator and stakeholders. In some cases, local environmental safety concerns have been investigated by the nuclear safety regulator in close collaboration with other actors within the regulatory system and with representatives of civil society.

Increased experience in repository siting or development

Progress in the implementation of long-term radioactive waste management facilities relies on a clear strategy for the selected management solution, sound support by government and policy-makers, the commitment of the involved parties and a well structured process of dialogue/interaction between implementer, regulators, political decision-makers and the general public.

In a repository siting process, local political authorities are key decision-makers (even more so if the municipalities participate on a voluntary basis, or have veto rights). As such they are natural intermediaries for dialogue between civil society and the nuclear safety regulator with responsibility for radioactive waste disposal. The nuclear safety regulator should take a proactive role in interactions with the local political authorities. The objective cannot be to gain public acceptance of a project but should be to build up the nuclear safety regulator's credibility and gain public confidence in the regulator's role as guardian of health and safety, as well as to provide national and local decision-makers with the necessary information on safety matters.

Experience has been gained in several OECD member states regarding interaction between the nuclear safety regulator and the general public in the case of repository siting or development. This may be facilitated by locating regulatory staff in siting areas where local people may want to call on their expertise. In this way, high levels of interaction have been maintained by some regulators and through the visibility gained, they may be invited by local officials to participate in public meetings to explain the regulatory role in the decision-making process as well as other legal matters of importance. This effectively supports the local communities in their development of comments or submissions to inquiries, or other deliberations. Nuclear safety regulators also respond to requests by local liaison committees to state their views on repository matters. While interacting in this way, a regulatory body should take care not to intervene on any issue or point of procedure during a siting process that might result in question to its neutrality and independence.

Competence building for public communication

As an independent body, the nuclear safety regulator should provide independent, neutral, balanced and factual information about issues related to safety. In addition to regulatory control functions, public information is now increasingly a key function of nuclear safety regulators. In some cases, this is stated in legal instruments creating certain nuclear safety regulators and it is often included as a goal in regulatory strategic plans. Also, most nuclear safety regulators have the obligation to make regular or periodic reports but also to provide information to stakeholders. Recently, the Fukushima accident has tested the regulatory organisations' communication skills and has stimulated regulatory preparedness and ability to inform the public.

Communicating with the public is not a simple activity because of the limitations in translating technical language for public understanding. When a nuclear safety regulatory body decides to increase interactions with stakeholders, a series of questions emerges: Who can take the role of communicator in each organisation? Which criteria can guide the selection of the right staff for each context? What skills and training are needed? Working methods differ among national nuclear safety regulators. In some contexts, all staff with a regulatory role are considered to be potential communicators, with staff at every level responding to community requests for input or appearing in local and national media. In other cases, management identifies expert staff with a natural aptitude for outreach, or sets training programmes to assist these and other staff to respond to external requests.

Communication requires a commitment to continuous learning, for example, training in risk communication and in conducting public meetings may be necessary. Communication with the news media is a matter of particular importance, as they are both an audience in their own right and a channel for reaching other audiences. Nuclear safety regulators have to be prepared to respond on questions of debate

and issues of public interest (e.g. waste disposal alternatives and options, general feasibility of disposal, retrievability, etc). Regulators should consider how they should position themselves on such questions and issues.

The last decade shows increasing use by nuclear safety regulators of the full range of new information technologies, including social networking. Many nuclear safety regulators are considering how practices might evolve with the offer and demand associated with new online tools. The regulators are examining the limitations associated with such technologies, with respect e.g. to the need to identify the authors of opinions submitted through electronic means, and to measure the representative character of such opinions. Working groups are often formed to analyse performance of these technologies for regulatory needs.

Attributes of a nuclear safety regulator that build confidence and earn public trust

Public trust is based both on track record and on perceived morality and values. A good track record would suggest, from experience or evidence, that the nuclear safety regulator is independent, makes decisions in an open and transparent manner, and is responsive to the public. A perception of reliability, honesty, veracity, fairness, strength, etc. of a person or the regulatory organisation, would enhance confidence in a regulator by the public. Public trust is thus necessary to further legitimate the mission and role of the nuclear safety regulator in the eye of the public.

A number of organisational and behavioural features appear essential to building confidence and meriting public trust. They are discussed below from the perspective of the nuclear safety regulator.

Competence**:** *Competence is both statutory and effective. Statutory competence is granted by the mandate defined for a nuclear safety regulator in the national programme. It is a prerequisite for legitimacy and action. Effective competence relies on the training and expertise of regulatory staff, and sufficient resources for careful scrutiny of the implementer's proposals and arguments*. The Regulators' Forum found that scientific and technical expertise is strengthened when pertinent R&D is undertaken directly by the nuclear safety regulator. From a human resources viewpoint, participating in R&D is attractive to young scientists. Achieving and maintaining adequate effective competence within nuclear safety regulators relies on organisational ability to attract and retain capable staff.

Openness and transparency: *Being proactive in providing valid and reliable information about decisions, policies and issues related to safety*. Examples gathered from NEA member organizations show that the nuclear safety regulators have reinforced their openness and transparency commitments. Enforcement policies, decision records, pollution inventories, and other documents are freely available on regulatory websites. Nuclear safety regulators are moving from the background to the foreground, accepting or inviting media attention on issues within their expertise, seeking opportunities to answer questions, to discuss and to exchange views with the public or organisations.

Clarity: *Use of plain language to explain safety, institutional and procedural concepts is essential for fostering the understanding and transparency necessary for building trust*. Examples gathered from Regulators' Forum members show greater recognition of the need to communicate with stakeholders and the public in plain language.

Accountability**:** *Nuclear safety regulators must be prepared to have their actions and decisions probed and questioned in public fora*. The reinforced trend of the last decade towards more stakeholder and public engagement indicates the willingness of the nuclear safety regulators to expose, discuss and justify their work.

Independence: *Regulators need to be independent of organizations of the nuclear energy industry and other institutions likely to be affected by licensing decisions and other regulatory decisions on nuclear safety, environmental protection and radiological protection*. Most nuclear safety regulators are now clearly separated from the national ministry in charge of Energy and/or Industry. They are under

supervision of either a different Ministry such as Health or Environment, or they are formed as independent agencies reporting e.g. to high elected authorities.

Most countries have already, for more than a decade, enjoyed a legal system that provides for independence of the nuclear safety regulator from the Ministry of Energy or Industry. Among regulatory members of the RWMC, three more countries – France, Switzerland, and Korea - completed this separation after 2006 and Japan projects the creation of an independent nuclear regulatory agency by mid-2012.

A 2009 Regulators' Forum workshop highlighted the value of regulatory R&D in ensuring independence of regulatory judgment when reviewing the implementer's safety case. Regulatory sponsored research helps identify the issues most important to safety, improve the quality of regulation by providing in-depth understanding of the safety case, identify problems before they become significant safety or regulatory concerns and also foster more timely regulatory decisions.

CONCLUSIONS

Changes in modern society demand new forms of risk governance in dealing with hazardous activities characterised by the involvement of the concerned stakeholders in associated decision-making processes. For radioactive waste disposal, trends in regulatory role, image and practice that had appeared at the beginning of the 2000s have deepened and spread in the ensuing decade.

With the clarification of roles and better understanding of the systemic nature of safety, a regulatory system has moved clearly into view: the regulatory cycle for nuclear facilities involves not just one institution but a range of bodies associated with development and delivery. The regulatory system includes nuclear safety and environmental protection (technical regulatory) authorities, policy bodies such as Parliament, Government, and regional authorities, pluralistic or expert oversight committees, and supporting technical research bodies.

The decision-making process in radioactive waste management and disposal today is viewed in the context of a well structured dialogue/interaction between implementer, nuclear safety regulator, political decision-maker and the general public. A necessary condition for a successful process is that institutions and decision-makers gain and merit societal recognition that they are trustworthy and accountable.

Among all the players involved in the radioactive waste management decision making process, the change in the role of the nuclear safety regulator from the end of the 1990s has probably been most notable. The traditional position worldwide had been that the nuclear safety regulator should not be too intensely involved with the disposal programme until the licensing process proper begins, since its independence might be legally compromised. In recent years, this position has resolutely changed toward a more active and visible role in the pre-licensing steps.

The nuclear safety regulator is more likely to provide informal guidance and recommendations regarding the technical options selected by the implementer for a storage or repository project. Nuclear safety regulators, in their role of representing the interest of public protection, are more likely to become involved early in the siting process and to respond proactively to local community requests for collaboration and mutual information.

Nuclear safety regulators have a role both in developing safety standards and criteria to ensure public health and in evaluating whether these standards and criteria will be reasonably met by proposed facilities. As a waste management facility project progresses and depending on the country, the nuclear safety regulator may increasingly be called upon to review preliminary safety cases and supporting assessments and information, and to provide feedback to the implementer both formally and informally. Successful experiences in facility siting have shown that active regulatory involvement is needed and is also possible without endangering the independence and integrity of the nuclear safety regulator. An open, stepwise regulatory process led by a respected regulator can give confidence that the implementer's proposals are subject to the needed detailed technical scrutiny on behalf of the public.

The independence and public accountability of the nuclear safety regulator are crucial to public confidence in the national radioactive waste management programme, especially in the high-level radioactive waste (HLW) programme. Nuclear safety regulators should consciously strive to be, and be seen as, independent overseers of the quality of the implementer’s work and the credibility of the decision-making process. Most nuclear safety regulators are now clearly separated from the national ministry in charge of Energy and/or Industry and sometimes are formed as independent agencies reporting to high elected authority.

Keeping the public informed is considered a key function of regulators. The goals of a nuclear safety regulator in communicating with the public are to foster public understanding of the regulatory role and activities, to gain public trust and to provide national and local decision-makers with the necessary information on relevant matters. Nuclear safety regulators are increasingly called upon as the "people's experts", and have stepped forward to play an active role in public information.

Similarly, throughout the 2000s, nuclear safety regulators have gained increased opportunities for formalized interaction with civil society stakeholders, at the local and at the national level, within the framework of public hearings, enquiries, debates or other obligatory or voluntary consultations. Various approaches have been set up for involvement of the general public in rule making and licensing procedures.

Culture, politics, and history vary from country to country, providing differing contexts for establishing and maintaining public confidence; what works in one may not necessarily be effective in another. Nonetheless, the evolution in regulatory role, image and practice first seen in the 2003 report is confirmed as continuing in 2012, indicating convergence worldwide in the way that nuclear safety regulators in the radioactive waste management area are responding to societal demands upon the regulatory system.

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Consult also the OECD Nuclear Energy Agency web sites for the:

- RWMC Regulators' Forum
  http://www.oecd-nea.org/rwm/regulator-forum.html
- Forum on Stakeholder Confidence
  www.oecd-nea.org/rwm/fsc