Chapter 4

Milestones in Nuclear Law: A Journey in Nuclear Regulation

Stephen Burns

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Abstract The development of the nuclear legal framework has been an interesting journey reflecting a commitment to addressing the key aspects of the peaceful uses of nuclear energy through a variety of approaches using both binding treaties and conventions and non-binding codes and guidance. This complex framework of hard and soft law instruments has developed in response to action forcing events. Future development of the legal regime will be aided by greater harmonization and commitment to ensuring that institutions at an international and national level are transparent and willing to engage in constructive interaction with stakeholders. Legal advisers will continue to play an important role in assisting policy makers and technical experts in crafting comprehensive and effective approaches to further development of the framework for nuclear energy and its regulation. In those deliberations a number of key elements should be highlighted. This chapter suggests that elements

S. Burns (✉)

Formerly of U.S. Nuclear Regulatory Commission, Rockville, MD, USA

e-mail: Official.Mail@iaea.org

Formerly of Legal Affairs of the Nuclear Energy Agency, Organisation for Economic Co-operation and Development (OECD/NEA), Paris, France

are stakeholder trust, strong institutional capacity, and integration of international instruments and standards at national levels.

Keywords Nuclear regulation • Peaceful uses of nuclear energy • Binding treaties and conventions • Non-binding codes and guidance • Legal advisers • Safety and security • Permission principle • Soft law • Hard law

4.1 Introduction

The convening by the International Atomic Energy Agency (IAEA) of the ‘First International Conference on Nuclear Law: The Global Debate’, in Vienna, offers an opportunity to reflect upon the development of nuclear law since President Eisenhower’s ‘Atoms for Peace’ speech before the United Nations General Assembly in December 1953. Eisenhower’s speech laid out a vision of dedicating nuclear technology towards peaceful ends and can be said to have inspired the creation of the IAEA in 1957. Since that time nuclear law has developed around the broad concepts of safety, security and safeguards, and we can say that there has been a more intentional focus on the integration of these concepts with each other in recent years. As reflected in the Handbook on Nuclear Law,¹ a number of principles can be said to characterize nuclear law as it has developed and been implemented through national and international regimes.²

My own journey in nuclear regulation began upon graduation from law school in 1978, shortly before the Three Mile Island accident, when I began employment as a lawyer at the US Nuclear Regulatory Commission (NRC). Over the years, I was engaged in the broad range of safety and security issues that came before this agency. My role as counsel consisted of advising and representing the NRC’s technical staff in matters related to standards setting, licensing, inspection and oversight of nuclear power facilities and radioactive material. My primary engagement in the international aspects of nuclear law and regulation arose largely in the past 20 years as a senior counsel at the NRC, later as head of the Office of Legal Affairs at the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA) and then as a Commissioner and Chairman at the NRC. In this Chapter I hope to address a number of characteristics of nuclear law, particularly as they have shaped the framework for regulation, to further consider the context for providing legal advice and achieving good regulation, and finally to reflect on challenges that lie ahead.

¹Stoiber et al. 2003.

²The principles are: safety; security; responsibility; permission; continuous control; compensation; sustainable development; compliance; independence; transparency; and international co-operation.

4.2 Nuclear Regulation: Characteristics and Tensions

4.2.1 *Nuclear Activities are Born Regulated*

An interesting characteristic of nuclear activities and the nuclear industry is that they have been regulated since the very beginning. Although the discovery of X rays and radium did not give rise to more systematic regulation until well after their initial use in medical and other applications, the development of nuclear energy and access to nuclear materials was controlled by governmental authorities from the outset. This approach reflects the tension between the desire to secure such material from further weaponization and to promote the development of peaceful uses. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) embodies these principles in its objectives to curb the expansion of nuclear weapon States and to promote disarmament while allowing access to equipment, materials and information for the peaceful uses of nuclear energy.³

Thus, to use fissile materials and radioactive sources or to operate nuclear facilities requires some form of authorization or licence from the responsible national authority. The requirement for authorization to access radioactive materials and installations constitutes the ‘permission principle’ in nuclear law.⁴ The current system consists of a complex network of law and guidance grounded in the core principles of safety, security and safeguards, as noted earlier, with the focal points being radiological protection, waste management and decommissioning, transport, emergency preparedness and response, environmental protection, liability and compensation, and international trade.⁵

4.2.2 *A Framework Built on ‘Hard’ Law and ‘Soft’ Law*

As one might expect, the framework for nuclear regulation is comprised of both international and national instruments. But equally characteristic is the foundation for regulation in both binding treaties and conventions, as well as non-binding guidance and instruments developed by the international community. The difference between binding and non-binding instruments is typically described as a distinction between ‘hard’ law and ‘soft’ law. For example, the Convention on the Physical Protection of Nuclear Material (CPPNM) and its 2005 Amendment are examples of hard law instruments that specify certain obligations with respect to security that the contracting parties agree to implement in their national programmes and legal

³Treaty on the Non-Proliferation of Nuclear Weapons, opened for signature 1 July 1968, entered into force 5 March 1970 (NPT).

⁴Stoiber et al. 2003, p. 7.

⁵OECD/NEA 2021, Annex 1; www.iaea.org/resources/treaties/compendium-of-legal-instruments. Accessed 27 September 2021.

framework.⁶ In contrast, the 2004 Code of Conduct on the Safety and Security of Radioactive Sources is a non-binding code to which States are urged to make a political commitment to achieve a high level of security in order to control radioactive sources to, among other objectives, prevent their loss, unauthorized access or illegal transfer and to mitigate the harm from potential malicious uses.⁷ But even if the terms of a treaty or convention are seen as setting binding requirements and obligations, recommendations and guidelines issued by international bodies “not being formally binding, are, to the extent they are relevant, to be taken into account by the State so that the domestic rules and regulations and the measures it adopts are compatible (‘con adecuación’) with those guidelines and recommendations.”⁸

The development of guidance and standards can bring greater precision to the means of achieving the objectives of safety and security in nuclear applications. For example, consistent with the mandate under its Statute (Article III.A.6),⁹ the IAEA is empowered to establish or adopt “standards of safety for protection of health and minimization of danger to life and property”. The IAEA has established safety standards, reflected in fundamental safety principles, general and specific safety requirements, and safety guides, which “reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation.”¹⁰ The Fundamental Safety Principles include the Basic Safety Standards that were initially developed in 1960 and are now sponsored by eight international organizations, including the IAEA.¹¹ The Basic Safety Standards continue to be informed by the recommendations of the International Commission on Radiological Protection.

It is also worth noting that a number of conventions reflect or have been shaped by such non-binding guidance and standards. For example, the CPPNM has its roots in non-binding standards focused on security and its Amendment also draws on fundamental security principles.¹² Although efforts to establish conventions on emergency notification and assistance did not achieve fruition until after the 1986 accident at the Chernobyl nuclear power plant, guidelines developed after the 1979 accident at Three Mile Island served as a basis for the negotiation of the two conventions adopted

⁶Convention on the Physical Protection of Nuclear Material, opened for signature 3 March 1980, entered into force 8 February 1987 (CPPNM); Amendment to the Convention on the Physical Protection of Nuclear Material, entered into force 8 May 2016 (Amendment to the CPPNM).

⁷IAEA 2004.

⁸International Court of Justice, *Pulp Mills on the River Uruguay (Argentina v. Uruguay)*, Judgement, 20 April 2010, ICJ Reports 2010, p. 45.

⁹IAEA 1989.

¹⁰<https://www.iaea.org/resources/rpop/resources/international-safety-standards/about-iaea-safety-standards>. Accessed 27 September 2021.

¹¹European Commission, Food and Agriculture Organization of the United Nations, International Atomic Energy Agency, International Labour Organization, OECD Nuclear Energy Agency, Pan American Health Organization, United Nations Environment Programme, World Health Organization. See IAEA 2014.

¹²Lamm 2017.

in 1986.¹³ The Convention on Nuclear Safety (CNS) references in its preamble “a commitment to the application of fundamental safety principles for nuclear installations rather than of detailed safety standards and that there are internationally formulated safety guidelines which are updated from time to time and so can provide guidance on contemporary means of achieving a high level of safety”.¹⁴ Similarly, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) invokes the Basic Safety Standards and the IAEA’s Principles of Radioactive Waste Management in its preamble, and also draws on the Code of Practice on the International Transboundary Movement of Radioactive Waste in its provisions on that subject.¹⁵

Whether the instrument is characterized as hard or soft law, the obligations or commitments under the particular instrument are adopted under the national regulatory framework, consistent with the State’s constitution and legislative system, and are manifested as being appropriate in the licensing regime and in regulatory standards administered by the responsible national authority. Further guidance on implementation of the licence obligations and regulatory requirements may be issued by the regulatory authority and may also be informed by industry sponsored consensus guidance. As an example, the United States of America made a political commitment to the Code of Conduct on the Safety and Security of Radioactive Sources. The US Energy Policy Act of 2005, Section 170h, 42 USC 2210h, Radiation Source Protection, adopted the central tenets of the Code and directed the NRC as the national regulator to promulgate conforming requirements applicable to its licensees and to those regulated by individual States under the NRC’s Agreement State programme. The NRC issued orders to its licensees, which were eventually followed by the adoption of regulations in 10 CFR Part 37, Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material, to enhance its existing security and control requirements¹⁶ and by the issuance of further implementing guidance with respect to the regulations.¹⁷

¹³Convention on Early Notification of a Nuclear Accident, opened for signature 26 September 1986 (Vienna) 6 October 1986 (New York), entered into force 27 October 1986 (Early Notification Convention); Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, opened for signature 26 September 1986 (Vienna) 6 October 1986 (New York), entered into force 26 February 1987 (Convention on Assistance); IAEA 1984, 1985.

¹⁴Convention on Nuclear Safety, opened for signature 20 September 1994, entered into force 24 October 1996 (CNS), preambular para viii.

¹⁵Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, opened for signature 29 September 1997, entered into force 18 June 2001 (Joint Convention), preamble para xiv and Article 27; Wetherall 2005.

¹⁶Nuclear Regulatory Commission 2013a.

¹⁷Nuclear Regulatory Commission 2013b. A second revision to the guidance document was proposed in early 2019.

4.2.3 *Nuclear Law is More Often Reactive than Proactive*

On the whole, nuclear law can be said to be more reactive in its development than anticipatory in the establishment of its framework. Such a characterization can be said to stem from a variety of reasons—the extent of political will and foresight in establishing the framework, technological discovery and innovation outpacing the development of legal standards, and the impact of significant events on the legal framework. Certainly, there are ways in which the frameworks at both an international and a national level have sought to anticipate and outline the parameters within which the peaceful uses of nuclear energy could grow.

The IAEA Statute, for example, provides the framework that is intended to prevent the spread of nuclear weapons while allowing for the development of peaceful uses of nuclear technology. In establishing the IAEA, the Statute provides an organizational structure through which these goals are to be achieved in the future. The nuclear liability and compensation framework emerged in anticipation of the need to ensure adequate compensation for damage suffered by persons and property as a result of a nuclear accident as well as the desire to encourage development of nuclear technology by a nascent industry.¹⁸ The focus on establishing a liability regime in the late 1950s and early 1960s led initially to the adoption in 1960 of the Paris Convention on Third Party Liability in the Field of Nuclear Energy under OECD/NEA auspices and then in 1963 to the Vienna Convention on Civil Liability for Nuclear Damage under IAEA auspices.¹⁹

Obviously, at a national level, States needed at the earliest stages to establish the regulatory framework to provide for the establishment of nuclear installations and authorized uses of radioactive material. To draw on the early experience of the United States of America, the Atomic Energy Act of 1954, Public Law No. 83-703, constituted the organic legislation authorizing the civilian development of nuclear facilities. The Statute (Section 161b) established an authorization process under which regulated activities could be approved under appropriate standards and regulations as the then Atomic Energy Commission (AEC) deemed “necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property”. In its early regulations, the AEC allowed approval of construction of a nuclear plant to proceed even if additional technical evaluation and study might be needed, so long as the final determinations on safety were made before the authorization of operation of the facility. The approach garnered some opposition but ultimately survived challenge in the US Supreme Court.²⁰ The early

¹⁸Schwartz 2010.

¹⁹Paris Convention on Third Party Liability in the Field of Nuclear Energy, opened for signature 29 July 1960, entered into force 1 April 1968 (Paris Convention); Vienna Convention on Civil Liability for Nuclear Damage, opened for signature 21 May 1963, entered into force 12 November 1977 (Vienna Convention); additional protocols amending both conventions have come into force since their original adoption.

²⁰United States Supreme Court (1961), *Power Reactor Development Corp. v. International Union*, 367 US 396, 407.

experience under the legislation and regulations illustrates the hurdles that may be faced in trying to establish requirements as new technologies develop.

But even if aspects of nuclear law have tried to apply foresight to their development and framework, much of our experience can be said to be reactive to significant events or disruptions in its environment. Both the security and safety regimes have been influenced in this way. The terrorist attacks in the United States of America on 11 September 2001 sparked a focus on the nuclear security threat and led by 2010 to the adoption of five of the seven binding legal instruments bearing on nuclear security which constitute the framework for counter-terrorism.²¹ The new instruments included the Amendment to the CPPNM²² as well as the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT)²³ and instruments adopted under the auspices of the International Maritime Organization and the International Civil Aviation Organization.²⁴ The United Nations Security Council further adopted resolutions, UNSCR 1373 (2001), Threats to International Peace and Security caused by Terrorist Acts, and UNSCR 1540 (2004), Non-proliferation of Weapons of Mass Destruction, which complement the framework.

The response to the September 2001 terrorist attacks also led to a reassessment of the non-binding Code of Conduct on the Safety and Security of Radioactive Sources. The Code itself had come to fruition after focus on the safety and security of sources had garnered greater attention in the 1990s, particularly in the light of earlier accidents that caused a number of deaths, such as the accident in Goiânia, Brazil, in 1987, and a sense that the regime for control of sources was inadequate in a number of countries. An IAEA conference on the topic in Dijon in 1998 helped in developing the Code, which was ultimately approved in September 2000.²⁵ The events of September 2001, however, led to consideration of securing such material against diversion or use for malicious purposes, such as a radioactive dispersal device. After further review of the Code by technical and legal experts and discussion at a conference in Vienna in early 2003, the revised Code was approved in September 2003 with the objectives of providing a high degree of safety and security to “prevent unauthorised access or damage to, and loss, theft or unauthorised transfer of, radioactive sources, so as to reduce the likelihood of accidental harmful exposure to such sources or the malicious use of such sources to cause harm to individuals, society or the environment” and to “mitigate or minimize the radiological consequences of any accident or malicious act involving a radioactive source.”²⁶

Perhaps the most dramatic example of the reactive nature of the development of international nuclear law is the emergence of the safety framework after the accident at the Chernobyl nuclear power plant in Ukraine, then part of the Soviet Union,

²¹Wetherall 2016, p. 42.

²²Amendment to the CPPNM, above n.6.

²³International Convention for the Suppression of Acts of Nuclear Terrorism, opened for signature 14 September 2005, entered into force 7 July 2007 (ICSANT).

²⁴Ibid., p. 18.

²⁵IAEA 1999.

²⁶IAEA 2003.

in 1986.²⁷ Chernobyl remains the most significant accident at a nuclear installation, particularly in terms of deaths resulting from the accident and transboundary effects. During a time before broad public use of the Internet and social media, its occurrence was not known or understood for several days after the accident. Prior to the accident, there were no broadly binding international treaties or conventions that addressed emergency notification and assistance or the safety of nuclear installations. Within months of the accident, the Early Notification Convention and the Assistance Convention were negotiated and entered into force, respectively, in October 1986 and February 1987. As noted earlier, the earlier development of guidance documents on notification and assistance in the years following the accident at the Three Mile Island nuclear power plant contributed to the swift negotiation of the conventions, as did the deferral of the more difficult debate over the form and scope that might be incorporated into an instrument addressing the safety of nuclear facilities.

Although work towards a safety convention languished for several years, ultimately members of the European Community proposed in 1990 the convening of a conference the following year to consider the status of nuclear safety and to recommend next steps.²⁸ The 1990 IAEA General Conference approved the proposal, and the special conference was held in early September 1991. Later that month, with the report of the proceedings in hand, the General Conference initiated the steps that would ultimately result in the development of a draft text of a convention. The open-ended Group of Experts on a Nuclear Safety Convention met seven times between May 1992 and February 1994 to shape the text that was submitted to the Diplomatic Conference convened in June 1994. The CNS was opened for signature in September 1994 and came into force in October 1996. Consideration was deferred on a convention on safe waste management but, as promised in Preamble (ix) of the CNS, work on such a convention resumed and eventually resulted in the adoption of the Joint Convention in 1997. Both the CNS and the Joint Convention are characterized as ‘incentive’ conventions, by which States are encouraged to strengthen safety within their national programmes and participate in the mechanism for peer review provided through the periodic meetings of the States Parties to the convention. In evaluating the efficacy of the conventions, debate has focused on the counterpoints between the embrace of general principles of safety versus specific norms, the emphasis on State responsibility versus a more international system, and the incentive versus a sanctions approach under the conventions.²⁹

It is also worth noting the impact of the Chernobyl accident on the nuclear liability regime. Although the first nuclear liability conventions had been adopted in the early 1960s under the auspices of the OECD/NEA and the IAEA, and could be considered, as noted previously, to be proactive in terms of establishing the framework for addressing liability, the instruments had in some respects languished. At the time of the accident, the Vienna Convention could count a limited number of parties, with only two possessing operating nuclear power plants; no countries in the former Soviet

²⁷Burns 2018.

²⁸Jankowitsch 1994.

²⁹Pelzer 2010, p. 88.

bloc were parties. Moreover, prior efforts to link the Vienna and Paris Conventions had stalled. In this context, the transboundary effects of Chernobyl spurred efforts to improve the conventions and achieve greater harmonization between the existing instruments. The Joint Protocol linking the Paris and Vienna Conventions on nuclear liability was negotiated in 1988.³⁰ Further negotiations led in 1997 to proposed revisions to both the Vienna Convention and to a new Convention on Supplementary Compensation (CSC); parties to the Paris Convention and its Brussels Supplementary Convention concluded negotiations to revise them in 2004.³¹ Notwithstanding the impetus that the Chernobyl accident provided to examine and improve the liability regime, it has taken some time for the changes in the regimes to come to fruition, as evidenced by the CSC and the 2004 Paris/Brussels protocols not coming into force until 2015 and 2022, respectively.

4.3 Preparing for the Regulatory Challenge

4.3.1 *Integrating Legal and Technical Support*

The first part of this chapter has explored some characteristics and tensions reflected in the international nuclear regulatory framework. In considering the future direction of nuclear law, it is worth noting the contribution of legal advisers to the sound establishment and administration of policies and practices related to the peaceful uses of nuclear energy and materials. Legal advisers play an important role at both the international and national level. The IAEA held a meeting in 2019, in which I was pleased to participate, on the Role of the Legal Adviser in a Regulatory Body.³² Although focused particularly on the role of the adviser in national regulatory organizations, the discussions had more general relevance to the various aspects of legal support.

Participants in the meeting included representatives with both legal and technical backgrounds from some 24 Member States and IAEA staff. The participants' home countries comprised a diverse set of Member States at different points along the spectrum of nuclear activities, ranging from States with mature programmes with operating nuclear installations, to those focused solely on radiological protection and the security of radioactive sources as well as to those embarking on a nuclear

³⁰Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention, opened for signature 21 September 1988, entered into force 27 April 1992 (Joint Protocol).

³¹Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage, opened for signature 29 September 1997, entered into force 4 October 2003 (1997 Vienna Protocol); Convention on Supplementary Compensation for Nuclear Damage, opened for signature 29 September 1997, entered into force 15 April 2015 (CSC); Protocol to Amend the Paris Convention on Nuclear Third Party Liability, opened for signature 12 February 2004, entered into force 1 January 2022 (2004 Paris Protocol).

³²<https://www.iaea.org/newscenter/news/providing-legal-support-to-the-regulatory-body-first-meeting-of-legal-advisers-held-in-vienna>. Accessed 27 September 2021.

energy programme. Legal support was provided in diverse ways. Some legal staff members were employed within the regulatory organization itself, while other legal advisers served in the justice ministry and were assigned to provide legal counsel or representation to the specialized government agencies responsible for nuclear regulation and related activities.

Broadly stated, legal advisers contribute to the development of a State's adoption and implementation of international legal instruments as well as the national legal and regulatory framework, its reporting under its international obligations, and the carrying out of authorization, inspection, oversight and enforcement of laws and regulations as provided under the national regime.³³ More specifically, legal advisers may assist in drafting basic legislative texts and related governmental policies. With respect to the regulatory regime, the legal adviser may help develop the regulations and related guidance to ensure compatibility with governing law and effectiveness as coherent and implementable standards. Moreover, legal advisers may support the authorization process by advising on proposed decisions with respect to their consistency with applicable regulatory requirements. Legal support is also critical in assessing proposed enforcement measures. Because decision making by the responsible governmental body may be subject to judicial or administrative proceedings, legal representation is critical in such proceedings. Such proceedings typically involve authorizations of nuclear activities or enforcement matters, but can also be related to processes related to establishing standards or environmental reviews. Legal advisers may also assist in stakeholder engagement and providing information to the public.

Of particular importance is the understanding that legal advisers are not the sole contributors to international or national nuclear law and regulation. Legal advisers must work in close cooperation with policy makers and technical experts to establish an effective framework and to set out comprehensive and meaningful standards to address the primary objectives of safety, security and safeguards. At its core the framework of nuclear law reflects the synthesis of technical and legal principles and objectives. Legal and technical experts need to establish effective communication and cooperation. Accordingly, as was discussed in the 2019 workshop, focus on the following objectives should enhance the integration of legal and technical aspects of nuclear law, particularly in carrying out the regulatory regime:

- (a) Ensuring that there is a common language between legal and technical experts (i.e. lawyers tend to focus on processes while technical experts focus on scientific substance) and mutual appreciation and understanding of their respective roles.
- (b) Ensuring that technical experts understand the legal requirements relevant for the performance of the respective regulatory functions and vice versa.
- (c) Ensuring awareness of the role of the legal adviser and related process for the provision of legal support.
- (d) Ensuring that technical experts understand the legal advice and recognize its importance.

³³IAEA 2018, paras 4.27–4.30, pp. 25–26.

- (e) Ensuring that legal experts understand the technical input so that the legal advice does not lose the technical meaning.
- (f) Ensuring that legal advice translates or articulates the technical input appropriately and clearly into general language.³⁴

Acknowledging the importance of effective collaboration between legal and technical experts is critical to the success of institutions responsible for implementing the framework for national and international control (i.e. regulation of the peaceful uses of nuclear energy). As former NRC Chairman Nils J. Diaz said, “[n]uclear regulation is a complex techno-legal construct that requires constant examination and management, even apart from socio-political issues.”³⁵

4.3.2 *Crafting Effective Regulation*

As noted earlier in this chapter, the use of nuclear materials and nuclear installations is subject to a comprehensive system of regulation administered by responsible institutions—a reflection of the permission principle in nuclear law to ensure safety, security and accountability. The sources of such standards are reflected in international instruments, guidance and standards, national law and regulations, and even consensus industry codes and standards.

Although governmental institutions are ultimately accountable under the laws and political systems of their respective countries and the applicable international instruments, they must always strive to ensure that decision making and actions are rooted in the sound scientific and engineering judgement that the institutions were established to undertake. Moreover, the regulator must be consistently open and transparent with its stakeholders to show that undue influence does not exist. As outlined in the safety conventions, the regulator must have, in addition to technical competence, adequate and sustainable funding to demonstrate its ongoing reliability, as well as, ideally, ongoing interaction with and support from counterparts around the world.³⁶

Culture and history can—and will—affect public perception and acceptance of any regulatory regime, and this can prove to be a challenge in some cases. Ultimately, however, no matter what the country, the culture, history or status of nuclear power development, the public must have trust in the regulator, and the regulator has a responsibility to nurture and maintain that trust. Trust is earned when a regulator makes its decisions in an open manner, with explanation of conclusions and after carefully considering many opinions and varied input. The regulator can further build confidence by constantly assessing the adequacy of safety and security based on experience and analysis and by undertaking an informed assessment of risk.

³⁴IAEA 2020, Annex 3, p. 16.

³⁵Diaz 2004.

³⁶CNS, above n.14, Article 8; Joint Convention, above n.15.

Prior to beginning his service on the US Supreme Court, Justice Stephen Breyer wrote a book on the subject of risk and regulation.³⁷ Justice Breyer noted that regulators generally have a two part job—risk assessment (i.e. measure it) and risk management (i.e. what are we going to do about it). In the risk assessment part of the equation, decisions will be informed by the probability and consequences of an event. For the management part of it, regulators are going to use their broad discretion to exhibit predictable and stable decision making. Justice Breyer’s book underscores that the public’s evaluation of risk often differs radically from the experts’, and he writes, “When we treat tiny, moderate and large risks too much alike we begin to resemble the boy who cried wolf.”³⁸ Thus, the challenge is to strive for a ‘sweet spot’ between under-regulation and over-regulation.

The art and science of effective regulation can be described, to borrow the title from Professor Malcolm Sparrow’s book on the topic, as the ‘regulatory craft’.³⁹ In nuclear safety, for example, the regulator further builds confidence by constantly assessing ‘how safe is safe enough’ based on experience and analysis, and an informed assessment of risk. Regulators must neither be too lax nor too strict, nor so isolated that they are making decisions in a vacuum. Effective regulation can be pursued without imposing undue burden and stifling innovation. Boundaries must be set, but such boundaries, for example, should allow operators to undertake electricity generation effectively and to innovate within the safety and security framework. Real life and actual operating experience must be considered, as well as public and stakeholder input.

Although it is unlikely that everyone will be convinced that regulators are always dutifully practicing good regulatory craftsmanship and are being transparent in their processes, the goal is always worth striving for. Indeed, the quest itself is the most important part of the journey. Every regulatory regime—whether newly created or well established—must find its own path to this common ideal. As more established nuclear regulators assist newer regulators, as all share and learn from others’ experience, as all participate in peer reviews and other opportunities through the international system, regulators are showing their respective countries and the world as a whole that they are providing credible oversight and management. Such good craftsmanship leads to good regulation and is important as we think of the challenges before us or that may emerge in the future.

4.4 Looking Forward

In trying to anticipate the future in the nuclear sector, we can attempt to identify trends and developments and assess their impact on nuclear law and regulation. At a high level the challenges ahead remain the same in terms of achieving the overarching

³⁷Breyer 1993.

³⁸Ibid., p. 28.

³⁹Sparrow 2000.

goals of safety, safeguards and security. For civilian uses of nuclear energy, this means a continued focus on the safe operation of existing nuclear installations, particularly as they may enter long term operation beyond their initial licence term, as well as a focus on the construction of new plants and assessment of emerging technologies. The management of radioactive waste and its disposal remains an area of focus. Adequate control of radioactive sources to ensure radiological safety and to prevent their misuse will continue to be a challenge. Although this is by no means a comprehensive list of the challenges that those engaged in nuclear law and regulation may face, it does prompt consideration of the context in and the means by which we go forward. In my view we are unlikely to see any new binding treaties or conventions absent some significant event or ‘near miss’. But in this context, the system can continue to improve even on a soft law basis if due attention is given to cooperation and collaboration in the international community, to greater harmonization of standards, and to transparency and stakeholder engagement.

4.4.1 Soft Law as the Primary Platform

The likelihood seems remote that new binding international legal instruments will be negotiated in the nuclear field in the foreseeable future. Although strong arguments can be made, for example, to elevate the Code of Conduct on the Safety and Security of Radioactive Sources to a binding convention,⁴⁰ or to improve the nuclear security framework,⁴¹ coalescence around such objectives has yet to occur. In the wake of the accident at the Fukushima Daiichi nuclear power plant, proposals emerged to amend both the Early Notification Convention and the CNS, but none of the proposals ultimately garnered the support to adopt such amendments.

In the case of the Early Notification Convention, work on improving the guidance on emergency response and reporting likely contributed to the absence of sufficient support to bring the Russian Federation’s proposal to a diplomatic conference.⁴² In terms of the CNS, several proposals to amend the CNS were offered, but only one offered by Switzerland continued to a diplomatic conference in 2015. In lieu of adopting the proposed amendment, contracting parties to the CNS agreed to a non-binding statement—the Vienna Declaration on Nuclear Safety—that commits to focusing on prevention and mitigation of accidents in new plant designs, periodic consideration of the safety of existing installations and implementation of ‘reasonably practicable’ safety improvements, and commitment to the IAEA Safety Standards and good practices identified during the CNS review meetings.⁴³

⁴⁰Gonzalez 2014.

⁴¹Wetherall 2016, pp. 22–37.

⁴²Johnson 2014, pp. 18–19.

⁴³Vienna Declaration on Nuclear Safety, adopted 9 February 2015 (Vienna Declaration).

Experts in the nuclear and other fields have elaborated on the difficulties in achieving binding international instruments as well as the advantages soft law instruments may provide in a particular context.⁴⁴ Among other things, such norms can elaborate more fully the means of achieving the goals that are addressed, establish the ‘good behaviour’ expected of States, provide a basis for legislation and regulation at a national level, and may sow the seeds for moving towards more formal obligations.

4.4.2 International Cooperation and Collaboration

Continued attention to cooperation and collaboration among States is critical to maintaining and enhancing the institutional capacity and legal framework for nuclear regulation. Such attention is critical not only for States with long experience with nuclear energy, but also to the capacity building of States new to the development and institution of nuclear energy programmes. As noted earlier, the CNS and the Joint Convention provide as part of their ‘incentive’ nature provisions for periodic review meetings of the contracting parties to consider the reports addressing their measures to implement their obligations under the conventions.

Apart from the obligations under these conventions, other opportunities for assessment and improvement of institutional capacity exist. Both the IAEA and the OECD/NEA have developed guidance on approaches to establishing effective organizations.⁴⁵ Periodic IAEA conferences on topics related to various aspects of safety and security provide opportunities for exchange among States. Moreover, the IAEA has developed a number of peer review services; a virtual technical meeting was held in 2020 on the peer review and advisory services related to nuclear safety and security.⁴⁶ These services can help States achieve excellence in their approaches to oversight of nuclear activities and conformance to international norms, and the results can be a good barometer of an effective and improving organization, or can identify gaps or weaknesses. Participation should be encouraged in these vehicles for self-assessment and peer review. And we should not dismiss the contribution that bilateral engagements or regional cooperation, such as undertaken in the European Union in the context of its directives related in the nuclear field, can also achieve. As an example of bilateral cooperation, the NRC hosted staff from Japan’s Nuclear Regulatory Authority (NRA) to provide them with greater insight into the NRC’s inspection approach to help the NRA update its own inspection regime. Cooperation is essential for effective nuclear law and regulation in the coming years.

⁴⁴Wetherall 2005; Dupuy 1991.

⁴⁵IAEA 2016; <https://www.oecd.org/publications/the-characteristics-of-an-effective-nuclear-regulator-9789264218741-en.htm>. Accessed 27 September 2021.

⁴⁶https://gnssn.iaea.org/main/Pages/PRASC-Technical-Meeting_2020.aspx. Accessed 27 September 2021; <https://www.iaea.org/services/review-missions>. Accessed 27 September 2021.

4.4.3 *Greater Harmonization*

Focus on greater harmonization of standards applied in the nuclear sector is an important objective in the future, particularly in the light of the prospects for development and installation of small modular reactors (SMRs) using either well established light water technology or advanced technologies. Each State is responsible for establishing its own regulatory requirements; as a result the regulatory regimes are essentially specific to each country, though informed by international guidance and standards as provided in the CNS. At a high level, steps towards harmonization gradually evolved over the years, spurred for example by the broad acceptance of the IAEA Safety Standards. Nonetheless, greater harmonization of regulatory criteria and standardization of designs can avoid the need to reengineer or customize a design for every country seeking to deploy a facility and may aid newcomer countries in establishing a nuclear energy programme. For SMRs, which may rely on modular assembly in factories, greater harmonization can be key to international deployment.

A number of initiatives over the past few decades have focused on the objective of greater harmonization. The Generation IV International Forum was established in 2001 to consider advanced designs, and the Multinational Design Evaluation Programme (MDEP)⁴⁷ was established in 2006 as a forum for cooperation among regulators undertaking the licensing of new reactors, particularly Generation III+ designs.⁴⁸ Within the nuclear industry, the Working Group on Cooperation in Reactor Design Evaluation and Licensing (CORDEL) in the World Nuclear Association (WNA) was formed in 2007 to promote harmonization and international convergence of safety standards for reactor designs.⁴⁹

In the context of the growing interest in SMRs, the IAEA and the OECD/NEA have provided opportunities to explore ways of ensuring safety in a context that allows technological innovation. In this regard, one sees the potential for further harmonization of regulatory requirements and cooperation among regulators.⁵⁰ For example, the US and Canadian nuclear regulatory authorities agreed on a joint Memorandum of Cooperation in August 2019 to enhance their longstanding regulatory interaction, with a specific emphasis on the assessment of new reactor technologies. The initiative includes sharing of regulatory insights from SMR design reviews and anticipates development of common guidance between the two organizations for the eventual review of licence applications using the designs. In sum, we appear to be poised for greater cooperation and harmonization in establishing regulatory acceptance criteria, a worthy objective in the years ahead.

⁴⁷<https://www.oecd-neo.org/mdep/>. Accessed 27 September 2021.

⁴⁸<https://www.gen-4.org/gif/>. Accessed 27 September 2021.

⁴⁹WNA 2019.

⁵⁰<https://www.iaea.org/topics/small-modular-reactors/smr-regulators-forum>. Accessed 27 September 2021; www.oecd-neo.org/jcms/pl_46728/multi-sector-workshop-on-innovative-regulation-challenges-and-benefits-of-harmonising-the-licensing-process-for-emerging-technologies. Accessed 27 September 2021.

4.4.4 Transparency and Stakeholder Engagement

Finally, a continued focus on enhancing transparency and engaging stakeholders is important to sustaining and further developing an effective legal and regulatory framework for nuclear activities. These principles have been more specifically acknowledged in the environmental conventions that also intersect with nuclear law.⁵¹ Although transparency is considered a core principle in nuclear law,⁵² the nuclear sector has grown to embrace greater transparency over the years. With its origins in the military area and the desire to deter the proliferation of nuclear weapons, the sector was more secretive at its beginning. To be sure, there remain significant aspects of the regulation of nuclear installations and materials that require confidentiality to safeguard information or material that can be otherwise used for unlawful or malicious purposes, to maintain security or even to protect interests in intellectual property. Nonetheless, credibility and trust in the responsible institutions necessitates a commitment to providing information in the public domain, even if it reveals shortcomings and need for improvement. As an example of how the international system has moved towards greater transparency, broader public dissemination of reports has evolved in the CNS review process. For the first time, after the seventh review meeting of the CNS held in 2017, all national reports were made publicly available.

Paired with the principle of transparency is a commitment to meaningful stakeholder engagement. Stakeholders constitute a broad and diverse set of persons and organizations: vendors and operators; those living near or working in nuclear facilities; government bodies and representatives at a local or national level; international counterparts and organizations; those who might be adversely affected by the regulated operations; the media; and non-governmental organizations. Stakeholders are not only those who may support the regulatory organization and its objectives, but also those who are deeply sceptical, and even those who are largely indifferent, except when the regulator or the regulated draws media attention. Engagement with stakeholders should be meaningful and maximize opportunities to build trust, to enhance participation and obtain feedback. Both the IAEA and the OECD/NEA have examined the issue as it relates to the nuclear sector,⁵³ and continued focus is needed to ensure the proper evolution and effectiveness of nuclear law and regulation.

⁵¹Convention on Environmental Impact Assessment in a Transboundary Context, opened for signature 25 February 1991, entered into force 10 September 1997 (Espoo Convention); Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, opened for signature 25 June 1998, entered into force 30 October 2001 (Aarhus Convention); Protocol on Strategic Environmental Assessment to the Espoo Convention, opened for signature 21 May 2003, entered into force 11 July 2010 (Kiev Protocol).

⁵²Stoiber et al. 2003, p. 10.

⁵³IAEA 2017; OECD/NEA 2015.

4.5 Conclusion

Law is a means not an end in nuclear regulation. The development of the legal framework has been an interesting journey reflecting a commitment to addressing the key aspects of the peaceful uses of nuclear energy through a variety of approaches using both binding treaties and conventions as well as non-binding codes and guidance. The state of this complex set of relevant instruments can at times make one feel pessimistic when considering what it took to reach the point where we are today and the gaps that may still exist. Yet, one can also be optimistic that we will continue to progress, even if that requires a focus on pragmatic steps that may be more incremental than revolutionary.

Our progress requires an intentional focus and dedication to international cooperation and a willingness to share experience and to be open to continuous improvement. Future improvement in the legal regime will be aided by seeking greater harmonization across the system. And it requires a commitment to ensuring that institutions at an international and national level are transparent and willing to engage in constructive interaction with stakeholders. Legal advisers will continue to play an important role in assisting policy makers and technical experts in crafting comprehensive and effective approaches to further development of the framework for nuclear energy and its regulation. In those deliberations, we can continue to ask ourselves a number of questions. Are we credibly engaging the important issues in a manner worthy of our stakeholders' trust? Have we ensured a strong institutional capacity at both an international and a national level? Have we ensured applicable international instruments and standards have been integrated into national regimes? Does the framework comprehensively address the primary objectives of safety and security and where should we focus for possible improvement?

The journey continues.

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