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The impact of the major nuclear power plant accidents on the international legal framework for nuclear power

*by Stephen G. Burns**

Over time, numerous events and developments have shaped the utilisation of nuclear energy as well as the approach to its regulation. For example, the Three Mile Island (TMI) accident in 1979 was a significant event affecting the nuclear power industry in the United States (US) and the US Nuclear Regulatory Commission's (NRC) regulatory programme, yet other incidents or "near misses" at facilities, scientific and engineering assessments of reactor technology, and changes to enhance the NRC's organisational effectiveness have also shaped the framework for regulation.[1] Nonetheless, in public consciousness, three major nuclear power accidents have arguably dominated the debate over the safety and regulation of nuclear power operations: the TMI accident, the 1986 Chernobyl accident in Ukraine, then part of the Union of Soviet Socialist Republics (USSR), and the multi-plant Fukushima Daiichi accident in Japan in 2011. Having worked on the response to all three accidents at the NRC and to the Fukushima Daiichi accident at the Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency (NEA), I thought it worth reflecting on the impact of those accidents on nuclear law and particularly the international dimensions of the field. For each accident, there are certainly impacts that the events have had on national legislation pertaining to nuclear energy, whether in the country where the accident occurred or in others. This article focuses on the international dimension by considering commentary and analysis contemporaneous with the events as well as reflections made some decades after the accidents occurred. And though each accident has had an impact, the Chernobyl accident has clearly been the most significant driver of change in the international legal regime.

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1. See Fewell, J.B., D. Ferraro and D. Reddick (2017), "Accidents and Innovation Shaping the Nuclear Regulatory Landscape", *Infrastructure*, Vol. 56, No. 4, ABA Publishing, pp. 3-13. The World Nuclear Association (WNA) lists historical nuclear reactor accidents on its website and notes the more serious toll non-nuclear energy accidents have exacted on human life. WNA (2017), *Safety of Nuclear Power Reactors*: *Appendices*, www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/appendices/safety-of-nuclear-power-reactors-appendix.aspx (accessed 5 Dec. 2018).

I. Three Mile Island

The Three Mile Island Nuclear Station, located near Harrisburg, Pennsylvania, had two licensed units. Unit 2 had been licensed to operate since February 1978. At about 4:00 a.m. on Wednesday, 28 March 1979, Unit 2 experienced equipment failure on the plant's secondary side that prevented the main feed water pumps from sending water to the steam generators, which would remove heat from the core.[2] The turbine generator and then the reactor itself began to shut down and thereby increase the pressure in the reactor's primary system. Per design, the pilot-operated relief valve opened to help control pressure, but the valve failed to close and stuck open when pressure fell to an acceptable level. Moreover, the control room's instrumentation erroneously indicated that the valve had closed so that the operating crew was unaware that coolant in the form of steam was pouring out of the open valve. As a consequence, the crew did not understand that the plant was experiencing a severe loss-of-coolant accident. Other instrumentation readings also led the crew to incorrectly assume that the water level was adequate to cover the reactor core. The operators then took steps that exacerbated the situation and consequently led to a drop in water level in the reactor pressure vessel and overheating of the core.

Some 3 hours and 20 minutes after the accident began, the operators started the emergency core cooling system again. The core began to cool. By 8:00 a.m., the transient was over, but the sequence of events caused a partial meltdown of the reactor core and a small offsite release of radioactivity (equivalent to a dose of about 100 millirem or 1 millisievert (mSv) above background at the site boundary). However, for several days uncertainty about the possibility of a hydrogen explosion in the reactor vessel dominated the technical assessment of the plant's status. In the face of this uncertainty, Pennsylvania Governor Richard Thornburgh advised on Friday, 30 March 1979, that persons within a five-mile (eight kilometres (km)) radius of the plant should stay indoors and that pregnant women and preschool-age children should evacuate the area. On Sunday, 1 April 1979, President Jimmy Carter, First Lady Rosalynn Carter, and Governor Thornburgh visited the plant with NRC's lead official Harold Denton. At this point, the reactor's condition was considered to be relatively stable and to no longer pose a significant danger. The Governor's precautionary advisory to pregnant women and preschool-aged children was lifted within two weeks.

The Three Mile Island accident had a significant impact on the US nuclear industry and the NRC.[3] Official reports on the accident, one by a Presidential Commission and the other an inquiry sponsored by the NRC itself, contain blistering criticism of the NRC and the industry.[4] For example, the Presidential Commission's report concluded, "With its present organization, staff, and attitudes, the NRC is unable to fulfil its responsibility for providing an acceptable level of safety for nuclear power plants."[5] Both reports even called for the reconfiguration of the NRC (then barely into its fourth year of existence) into an agency headed by a single administrator, a step that President Carter ultimately rejected in favour of a reorganisation plan intended to enhance the role of the Chairman in an emergency

2. The description of the event is taken from the factsheet posted on NRC (2018), "Backgrounder on the Three Mile Island Accident", www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html (accessed 5 Dec. 2018).
3. For an overview of the impacts of the accident on nuclear regulation in the United States, see NRC, Office of Nuclear Regulatory Research (2016), *Three Mile Island Accident of 1979 Knowledge Management Digest – Overview*, NUREG/KM-0001, Rev. 1.
4. See Report of the President's Commission on the Accident at Three Mile Island (1979), *The Need for Change: The Legacy Of Three Mile Island*; NRC Special Inquiry Group (1980), *Three Mile Island: A Report to the Commissioners and to the Public*, NUREG/CR1250, Vols. 1-3.
5. Report of the President's Commission (1979), *supra* note 4, p. 56.

and improve NRC's organisation.[6] The accident had also revealed significant weaknesses in emergency planning and response capabilities. President Carter consolidated federal responsibility for offsite emergency planning and response to radiological incidents in the Federal Emergency Management Agency, which had been established by his administration before the Three Mile Island accident. The NRC required utilities to develop, maintain and exercise emergency response plans, including integration with offsite responders.[7]

Other regulatory actions included a vast array of initiatives aimed at improving the safety of design and operation of nuclear stations as well as mitigating the consequences of events when things went awry. The NRC staff issued to licensees and licence applicants in 1980 the consolidated recommendations from its "TMI Action Plan", which the Commission had approved for implementation.[8] The new requirements were reflected in the outcome of licensing reviews, orders to operating licensees and changes to the NRC's regulations. Within the nuclear industry itself, the Institute of Nuclear Power Operations (INPO) was established to improve the safety focus of power operations and the accountability of plant operating organisations.[9] Through INPO, the industry established standards of excellence against which it would hold its members accountable – a measure of self-policing through inspection and evaluation.

For the United States, historian J. Samuel Walker observes, "The dual legacy of the [Three Mile Island] crisis was, on the one hand, to galvanize regulatory and operational improvements that reduced the risks of another severe accident and, on the other hand, to increase opposition to the expansion of nuclear power".[10] That conclusion holds true outside the United States as well. For example, France, with currently the largest operating fleet in Europe, implemented improvements to plant design, operating procedures and emergency preparedness.[11] But the accident also proved to be a catalyst for anti-nuclear sentiment, as reflected in a 1980 referendum and resulting change to national law in Sweden that froze its nuclear energy programme and set a long-term phase-out of the existing Swedish reactor fleet.[12] Given the broad attention to the accident, did Three Mile Island have a more global effect on international nuclear law and regulation? We know that no new international conventions or legal instruments resulted directly from the accident at Three Mile Island. Nonetheless, the accident did provide further impetus for sharing information on operational experience and laid the groundwork for bilateral and multilateral approaches to providing assistance during an emergency. Moreover, the accident helped prompt the initiation of the international safety inspections of

6. Reorganization Plan No. 1 of 1980, 45 *Federal Register* (Fed. Reg.) 40561 (16 June 1980), codified in 5 United States Code (USC) Appendix.
7. NRC's rules are reflected in 10 Code of Federal Regulations (CFR) 50.47 and in Appendix E to 10 CFR Part 50 and were adopted in 1980 after consideration of lessons learnt from the Three Mile Island accident. Emergency Planning, Final Rule, 45 Fed. Reg. 55402 (19 Aug. 1980).
8. NRC, Office of Nuclear Reactor Regulation (1980), *Clarification of TMI Action Plan Requirements*, NUREG-0737.
9. On INPO's development, see Rees, J.V. (1994), *Hostages of Each Other: The Transformation of Nuclear Safety since Three Mile Island*, University of Chicago Press, Chicago.
10. Walker, J. S. (2004), *Three Mile Island: A Nuclear Crisis in Historical Perspective*, University of California Press, Berkeley, California, p. 244.
11. See Institut de Radioprotection et de Sûreté Nucléaire (2015), *Nuclear Power Reactor Core Melt Accidents*, chap. 7.1.5, pp. 350-56; Tanguy, P. (1983), "The French Approach to Nuclear Safety", *Nuclear Safety*, Vol. 24, No. 5, US Department of Energy Technical Information Center, Oak Ridge, pp. 589, 594-95.
12. See NEA (1980), "Sweden, Nuclear Legislation, Bill concerning the future energy policy (1980)", *Nuclear Law Bulletin*, No. 26, OECD, Paris, p. 23; *ibid*., Sandstrom, S., "After the Referendum", pp. 53-57.

nuclear power plants through the International Atomic Energy Agency's (IAEA) Operational Safety Review Team (OSART) programme that continues to this day.[13]

The importance of systematic reporting and evaluation of operating experience was underscored by the realisation that two precursor events had occurred at other reactors but were unknown to the staff operating Three Mile Island. The Davis-Besse plant in Ohio and the Beznau plant in Switzerland had also experienced a stuck pilot-operated relief valve with misleading indications to operators that the reactor coolant system had sufficient water, but the operators at both plants were able to recognise and address the problem before serious damage occurred. Although the Davis-Besse event had been reported to NRC, the Special Inquiry Group report found that the NRC's "preoccupation with hardware and design questions, and the lack of any clear-cut responsibility for identifying significant operating problems and warning operators about them combined to prevent the real message of Davis-Besse from getting to Three Mile Island."[14] The agency did not become aware of the Beznau experience until *after* the TMI accident.[15]

Initial steps to establish a system to share information on incidents at nuclear installations had begun under an NEA initiative in 1978, and OECD countries approved the institution of an Incident Reporting System in 1981.[16] The OECD Council adopted the system as a Council Recommendation in 1983; such recommendations, though not binding, are accorded "great moral force as representing the political will of the Adherents".[17] The IAEA extended the reporting system to its member states with nuclear power programmes in April 1983, and the IAEA and NEA now jointly run the system.[18]

In the realm of emergency response and assistance, the Three Mile Island accident prompted the IAEA to enhance its activities and to encourage states to consider arrangements to provide mutual assistance in the event of an accident. Although efforts to establish a legal framework for emergency assistance had borne some fruit in the 1960s with the conclusion of the Nordic Mutual Emergency Assistance Agreement, little enthusiasm had existed for a broader agreement.[19] After the Three Mile Island accident, discussions were initiated under IAEA auspices to consider further development of an assistance framework. The United States had initiated efforts to negotiate a convention to address arrangements for emergency assistance.[20] The efforts led in February 1982 to the establishment of a group of experts to study the means of responding to and facilitating requests for assistance prompted by a radiological emergency. The expert panel developed two documents: *Guidelines for Mutual Emergency Assistance Arrangements in Connection with a Nuclear*

13. See Sacchetti, D. (2009), "The Peer View", *IAEA Bulletin*, Vol. 50, No. 2, p. 29; Hancher, L. and P. Cameron (1988), "After Chernobyl: Has Anything Really Changed?", in P. Cameron, L. Hancher and W. Kühn (eds.), *Nuclear Energy Law After Chernobyl*, Graham and Troutman, London, pp. 183-84.
14. NRC Special Inquiry Group, *supra* note 4, Vol. 1, p. 95; see also *ibid.*, pp. 94-99 for further context.
15. *Ibid.*, p. 94.
16. IAEA (2018), *Operating Experience Feedback for Nuclear Installations*, IAEA Safety Standards Series No. SSG-50, Annex, pp. 35-36; IAEA (2010), *IRS Guidelines – Joint IAEA/NEA International Reporting System for Operating Experience*, Services Series No. 19, p. 1.
17. OECD (1983), *Recommendation of the Council concerning the Operation of a Nuclear Power Plant Incident Reporting System*, OECD/LEGAL/0201, C(83)6/Final, adopted 22 Feb. 1983, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0201.
18. See references in *supra* note 16.
19. IAEA (1963), *Nordic Mutual Emergency Assistance Agreement in Connection with Radiation Accidents*, INFCIRC/49; see Cameron, P. (1988), "The Vienna Conventions on Early Notification and Assistance", in *Nuclear Energy Law After Chernobyl*, *supra* note 13, p. 22.
20. Cameron, P. (1988), *supra* note 19, p. 21.

Accident or Radiological Emergency (IAEA Doc. INFCIRC/310, 1984) and *Guidelines on Reportable Events, Integrated Planning and Information Exchange in Transboundary Release of Radioactive Materials* (IAEA Doc. INFCIRC/321, 1985). These recommendations were useful to states as models if they wished to pursue bilateral or multilateral agreements, but they fell short of any binding international agreement on the subject.

Although no new binding international legal instruments came into being as a result of the Three Mile Island accident, the response to the accident sowed seeds that would finally germinate in the wake of the Chernobyl accident. Indeed, the 1994 Diplomatic Conference on the Convention on Nuclear Safety acknowledged that:

> The accident at Three Mile Island and the disaster at Chernobyl had given further impetus to the establishment of international norms. While the Chernobyl accident was the only one to have transboundary radiological consequences, the impact of both accidents had gone far beyond the borders of the States where they had occurred.[21]

II. Chernobyl

On 26 April 1986, a sudden power surge during a reactor systems test destroyed Unit 4 of the nuclear power station at Chernobyl, Ukraine, in the former Soviet Union. The operators had prepared a test to determine the length of time that the turbines could rotate and provide power to the main circulating pumps in the event of a loss of main electric supply.[22] Among other actions, the operators disabled the automatic shutdown mechanisms prior to the planned test. The reactor became extremely unstable, and when the operators began the shutdown procedure, the control rods caused a significant power surge as they were inserted into the reactor core. The reactor experienced substantial damage, the control rods jammed without having fully inserted, and intense steam generation eventually caused a steam explosion that spewed fission products into the atmosphere. Another explosion soon followed, throwing graphite and other fragments out of the fuel channels. The fuel melted and started fires that added to the radioactive release.

The accident resulted in the largest uncontrolled release of radioactive material ever experienced from any civilian installation. For some ten days, large quantities of radioactive material were released into the air. Most of the released material fell close to the plant in the form of dust and debris, but some material was carried by wind over Belarus, Russia, Ukraine and even into Scandinavia and other parts of Europe. Initial information that an accident had occurred came from detection of

21. "Summary Record of the First Plenary Meeting of the Diplomatic Conference on a Nuclear Safety Convention", in IAEA (1994), *Convention on Nuclear Safety*, Legal Series No. 16, p. 64, para. 12.
22. The summary of the accident is based on information posted online at: WNA (2018), "Chernobyl Accident 1986", www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx (accessed 5 Dec. 2018). Information on health effects was drawn from the World Health Organization (WHO). See WHO/IAEA/UNDP, Press Release, "Chernobyl: the true scale of the accident" (5 Sept. 2005), www.who.int/mediacentre/news/releases/2005/pr38/en/; WHO (2016), "1986-2016: Chernobyl at 30", www.who.int/ionizing_radiation/chernobyl/Chernobyl-update.pdf?ua=1. The IAEA issued an official report on the accident through its International Nuclear Safety Advisory Group (INSAG) in IAEA (1986), *Summary Report on the Post-accident Review Meeting on the Chernobyl Accident*, INSAG-1, IAEA, Vienna, which was later updated in IAEA (1992), *The Chernobyl Accident: Updating of INSAG-1*, INSAG-7, IAEA, Vienna. The document includes as an annex a report commissioned by the USSR State Committee for the Supervision of Safety in Industry and Nuclear Power.

elevated radiation readings in Sweden, before the Soviet government had informed the international community that the accident had occurred.

Emergency responders poured sand and boron by helicopter on the reactor debris in order to extinguish the fires, mitigate radioactive releases and prevent the criticality of the nuclear material. A temporary concrete "sarcophagus" was constructed within a few weeks to retard further release of radioactive material. The government closed the area within 30 km of the plant, except for those persons who were involved in the recovery from the accident or who were operating the undamaged reactors at the site (which were not finally closed until 1999). Some 115 000 people were evacuated from the most heavily contaminated areas in 1986 and another 220 000 people were evacuated in following years.

About 1 000 on-site staff and emergency workers received high radiation doses on the first day of the accident. By July 1986, 28 deaths, including 6 fire fighters, had resulted from radiation exposures – estimated to range up to 20 000 mSv – which were incurred by those responding to the accident on the first day. Some 200 000 people from across the Soviet Union were involved in the recovery and clean-up during 1986 and 1987. They also received high doses, on average 100 mSv. Experts estimate, based on statistical projections, that radiation exposure among the higher-exposed populations could cause up to 4 000 eventual deaths, i.e. among emergency workers in 1986-1987 as well as among the evacuees and residents of the most contaminated areas. About 4 000 cases of thyroid cancer have resulted from the accident, and nine children died from thyroid cancer.

As noted above, the occurrence of the accident was not immediately known outside the Soviet Union, and the initial response of the international community was to urge the Soviet government to provide information relevant to the accident. For example, a statement issued by the G-7 during its Tokyo summit in early May 1986 urged the Soviet government "which did not do so in the case of Chernobyl, to provide urgently such information [on the emergency and accident], as our and other countries have requested".[23] The Soviet government invited IAEA Director General Hans Blix to visit the USSR and Chernobyl in early May. In a speech broadcast on 14 May 1986, Soviet General Secretary Mikhail Gorbachev, while accusing the Western powers of trying to make political capital out of the accident, nonetheless announced the openness of the Soviet Union to broad enhancements in the international regime for notification, assistance and plant safety, a message he reiterated in subsequent communications to the IAEA.[24] The IAEA through its Board of Governors soon put the wheels in motion that would lead to the broad consideration of new instruments to govern the international nuclear safety regime.

Even the novice at nuclear law gains an early appreciation of the impact of the Chernobyl accident on the international legal framework affecting emergency notification and assistance, the safety of nuclear installations, and the liability for damage from nuclear incidents. The Early Notification Convention and the Assistance Convention were negotiated within months of the accident and entered

23. IAEA (1986), "Statement Issued on 5 May 1986 by the Heads of Government of Seven Major Industrial Nations and the Representatives of the European Community", IAEA Doc. INFCIRC/333.
24. Letter dated 14 May 1986 from the Permanent Representative of the Union of Soviet Socialist Republics to the United Nations addressed to the Secretary-General, A/41/339 (1986), Annex, "Address given on Soviet Television on 14 May 1986 by the General Secretary of the Central Committee of the Communist Party of the Soviet Union (CPSU)", pp. 5-7, http://undocs.org/A/41/339; Letter from Mr M. Gorbachev, General Secretary of the Central Committee of the Communist Party of the Soviet Union, to Dr H. Blix, Director General of the Agency (20 June 1986), IAEA Doc. INFCIRC/334.

into force before a year had passed.[25] The Convention on Nuclear Safety was adopted in 1994 and was followed by the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management in 1997.[26] Although nuclear liability conventions had been adopted in the early 1960s, the transboundary effects of Chernobyl spurred efforts to improve the conventions and achieve greater harmonisation between the existing instruments. The Joint Protocol linking the Paris and Vienna Conventions on nuclear liability was negotiated in 1988,[27] and further negotiations led to proposed revisions to both the Vienna and Paris Conventions and to a new Convention on Supplementary Compensation (CSC).[28] Some suggest that the accident had an impact as well on other instruments relating to nuclear safety and environmental protection.[29]

For some, the reaction to the negotiation of new international legal instruments after Chernobyl could be said to be, "It's about time!". From this point of view, nuclear energy had lagged in the development of a robust system of international legal instruments and was dominated by national systems of law and regulation that guarded themselves against external scrutiny. But Dr Norbert Pelzer offers a more balanced assessment of the lessons from Chernobyl in an article he wrote within a year of the accident:

> [O]ne can state that – long before the Chernobyl accident in 1986 – there has been a comprehensive régime of national and international norms to assure the safe use of peaceful nuclear energy and to guarantee just compensation in case of an incident. So the stable door seemed to be locked without giving the horse a chance to bolt. It bolted nevertheless, Chernobyl happened, and the management of the incident proved that there are still gaps in the system.[30]

25. Convention on Early Notification of a Nuclear Accident (1986), IAEA Doc. INFCIRC/335, 1439 UNTS 276, entered into force 27 Oct. 1986 (Early Notification Convention); Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), IAEA Doc. INFCIRC/336, 1457 UNTS 134, entered into force 26 Feb. 1987 (Assistance Convention).
26. Convention on Nuclear Safety (1994), IAEA Doc. INFCIRC/449, 1963 UNTS 293, entered into force 24 Oct. 1996 (CNS); Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997), IAEA Doc. INFCIRC/546, 2153 UNTS 357, entered into force 18 June 2001 (Joint Convention).
27. Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (1988), IAEA Doc. INFCIRC/402, 1672 UNTS 293, entered into force 27 Apr. 1992 (Joint Protocol).
28. Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (1997), IAEA Doc. INFCIRC/566, 2241 UNTS 302, entered into force 4 Oct. 2003 (1997 Vienna Protocol); Convention on Supplementary Compensation for Nuclear Damage (1997), IAEA Doc. INFCIRC/567, 36 ILM 1473, entered into force 15 April 2015 (CSC); Protocol to Amend the Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982 (2004) (not yet in force), available at: www.oecd-nea.org/law/paris_convention.pdf (2004 Paris Protocol).
29. See Sands, P. (1996), "Observations on International Nuclear Law Ten Years after Chernobyl", *Review of European, Comparative & International Environmental Law* (*Reciel*), Vol. 5, Issue 3, Wiley-Blackwell Publishing, Oxford, p. 199.
30. Pelzer, N. (1987), "The impact of the Chernobyl accident on international nuclear energy law", *Archiv des Völkerrechts*, Vol. 25, No. 3, Mohr Siebeck Verlag, Tübingen, p. 295. Compare Tanguy, P. (1988), "Three decades of nuclear safety", *IAEA Bulletin*, Vol. 30, No. 2, pp. 51-57. For perspectives that preceded the Chernobyl accident, see Pelzer, N. (1981), "The nature end scope of international co-operation in connection with the peaceful uses of nuclear energy, and its limits - an assessment", *Nuclear Law Bulletin*, No. 27, OECD, Paris, pp. 34-49; de la Fuente, A.H. (1982), "The legal force of international rules relating to nuclear risks", *Nuclear Law Bulletin*, No. 30, OECD, Paris, pp. 47-59.

Despite the call to action prompted by the accident and the resulting negotiation of new legal instruments, the commentary on the development and text of the new instruments reflects a mixed reaction to the outcomes, both in views expressed contemporaneously with their negotiation as well as in retrospective reflection on what had been achieved. The cup was half full *and* half empty: the new instruments marked great progress in establishing international norms – but couldn't they have been much better?[31]

A. Early Notification and Assistance Conventions

Within a month of the accident, the IAEA Board of Governors had set out the path that would lead to the adoption of the Early Notification and the Assistance Conventions. In July 1986 the IAEA had invited experts to work toward developing a framework for notification and assistance in the event of a nuclear accident, and by the end of September 1986 the conventions had been adopted and opened for signature at a special session of the IAEA General Conference.[32]

Apart from the political will galvanised by the accident, several additional factors contributed to the conventions' swift negotiation. First, the focus was narrowed to the issues of notification of incidents posing a threat of radiological releases and of the provision of mutual assistance to mitigate the consequences of incidents and recover from them. Thus, the more complex and potentially controversial question was pushed down the road as to whether international instruments should lay out standards for the safety of nuclear installations or establish a scheme for ensuring adherence to such standards. The narrower approach can be understood as allowing states to focus on the possibility of "easy wins" to help restore public credibility after the Chernobyl accident and to avoid a stalemate over further progress had debate over safety standards turned to a focus on the argued defects in the Soviet reactor designs.[33]

Second, the existence of the relatively fresh guidelines in INFCIRC/310 and INFCIRC/321 that arose out of post-Three Mile Island discussions, as well as earlier related efforts, helped speed negotiation of the new Early Notification and Assistance Conventions by providing a baseline for their substantive content.[34] Third, the language of the conventions is extraordinarily flexible, so much so that the text is criticised as allowing states to simply decide for themselves how they will comply without repercussions. As Carlton Stoiber colourfully puts it, the conventions are full of "weasel words" that allow a state "to make its own determination about what action to take or what information to provide to other

31. See e.g. Sands, P. (1996), *supra* note 29, p. 200.
32. A good overview of the conventions is found in Moser, B. (1989), "The IAEA Conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency", *Nuclear Law Bulletin*, No. 44, OECD, Paris, pp. 10-23. See also Pelzer, N. (1987), *supra* note 30, p. 299; Rautenbach, J., W. Tonhauser and A. Wetherall (2006), "Overview of the International Legal Framework Governing the Safe and Peaceful Uses of Nuclear Energy – Some Practical Steps", in NEA and IAEA (eds.), *International Nuclear Law in the Post-Chernobyl Period*, OECD, Paris, p. 9.
33. See Cameron, P. (1988), *supra* note 19, p. 20; Stoiber, C. (2018), "Inside nuclear baseball: Reflections on the development of the safety conventions", *Nuclear Law Bulletin*, No. 100, OECD, Paris, p. 61.
34. Adede, A.O. (1987), *The IAEA Notification and Assistance Conventions in the Case of a Nuclear Accident*, Graham and Trotman – Martinus Nijhoff, London, pp. xxii, 1 (Mr Adede was a legal adviser at IAEA and secretary to the Group of Experts that negotiated the conventions); Cameron, P. (1988), *supra* note 19, pp. 21-22; Pelzer, N. (1987), *supra* note 30, pp. 304-305. Mr Adede's view of the progress achieved through the conventions was criticised as too sanguine in one review. Sands, P. (1991), "Book Review", *British Yearbook of International Law*, Vol. 61, Issue 1, Oxford University Press, pp. 363-364.

parties", and they lack enforcement measures or strong dispute resolution procedures that would strengthen them.[35] For example, the Early Notification Convention essentially vests in the state where the incident occurs the discretion to determine the significance of the event for other states, thereby leading one to wonder whether the Soviet Union would have given notification of the Chernobyl accident had the convention been in force at that time.[36] Thus, some argue that the Early Notification Convention is weaker than other international instruments on reporting similar events or even customary law.[37] The Assistance Convention's provisions allowing a state to avoid dispute resolution by opting out of the provisions is similarly criticised.[38]

Nonetheless, the two conventions were praised for their swift negotiation and entry into force and are credited as making necessary progress, if only with modest effect, in the establishment of the international nuclear safety regime. Viewed from the perspective contemporaneous with their negotiation, the conventions are viewed as a "first step in the right direction" and of "considerable significance".[39]

B. The safety conventions

As noted earlier, consideration of a convention addressing the safety of nuclear power plants was deferred in the immediate aftermath of the Chernobyl accident. Finally, in 1990, member states of the European Community proposed the convening of a conference in 1991 to review the status of nuclear safety and to formulate recommendations at both a national and an international level.[40] The 1990 General Conference approved the proposal, and the special conference was held in early September 1991. Later that month, having received the report on the proceedings, the General Conference initiated the steps that would ultimately result in the development of a draft text of a convention. An open-ended "Group of Experts on a Nuclear Safety Convention" met seven times between May 1992 and February 1994

35. Stoiber, C. (2018), *supra* note 33, p. 62.
36. Pelzer, N. (1987), *supra* note 30, p. 303.
37. *Ibid.*; Sands, P. (1996), *supra* note 29, p. 200; Carroll, S. (1996), "Transboundary Impacts of Nuclear Accidents: Are the Interests of Non-Nuclear States Adequately Addressed by International Nuclear Safety Instruments?", *Reciel*, Vol. 5, Issue 3, p. 207; Politi, M. (1987), "The Vienna Conventions of September 26, 1986 on early notification and assistance in case of a nuclear accident or radiological emergency", in F. Vandenabeele (ed.), *Nuclear Inter Jura '87*, *Proceedings*, International Nuclear Law Association, Belgium, pp. C-93 to C-96.
38. Cameron, P. (1988), *supra* note 19, p. 29; Pelzer, N. (1987), *supra* note 30, p. 306; Politi, M. (1987), *supra* note 37, p. C-94.
39. Cameron, P. (1988), *supra* note 19, p. 32, *quoting* Pelzer, N. (1987), *supra* note 30, p. 306. See also Pelzer, N. (2006), "Learning the Hard Way: Did the Lessons Taught by the Chernobyl Accident Contribute to Improving Nuclear Law?" in *International Nuclear Law in the Post-Chernobyl Period*, *supra* note 32, pp. 78-79.
40. See Note by the Director General (1991), "Measures to Strengthen International Co-Operation in Matters relating to Nuclear Safety and Radiological Protection", IAEA Doc. GC(XXXV)/970, p. 1. Political developments such as the dissolution of the Soviet Union and the reunification of Germany provided renewed impetus for a nuclear safety convention. See Wellock, T. (2013), "The Children of Chernobyl: Engineers and the Campaign for Safety in Soviet-designed Reactors in Central and Eastern Europe", *History and Technology*, Vol. 29, No. 1, Routledge, London, pp. 3, 14-15; Stoiber, C. (2018), *supra* note 33, p. 63; Stoiber, C. (1999), "International Convention on Nuclear Safety: National Reporting as the Key to Effective Implementation", in N. Horbach (ed.), *Contemporary Developments in Nuclear Energy Law: Harmonising Legislation in CEEC/NIS*, Kluwer Law International, London, pp. 97, 98. The following two excellent synopses were drawn upon when describing the developments leading to the Convention on Nuclear Safety: Jankowitsch, O. (1994), "The Convention on Nuclear Safety", *Nuclear Law Bulletin*, No. 54, OECD, Paris, pp. 9-22, and Jankowitsch, O. and F. Flakus (1994), "International convention on nuclear safety: A legal milestone", *IAEA Bulletin*, Vol. 36, No. 3, pp. 36-40.

to shape the text that would be then submitted for consideration at a Diplomatic Conference convened in June 1994.

The preliminary work of the expert group is reflected in the final draft of the proposed convention and in the Convention on Nuclear Safety as it was adopted at the Diplomatic Conference. For example, the expert group agreed that the principles set out in a draft document on safety fundamentals would serve as the basis of the obligations of the parties to the Convention.[41] The incentive nature of the Convention's approach also stems from the deliberation of the expert group, as did the decision to focus the Convention on nuclear power plants and to defer consideration of an international agreement on safe waste management. The Convention on Nuclear Safety was opened for signature in September 1994 in conjunction with the 38th General Conference and came into force in October 1996.

Following the commitment (see CNS, Preamble (ix)) to further develop a convention that would address the safety of radioactive waste management, the General Conference in 1994 invited the Director General and the Board of Governors to begin preparations for such a convention.[42] An expert group prepared a draft text in March 1997. The Joint Convention follows in many respects the general framework of the Convention on Nuclear Safety, including the "incentive" model. One issue that required more extensive negotiation included the issue of the treatment of spent fuel (which reprocessing states would not consider "waste"); ultimately, consensus was achieved by using safe management as a common focus for both radioactive waste and for spent fuel – thus, a "joint convention" covering both. Other issues included (1) ensuring proper integration with the Convention on Nuclear Safety in treating waste stored on an installation site and the treatment of an installation when it entered the decommissioning phase, (2) coverage of waste related to military or defence programmes, and (3) provisions on transboundary movement of waste and spent fuel. The Joint Convention was adopted on 5 September 1997 at the conclusion of the Diplomatic Conference convened to consider the draft. The Joint Convention entered into force in June 2001.

The reaction to the conventions was mixed, ranging from cautious optimism over their potential for enhancing nuclear safety to blunt criticism of them as creating a toothless regime that fails to solidify specific norms or obligations on their adherents.[43] Viewpoints differed over 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. As noted above, the expert groups who developed the convention drafts relied on the safety fundamentals document that had been recently issued by the IAEA rather than more precise binding technical standards. These advisory norms were thus recognised within the conventions as a baseline of acceptable common standards for safety, but the conventions stop short of elevating them to

41. IAEA (1993), *Safety Fundamentals: The Safety of Nuclear Installations*, Safety Series No. 110, superseded by IAEA (2006), *Fundamental Safety Principles*, IAEA Safety Standards Series, No. SF-1, IAEA, Vienna.
42. An overview of the negotiation of the Joint Convention is provided in Tonhauser, W. and O. Jankowitsch-Prevor (1997), "The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", *Nuclear Law Bulletin*, No. 60, OECD, Paris, pp. 9, 12-21. The text and relevant official documents can be found in IAEA (2006), *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*, IAEA International Law Series No. 1, IAEA, Vienna.
43. Norbert Pelzer provides a good bibliography of commentary on the two conventions in his 2006 article "Learning the Hard Way: Did the Lessons Taught by the Chernobyl Accident Contribute to Improving Nuclear Law?", *supra* note 39, p. 88, nn. 77 and 78.

more stringent, enforceable requirements.[44] While some might defend the efficacy of this approach in the face of the variance among widely differing national systems, others would compare the approach unfavourably to the international standards governing the aviation and maritime industries.[45]

From the outset, tension was present between an approach resting upon state authority and responsibility as opposed to a more intrusive international inspection and sanctions regime.[46] Even in some of the earliest statements encouraging movement toward an international safety regime, IAEA Director General Hans Blix suggested:

> Whatever is done, however, it is important to retain the principle that responsibility for nuclear safety must remain with national governments. They alone can legislate. They alone exercise the power to enforce. They cannot be relieved of this duty by any international arrangements. But they might, of course, be required to comply with minimum standards.
>
> Whatever might be done as regards international safety standards, important steps could and should probably be taken in the sphere of international safety review of nuclear installations. I am not suggesting for your consideration a system of safety inspections in any way parallel to the safeguards. However, schemes falling short of such radical ideas and taking present programmes as a point of departure might have considerable value and be acceptable.[47]

The ultimate "incentive" approach of the conventions reflects a path that accommodates the tension between the competing considerations. In an oft-cited passage from her article on the Convention on Nuclear Safety, Odette Jankowitsch notes that the incentive character of the convention is intended to be synonymous with "encouragement" or "emulation", i.e. the peer reviews would be persuasive in encouraging states to achieve their obligations under the Convention and improve the safety of their facilities.[48] Notwithstanding the criticism of some commentators of the conventions as "disappointing" and failing to establish, or indeed evading, a "clearly binding international regime",[49] more recent assessments of the

44. See Lamm, V. (2017), "Reflections on the development of international nuclear law", *Nuclear Law Bulletin*, No. 99, OECD, Paris, pp. 31, 36, 41-43. Nonetheless, Chernobyl fostered greater discussion about common safety criteria, progress that should not be discounted given the variability in national approaches, not only between the Soviet Union and other nations, but among other states as well. See Wellock, T. (2013), *supra* note 40, pp. 6-8.
45. Compare Handl, G. (1988), "Transboundary Nuclear Accidents: The Post-Chernobyl Multilateral Legislative Agenda", *Ecology Law Quarterly*, Vol. 15, Issue 2, University of California Berkeley School of Law, Oakland, pp. 203, 207 with Kamminga, M. (1995), "The IAEA Convention on Nuclear Safety", *International and Comparative Law Quarterly*, Vol. 44, Issue 4, Cambridge University Press, Cambridge, pp. 872, 873.
46. See Reyners, P. (1996), "The Convention on Nuclear Safety of 1994", *Reciel*, Vol. 5, Issue 3, p. 231, 232 and 234; Pelzer, N. (2006), *supra* note 39, p. 87.
47. Director General's Statement to Meeting of the Board of Governors, 21 May 1986, at 11; see also Blix, H. (1986), "The post-Chernobyl outlook for nuclear power", *IAEA Bulletin*, Vol. 28, No. 3, IAEA, Vienna, pp. 9, 11.
48. Jankowitsch, O., "The Convention on Nuclear Safety", *supra* note 40, p. 13. Ms Jankowitsch served as secretary to the Group of Experts and was an IAEA legal advisor.
49. See Kamminga, M. (1995), *supra* note 45, p. 880; Szasz, P. (1994), "Introductory Note, International Atomic Energy Agency: Convention on Nuclear Safety", *International Legal Materials*, Vol. 33, pp. 1514, 1515; Cameron, P. (1999), "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", in N. Horbach (1999), *supra* note 40, pp. 117, 128. Boustany, K. (1998), "The Development of Nuclear Law Making or the Art of Legal 'Evasion'", *Nuclear Law Bulletin*, No. 61, OECD, Paris, pp. 39-53.

conventions' incentive approach have been more favourable, if still advising some caution.[50]

C. The nuclear liability conventions

At the time of the Chernobyl accident a nuclear liability regime of sorts existed in the international sphere in the form of two independent conventions: the 1960 Paris Convention established under OECD auspices (with the additional compensation scheme established under the Brussels Supplementary Convention) and the 1963 Vienna Convention under IAEA auspices.[51] Although the two conventions shared common principles, such as strict liability, channelling of liability to the operator, the obligation to maintain financial security, and assignment of jurisdiction, there was no link between the conventions. Thus, a victim would be likely shut out of compensation for injuries suffered if the accident occurred in a neighbouring state that was party to a different convention than the one to which the state where the victim lived adhered.

Attempts to link the two conventions stretched back to the time that the Vienna Convention had been adopted in 1963. A serious effort to negotiate a joint protocol linking the conventions gained some traction in 1974 but fell by the wayside. Work recommenced in 1984, but the Chernobyl accident – the first with significant transboundary effects – finally inspired an intentional focus on linking the existing conventions through the Joint Protocol adopted in 1988 as well as working further toward the improvement of the individual conventions.[52] That the Soviet Union did not adhere to an existing liability convention and the low likelihood of obtaining an enforceable judgment in Soviet courts added to the call for expanding and improving the existing liability regime.[53] Moreover, the conventions enjoyed relatively limited adherence. Although the Paris-Brussels regime in 1986 included fourteen OECD states in Europe as members (including all countries that operated nuclear power plants), only ten states had ratified the Vienna Convention.

50. Handl, G. (2003), "The IAEA Nuclear Safety Conventions: An Example of Successful 'Treaty Management'?", *Nuclear Law Bulletin*, No. 72, OECD, Paris, pp. 7-27; Pelzer, N. (2006), *supra* note 39, pp. 93-95; de Wright, T. (2007), "The 'Incentive' Concept as Developed in the Nuclear Safety Conventions and its Possible Extension to Other Sectors", *Nuclear Law Bulletin*, No. 80, OECD, Paris, pp. 29-47; Montjoie, M. (2015), "Treaty implementation applied to conventions on nuclear safety", *Nuclear Law Bulletin*, No. 96, OECD, Paris, pp. 9-34.
51. Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982 (1960), 1519 UNTS 329 (Paris Convention or PC); Convention of 31st January 1963 Supplementary to the Paris Convention of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982 (1963), 1041 UNTS 358 (Brussels Supplementary Convention or BSC); Vienna Convention on Civil Liability for Nuclear Damage (1963), IAEA Doc. INFCIRC/500, 1063 UNTS 266, entered into force 12 Nov. 1977.
52. See IAEA (2013), *The 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention – Explanatory Text*, International Law Series No. 5, IAEA, Vienna, pp. 4-8; Busekist, O. (1989), "A Bridge Between Two Conventions on Civil Liability for Nuclear Damage: the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention", *Nuclear Law Bulletin*, No. 43, OECD, Paris, pp. 10, 11-14.
53. See, e.g. Country report for Federal Republic of Germany (1986), "Compensation for Damage caused by the Chernobyl Accident under the Atomic Energy Act (1986)", *Nuclear Law Bulletin*, No. 38, OECD, Paris, pp. 21-22; Country report for Sweden (1986), in *ibid.*, pp. 33-34 (addressing compensation to victims suffering damage from the Chernobyl accident).

Only two of them – Argentina and Yugoslavia – operated nuclear power facilities, and none of the Soviet satellite states adhered to the Vienna Convention.[54]

The Joint Protocol was the initial task intended to improve the liability regime. The IAEA and NEA experts worked on a proposal in 1986 and 1987, and the IAEA Board of Governors' and the OECD Council's respective actions approved the holding of a Diplomatic Conference to consider the texts. The Diplomatic Conference adopted the draft text on 21 September 1988 and it entered into force in April 1992 upon the ratification or accession of five states party to the Paris and five states party to the Vienna liability conventions.[55]

The conclusion of the Joint Protocol was widely viewed as only a first, though necessary, step toward invigorating the international nuclear liability regime.[56] The Joint Protocol only linked those within the existing Paris and Vienna regimes that ratified the Joint Protocol; it did not attempt to otherwise improve the compensation scheme under the conventions. Focusing on "modernising" the liability conventions was the next step. However, the journey toward an improved liability regime since Chernobyl has been a lengthy one, as evidenced by the time that it took after the accident occurred to negotiate revisions to the Vienna and Paris Conventions – 11 and 16 years respectively. Moreover, the CSC, an additional convention developed under IAEA auspices concurrent with the 1997 Vienna Protocol, only recently came into force in 2015, and the Paris- Brussels regime's revisions have yet to come into force.

Among other things, improvements to the liability regime focused on increasing the minimum liability amount, compensating a broader range of damage (including for the first time the environmental and economic costs of an accident), compensating more victims by widening the geographical scope of the regimes, and extending the prescription period within which victims may make their claims.[57] Work on revising the Vienna Convention began in 1989 and was ultimately shepherded by a Standing Committee on Liability for Nuclear Damage that held 17 sessions from 1990 to 1997. In its early stages, discussion focused not only on the liability of individuals or juridical entities under the law but also on the question of state liability in the event of an accident.[58] Ultimately, however, the work centred on

54. See IAEA (1988), "Special Report, Highlights of the IAEA General Conference: 32nd regular session", *IAEA Bulletin*, Vol. 30, No. 4, IAEA, Vienna, p. 35.
55. See IAEA (2013), *supra* note 52, pp. 6-10.
56. See Boulanenkov, V. and B. Brands (1988), "Nuclear Liability: Status and prospects", *IAEA Bulletin*, Vol. 30, No. 4, pp. 5-9; Sands, P. (1996), *supra* note 29, p. 200; Carroll, S. (1996), *supra* note 37, pp. 208-209.
57. "Progress towards a global nuclear liability regime" (2014), *Nuclear Law Bulletin*, No. 93, OECD, Paris, pp. 9-23. An earlier version of this note was developed as a background document for the policy debate on nuclear liability held in April 2014 before the NEA Steering Committee. Appendix 1, pp. 21-22 (outlines the enhancements under the revised conventions).
58. IAEA (2007), *The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts*, IAEA International Law Series No. 3, pp. 18-19; see Pelzer, N. (1987), *supra* note 30, p. 308; see also Lamm, V. (1998), "The Protocol amending the 1963 Vienna Convention", *Nuclear Law Bulletin*, No. 61, OECD, Paris, pp. 7-24.

revision to the Convention and on establishing an approach to supplemental funding.[59]

The Protocol to Amend the Vienna Convention was adopted at a Diplomatic Conference on 12 September 1997 and entered into force on 4 October 2003. The 1997 Vienna Protocol exists concurrently with the 1963 Vienna Convention. Thus, states may accede to the 1963 Vienna Convention only; the Vienna Convention *and* its 1997 Protocol; or the 1997 Vienna Protocol but not to the 1963 convention. The Diplomatic Conference also adopted the CSC, which is open to all states, including those already parties to the Paris-Brussels or Vienna regimes. Support for establishing a mechanism to provide supplementary funds to compensate nuclear damage arose during the discussion of the new Vienna Protocol, which would be over and above the amounts to be provided by the operator under the Paris and Vienna Conventions. The system of supplementary state funding in the CSC was modelled in part on the Brussels Supplementary Convention.

The CSC provides for a two-tier compensation system: the first tier is provided by the operator and, if necessary, the state where its installation is situated; the second tier is provided by the CSC states. The CSC allows a state to establish at its option a third tier of compensation. The CSC was also intended to provide the basis for a global liability regime to supplement and enhance the measures provided in the Paris and Vienna regimes. Importantly, the CSC allowed the United States to join an international nuclear liability convention without amending its national law, the Price-Anderson Act, 42 USC Section 2210, which provides for economic channelling of liability to the operator rather than the legal channelling approach provided in the conventions. The free-standing nature of the CSC and its structure gave support to the argument that the CSC lays the foundation for a more global liability regime.[60]

The parties to the Paris-Brussels regime participated in the discussions on the 1997 Protocol and soon moved to improve their own regime.[61] On 12 February 2004, the Protocol to Amend the Paris Convention and the Protocol to Amend the Brussels Supplementary Convention were signed. The protocols have yet to enter into force, mainly because a decision of the Council of the EU of 8 March 2004 requires that the contracting parties to the Paris Convention that are also EU members "take the necessary steps to deposit simultaneously their instruments of ratification of the

59. A rich record of the viewpoints of experts on the changes to the liability system leading to the revised Vienna Convention and ultimately the revised Paris-Brussels regime can be found in a series of NEA publications on the subject. See NEA (2000), *Reform of Civil Nuclear Liability: Budapest Symposium 1999*, OECD, Paris; NEA (1994), *Liability and Compensation for Nuclear Damage: An International Overview*, OECD, Paris; NEA (1992), *Nuclear Accidents: Liabilities and Guarantees*, Proceedings of the Helsinki Symposium Organised Jointly by the NEA and IAEA, OECD, Paris. These publications are available at: NEA (2018), "Nuclear liability publications, workshops and symposia", www.oecd-nea.org/law/nuclear-liability-pubs-workshops-symposia.html (accessed 5 Dec. 2018).
60. McRae, B. (1998), "The Compensation Convention: Path to a Global Regime for Dealing with Legal Liability and Compensation for Nuclear Damage", *Nuclear Law Bulletin*, No. 61, OECD, Paris, pp. 25-38.
61. Dussart-Desart, R. (2005), "The Reform of the Paris Convention on Third Party Liability in the Field of Nuclear Energy and of the Brussels Supplementary Convention", *Nuclear Law Bulletin*, No. 75, OECD, Paris, pp. 7-33. Unofficial consolidated texts of both revised conventions under the protocols are published in NEA (2005), *Supplement to Nuclear Law Bulletin*, No. 75, OECD, Paris.

Protocol, or accession to it".[62] At the time, this requirement did not seem to be a constraint, but it ultimately became one. Only Italy among the Paris Convention states has yet to conclude its national prerequisites for ratification of the 2004 Protocols.

Building on the common principles that underlie the original liability conventions, the efforts to improve the international liability regime did make progress in the years after Chernobyl. A broader range of compensable damages, longer time to make claims and a wider group of covered claimants are provided in the revised and new conventions. Moreover, a substantial increase in the minimum liability amounts was achieved: e.g. from operator liability of 15 million Special Drawing Rights (SDR, equivalent to about EUR 18.1 million or USD 21 million) maximum to EUR 700 million minimum under the revised Paris Convention and, under the 1997 Vienna Protocol, from USD 5 million in gold valued at USD 35 per troy ounce adjusted to reflect the current price of gold (about USD 172 million or EUR 123 million with gold at USD 1200 per troy ounce) to SDR 300 million (about EUR 362 million or USD 421 million). Despite these improvements, progress was slow in the 25 years that lapsed between the Chernobyl and Fukushima Daiichi accidents. By 2011 neither the CSC nor the 2004 Paris and Brussels protocols had taken force, and adherence to the 1997 Vienna Protocol was modest. Whatever momentum Chernobyl had prompted seemed to have lost its steam.[63]

III. Fukushima Daiichi

The Great East Japan Earthquake struck north-eastern Japan on 11 March 2011, approximately 130 km east of the city of Sendai and approximately 370 km northeast of Tokyo, Japan.[64] The magnitude 9.0 earthquake and ensuing tsunami caused widespread devastation, including the loss of over 15 000 lives and disruption of local infrastructure. Eleven operating nuclear power plants along the north-eastern coast of Japan shut down automatically, including three plants operating at the six-unit Fukushima Daiichi station. At the time of the accident, Units 1 through 3 were operating, Unit 4 (located adjacent to Unit 3) had no fuel in its reactor, and Units 5 and 6, which are located separately from Units 1-4 on the site, were shut down for routine maintenance and refuelling. The plants were boiling water reactors designed by the General Electric Company. The station lost power from the electrical grid, and flooding caused by the tsunami waves, including one as high as 15 metres, rendered all but one of the site's diesel generators incapable of supplying back-up power. As a consequence, four of the units at the site entered a condition called "station blackout", meaning the only electric power available came from station

62. Council Decision 2004/294/EC of 8 March 2004 authorising the member states to ratify, in the interest of the European Community, the Protocol of 12 February 2004 amending the Paris Convention, *Official Journal of the European Union* (OJ) L 97 (1 Apr. 2004), p. 53. The Council had to authorise member states that are contracting parties to the Paris Convention to ratify the 2004 Protocol to amend the Convention because some of its provisions concern the judicial resolution of disputes, a subject that, according to EU law, falls under the EU's exclusive competence.
63. See Pelzer, N. (2010), "Main Features of the Revised International Regime Governing Nuclear Liability – Progress and Standstill", in NEA (ed.), *International Nuclear Law: History, Evolution and Outlook*, OECD, Paris, pp. 355, 382-386.
64. The description of the accident is adapted from Burns, S. (2012), "The Fukushima Daiichi Accident: The International Community Responds", *Washington University Global Studies Law Review*, Vol. 11, No. 4, Washington University, St. Louis, pp. 739, 741-45, and the references cited therein. The IAEA has issued a multi-volume report addressing the accident and the lessons learnt therefrom. IAEA (2015), *The Fukushima Daiichi Accident: Report by the Director General*, GC(59)/14, Vols. 1-6, IAEA, Vienna. Volume 1 contains an executive summary.

batteries, which are capable of providing power only in terms of hours, not days. Although Units 1 through 3 had shut down automatically as designed in response to the earthquake itself, continued cooling of the reactor cores was necessary to remove residual heat and required the operability of equipment that relies in part on electric power.

Not only did workers at the plant have to deal with securing the operation of critical safety equipment, but they also faced significant damage to site infrastructure from the earthquake and tsunami. The damage complicated the workers' ability to access parts of the plant and conduct other recovery operations. Despite valiant efforts to cool the plants, adequate core cooling was lost within hours in the Unit 1 reactor, within 36 hours in Unit 3, and 71 hours in Unit 2. As a consequence, the fuel in each of these reactors was damaged.

Explosions caused by the ignition of hydrogen gas released from the damaged fuel in the reactors impaired the functionality of equipment and the integrity of structures at the site, thereby further complicating site operations and recovery. Concerns also arose over the cooling capability for the spent fuel pools in each unit. At first, some debate occurred over whether the spent fuel pool in Unit 4 had been substantially drained; loss of spent fuel cooling capability could lead to fuel damage and radioactive releases. This turned out not to be the case. Units 5 and 6, which are separated from the other Daiichi units and built on higher ground, were brought to a safe condition, in part relying on the single diesel generator that remained operable at Unit 6.

The Japanese government initially ordered evacuation of residents within a 2-km zone, increased it to 10 km from the site and then expanded the evacuation to as far as 30 km from the site. In April 2011, the government established a restricted area within 20 km of the site to allow temporary access for members of the public but excluded the public within 3 km. Unlike Chernobyl, no early health effects much less deaths were observed due to radiation exposure of workers or nearby residents, and no discernible latent radiation health effects are expected. No significant radioactive releases were experienced outside of Japan. Japan did initiate communication with the IAEA within about an hour and a half after the earthquake, consistent with the Early Notification Convention, and member states began enquiring about plant status through the IAEA's contact points for the Early Notification and Assistance Conventions about three hours after the earthquake. Japan did not formally seek aid under the Assistance Convention.[65]

The accident occurred a few weeks before the scheduled Fifth Review Meeting in early April 2011 of the contracting parties to the Convention on Nuclear Safety. At the conclusion of the review meeting, the contracting parties adopted a statement committing themselves to achieving high levels of nuclear safety through the enhancement of national measures and international co-operation, to preventing and mitigating accidents, and to carry out efforts to ensure the safety of existing and planned nuclear plants from the lessons learnt from the accident.[66] The parties also committed themselves to holding a dedicated meeting on the accident in 2012 at which the parties would consider lessons learnt from the accident and "if necessary, the continued suitability of the provisions of the Convention on Nuclear Safety". IAEA Director General Yukiya Amano announced the convening of a ministerial conference in June 2011 to make an initial assessment of the accident and its bearing on the international regime for emergency response and for safety.

65. IAEA (2015), *supra* note 64, Vol. 1, pp. 94-96; *ibid.*, Vol. 3, p. 131, Table 3.5 (timeline of events) and pp. 134-137.
66. IAEA, "Summary Report of the 5th Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, 4-14 April 2011", IAEA Doc CNS/RM/2011/6/Final, pp. 2-3.

In early June, the G-8 and the NEA held an International Ministerial Seminar on Nuclear Safety in Paris followed by a meeting of nuclear regulators.[67] These meetings were followed shortly thereafter by the ministerial conference on nuclear safety at the IAEA in Vienna.[68] As a result of the June ministerial conference, the IAEA developed a draft "Action Plan" of items for member states, operators, the IAEA, and other multinational organisations to carry out to strengthen nuclear safety. All 151 member states endorsed the plan at the General Conference on 22 September 2011.[69]

A. Impact on the emergency response and safety regime

The IAEA Action Plan encouraged the co-operation and involvement of member states in implementing 12 main actions:

- safety assessments of nuclear power plants in light of lessons learnt from the accident;
- strengthening peer reviews conducted by the IAEA;
- strengthening emergency preparedness and response capabilities;
- strengthening the effectiveness of national regulatory bodies;
- strengthening the effectiveness of operating organisations with respect to nuclear safety;
- reviewing and strengthening IAEA Safety Standards and improving their implementation;
- improving the effectiveness of the international legal framework;
- facilitating the development of the infrastructure necessary for member states embarking on a nuclear power programme;
- strengthening and maintaining capacity building (i.e. ensuring available human resources necessary for safe nuclear power operation);
- protecting people and the environment from ionising radiation following an emergency;
- enhancing the transparency and effectiveness of communications and improving the dissemination of information; and
- effectively utilising research and development.

67. The NEA produced a report on the forum. NEA (2011), "Proceedings of the Forum on the Fukushima Accident: Insights and Approaches", NEA Doc. NEA/CNRA/R(2012)12, OECD, Paris.
68. See IAEA (2011), "Declaration by the IAEA Ministerial Conference on Nuclear Safety in Vienna on 20 June 2011", IAEA Doc. INFCIRC/821; IAEA (2011), Report by the Director General, "IAEA Ministerial Conference on Nuclear Safety 20-24 June 2011", IAEA Doc. GOV/INF/2011/13-GC(55)/INF/10.
69. IAEA (2011), "Draft IAEA Action Plan on Nuclear Safety", Report by the Director General, IAEA Doc. GOV/2011/59-GC(55)/14, endorsed by the IAEA General Conference in Resolution, "Measures to strengthen international cooperation in nuclear, radiation, transport and waste safety", IAEA Doc. No. GC(55)/RES/9 (22 Sept. 2011; IAEA (2011), "Initial Progress in Implementation of the IAEA Action Plan on Nuclear Safety", Report by the Director General, IAEA Doc. GOV/INF/2011/15, sec. A.2.

As to improving the effectiveness of the international legal framework, the Action Plan calls on states, in the context of nuclear safety,

> to explore mechanisms to enhance the effective implementation of the Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, the Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, and to consider proposals made to amend the Convention on Nuclear Safety and the Convention on the Early Notification of a Nuclear Accident.[70]

The focus on the safety implications of the accident was not carried out solely through the international framework. National and regional responses to the accident led the way, whether in focusing on plant safety or re-assessing national policy on generating power from nuclear plants. For example, the European Union initiated "stress tests" (a term borrowed from the recent global financial crisis) to assess the safety of nuclear power plants and took other steps that eventually resulted in the adoption of revised safety directive in 2014. In the United States, the NRC constituted a task force to evaluate the implications of the accident for US plants and ultimately required measures to improve plant equipment, to enhance capability to cope with severe accidents, and to re-evaluate natural hazards such as seismic and flooding events that could adversely affect plants. Japan initiated a process to reassess the safety of its reactor fleet and changed its regulatory structure in the face of withering criticism of its institutions as having caused a "man-made disaster" at the Fukushima Daiichi station.[71] As to energy policy, Germany is notable for its swift decision – the *Energiewende* – to transition away from nuclear energy production.[72]

The Fukushima Daiichi accident has been a catalyst for a re-examination of the underlying assumptions of the framework for nuclear safety and a cause for reflection on the capacity and integrity of the responsible institutions. However, as for the international conventions related to nuclear safety, no changes have been made as a consequence of the Fukushima Daiichi accident. This should not be viewed as a failure of the international system but the result of the necessary and ultimately more productive focus on technical criteria, mitigation measures and public protection, and the resulting improvement of the "soft law" guidance and standards arising out of the lessons learnt from the accident.

Although the IAEA Action Plan identified, for example, potential changes to the Early Notification Convention as a task, the IAEA and its members worked on enhancing communication as well as assessment and dissemination of information in the context of the existing conventions as a means to productive improvement of

70. IAEA Draft Action Plan, *supra* note 69, p. 4.
71. See Burns, S. (2012), *supra* note 64, pp. 745-750, 758-759. The updated EU Directive was issued as 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, OJ L 219 (25 July 2014), p. 42 (2014 Amended Safety Directive).
72. On the ups and downs of Germany's policy on nuclear power, see Winter, G. (2013), "The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law", *Journal of Environmental Law*, Vol. 25, Issue 1, Oxford University Press, Oxford, pp. 95-124.

the system of notification and assistance.[73] The Russian Federation had offered a proposal to amend the Early Notification Convention, but the required majority of contracting parties did not request the convening of a Diplomatic Conference to consider the proposal.[74]

Amendments to the Convention on Nuclear Safety were offered by Russia, Spain and Switzerland, but only a later Swiss amendment reached consideration at a Diplomatic Conference in 2015 where the contracting parties agreed to a non-binding declaration in lieu of the proffered amendment. Under Article 32 of the Convention on Nuclear Safety, proposed amendments to the Convention are considered at a review meeting or at an extraordinary meeting, and proposed amendments may be adopted by consensus or, in the absence thereof, submitted to a Diplomatic Conference if two-thirds of the parties present and voting at the meeting approve. Although Spain withdrew its proposal, Swiss and Russian proposals came before the 2012 extraordinary meeting that the contracting parties had agreed to hold after the Fifth Review Meeting.[75]

The Swiss proposal included amendments aimed at greater transparency, by requiring periodic reviews of national regulatory bodies (e.g. through an IAEA Integrated Regulatory Review Service mission) and public dissemination of the regulatory body's findings and by making country reports under the Convention publicly available and deleting the provision in the Convention providing for confidentiality of the debates at the review meetings on country reports. As to the safety of installations, the Swiss proposal would require systematic safety assessments based on updated information from operating experience and state of the art hazards assessments of the facility and its siting, design reviews by external experts to ensure compliance with IAEA standards, external reviews of operational safety, i.e. through OSART missions conducted by the IAEA. Russia proposed including requirements for regular assessment of existing installations, noting IAEA safety standards as a basis for the regular assessment of a plant, and requiring that plant designs take into account an integrated assessment of unfavourable natural and "man-made" hazards affecting a site. The proposal also focused on institutional aspects, such as ensuring the requisite infrastructure and planning to support construction of new facilities and to ensure integration of relevant national bodies

73. IAEA (2015), *supra* note 64, Vol. 1, pp. 96-99; see also IAEA (2015), *Assessment and Prognosis in Response to a Nuclear or Radiological Emergency*, International Experts Meeting 20-24 April 2015, IAEA/IEM/IX, IAEA, Vienna and IAEA (2013), *Preparedness and Response for a Nuclear or Radiological Emergency in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant*, IAEA/REP/EPR, IAEA, Vienna (the reports are the result of experts' meetings conducted under IAEA auspices).
74. Johnson, P.L. (2014), "Opening Address: Developments in Nuclear Law", in R.F. Manovil (ed.), *Nuclear Law in Progress*, Proceedings of 21st International Nuclear Law Association Congress, Legis, Buenos Aires, pp. 13, 18-19. The Russian proposal would have specified the contracting party's obligation to report within 24 hours of specified information on the incident (including a preliminary assessment of the accident on the International Nuclear and Radiological Event Scale) and its obligation to make accessible environmental monitoring information and to post that information on its competent authority's website. Letter from S.V. Kirienko, Director General of the State Atomic Energy Corporation, to Yukiya Amano, Director General, IAEA (20 June 2011), forwarding "Proposals of the Russian Federation for amendments to the Convention on Early Notification of a Nuclear Accident".
75. IAEA, "Progress in the Implementation of the IAEA Action Plan on Nuclear Safety, Supplementary Information", IAEA Doc. GOV/INF/2012/11-GC(56)/INF/5, p. 22, para. 138.; Johnson, P.L. (2013), "The post-Fukushima Daiichi response: The role of the Convention on Nuclear Safety in strengthening the legal framework for nuclear safety", *Nuclear Law Bulletin*, No. 91, OECD, Paris, pp. 7, 14-15.

and operating organisations have resources and authority for effective emergency management and accident mitigation.[76]

At the extraordinary meeting held in August 2012 (only the second such meeting to have been held under the Convention), the contracting parties decided to establish a working group on "effectiveness and transparency" to consider actions to strengthen the Convention and to take into account potential amendments, including the Russian and Swiss proposals.[77] The working group's efforts resulted primarily in proposed revisions to various guidance documents and its report was considered at the Sixth Review Meeting of the Convention on Nuclear Safety held in March through April 2014.[78] The record of the Sixth Review Meeting reflects no further action on the original Russian and Swiss proposals, but Switzerland had submitted a new proposal in December 2013 to be considered at the Review Meeting.

Although Switzerland complimented the efforts of the working group to improve the review process of the Convention, it also suggested an amendment to Article 18 to emphasise "the critical importance" of maintaining containment integrity, a lesson of the Three Mile Island, Chernobyl and the Fukushima Daiichi accidents:

> Nuclear power plants shall be designed and constructed with the objectives of preventing accidents and, should an accident occur, mitigating its effects and avoiding releases of radionuclides causing long-term off site contamination. In order to identify and implement appropriate safety improvements, these objectives shall also be applied at existing plants.[79]

The Swiss amendment was comparable to the EU's 2014 Amended Safety Directive, particularly Article 8's admonition that member states implement the "objective of preventing accidents" and mitigating their consequences so as to avoid radioactive releases that would hamper initial emergency response or "would require protective measures that could not be limited in area or time".

At the Sixth Review Meeting, the necessary two-thirds majority of the contracting parties (only Canada and the United States dissented) decided to refer the new Swiss proposal to a Diplomatic Conference, which was held on 9 February 2015.[80] An informal working group held several meetings in preparation for the conference. Ultimately, the contracting parties concluded that consensus was not possible on the amendment.[81] A number of major nuclear power states, such as Russia and the United States, did not support the amendment. Arguments against the amendment questioned whether it added any real value, i.e. that it was unnecessary in light of the existing text of Article 18 addressed to the design of nuclear facilities and of the changes to relevant guidance documents to address lessons from the Fukushima Daiichi accident. Moreover, the amendment could be counterproductive. A long time might be required to attain the needed assent of two-thirds of the contracting parties; the outcome could also bifurcate the

76. The Swiss and Russian proposals are attached to the Final Summary Report, 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety, 27-31 Aug. 2012, IAEA Doc. CNS/ExM/2012/04/Rev.2.
77. *Ibid.*, p. 9, para. 33.
78. Lacoste, A.-C. (2014), "Summary Report", 6th Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, 24 March–4 April 2014, IAEA Doc. CNS/6RM/2014/11_Final, p. 10, para. 41.
79. *Ibid.*, Annex 1, "Proposal to amend the CNS by Switzerland".
80. *Ibid.*, p. 10, para. 42; "Summary Report", Diplomatic Conference to consider a Proposal by Switzerland to amend the Convention on Nuclear Safety, 9 Feb. 2015, IAEA Doc. CNS/DC/2015/3/Rev.2.
81. "Summary Report", *supra* note 80, para. 11.

convention scheme into groups of states that either were party to the amendment or were not.[82]

The contracting parties instead agreed to adopt the "Vienna Declaration on Nuclear Safety" that reiterated principles of the Convention on Nuclear Safety to prevent accidents and mitigate their consequences.[83] The Vienna Declaration provides with respect to the safety of installations:

1. New nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.

2. Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner.

States' requirements for addressing the objectives are to take into consideration relevant IAEA safety standards and other "good practices" through the life of the plant. The contracting parties also agreed to address these principles in their national reports for the Seventh Review Meeting scheduled for 2017.

The Vienna Declaration simply reaffirms the objectives of the Convention on Nuclear Safety; it neither replaces the Convention nor does the Declaration place any legal requirements upon the contracting parties. But, as one observer notes, the future treatment of the Vienna Declaration could lead to its consideration as customary international law depending on its application in future review meetings

82. See Stoiber, C. (2015), "Developments in the Law of Nuclear Safety: the Vienna Declaration", in C. Raetzke, U. Feldmann, A. Frank (eds.), *Aus der Werkstatt des Nucklearrechts*, Nomos Verlag, Baden-Baden, pp. 397, 405-406; Durand-Poudret, E. (2015), "Towards a new international framework for nuclear safety: Developments from Fukushima to Vienna", *Nuclear Law Bulletin*, No. 95, OECD, Paris, pp. 27, 32, 35.

83. "Summary Report", *supra* note 80, Annex I, "Vienna Declaration on Nuclear Safety", IAEA Doc. CNS/DC/2015/2/Rev.1. The text of the Vienna Declaration is also published as INFCIRC/872. The Swiss characterised the outcome of the conference a success even though their amendment did not gain consensus. Swiss Federal Nuclear Safety Inspectorate (ENSI) (9 Feb. 2015), News Post, "International community adopts Swiss idea for improving nuclear power plant safety" (comments of Dr Hans Wanner), www.ensi.ch/en/2015/02/09/international-community-adopts-swiss-idea-for-improving-nuclear-power-plant-safety/. However, others noted their disappointment with the outcome. For example, the Autorité de sûreté nucléaire [Nuclear Safety Authority] (ASN), the French nuclear regulator, issued a press release stating:

> The general objectives of nuclear safety of the Convention remain below the legally-binding dispositions of the European directive on Nuclear Safety revised in 2014. This situation might lead to a two-tier nuclear safety in the world, which would eventually be detrimental to all the countries. Anyway, the outcome of the negotiations does not live up to the issues at stake, recalled by the Fukushima Daiichi accident. ASN will keep on promoting the highest safety standards at the international level.

ASN, Press Release, "Diplomatic Conference of the Convention on Nuclear Safety: ASN considers the outcome does not live up to the safety issues at stake after the Fukushima Daiichi accident and will keep on promoting the highest safety standards" (10 Feb. 2015), www.french-nuclear-safety.fr/Information/News-releases/CSN-ASN-considers-the-outcome-does-not-live-up-to-the-safety-issues.

and treatment in IAEA standards and review missions.[84] The contracting parties at the Seventh Review Meeting in 2017 agreed to address the Declaration's principles in their country reports and the discussions and agreed to reference the declaration in the introductory section of the guidelines on preparation of national reports for the Convention review meetings.[85] The Declaration certainly is viewed as a vital instrument shaping the safety perspective by some states, particularly within Europe.[86] However, the extent to which the emphasis on the Vienna Declaration will continue more broadly is yet to be seen.

B. Nuclear liability

Although the Fukushima Daiichi accident did not have appreciable transboundary effects, the scope of damage and Japan's implementation of its scheme to provide for compensation drew the attention of the international community.[87] With respect to nuclear liability, the IAEA Action Plan on Nuclear Safety calls on:

> Member States to work towards establishing a global nuclear liability regime that addresses the concerns of all States that might be affected by a nuclear accident with a view to providing appropriate compensation for nuclear damage. The IAEA International Expert Group on Nuclear Liability (INLEX) to recommend actions to facilitate achievement of such a global regime. Member States to give due consideration to the possibility of joining the international nuclear liability instruments as a step toward achieving such a global regime.[88]

INLEX was established as an advisory group to the Director General in 2003. In response to the Action Plan, INLEX issued in 2012 a set of recommendations to facilitate progress toward a global nuclear liability regime and to encourage both nuclear and non-nuclear states to consider joining one or more of the relevant

84. Stoiber, C. (2015), *supra* note 82, p. 407.
85. "Summary Report", Seventh Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, 27 March – 7 April 2017, IAEA Doc. CNS/7RM/2017/08/Final, pp. 2, 4, 6, 10, para. 2, 13, 22-24, 40-41. The change to the introduction to IAEA INFCIRC 572, *Guidelines regarding National Reports under the Convention on Nuclear Safety* is reflected in Rev. 6, p. 1, para. 3, issued 19 Jan. 2018.
86. See Western European Nuclear Regulators Association (WENRA) (2016), *Position Paper: WENRA Input to IAEA Safety Strategy*, pp. 3, 5-6, available at www.wenra.org/media/filer_public/2017/07/21/wenra_position_paper_iaea_strategy.pdf. A recent news post by the Swiss regulatory authority contains criticism of non-European states (with the exception of Japan) in the context of the Vienna Declaration. ENSI, News Post, "The lessons from Fukushima must not be forgotten" (14 Sept. 2018), www.ensi.ch/en/2018/09/14/the-lessons-from-fukushima-must-not-be-forgotten/:
    > "The Vienna Declaration stands for a culture that is characterised by the concept of continuous improvement of nuclear safety," sums up Hans Wanner, Director General of [ENSI] and Chairman of [WENRA]. In particular, the declaration demands the periodic backfitting of existing nuclear power plants … The first conclusion two and a half years after the Vienna Declaration is sobering. While in Switzerland and in Europe such backfittings are already implemented as standard, concrete backfitting obligations or changes in the legislation have not occurred in any other countries outside Europe with the exception of Japan.
87. NEA Legal Affairs prepared in co-operation with the Japanese government a comprehensive compilation of commentary and texts related to the compensation carried out in Japan in response to the accident. NEA (2012), *Japan's Compensation System for Nuclear Damage*, OECD, Paris.
88. IAEA Action Plan, *supra* note 69, p. 5.

international instruments.[89] INLEX urged states to reflect the international principles in their national legislation in order to establish a more universal system and to make progress in strengthening the modernised liability regimes. The recommendations included setting higher minimum liability amounts and ensuring coverage of latent injuries, as well as taking steps to secure financial remuneration or provide compensation where an accident might exceed the capacity of the required financial security. States are urged to ensure that claims arising from a nuclear accident are dealt with in a single forum, in a prompt, equitable and non-discriminatory manner with minimal litigation.

Although INLEX urges states – whether nuclear facilities exist in their territory or not – to establish treaty relations with as many states as practical, the INLEX recommendations do not express a preference for one of the existing nuclear liability regimes, noting that:

> [T]he CSC establishes treaty relations among States that belong to the Paris Convention, the Vienna Convention or neither, while leaving intact the Joint Protocol that establishes treaty relations among States that belong to the Paris Convention or the Vienna Convention. In addition to providing treaty relations, the CSC mandates the adoption of the enhancements developed under the auspices of the IAEA and contains features to promote appropriate compensation, including an international fund to supplement the amount of compensation available for nuclear damage.

Because INLEX is comprised of experts who are experienced in or advocate for one or more of the regimes, the dual approach reflected in the statement is understandable.[90] The recommendations did not foresee a change to the liability instruments but rather broader adherence to them as the path to be taken.

Notwithstanding the differing viewpoints as to which route provides the better path, a number of states affirmed their support for greater progress. For example, France and the United States – countries party to different international liability conventions – issued a "Joint Statement on Liability for Nuclear Damage" in August 2013 agreeing to "promote efforts to achieve a global nuclear liability regime based on treaty relations among France, the United States and other countries that might be affected by a nuclear accident", to "coordinate their actions in encouraging adherence to the enhanced international nuclear liability instruments" and to "urge countries to adopt national laws that incorporate the nuclear liability principles and recent enhancements to those principles", as well as certain best practices.[91] The G-20 issued a declaration in September 2013 after its meeting in St. Petersburg that

89. INLEX (June 2012), *Recommendations on How to Facilitate Achievement of a Global Nuclear Liability Regime, As Requested by the IAEA Action Plan on Nuclear Safety*, available at: http://ola.iaea.org/ola/documents/ActionPlan.pdf. I served as the NEA observer to INLEX in 2012 when these recommendations were adopted.
90. On the merits of the different instruments on liability, see views doubting the efficacy of the CSC as the basis of a unifying regime in Pelzer, N. (2006), *supra* note 39, p. 114; Chirpius, V. (2012), "Could the Convention on Supplementary Compensation (CSC) for Nuclear Damage Become the Fundament for a Unified EU Legal Regime of the Nuclear Third Party Liability?", in Beyens, M., D. Philippe and P. Reyners (eds.) (2012), *Prospects of a Civil Nuclear Liability Regime in the Framework of the European Union: Proceedings*, Bruylant, Brussels, pp. 78-81; for views supporting the CSC as the basis of a global regime, see Tonhauser, W. (2012), "Reactions to the EC Legal Study from a Legal and Policy Viewpoint", in *ibid.*, pp. 24-25; Brown, O. (2012), "Convention on Supplementary Compensation for Nuclear Damage (CSC)", in *ibid.*, pp. 169-170; McRae, B. (2007), "The Convention on Supplementary Compensation for Nuclear Damage: Catalyst for a Global Nuclear Liability Regime", *Nuclear Law Bulletin*, No. 79, OECD, Paris, pp. 17, 22-23.
91. The Joint Statement is available at: www.energy.gov/downloads/united-states-and-france-sign-joint-statement-civil-liability-nuclear-damage.

encouraged "multilateral cooperation towards achieving a global nuclear liability regime".[92]

Despite the slow path to progress, some accomplishments have been made. The CSC has finally come into force with the accession of Japan in 2015, followed by India in 2016 and Canada in 2017, all states with operating nuclear power plants. Countries seeking to embark on a nuclear power plant programme, such as Ghana, Jordan, Saudi Arabia and the United Arab Emirates, have joined the CSC or the 1997 Vienna Protocol or both. There is more to be done, the entry into force of the 2004 Protocols to the Paris and Brussels Conventions being perhaps the most important next step. But even if a well-integrated global regime is not within our immediate grasp, continued effort to harmonise the regimes and broaden the participation in them remains a worthy objective.[93]

IV. Conclusion

Three Mile Island was the wake-up call. Chernobyl was the spur to action. Fukushima Daiichi was a cause for reflection. Each of these accidents has influenced the development of nuclear law, though the regime within which the international community operates today is largely the product of the instruments developed after the Chernobyl accident. The safety regime has seen the push and pull of the debate whether the pragmatism of the current incentive regime serves us well or whether the insistence on more exacting international standards would better serve nuclear safety. In the liability field, the question as to how or whether to broaden the reach of one or more of the existing conventions is the focus.

Our task within the international framework is to keep the dialogue open and to keep at the work of sustaining and improving robust national regimes and the international standards and rules that govern us. That task is ongoing – and not always easy. It is one that should not await the next crisis to maintain or inspire our effort.[94] It requires vigilance, engagement, frankness in assessments, and continued movement toward greater transparency in national activities and assessments through the various review mechanisms. Ultimately, all states need to show how they have acted to meaningfully strengthen their institutions, maintain and as needed improve plant safety, mitigate the potential impact of malfunctions and natural events, and protect the public.

92. The G-20 Leaders' Declaration, Saint Petersburg Summit (5-6 Sept. 2013), p. 24, para. 97, available at: www.g20.utoronto.ca/2013/Saint_Petersburg_Declaration_ENG.pdf.
93. For an insurer's perspective on implementation of the revised conventions, see Quéré, A. (2014), "Challenges facing the insurance industry since the modernisation of the international nuclear third party liability regime", *Nuclear Law Bulletin*, No. 94, OECD, Paris, pp. 77-104.
94. See Rautenbach, J., W. Tonhauser and A. Wetherall (2006), *supra* note 32, p. 35.

Today is yesterday's pupil: Reactor licence renewal in the United States

*by Kimberly Sexton Nick**

> *"Over the next 25 years, more than half the nuclear plants in the United States will turn 40, and their operating licenses will expire as they do. With no reactors on order and only two under construction, the nuclear industry's hope for survival probably rests on continued operation of existing plants."*[1]

It has been 27 years since the above statement was made and yet almost the same thing could be said about the state of nuclear power in the United States (US) today: over the next 20 years, half of the nuclear power plants in the United States will turn 60, and their operating licences will expire as they do.[2] With no reactors on order and only two under construction,[3] the US nuclear industry's hope for survival rests in part on the continued operation of existing plants.

The United States is not alone in this situation. As the enthusiasm for nuclear new build wanes in many western countries, the focus is shifting to reactor licence renewal, lifetime extension and long-term/continued/extended operation of currently operating nuclear reactors.[4] Currently, well over half of nuclear power

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The first part of the title for this article is a quotation from Benjamin Franklin in his 1751 *Poor Richard Improved*, National Archives (2018), "Founders Online", http://founders.archives.gov/documents/Franklin/01-04-02-0029 (accessed: 10 Oct. 2018); original source: Labaree, L.W. (ed.) (1961), *The Papers of Benjamin Franklin, vol. 4, July 1, 1750, through June 30, 1753*, Yale University Press, New Haven, pp. 84-101 ("today is yesterday's pupil").

1. Wald, M.L. (1991), "Due Up for License Renewal: The Future of Nuclear Power", *New York Times*, 24 June, available at: www.nytimes.com/1991/06/24/us/due-up-for-license-renewal-the-future-of-nuclear-power.html.
2. See NEI (2018), "Second License Renewal", www.nei.org/advocacy/make-regulations-smarter/second-license-renewal (accessed: 28 Sept. 2018).
3. Vogtle Electric Generating Plant, Units 3 and 4, currently under construction in Waynesboro, Georgia, which will be operated by Southern Nuclear Operating Co., Inc.
4. Countries around the world use different terminology to describe the operation of a nuclear power plant beyond its originally designed, licenced or envisaged life or period of operation. For the purposes of simplicity, this article takes the following approaches:
   - Long-term operation (LTO) will be used in to refer all of the following terms: long-term operation, continued operation and extended operation. Often the differences between these terms originate in translations of the same concept. The following IAEA definition, while not the "official" definition of LTO, is the most commonly-used definition when describing the concept: "Operation beyond an established timeframe

reactors around the world have been operating for more than 31 years and almost 20% were put into operation in or before 1977. The five oldest operating nuclear power reactors were connected to the grid in 1969, 49 years ago.[5] As recently highlighted by the European Commission (EC), "The importance of long-term operations is expected to increase in the coming years, and by 2030 the majority of the fleet [in the European Union (EU)] would be operating beyond its original design life. Long-term operations are expected to represent the majority of nuclear investments in the short to medium term."[6] Thus, if new nuclear power plants are less and less likely to come online in Europe and North America, authorising these older plants to continue to safely operate becomes the only viable source of ensuring that nuclear energy continues to contribute to meeting climate change goals.[7]

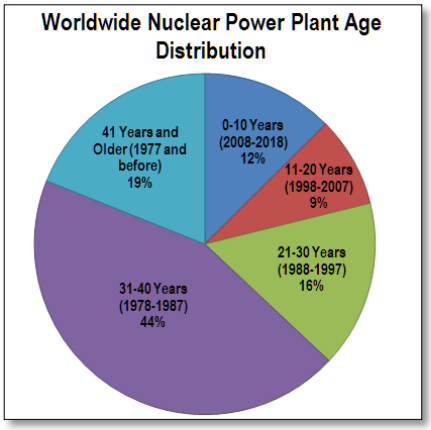

Figure 1.
Chart: K.S. Nick. Data source: IAEA (2018), PRIS, https://pris.iaea.org/PRIS/home.aspx (accessed: 27 Sept. 2018).

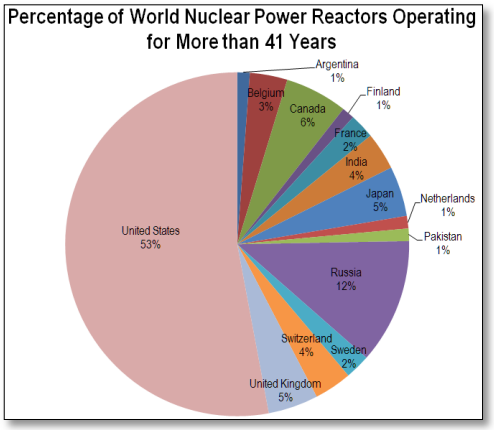

Figure 2.
Chart: K.S. Nick. Data source: IAEA (2018), PRIS, https://pris.iaea.org/PRIS/home.aspx (accessed: 27 Sept. 2018).

set forth by, for example, licence term, design, standards, licence and/or regulations, which has been justified by safety assessment, with consideration given to the life limiting processes and features of SSCs." IAEA (2009), Ageing Management for Nuclear Power Plants, Safety Guide No. NS-G-2.12, IAEA, Vienna, p. 8, para. 2.17.

- There is no commonly accepted definition of the term lifetime extension (LTE). Sometimes LTE is used interchangeably with LTO. In other instances, it is used in reference to a specific "plant life extension" or PLEX programme. In this article, LTO and LTE will be considered as the same concept.
- Generally speaking, when an operating licence is issued for a defined period of time (often-times 10, 20, 30 or 40 years), the ability to operate past the originally-issued licence term requires a renewed licence. While the operation according to a "renewed licence" does not necessarily indicate that the reactor in question is operating in the period of LTO, it is the case in the United States.

5. Beznau, Unit 1 in Switzerland; Nine-Mile Point, Unit 1 and Ginna in the United States; and Tarapur, Units 1 and 2 in India. International Atomic Energy Agency (IAEA) (2018), "Power Reactor Information System (PRIS)", https://pris.iaea.org/PRIS/home.aspx (accessed: 27 Sept. 2018).
6. EC (2018), *In-depth Analysis in Support of the Commission Communication COM(2018) 773 "A Clean Planet for all A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy"*.
7. See e.g. NEA (2012), *The Economics of Long-term Operation of Nuclear Power Plants*, OECD, Paris, p. 108, "LTO of NPPs could be a key element in the decarbonising of electricity generation since they maintain low carbon sources of baseload electricity which cannot easily be replaced by other low-carbon technologies."; Plumber, B., "How Retiring Nuclear Power Plants May Undercut U.S. Climate Goals", *New York Times* (13 June 2017), available at: www.nytimes.com/2017/06/13/climate/nuclear-power-retirements-us-climate-goals.html.

The situation is even more pronounced in the United States, which is home to the second oldest operating nuclear power plant (Nine Mile Point, Unit 1); the largest number, as well as greatest percentage, of reactors operating past 40 years of age in the world; and where 11 of the remaining 98 nuclear power plants have already publicly announced closure plans over the next seven years.[8] This situation makes authorising life beyond 60 years increasingly important.

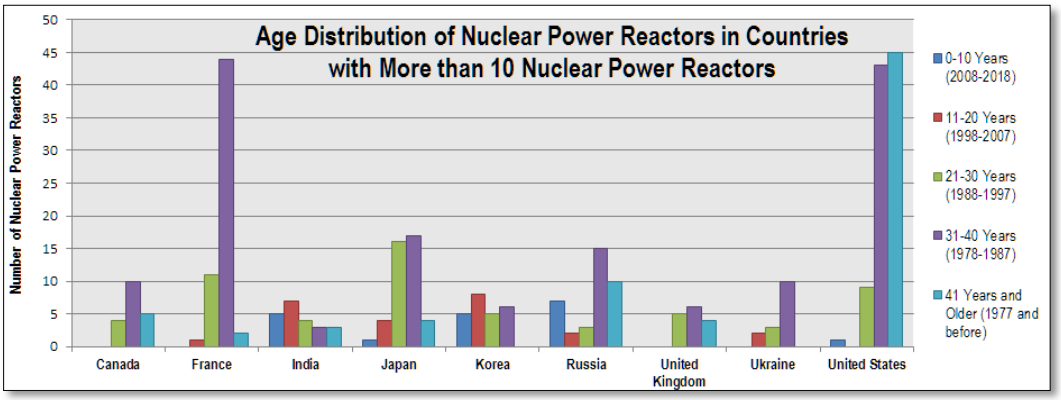

Figure 3.
Chart: K.S. Nick. Data source: IAEA (2018), PRIS, https://pris.iaea.org/PRIS/home.aspx (accessed: 27 Sept. 2018).

Although the first renewed operating licence was granted less than 20 years ago,[9] the United States has decades of knowledge and experience in the licensing and regulation of nuclear power reactors as they enter the period of LTO. And while the NRC determined years ago that renewed licences could be subsequently renewed, it only recently determined that the existing licence renewal regulations were sufficient to cover the period of subsequent renewal, the period of 60-80 years.[10] The NRC is currently reviewing three applications for subsequent licence renewal[11] and one additional site has submitted a letter of intent to request subsequent licence

8. Those plants are:
   - Pilgrim Nuclear Power Station: by end of May 2019;
   - Three Mile Island Nuclear Station, Unit 1: September 2019;
   - Davis-Besse Nuclear Power Station, Unit 1: May 2020;
   - Perry Nuclear Power Plant, Unit 1: May 2021;
   - Indian Point Nuclear Generating, Units 2 and 3: 2020 and 2021, respectively;
   - Beaver Valley Power Station, Units 1 and 2: May and October 2021, respectively;
   - Palisades Nuclear Plant: by May 2022; and
   - Diablo Canyon Power Plant, Units 1 and 2: by August 2025.

   NRC (2018), *Information Digest, 2018-2019*, NUREG-1350, Vol. 30, NRC, Washington, DC, p. xii.
9. The final report for the Calvert Cliffs Nuclear Power Plant license renewal application was submitted by Baltimore Gas and Electric to the US NRC in July 1998, and is available at: www.nrc.gov/reactors/operating/licensing/renewal/applications/calvert-cliffs/epri.pdf. The renewed licence was issued by the NRC on 23 March 2000. NRC (2017), "Calvert Cliffs Nuclear Power Plant, Units 1 & 2 – License Renewal Application", www.nrc.gov/reactors/operating/licensing/renewal/applications/calvert-cliffs.html (accessed: 11 Oct. 2018). The licence renewal status of all nuclear power reactors in the United States is provided in an Annex to this article.
10. See e.g. NRC (2017), *Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants: Final Report*, NUREG-2192, NRC, Washington, DC, p. xxix.
11. Turkey Point Nuclear Power Plant, Units 3 and 4; Peach Bottom Atomic Power Station, Units 2 and 3; and Surry Power Station, Units 1 and 2. NRC (2018), "Status of Subsequent License Renewal Applications", www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html (accessed: 11 Dec. 2018).

renewal.[12] Because the unique, highly prescribed nature of the licensing process in the United States is not always well understood in light of the approach taken in many other countries, a detailed understanding of the history and procedure of the legal and regulatory framework is especially beneficial at this time.

With many countries not focusing on nuclear new build, a renewed spotlight has been put on extended plant operation, with international organisations like the NEA looking at the legal, regulatory, economic, technical and policy aspects of LTO and the United Nations Economic Commission for Europe (UNECE)[13] analysing the role of environmental reviews in the authorisation of LTO. To familiarise an international legal audience, or even new US regulatory attorneys, with the licence renewal approach taken by the United States, this article will first provide in Part 1 a brief background on the licensing process determined by the US government over 60 years ago. It will then detail the regulatory history of the Licence Renewal Rulemaking, explain why certain decisions were made, and look at the issues from a policy perspective, as well as from the standpoint of protecting public health, safety and the environment. Once it is well understood why the NRC made the decisions it did, the next step is putting it into perspective in Part 2 by looking at LTO in an international setting so that the differences in the US regulatory approach can be better understood. Then, the article will take the theory, the policy and the perspectives from Parts 1 and 2 and put it into practice in Part 3, explaining the procedural steps of authorising licence renewal. In the end, the reader will hopefully appreciate that while different from many other countries, the US approach to authorising LTO is fundamentally sound and has worked well for the past 20 years. And more importantly that there is no reason the same approach cannot continue to work for the 60-80-year time period.

PART 1: THE THEORY AND THE POLICY OF REACTOR LICENCE RENEWAL

I. Initial operating licences in the United States

Under the US Atomic Energy Act of 1954, as amended (AEA),[14] licences for the commercial operation of a production or utilisation facility, which include nuclear power reactors, "shall be issued for a specified period, as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years from the authorization to commence operations".[15] There are two general explanations for this 40-year licence term:

12. North Anna Power Station, Units 1 and 2. NRC (2018), "Status of Subsequent License Renewal Applications", *ibid.*
13. Despite its name, the UNECE includes 56 member states across Europe, Asia (Israel, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) and North America (Canada and the United States).
14. Pub. L. No. 83-703, 68 Stat. 919 (original text of the 1954 Act). The AEA, as amended, is codified at 42 *United States Code* (USC) 2011-2021, 2022-2286i, 2296a-2297h-13. The USC is the consolidated publication of the general and permanent laws of the United States.
15. AEA, sec. 103(c). It should be noted that the 40-year licence term did not always commence from the start of operations. In the beginning, and for the first 25 years of licensing, the 40-year term actually began at the date of issuance of the licence of the construction permit. 10 CFR 50.51, "Duration of license, renewal" originally stated that "Each license will be issued for a fixed period of time to be specified in the license but in no case to exceed 40 years from the date of issuance." 21 *Federal Register* (Fed. Reg.) 355, 359 (19 Jan. 1956); see also NRC (1988), *Regulatory Options for Nuclear Power Plant License Renewal: Draft for Comment*, NUREG-1317, NRC, Washington, DC, p. 1-1. In 1982, the NRC issued a policy that determined the 40-year licence period could instead begin at the date of issuance of the operating licence. Memorandum dated 16 Aug. 1982 from W. Dircks,

- The Federal Communications Act of 1934 was a model for the AEA and the drafters of the AEA extracted almost verbatim the licensing provisions of that law for the atomic bill.[16] Under the Federal Communications Act of 1934, "radio stations were licensed to operate for several years and then allowed to renew their licenses as long as they continued to meet their charters".[17]

- In addition, there were antitrust and economic considerations.[18] Although part of the basis for the time limit was "to prohibit open-ended or perpetual licenses", the specific term was chosen as "a compromise between the efforts of the Justice Department and electric cooperatives, who championed a 20-year limit on the basis of antitrust concerns, and the view of the utility industries that a longer period was necessary to ensure full amortization of a nuclear power plant".[19] The 40-year amortisation period is based on that of fossil fuel plants.[20]

While the 40-year decision was not based on a technical rationale or operating experience,[21] nor was it based on safety or common defence and security concerns,[22] certain components of nuclear power reactors may have been designed based on an assumption of a 40-year lifetime.[23] Thus, even if the rule was not based on safety or technical reasons, it informed the design of nuclear power plants.[24]

Section 103(c) of the AEA goes on to say that the 40-year licence "may be renewed upon the expiration of such period". The Commission's regulations at Title 10 of the *Code of Federal Regulations* (CFR)[25] Section 50.51(a), "Continuation of license" implemented this by stating that "Each license will be issued for a fixed

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Executive Director for Operations, to the Commissioners. By virtue of this policy, reactor operators began to apply for amendments to their operating licences to extend the authorised period of operation to recover the time it took for construction, adding years to their operating licences. See e.g., NRC (1985), Baltimore Gas and Electric Company, Docket No. 50-317, Calvert Cliffs Nuclear Power Plant Unit No. 1, Amendment To Facility Operating License, Amendment No.102, License No. DPR-53; NRC (1985), Baltimore Gas and Electric Company Docket No. 50-318, Calvert Cliffs Nuclear Power Plant Unit No. 2, Amendment to Facility Operating License, Amendment No.84, License No. DPR-69; and (NRC), "Safety Evaluation by the Office of Nuclear Reactor Regulation related to Amendment Nos. 102 and 84 to Facility Operating License Nos. DPR-53 AND DPR-69".

16. Mazuzan, G.T. and J.S. Walker (1984), *Controlling the Atom: The Beginnings of Nuclear Regulation 1946-1962*, NUREG-1610, University of California Press, Berkeley, California, pp. 26, 71. Hewlett, R.G. and J.M. Holl (1989), *Atoms for Peace and War 1953-1961: Eisenhower and the Atomic Energy Commission*, University of California Press, Berkeley, California, p. 121, fn. 17 ("The portions used almost verbatim are Sections 308(b) and 312(a) of the Communications Act of 1934, P.L.416, 73 Cong., 2 seas.").
17. NRC (2016), "Additional Information on Orientation", www.nrc.gov/reactors/operating/licensing/renewal/introduction/orientation/orientation2.html#flow (accessed: 8 Oct. 2018).
18. NRC (2018), "Backgrounder on Reactor License Renewal", www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-reactor-license-renewal.html (accessed: 28 Sept. 2018).
19. "Final Rule: Nuclear Power Plant License Renewal", 56 Fed. Reg. 64943, 64962 (13 Dec. 1991).
20. Walker, J.S. and T.R. Wellock (2010), *A Short History of Nuclear Regulation, 1946-2009*, NUREG/BR-0175, Rev. 2, NRC, Washington, DC, p. 68.
21. *Ibid.*
22. 56 Fed. Reg. at 64960.
23. "Final Rule: Nuclear Power Plant License Renewal; Revisions", 60 Fed. Reg. 22461, 22479 (8 May 1995). See also, Florida Power & Light Co. (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 7 (2001).
24. "The 40-year license might not have had a technical basis but it had technical implications." NRC (2014), *No Undue Risk: Regulating the Safety of Operating Nuclear Power Plants*, NUREG/BR-0518, NRC, Washington, DC, p. 9.
25. The CFR is multi-volume publication with 50 subject matter titles codifying the general and permanent rules of the US federal government.

period of time to be specified in the license but in no case to exceed 40 years from date of issuance … Licenses may be renewed by the Commission upon the expiration of the period."[26] At the time, however, even though licence renewal was allowed in principle, there were no standards and no procedures for this type of licensing action.[27]

II. Origins of US reactor licence renewal and the 1991 Licence Renewal Rulemaking

Starting in the early 1980s, the NRC began to research the effects of ageing of nuclear power plant systems, structures and components (SSCs).[28] These various research activities "concluded that most nuclear plant aging issues are manageable and do not pose technical issues that would prevent them for operating additional years beyond their original 40-year license period."[29] As such, individuals and entities both inside and outside of the NRC urged the agency to analyse the issue and "develop standards and procedures for license renewal so that the utilities would know what will be required to obtain a renewed operating license".[30] The issue was time-sensitive because a number of nuclear power plants had licences that were due to expire and utilities were interested in determining whether it made economic sense to renew those licences – and if not – to build replacement power plants.[31]

As explained by the NRC, the central regulatory question was: "What is an adequate licensing basis for renewing the operating license of a nuclear power plant?",[32] or, more specifically, "What should be the regulatory approach and requirements for renewed licenses in order to have continued assurance of public health and safety?"[33] The NRC considered four alternative regulatory approaches in evaluating the issue:

- continue the existing current licensing basis (CLB)[34] of the plant as is, without additional modification;
- supplement the existing CLB with necessary safety modifications based on life after 40 years;
- supplement the existing CLB with necessary safety modifications based on life after 40 years and assess the design of the plant against selected new plant standards; and

26. 56 Fed. Reg. at 64976.
27. *Ibid*., 64943.
28. *Ibid*.
29. "Backgrounder on Reactor License Renewal", *supra* note 18 (accessed: 28 Sept. 2018).
30. 56 Fed. Reg. at 64943; Walker, J.S. and T.R. Wellock (2010), *supra* note 20, p. 69.
31. 56 Fed. Reg. at 64943.
32. NUREG-1317, *supra* note 15, p. ix.
33. Sheron, B.W., "Regulatory Options for Nuclear Power Plant License Renewal", presentation given to US NRC Commissioners during the US NRC public meeting, "Briefing on Policy Paper for Plant Life Extension", Rockville, Maryland, 12 July 1988, slide 10 (slides included in the in the final transcript of the meeting).
34. At a generic level, the licensing basis can be defined as "the collection of documents or technical criteria that provides the basis upon which the NRC issues a license to construct or operate a nuclear facility". NRC (2018), "Licensing basis", www.nrc.gov/reading-rm/basic-ref/glossary/licensing-basis.html (accessed 11 Oct. 2018). Because of the certainty of safety improvements over the life of a nuclear power plant, the licensing basis of a nuclear power plant at the time of a licence renewal is going to be much different than that at its initial licensing. As the licensing basis changes over time, the then-applicable basis on which the NRC regulates that particular plant is known as the CLB. This does not necessarily mean, however, that all currently-applicable safety standards apply. A precise definition of the CLB came out of the 1991 License Renewal Rulemaking. See *infra*.

- treat the plant as a new plant and require compliance with all current safety standards.[35]

In 1991, the NRC adopted 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants", which "establishe[d] the procedures, criteria, and standards governing nuclear power plant license renewal".[36] From the technical/safety standpoint, it was determined that the scope of the review for licence renewal would not duplicate that performed at original licensing stage and instead "focus[] upon those potential detrimental effects of aging that are not routinely addressed by ongoing regulatory oversight programs" since "[t]he issues and concerns involved in an extended 20 years of operation are not identical to the issues reviewed when a reactor facility is first built and licensed."[37]

The NRC determined that the CLB would carry forward into the renewed licence[38] and that the licence renewal review should not be used as an opportunity to assess a plant against current regulatory requirements because:

> (a) its program of oversight is sufficiently broad and rigorous to establish that the added discipline of a formal license renewal review against the full range of current safety requirements would not add significantly to safety, and (b) such a review is not needed to ensure that continued operation during the period of extended operation is not inimical to the public health and safety.[39]

The option to treat the plant as new created strong opinions on both sides. Some argued that "old" plants should not be re-licensed because they did not meet current licensing standards, while others argued that if current licensing standards were used there would probably be no renewed licences[40] due to the costs of potential plant redesigns. To assuage the safety concerns associated with not performing a wholesale new plant licensing review, the NRC had to clarify the understanding of the CLB, especially as it related to licence renewal. The NRC included a regulatory definition of CLB in the new rule, which explained that the CLB is:

- different for each nuclear power plant;[41]

35. 56 Fed. Reg. at 64945.
36. *Ibid*., 64961.
37. Florida Power & Light Co. (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 7 (2001).
38. 10 CFR 54.33(d), "Continuation of CLB and conditions of renewed license", "The licensing basis for the renewed license includes the CLB, as defined in § 54.3(a)".
39. 56 Fed. Reg. at 64945-6.
40. See e.g. conversation between Commissioner T.M. Roberts and B.W. Sheron, Director, Division of Reactor and Plant Systems, NRC Office of Research, during "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript p. 19.
41. 10 CFR 54.3(a), "Definitions" defines the CLB as:
    > the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 52, 54, 55, 70, 72, 73, 100 and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2 as documented in the most recent final safety analysis report (FSAR) as required by 10 CFR 50.71 and the licensee's commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports.

- "not static"[42] and instead "represents the evolving set of requirements and commitments … that are modified as necessary over the life of a plant to ensure continuation of an adequate level of safety";[43] and

- not reviewed as part of the licence renewal process, as any issues associated with current plant operation are continually assessed as part of the regular regulatory oversight process.[44]

Therefore, any need to address a current safety issue is handled through traditional operating reactor regulatory oversight process rather than through the licence renewal process.[45]

Many additional regulatory issues had to be addressed, and these were categorised into three main topical areas: (1) technical/safety, (2) environmental and (3) procedural. Each procedural topic contained a subset of regulatory issues that each had to be outlined with alternative approaches, put out for public comment, reviewed and amended as appropriate based on comments, and decided upon:

- Form of licence renewal: Would the request for a renewed licence be treated as a request for a new licence or an amendment to the existing licence or would a new set of regulatory requirements be developed specifically for licence renewal?

- Length of licence renewal term: Would the new, amended or renewed licence be applicable for the statutory maximum of 40 years or some other set time period or would it be decided on a case-by-case basis?

- Latest date for renewal application: The regulation in place at the time provided that an existing licence would continue in place if a renewal application was submitted up to 30 days before licence expiration, but would this be too short?

- Earliest date for renewal application: Because of the need for licensees to plan years in advance to replace power if needed, a decision would be needed well in advance of a licence's expiration. The question remained regarding how long in advance was an appropriate balance between the needs of the licensee and the regulator's need for operational experience?

- Effective date of renewal: Would the renewal begin at the expiration of the original licence, a so-called "tack-on" renewal, or would it take effect immediately upon a favourable decision and therefore supersede the original licence, a so-called "supersession" renewal?

42. Nuclear Generation Co. and Entergy Nuclear Operations, Inc. (Pilgrim Nuclear Power Station), CLI-10-14, 71 NRC 449, 454 (2010).
43. 60 Fed. Reg. at 22473.
44. *Ibid*., 22473 (8 May 1995); see also 10 CFR 54.30, "Matters not subject to a renewal review"; Pilgrim Nuclear Power Station, 71 NRC at 454, *supra* note 42.
45. 10 CFR 54.30, "Matters not subject to a renewal review":
> (a) If the reviews required by § 54.21 (a) or (c) show that there is not reasonable assurance during the current license term that licensed activities will be conducted in accordance with the CLB, then the licensee shall take measures under its current license, as appropriate, to ensure that the intended function of those systems, structures or components will be maintained in accordance with the CLB throughout the term of its current license.
> (b) The licensee's compliance with the obligation under Paragraph (a) of this section to take measures under its current license is not within the scope of the license renewal review.

- Use of the Backfit Rule: Two separate questions emerged here, with the first related to backfits in the original licensing term. The second, and more substantial question, was whether and how the Backfit Rule would apply to plant upgrades required for licence renewal?

- Public hearings: Four separate questions had to be addressed in this area: (1) Is there a right to a hearing? (2) When should the hearing be held? Does the hearing have to be held before the decision or can it be held after? (3) Does the hearing have to be formal or can a more informal hearing procedure be developed? (4) What issues can be litigated in a hearing?[46]

The Licence Renewal Rulemaking decided on each of the procedural issues, providing full explanations for each determination.

A. Form of licence renewal

The NRC determined that operation beyond 40 years would be authorised through the issuance of a renewed operating licence.[47] Simply amending the original licence was not sufficient.[48] The Commission concluded that this was a necessary determination based on the language in the Atomic Energy Act, the legislative history for the Act and comparable licensing regimes in other federal agencies.[49] While there was some concern that calling it a "renewed licence" would indicate that it was a "new" licence and therefore subject to current requirements,[50] these considerations did not impact the final decision.

B. Length of licence renewal term

After determining that extended operation would be authorised in a renewed licence, the next question was for how long. It was determined that a renewed licence could be granted "for more than 20 years beyond the existing license expiration".[51] Given the language in the AEA, it was legally permissible for the NRC to determine that a renewed licence could be issued for up to 40 years, but the NRC made a policy decision to select 20 years as the term. It should be noted that renewed licences do not have to be issued for exactly 20 years; instead, 20 years is the maximum limit. In practice, renewed licences are generally issued for this amount of time.

The 20-year period was selected based on considerations:

- from an agency perspective, the desire for a longer term due to the significant staff resources needed to review a licence renewal application (LRA);

- from an industry perspective, the desire to provide for long-term planning; and

- from a technical perspective, there is sufficient understanding of age-related degradation to ensure safe operation for a further 20 years.

46. NUREG-1317, *supra* note 15, pp. 5-1 to 5-8. Five additional procedural issues were analysed but are not addressed in this article: material alterations; emergency planning; decommissioning; antitrust review; and Price-Anderson Act coverage.
47. 56 Fed. Reg. at 64945.
48. *Ibid.*, 64945, 69961-2.
49. *Ibid.*, 64961.
50. See e.g. conversation between Commissioner K. Carr and NRC General Counsel W.C. Parler during "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript p. 31.
51. 56 Fed. Reg. at 64945.

Indicating, perhaps, a bit of the uncertainty involved in the selection, the NRC noted that the issue could be revisited in the future with the possibility of granting renewed licences for longer than 20 years.[52]

C. Earliest and latest dates for renewal application

Given the long planning periods associated with licensing nuclear power reactors, the NRC balanced the needs of the regulator and the operator in determining the earliest and latest dates for the submission of licence renewal applications: the application for a renewed licence can be submitted up to 20 years before the expiration of the current licence[53] and if a sufficient LRA is submitted at least 5 years before the expiration of the current operating licence that licence will continue without expiration until the NRC has made a final determination on the LRA.[54] This five-year provision is known as "timely renewal".

The timely renewal rule, like the 40-year licence term, did not originate with the NRC. Here, the timely renewal doctrine comes from the US Administrative Procedure Act (APA).[55] Section 9(b) of the APA states that "[w]hen the licensee has made timely and sufficient application for a renewal or a new license in accordance with agency rules, a license with reference to an activity of a continuing nature does not expire until the application has been finally determined by the agency."[56] As explained by the NRC, the purpose of the APA timely renewal provision "is to protect a licensee who is engaged in an ongoing licensed activity and who has complied with agency rules in applying for a renewed or new license from facing license expiration as the result of delays in the administrative process."[57]

The NRC originally implemented the timely renewal rule in its regulations with a 30-day time period.[58] This had to change, however, once the possibility of licence renewal came into focus since 30 days was clearly not a reasonable amount of time to review an LRA. Instead, the NRC anticipated that it would take two years to review an LRA, plus an additional year or more if an adjudicatory hearing were to take place.[59] Although it originally considered three years as an appropriate time frame, the Commission eventually decided on five years, not for any substantive

52. *Ibid.*, 64964. Although not specifically stated, the idea that the 20-year term was slightly arbitrary was danced around in a discussion between Chairman K. Carr, E. Beckjord, Director, NRC Office of Research, Dr T. Murley, Director, NRC Office of Nuclear Reactor Regulation and J. Taylor, NRC Executive Director for Operations during "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript pp. 68-72.
53. 10 CFR 54.17(c), "Filing of application"; 56 Fed. Reg. at 64945.
54. 10 CFR 2.109(b), "Effect of timely renewal application".
55. Administrative Procedure Act (APA), 5 USC 551 et seq. (1946) as amended.
56. APA, 5 USC 558(c)(2), "Imposition of sanctions; determination of applications for licenses; suspension, revocation, and expiration of licenses".
57. Letter from Peter S. Tam to Christopher M. Crane (22 Dec. 2004) regarding "Oyster Creek Nuclear Generating Station – Exemption from the Requirements of Section 109(b) of 10 CFR Part 2, Regarding the Effect of Timely License Renewal Application (TAC No. MC3967)", Enc. 1, p. 3, available at: www.nrc.gov/docs/ML0429/ ML042960164.pdf.
58. 56 Fed. Reg. at 64962.
59. Early reviews were conducted on a 22-month schedule from receipt to renewal (without an adjudicatory hearing) while current reviews are conducted on an 18-22-month schedule without an adjudicatory hearing and if a hearing is held, it is anticipated that a decision can be made within 30 months. "Backgrounder on Reactor License Renewal", *supra* note 18 (accessed: 9 Oct. 2018); NRC (2017), "Reactor License Renewal Process", www.nrc.gov/reactors/operating/licensing/renewal/process.html (accessed: 9 Oct. 2018).

reason but rather for consistency with the five-year requirement for decommissioning planning and financial assurance information.[60]

The idea of timely renewal struck some as odd, questioning why the clear and firm expiration date of a licence could be rendered meaningless simply because the licence renewal review had not yet been completed.[61] It seemed even more peculiar that timely licence renewal could seemingly go on indefinitely.[62] But, the Commission had little choice in the matter of whether to implement a timely renewal rule; its only option was to determine a reasonable time period. The timely renewal rule did, however, ensure that protracted hearings would not impact reactor operation, nor, on the other side, would a looming deadline impact a full and fair hearing. And, as put succinctly, and bluntly, by former NRC Commissioner Kenneth Rogers in 1988, "If there is any question we think that the plant is unsafe, notwithstanding anything else, we could shut it down."[63] So, again, any need to address a current safety issue is handled through the traditional operating reactor regulatory oversight process rather than through the licence renewal process.

Interestingly, there was more push-back on the 20-year period than the timely renewal doctrine. Many commenters believed that applying 20 years in advance of licence expiration was far too early because it would not provide enough operating experience to support the review and that subsequent operating experience, obtained after the renewed licence was issued, would not be taken into account.[64] The Commission rejected these arguments, explaining that it proposed the earliest possible date for the application taking into consideration the estimated amount of time for the review process plus the time indicated in industry studies needed to replace a nuclear power plant with a new source of electricity generation (10-12 years for fossil fuel and 12-14 for nuclear or other technologies).[65]

60. 56 Fed. Reg. at 64962. The NRC confirmed that the dates are somewhat arbitrary, declaring early in the rulemaking process "that there is not a strong basis for selecting a particular cutoff time". "Advance notice of proposed rulemaking; notice of workshop: Nuclear Power Plant License Renewal; Public Workshop on Technical and Policy Consideration", 54 Fed. Reg. 41980, 41984 (13 Oct. 1989). In fact, the NRC has at least once issued an exemption from the timely renewal doctrine to a nuclear power plant, the Oyster Creek Nuclear Generating Station. On this occasion, the NRC found that allowing an LRA submitted 44 months before the expiration of its original licence, rather than 60, could take advantage of the timely renewal doctrine if necessary based on the fact that 44 months was within the 3-year period originally contemplated for timely renewal.
61. See e.g. conversation between Commissioner K. Rogers and NRC General Counsel W.C. Parler during "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript pp. 47-49.
62. See e.g. *ibid*. Although not indefinite, the LRA for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) was a test of the timely renewal doctrine. The LRA for IP2 and IP3 was received on 30 April 2007. The NRC staff completed its safety review approximately 30 months later. Due to an ongoing adjudicatory proceeding, the licence renewal process extended for years and IP2 and IP3 entered into timely renewal on 29 September 2013 and 13 December 2015, respectively. Prior to entering into timely renewal, certain licence renewal commitments for each unit were required to be implemented. The NRC finally issued the renewed operating licences for IP2 and IP3 on 17 September 2018, capping off an 11-year review. NRC (2018), "Indian Point Nuclear Generating Units Nos. 2 and 3 – License Renewal Application", www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html (accessed: 8 Oct. 2018); NRC (2016), "Indian Point Timely Renewal", www.nrc.gov/info-finder/reactors/ip/ip-timely-renewal.html (accessed: 8 Oct. 2018).
63. Roger, K. (Commissioner), "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript p. 49.
64. 56 Fed. Reg. at 64963.
65. *Ibid*.

D. Effective date of renewal

Legally speaking, it was perfectly acceptable for the NRC to decide that upon a favourable decision authorising a renewed licence either the "existing license would run its course and be replaced by the renewed license", i.e. a "tack-on license", or that the extended period of operation would be added on to the existing period of operation with a new "supersession license".[66] There were distinct advantages and disadvantages to each approach – so much so that the industry "requested that the regulations be developed so that the licensee has the flexibility to choose between tack-on and supersession."[67]

The tack-on approach is cleaner and arguably closer to what was envisioned by Congress given the statement in AEA section 103(c) that the 40-year licence "may be renewed upon the expiration". But, if a renewed licence can be issued at year 20 with another 20 years to go before its effectiveness, the long intervening period can create regulatory instability regarding the implementation and enforcement of licence conditions in the renewed licence, as well as changes to the CLB.[68] On the contrary, supersession provides for greater stability in regulatory oversight and allows the licensee to better plan for any necessary changes and modifications, though it does require more work up front.[69]

Weighing both options, the determination was made that a renewed licence that supersedes the original operating licence was required for operation past 40 years. The renewed licence would become effective immediately upon issuance by the NRC,[70] meaning that the actual term of the renewed licence can be up to 40 years, though this is not likely.[71] If a renewed licence is subsequently set aside upon further administrative or judicial appeal, the operating licence or combined licence previously in effect will be reinstated unless its term has expired and the renewal application was not filed in a timely manner.

E. Use of the Backfit Rule

Unlike many countries, the NRC does not explicitly regulate on the basis of continuous improvement of safety.[72] Instead, the NRC regulates on the basis of

66. *Ibid*., 64964; Parler, W.C., "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript p. 35.
67. NUREG-1317, *supra* note 15, p. 5-3.
68. *Ibid*.
69. *Ibid*.
70. 10 CFR 54.31(c), "Issuance of a renewed license".
71. 10 CFR 54.31(b), "Issuance of a renewed license", "A renewed license will be issued for a fixed period of time, which is the sum of the additional amount of time beyond the expiration of the operating license or combined license (not to exceed 20 years) that is requested in a renewal application plus the remaining number of years on the operating license or combined license currently in effect. The term of any renewed license may not exceed 40 years."
72. See e.g. Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, *Official Journal of the European Union* (OJ) L 219 (25 July 2014) (2014 Amended Safety Directive), Article 1(a), "The objectives of this Directive are to establish a Community framework in order to maintain and promote the continuous improvement of nuclear safety and its regulation" and Article 6(c), "Member States shall ensure that the national framework requires that: licence holders are to regularly assess, verify, and continuously improve, as far as reasonably practicable, the nuclear safety of their nuclear installations in a systematic and verifiable manner."

ensuring "adequate protection" of public health and safety,[73] which is "presumptively assured by compliance with [NRC] regulations and other license requirements".[74] This should not be taken, however, to mean that safety is a fixed concept or that regulatory requirements never change. As explained by the NRC in a 1988 rulemaking, "adequate protection is not absolute protection or zero risk[; therefore,] safety improvements beyond the minimum needed for adequate protection are possible. The Commission is empowered under section 161 of the [AEA] to impose additional safety requirements not needed for adequate protection and to consider economic costs in doing so."[75]

The NRC's safety improvement process is handled through the "Backfit Rule".[76] These so-called "backfits" can include generic backfits imposed through an administrative rulemaking process on all licensees or by administrative orders on a plant-specific basis. Sometimes, new information comes to light that causes the NRC to need to define or redefine what level of protection is regarded as adequate.[77] In addition, the NRC can require plant upgrades if in light of new technical information it determines that "existing programs or regulations need to be revised to assure an acceptable level of safety."[78]

Contrary to the wishes of the industry,[79] the NRC determined that a backfit analysis would not be necessary to impose new requirements through the licence renewal process. The NRC stated that two types of modifications would normally be required as part of the licence renewal process:

- those necessary to ensure adequate protection, whether or not related to plant ageing; and
- those that address age-related degradation unique to licence renewal that are necessary to ensure compliance with the plant's CLB.

Any changes based on either of these situations would be able to be imposed, regardless of cost, under exemptions already contained in the Backfit Rule: the adequate protection exemption of 10 CFR 50.109(a)(4)(ii) and the compliance exemption of 10 CFR 50.109(a)(4)(i).[80] To put it simply, because a renewal is "treated

73. AEA, sec. 182a., 42 USC 2232(a). Despite what Winston Churchill once said – "What is adequacy? Adequacy is no standard at all" – adequate protection is the statutory regulatory standard of the US NRC. BBC America (2014), "50 Sir Winston Churchill Quotes to Live By", www.bbcamerica.com/anglophenia/2015/04/50-churchill-quotes (accessed: 11 Oct. 2018).
74. See e.g. "Final Rule: Revision of Backfitting Process for Power Reactors", 53 Fed. Reg. 20603, 20606 (6 June 1988); see also, Ostendorff, W.C. and K.A. Sexton (2013), "Adequate protection after the Fukushima Daiichi accident: A constant in a world of change", *Nuclear Law Bulletin*, No. 91, OECD, Paris, p. 24.
75. 53 Fed. Reg. at 20604.
76. 10 CFR 50.109, "Backfitting". At the NRC, a "backfit" is defined as "the modification of or addition to systems, structures, components, or design of a facility; or the design approval or manufacturing license for a facility; or the procedures or organization required to design, construct or operate a facility; any of which may result from a new or amended provision in the Commission's regulations or the imposition of a regulatory staff position interpreting the Commission's regulations that is either new or different from a previously applicable staff position".
77. 10 CFR 50.109(a)(4)(iii).
78. NRC (2010), "Integrated Regulatory Review Service Mission to the United States: Module 11a: Periodic Safety Review", available at: www.nrc.gov/docs/ML1125/ML112510453.pdf, p. 7.
79. SECY-90-0121, "Report on License Renewal Workshop and Proposed Revisions to the Program Plan and Schedule for Rulemaking", 17 Jan. 1990, Enclosure 3 "Results of the Workshop on Technical and Policy Considerations for Nuclear Power Plant License Renewal", p. 6.
80. 56 Fed. Reg. at 64966.

as kind of a new licence [y]ou start it off fresh. And the Backfit Rule does not apply [to the application for the renewal]."[81]

F. Public hearings

As mentioned, four separate questions needed resolution in relation to public hearings. These questions were intrinsically linked to the question of what form the licence renewal would take. If extended operation was authorised through a renewed licence, very different hearing requirements would attach to this decision than if extended operation was authorised through a licence amendment. For example, whether the public has a right to a hearing on a licence renewal decision under the Atomic Energy Act depends on the type of licensing action undertaken. Section 189a.(1)(A) of the AEA states that "[i]n any proceeding … for the granting, suspending, revoking, or amending of any license … the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding." While it is clear that authorising extended operation through a licence amendment would require an opportunity for a hearing, the question was raised as to whether a licence renewal would as well.[82] Ultimately it was determined that interested members of the public would be provided an opportunity for a formal public hearing to challenge the licence "renewal applicant's proposals to address age-related degradation unique to license renewal and compliance with applicable requirements of 10 CFR Part 51".[83] This hearing would occur before the licensing decision is made.

Although specifically requested by industry, the NRC declined to adopt special hearing procedures for licence renewal. The NRC explained that the timely renewal rule coupled with the narrower scope of litigable issues, as well as the then-recent procedural changes to the 10 CFR Part 2, "Agency Rules of Practice and Procedure", which among other changes raised the threshold for admission of contentions and reduced discovery against the staff, provided a satisfactory process.[84] As explained by former NRC General Counsel William C. Parler, "Even if it is nothing else, [the hearing] would be much more narrow, much more focused, and much more efficient."[85]

III. Updating the Licence Renewal Rule in 1995

Within a year of releasing the original Licence Renewal Rule, the NRC began receiving formal recommendations from industry regarding how to improve the licence renewal process.[86] Following its routine administrative rulemaking process, the NRC obtained comments from the numerous and varied constituencies, including "nuclear utilities, industry organizations, public interest groups, architect and engineering firms, consultants and contractors, and Federal and State governments" as well as private citizens.[87] In particular, the nuclear industry did not feel that "it received adequate credit for age-related programs already in place, particularly the new maintenance rule", which dealt with the ageing of active safety

81. See e.g. conversation between Commissioner K. Carr, Dr W. Minners, Deputy Director, US Office of Nuclear Regulatory Research and NRC General Counsel W.C. Parler, during the US NRC "Briefing on Status of Proposed Rule on License Renewal", Rockville, Maryland, 30 Jan. 1990, pp. 43-45.
82. NUREG-1317, *supra* note 15, p. 5-4.
83. 56 Fed. Reg. at 64945.
84. *Ibid.*, 64966; SECY-90-0121, *supra* note 79, Enclosure 3, pp. 6-7.
85. Parler, W.C., "Briefing on Status of Proposed Rule on License Renewal", *supra* note 81, p. 55.
86. 60 Fed. Reg. at 22461-2.
87. *Ibid.*, 22462.

components and therefore did not need to be reviewed again during the licence renewal process.[88]

Based on input from the public as well as the NRC's independent review, four years later in 1995, the NRC revised the Licence Renewal Rule to make the process "more efficient, stable and predictable than the previous license renewal rule".[89] The NRC "determined that the rule could be amended … while retaining the same degree of safety provided by the previous rule".[90] Some of the more significant changes were:

- a clear "focus on the adverse effects of aging rather than identification of all aging mechanisms";
- a new section, 10 CFR 54.4 was added to clearly identify the "systems, structures, and components within the scope of the license renewal rule and identif[y] the important functions (intended functions) that must be maintained"; and
- a narrower subset of structures and components were made subject to an ageing management review for licence renewal, this time with a focus only on passive, long-lived structures.[91]

Since that time, although the Rule continues to evolve and change, the substance of licence renewal remains largely the same, as do the principles:

1. With the possible exception of the effects of ageing on certain systems, structures, and components, and a few other issues related to safety only during the period of extended operation, the current regulatory process is adequate to ensure the licensing bases of all operating plants provide and maintain an acceptable level of safety; and
2. Each plant's licensing basis is required to be maintained during the renewal term just as during the original licensing term.[92]

These two principles of licence renewal, while concise, reflect core regulatory concepts at the NRC.

88. NUREG/BR-0518, *supra* note 23, p. 9.
89. "Backgrounder on Reactor License Renewal", *supra* note 18 (accessed: 28 Sept. 2018).
90. 60 Fed. Reg. at 22485.
91. *Ibid*., 22463.
92. The current principles are available at "Backgrounder on Reactor License Renewal", *supra* note 18 (accessed: 28 Sept. 2018). As comparison, the text below shows the changes as compared with "Final Rule: Nuclear Power Plant License Renewal; Revisions", 60 Fed. Reg. at 22464:

    Principle 1: "with the possible exception of the ~~detrimental~~ effects of aging on ~~the functionality of~~ certain ~~plant~~ systems, structures, and components~~, in the period of extended operation~~ and ~~possibly~~ a few other issues related to safety only during the period of extended operation, the current regulatory process is adequate to ensure that the licensing bases of all ~~currently~~ operating plants provides and maintains an acceptable level of safety ~~so that operation will not be inimical to public health and safety or common defense and security~~".

    Principle 2: "each ~~the~~ plant~~-specific~~ licensing basis is required to ~~must~~ be maintained during the renewal term ~~in the same manner and to the same extent~~ just as during the original licensing term".

IV. The 1996 update to the Licence Renewal Rule and incorporation of environmental provisions

On 1 January 1970, the National Environmental Policy Act of 1969, or NEPA, was signed into law.[93] NEPA is both a policy and a procedure. As a policy, it requires the federal government to use all practicable means and measures to create and maintain conditions under which man and nature can exist in productive harmony.[94] It does so through providing a procedure by which federal agencies are required to incorporate environmental considerations into both the planning and the decision-making stages, before decisions are made and before actions are taken, through a systematic interdisciplinary approach.[95] It is then up to the agencies themselves to implement the procedure.[96]

The NRC first implemented NEPA into its regulations at 10 CFR Part 51 in 1974. While not finalised in the original Licence Renewal Rulemaking, note was made of a process underway to address the environmental impacts of licence renewal in a separate rulemaking.[97] Two main questions were at the core of the NRC's environmental decision making. The first question was what form should NEPA compliance take. Under NEPA, all federal agencies are to prepare detailed statements assessing the environmental impact of, and alternatives to, "major federal actions significantly affecting the quality of the human environment".[98] It is not always obvious, however, whether a major federal action will have a significant effect on the quality of the human environment. An agency can always, as a matter of policy, determine to prepare an Environmental Impact Statement (EIS) whether or not a determination has been made that the proposed action will have a significant impact. The other alternative is for an agency to prepare an Environmental Assessment (EA) to determine whether the major federal action has the potential to cause significant environmental effects.[99] Based on the EA, the agency will either determine that there are no significant environmental impacts and therefore issue a "Finding of No Significant Impacts" (FONSI) documenting the rationale for this conclusion, or it will determine that there will be significant impacts and move forward in the preparation of an EIS.[100]

The NRC determined by rule in 1984 that certain specific types of licensing actions would require an EIS, and licence renewal was one such action.[101] The NRC considered, however, whether as an alternative a site-specific EA, rather than a site-specific EIS, could be performed to comply with NEPA. The NRC originally believed that such an alternative approach would be possible. The Nuclear Energy Institute,

93. National Environmental Policy Act of 1969, as amended (NEPA), Pub. L. 91-190, 42 USC 4321-4347.
94. NEPA, sec. 101, 42 USC 4331.
95. NEPA, sec. 102(2)(A), 42 USC 4332.
96. In addition, federal level regulations were issued in 1978 to implement NEPA and these regulations are binding on all federal agencies. 40 CFR 1500.3, "Mandate".
97. 56 Fed. Reg. at 64945.
98. NEPA, sec. 102(2)(C), 42 USC 4332; see also 40 CFR Part 1502, "Environmental Impact Statement".
99. 40 CFR 1501.3, "When to prepare an environmental assessment"; 40 CFR 1501.4, "Whether to prepare an environmental impact assessment"; 40 CFR 1508.9, "Environmental assessment".
100. 40 CFR 1501.4(c) and (e), "Whether to prepare an environmental impact assessment"; see also, EPA (2017), "National Environmental Policy Act Review Process", www.epa.gov/nepa/national-environmental-policy-act-review-process (accessed 11 Oct. 2018).
101. 10 CFR 51.20, "Criteria for and identification of licensing and regulatory actions requiring environmental impact statements". "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions and Related Conforming Amendments", 49 FR 9352, 9384 (12 Mar. 1984).

several utilities and the Department of Energy agreed with the NRC's original proposal to undertake site-specific EAs, rather than EISs.[102] But, the NRC ultimately determined that it was not likely that "an assessment of the full set of environmental impacts associated with an additional 20 years of operation would not result in a 'finding of no significant impact'".[103] Therefore, each licence renewal decision would have to include a site-specific EIS.

The second question was whether a generic (also known as a programmatic) EIS (GEIS) should be prepared to "address potential environmental issues that are common to several or all plants requesting license renewal … [and] identify major factors that could influence the need for site-specific environmental impact statements in making individual relicensing decisions".[104] Although not legally required, the NRC analysed whether as a policy matter a GEIS would be beneficial to the licence renewal process,[105] since it would reduce the burden on both the staff and the industry in re-analysing the same issues over and over again, and it would also prevent these issues from being challenged in adjudicatory hearings on individual LRAs.[106] Industry supported the generic approach because by programmatically resolving a significant number of environmental issues, these issues were all essentially shielded from litigation in individual licence renewal proceedings.[107]

There was much discussion, however, about even what form this generic approach would take: a generic EA or a GEIS. Ultimately, the NRC determined that a GEIS was best and began developing a document that would "address, in generic fashion, the impacts associated with continued operation of a nuclear plant beyond its original license, including the impacts of activities to counter the effects of aging, the impacts of high-level and low-level waste, and the effects of radioactive discharges".[108] The generic environmental findings in the GEIS could then be incorporated into a site-specific supplemental EIS.

Five years after the 1991 Licence Renewal Rule, the NRC published the environmental provisions for licence renewal. In 1996, the NRC published revisions to the environmental regulations in Part 51 to define the scope of the agency's environmental review and require the preparation of a site-specific Supplement to the Generic Environmental Impact Statement (SEIS) by the NRC in support of each licence renewal decision.[109] In addition, the NRC also published the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (GEIS)*.[110] Since the publication of the GEIS, 59 site-specific supplements have been

102. "Final Rule: Environmental Review for Renewal of Nuclear Power Plant Operating Licenses", 61 Fed. Reg. 28465, 28471 (5 June 1996).
103. *Ibid.*, 28471.
104. NUREG-1317, *supra* note 15, p. xii. The NEPA implementing regulations encourage using the "tiering" method, whereby a programmatic or policy level broad EIS is prepared to cover issues that could come up across a large number of separate programmes or policies. 40 CFR 1502.20, "Tiering". Site-specific EISs are then prepared that summarise and incorporate by reference the information in the programmatic EIS and then concentrate the analysis on the site-specific environmental issues. 40 CFR 1502.20, "Tiering".
105. Parler, W.C., "Briefing on Policy Paper for Plant Life Extension", *supra* note 33, transcript p. 28.
106. 54 Fed. Reg. at 41984.
107. Minners, W., "Briefing on Status of Proposed Rule on License Renewal", *supra* note 81, p. 11.
108. 60 Fed. Reg. at 22489.
109. NRC (2006), *Frequently Asked Questions on License Renewal of Nuclear Power Reactors*, NUREG-1850, NRC Washington, DC, p. 4-8.
110. NRC (1996), *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, NRC, Washington, DC.

published[111] and a lessons learnt process undertaken to review, re-evaluate and revise the GEIS with a revision published in 2013.[112]

PART II: INTERNATIONAL PERSPECTIVES ON LTO

V. Safety reviews

According to the NEA Committee on Nuclear Regulatory Activities (CNRA), the fundamental principle "underpinning of any programme on extended operation" is that "[t]he safe operation of the nuclear power plant needs to be ensured during the period considered for long-term operation."[113] Broadly speaking, there are two main approaches to approving LTO: licence renewal and periodic safety reviews (PSRs). Regardless of the approach that a country takes in approving LTO, safe operation "is achieved through maintaining the current licensing basis of the plant and effectively managing ageing of systems, structures and components within the scope of licence renewal."[114]

In comparison to the United States, many countries, especially European,[115] but also others such as Canada and Korea, provide for a PSR. A PSR "is a comprehensive safety review of all important aspects of safety, carried out at regular intervals, typically every ten years."[116] The "safety review" is also called a "reassessment" because it looks at a number of factors including "the cumulative effects of ageing, modifications, operating experience, technical developments and siting aspects",[117] with an assumption that following the regulatory review of the operator's PSR a number of safety improvements will be proposed.[118] This follows the IAEA approach of continuous safety improvement.[119]

The PSR is not necessarily the only factor in a decision to allow LTO.[120] As stated by the IAEA, "a PSR may be used in support of the decision making process for licence renewal or long term operation".[121] Thus, PSRs can be combined with other approaches, like licence renewal and refurbishment. The NRC, however, does not make use of PSRs because its regulatory structure was already well established by

111. A link to each of the supplements is available at NRC (2018), Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437), www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1437/.
112. NRC (2013), *Generic Environmental Impact Statement for License Renewal of Nuclear Plants – Final Report (GEIS)*, NUREG-1437, Revision 1, NRC, Washington, DC.
113. 2012 (NEA), *Challenges in Long-term Operation of Nuclear Power Plants: Implications for Regulatory Bodies*, OECD, Paris, p. 9.
114. *Ibid.*, p. 11.
115. See e.g., 2014 Amended Safety Directive, *supra* note 72, Article 8(c).
116. IAEA (2013), *Periodic Safety Review for Nuclear Power Plants*, Specific Safety Guide No. SSG-25, IAEA, Vienna, p. 1.
117. IAEA (2007), *IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection*, IAEA Doc. STI/PUB/1290, IAEA, Vienna, p. 141
118. IAEA (2013), *supra* note 116, p. 55.
119. See e.g., IAEA (2016), *Governmental, Legal and Regulatory Framework for Safety*, IAEA Safety Standards Series, General Safety Requirements, No. GSR Part 1 (Rev. 1), IAEA, Vienna, p. 24, para. 4.27, "The regulatory body shall emphasize the continuous enhancement of safety as a general objective".
120. It should be noted that a specific decision or authorisation does not necessarily result from a PSR. In some instances, following a regulatory review of the PSR documentation by the operator, there may be an implicit decision to allow continued operation but there is no explicit regulatory decision or authorisation. This lack of a clear licensing decision factors in during considerations related to environmental reviews, as discussed below.
121. IAEA (2013), *supra* note 116, pp. 1, 8-10; see also IAEA (2016), *Safety of Nuclear Power Plants: Commissioning and Operation*, Specific Safety Requirements No. SSR-2/2 (Rev. 1), p. 19; IAEA (2009), *supra* note 4, pp. 32-33.

the time the PSR approach was developed.[122] And the NRC felt that no change was necessary because its regulatory process was already robust enough to encompass the goals of the PSR and that its daily, yearly and as-needed inspection and assessment processes met the PSR objectives on a more frequent basis.[123] Through daily on-site monitoring, periodic inspections, evaluations of operating experience, resolution of generic issues, updates of the licensing basis, and imposition of new requirements, the NRC ensures adequate protection of public health and safety.[124]

VI. Environmental reviews

The licence renewal process in the United States follows two tracks: a safety and an environmental track. While there have been some adjustments over time, the two-track review process has remained since the beginning. The clear requirement for a licence renewal environmental review is different from the situation in many countries where an environmental review is not required as part of the LTO authorisation process. There are several explanations for this, many having to do with the form of authorisation. Where licences are open-ended, no changes are made to the licence, and no major works are foreseen to continue operation, there is not necessarily a trigger to perform such an environmental review under the existing laws.

A. Espoo Convention

The Espoo Convention is mainly a European convention, with the exception of Canada, and while Russia and the United States, among other UNECE member countries, are signatories, they are not parties.[125] Of the 30 countries that have operating nuclear power reactors, over half (18) are parties to the Espoo Convention.[126] Like NEPA, the Espoo Convention sets out the obligations of parties "to give explicit consideration to environmental factors at an early stage in the decision-making process".[127] The difference, however, is that NEPA's focus is internal, while the Espoo Convention's focus is external. As stated in Article 2(1) of the Espoo Convention, "The Parties shall, either individually or jointly, take all appropriate and effective measures to prevent, reduce and control significant adverse transboundary environmental impact from proposed activities."[128] The operative word in that sentence is "transboundary". In many ways, the Espoo Convention can be viewed as an extension of national environmental impact assessment (EIA) laws.[129] Regional EIA agreements like Espoo ensure "that states

122. NRC (2010), *supra* note 78, p. 1.
123. *Ibid*., pp. 1, 12-13.
124. *Ibid*., p. 4.
125. The Convention was amended for the first time in 2001 to allow all United Nations member states to accede to the Convention. Although in force since 2014, that amendment is not yet effective, pending seven missing ratifications.
126. The contracting parties to the Espoo Convention with operating nuclear power reactors are: Armenia, Belgium, Bulgaria, Canada, Czech Republic, Finland, France, Germany, Hungary, Netherlands, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine and the United Kingdom. The countries that have operating nuclear power reactors that are not parties to the Espoo Convention are: Argentina, Brazil, China, India, Iran, Japan, Korea, Mexico, Pakistan, Russia, South Africa and the United States.
127. Convention on Environmental Impact Assessment in a Transboundary Context (1991), 1989 UNTS 310, entered into force 10 Sept. 1997 (Espoo Convention).
128. As noted in UNECE (2006), "Guidance on the Practical Application of the Espoo Convention", ECE/MP.EIA/8, p. 8, "Environmental impact assessment existed in the national legislation of most Parties and thus it was technically possible to extend the assessment across the border under the Convention."
129. UNECE (2006), "Guidance on the Practical Application of the Espoo Convention", ECE/MP.EIA/8, p. 8.

apply EIA without extraterritorial discrimination – that they take extraterritorial effects into account just as they take domestic effects into account, and that they enable foreign residents to have access to the domestic EIA procedures to the same extent as local residents."[130]

Although the Convention does apply to some nuclear energy-related activities, it does not apply to *all* nuclear energy-related activities. Herein lies the challenge. At the screening stage, countries normally have to apply the provisions of the Convention when two requirements are met: (1) the proposed activity is listed in the Convention and (2) the proposed activity is likely to cause a significant adverse transboundary impact. Pursuant to Article 1 of the Espoo Convention, any major change to an activity listed under Appendix I of the Convention also falls within its scope of application. Although there is currently no doubt that new reactor construction requires a transboundary EIA, as explicitly required under Appendix I,[131] the question remains whether the same applies to LTO. It should be noted that most nuclear power reactors in the contracting parties' territory were built before the Espoo Convention entered into force in 1997 and "their construction was rarely subject to" a transboundary EIA and furthermore "not always to domestic EIA".[132]

Currently, only a handful of Espoo contracting parties perform a full scope transboundary EIA as part of the authorisation process for LTO.[133] In a 2011 note by the Espoo Secretariat on the application of the Convention to nuclear energy-related activities, it was stated that:

> The renewal of an NPP [nuclear power plant] licence is generally subject to EIA, though the location, technology and operating procedures may remain unchanged (see appendix III to the Convention). However, in many UNECE countries, NPPs are licensed without any lifetime limitation. Questions remain as to whether an extension of the designed operation period of an NPP is subject to the Convention if no licence renewal process is needed. The unlimited licence is normally coupled with the obligation to perform periodic safety reviews, usually every 10 years. Such a review could lead to a modification of the NPP and its operating licence; though national legislation does not always require EIA in such cases.[134]

130. Knox, J.H. (2002), "The Myth and Reality of Transboundary Environmental Impact Assessment", *American Journal of International Law*, Vol. 96, Issue 2, p. 291.
131. Appendix I lists the proposed activities that fall within its scope of application, one of which "nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kilowatt continuous thermal load)".
132. UNECE (2011), "Background note on the application of the Convention to nuclear energy-related activities: Note by the secretariat", CE/MP.EIA/2011/5, para. 2.
133. Transboundary EIAs have been performed for the lifetime extensions of the Paks NPP in Hungary and transboundary consultations are underway for the lifetime extension of Unit 3 of the Rivne NPP in Ukraine. The transboundary EIA procedures currently underway in Ukraine are a result of an Espoo Implementation Committee decision that found "that the extension of the lifetime of reactors 1 and 2 of the Rivne NPP after the initial licence has expired, even in absence of any works, is to be considered as a proposed activity under article 1, paragraph (v), and is consequently subject to the provisions of the Convention". UNECE (2014), "Report of the Implementation Committee on its thirtieth session", ECE/MP.EIA/IC/2014/2, Annex, p. 22, para. 59.
134. UNECE (2011), *supra* note 132, para. 9.

This statement aside, the note goes on to say that lifetime extension *might* be considered a "major change[] to nuclear-energy related activities, subject to the provisions of the Convention".[135] Other nuclear power reactor related activities such as decommissioning and power uprates could also potentially be considered a major change.[136] But, there is no explicit definition in the Convention of what constitutes a "major change". Therefore, many Espoo Convention contracting parties have adopted the belief that while a lifetime extension in the absence of licensing activity may be a change to an existing activity, it does not amount to a major change.[137]

At the moment there remains "considerable legal uncertainty as to whether and in what circumstances lifetime extensions of nuclear power plants require a

135. *Ibid*., para. 10.
136. *Ibid*.
137. At the risk of losing the reader with what may seem like a digression, the author notes that the philosophical underpinnings of this issue crystallised while listening to an episode of the "Revisionist History" podcast by Mr Malcolm Gladwell, available at: http://revisionisthistory.com/episodes/11-a-good-walk-spoiled. Although this episode focused on an unrelated matter, it raised a critical philosophical question: how do time and extent factor in to the determination that a change has occurred? In analysing the issue, Mr Gladwell referenced the philosophical conundrum associated with the "ship of Theseus", a 2 000 year old puzzle where a ship at sea has all of its old planks replaced with new planks one at a time until every piece of the ship is new. The question arises: when it arrives at port, is it the same ship or is it a new ship?

The answer depends on how one views change. As explained by Mr Gladwell, some believe it is a new ship because identity "is the sum of its component parts; change the parts, you change the thing". Others believe it is the same because "an object can maintain its identity so long as the change is gradual and the form or shape of the object is preserved to the changes of its component materials". These two approaches correspond to the mereological theory of identity and the spatiotemporal continuity theory, respectively. (A transcript of the podcast can be found at Simon Says Transcription (2017), "A Good Walk Spoiled with Malcolm Gladwell | S2/E1: Revisionist History podcast (Transcript)", https://blog.simonsays.ai/a-good-walk-spoiled-with-malcolm-gladwell-bf204294a1e8.)

For our purposes, instead of the ship of Theseus consider a nuclear power reactor. As explained by the NEA, "lifetime extension can imply replacement of some large components of the nuclear island … as well as major refurbishments or replacements on the conventional islands". NEA (2012), *The Economics of Long-term Operation of Nuclear Power Plants*, OECD, Paris, p. 19. The NEA goes on to note that "[i]ndependent of LTO, equipment in NPPs is regularly upgraded". *Id*. at 21. Additionally, ongoing oversight and maintenance programmes result in components being replaced throughout the initial operating life of a reactor. These factors ensure that while there are significant changes to a nuclear power reactor over the course of its life, not all changes occur at one specific point in time. So this leads to the question: at the time LTO is authorised, is the reactor the same as when it was originally authorised? And of course, the answer depends on how you view the meaning of change.

Under the current interpretation of the Espoo Convention, spatiotemporal continuity theory applies; no "major change" has occurred because the changes are gradual. But, there is another perspective. If viewed through the mereological theory of identity, because the reactor is the sum of its parts and those parts have largely changed over time, the reactor has in fact undergone a change – and in fact a major chance – regardless of the time period under which the changes occurred. Therefore, a transboundary EIA would be a necessary step in every LTO authorisation, regardless of whether the approval is implicit or explicit.

transboundary environmental impact assessment under the Espoo Convention".[138] Work is currently being done to address this issue, but draft guidance is not anticipated before September 2020.[139]

B. European Union EIA Directive

The 2014 EU EIA Directive[140] largely mirrors the text of the Espoo Convention and thus contains the same ambiguities. While nuclear power reactors are a project specifically listed in Annex I(2)(b), thus automatically subject to the EIA requirements, the Directive is silent as to LTO and therefore a determination would have to be made that there is a "change to or extension of projects listed in this Annex where such a change or extension in itself meets the thresholds, if any, set out in this Annex".[141] Using this methodology, any implicit or explicit action to allow LTO would normally be screened out of the scope of the EIA Directive. Therefore, unlike the mandatory EIS requirement in the United States, the determination of whether to perform a domestic EIA prior to LTO is left to the discretion of EU member states, for now.

PART III: THE PROCEDURE OF REACTOR LICENCE RENEWAL

VII. Licence renewal review process

A. Overview

In the United States, a renewed license may be issued by the Commission if three criteria are met. First, from a safety perspective, the NRC must determine that:

> [a]ctions have been identified and have been or will be taken with respect to [managing the effects of ageing and time-limited ageing analyses (TLAA)] such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and that any changes made to the plant's CLB in order to comply with this paragraph are in accord with the Act and the Commission's regulations.[142]

138. UNECE (2018), "Draft terms of reference for possible guidance on the applicability of the Convention to the lifetime extension of nuclear power plants: Proposal by the ad hoc working group", ECE/MP.EIA/WG.2/2018/4, p. 3. In fact, there are currently four pending matters before the Espoo Implementation Committee related to the lifetime extension of the Borssele NPP in the Netherlands (EIA/IC/INFO/15); Units 1 and 2 of Doel NPP and Unit 1 of the Tihange NPP in Belgium (EIA/IC/INFO/18); the Dukovany NPP in the Czech Republic (EIA/IC/INFO/19); and Unit 3 of the Rivne NPP, the South Ukraine NPP, five reactors at the Zaporizhzhya NPP and the Khmelnitsky NPP in Ukraine (EIA/IC/INFO/20). UNECE (n.d.), "Information from other sources", www.unece.org/environmental-policy/conventions/environmental-assessment/areas-of-work/review-of-compliance/information-from-other-sources.html (accessed 27 Nov. 2018). It is assumed that more cases will be coming in the future. UNECE (2018), "Progress report on the development of guidance on the application of the Convention to the lifetime extension of nuclear power plants: Report by the ad hoc working group", ECE/MP.EIA/2019/10, Advance Copy, p. 2, para. 4.
139. UNECE (2018), "Progress report on the development of guidance on the application of the Convention to the lifetime extension of nuclear power plants: Report by the ad hoc working group", ECE/MP.EIA/2019/10, Advance Copy, p. 6, para. 28.
140. Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, OJ L 124 (25 Apr. 2014) (EIA Directive).
141. *Ibid.*, Annex I(24).
142. 10 CFR 54.29(a), "Standards for issuance of a renewed license".

Second, all environmental regulations contained in Subpart A of Part 51 must be satisfied.[143] And finally, any adjudicatory hearing must be fully concluded.[144] The review follows this same process. Visually, the licence renewal process can be organised in the following chart, outlining the dual safety and environmental review tracks. All required documents are shown in bold, while all opportunities for public involvement are noted in red.

LICENCE RENEWAL PROCESS IN THE UNITED STATES

LICENSEE submits **licence renewal application** to the NRC, which contains:

Safety	Environmental
(1) **Technical Information (10 CFR 54.21)** • Integrated Plant Assessment • Current Licensing Basis • Time-Limited Ageing Analyses • Final Safety Analysis Report (2) **Technical Specifications (10 CFR 54.22)**	A **supplement to the original Environmental Report** (10 CFR 54.23). The supplemental Environmental Report can incorporate the 2013 GEIS.

↓

NRC begins licence renewal application review process:

Safety (10 CFR Part 54)		Environmental (10 CFR Part 51)
(1) Hold a public outreach meeting near the plant to provide local public information about the licence renewal process and opportunities for public involvement		(1) Publish **Notice of Intent** to prepare an SEIS
(2)(a) Conduct safety evaluation audit and review	(2)(b) Conduct on-site inspections	(2) Conduct public scoping meetings. Seek information on potential new and significant environmental issues.
(3)(a) Hold open meetings with the licensee on audits and safety issues	(3)(b) Hold open exit meetings with the licensee on the inspections	(3) Conduct a site environmental audit
(4)(a) Issue **Draft Safety Evaluation Report (SER)** and then a **Final SER**	(4)(b) Issue **Regional Inspection Report**	(4) Prepare and issue the **Draft SEIS** for public comment, distributing to appropriate federal, state and local agencies; Indian Tribes, interested organisations and individuals, etc.
(5)(a) Public review by the Advisory Committee for Reactor Safeguards (ACRS)	(5)(b) Issue **Regional Administrator Letter**	(5) Hold a public meeting on the Draft SEIS
(6)(a) **ACRS Recommendation Letter** issued to the Commission		(6) Issue the **Final SEIS**

↓

Potential for public hearings with the ATOMIC SAFETY AND LICENSING BOARD

↓

NRC **decision** on application

Figure 4.
Chart: K.S. Nick. Sources for information presented: NRC (2018), "Backgrounder on Reactor License Renewal", www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-reactor-license-renewal.html (accessed: 9 Oct. 2018); NRC (2017), "Reactor License Renewal Process", www.nrc.gov/reactors/operating/licensing/renewal/process.html (accessed: 9 Oct. 2018); NRC (2006), *Frequently Asked Questions on License Renewal of Nuclear Power Reactors*, NUREG-1850, NRC, Washington, DC, p. 1-9.

143. 10 CFR 54.29(b), "Standards for issuance of a renewed license".
144. 10 CFR 54.29(c), "Standards for issuance of a renewed license".

B. Licence renewal application

The required contents of an LRA are spelled out in NRC regulations in Title 10 of the CFR. The contents of the safety portion of the LRA are specified according to "general information" (section 54.19), "technical information" (section 54.21) and "technical specifications" (section 54.22). Section 54.23 requires that each LRA must also contain a supplemental Environmental Report in compliance with Subpart A of 10 CFR Part 51, which contains the NRC's regulations implementing section 102(2) of NEPA.

On the safety side, each application must contain:

- an integrated plant assessment (IPA) that lists those structures and components subject to an ageing management review (AMR);
- an evaluation of TLAAs that considers the effects of ageing on the structures, systems and components within the scope of the rule based on current operating assumptions;
- a supplement to the FSAR that describes the programmes and activities for managing the effects of ageing; and
- yearly updated amendments to the application indicating any material changes to the CLB during the time of the NRC review of the LRA.[145]

In addition, the LRA must include any changes or additions to the current technical specifications of the plant that are necessary to manage the effects of ageing during the period of extended operation.[146]

On the environmental side, the LRA must contain an environmental document entitled "Applicant's Environmental Report – Operating License Renewal Stage" that includes the following:[147]

- a statement on the purpose of and need for the proposed action (renewing the operating licence);
- a description of the proposed action, which includes: general plant information; any refurbishment activities related to licence renewal; any new programmes or activities for managing the effects of ageing that could impact the environment; changes to employment; and replacement power alternatives;
- information on the affected environment describing the plant's environmental setting as well as the environmental consequences of the proposed action and mitigating actions in the following areas: land use and visual resources, meteorology and air quality, noise, geology and soils, water resources, ecological resources, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management;
- an assessment of new and significant information regarding the environmental impacts of licence renewal identified by the licensee prior to beginning the LRA environmental review process, as well as any new and

145. 10 CFR 54.21, "Contents of application – technical information".
146. 10 CFR 54.22, "Contents of applications – technical specifications".
147. 10 CFR 51.53(c), "Postconstruction environmental reports"; NRC (2013), "Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications", Regulatory Guide 4.2, Supplement 1, NRC, Washington, DC.

significant information identified during the scoping process, site visits and comments from the public on the draft SEIS.[148]

The licensee's ER must be made available to the public for inspection.[149]

C. NRC review

Once the licensee submits their LRA, the NRC performs a sufficiency review, which entails the NRC making an explicit determination that the LRA is essentially complete with enough information that the agency can begin its review.[150] If the NRC concludes that the application is "sufficient", the application is "docketed".

Once the LRA has been formally docketed, the NRC will publish a "notice of intent" that it will prepare an EIS and send the notice to appropriate federal, state and local agencies; Indian Tribes; and to interested persons upon request, among others.[151] The notice should describe the proposed environmental scoping process to the public, which would then begin as soon as practicable after publication of the notice.[152]

- 1. Environmental review

As part of the scoping process, very soon after the LRA is docketed, the NRC holds a public meeting near the plant in question. Although multiple public meetings will be held throughout the LRA review process the first meeting is important as it launches the review process, informing the public about what to expect and how to be involved, and begins to formally gather information as part of environmental scoping. Interested members of the public can provide comments both during the course of public meetings and in writing; regardless of the format, the NRC treats all comments equally. During the scoping process, the NRC focuses on identifying new and significant information on the environmental impacts of licence renewal, which it will get from the public scoping process as well as on-site environmental audits of the plant to gather first-hand knowledge of the plant and the surrounding environment.

Once the NRC has gathered together all the information from the licensee's ER, the public comments and its own assessments, it will prepare a draft SEIS and issue it for public comment.[153] Following a similar format as the ER, the NRC's draft SEIS will evaluate, verify and validate all the information gathered. The NRC will seek to gather comments on the draft SEIS from the US Environmental Protection Agency, any other federal agency with expertise or legal jurisdiction, the licensee and appropriate state and local agencies, as well as Indian Tribes, among others.[154] In addition, the NRC will hold another public meeting to discuss its findings and seek further comment.[155]

The NRC must consider all information gathered during this public comment period, respond accordingly and determine whether there is a need to modify the

148. 10 CFR 51.53(c)(3)(iv); Regulatory Guide 4.2, *supra* note 147, p. 49.
149. 10 CFR 51.120, "Availability of environmental documents for public inspection".
150. 56 Fed. Reg. at 64962.
151. 10 CFR 51.27, "Notice of intent".
152. *Ibid.*; 10 CFR 51.29, "Scoping – environmental impact statement and supplement to environmental impact statement".
153. 10 CFR 51.70, "Draft Environmental Impact Statement – General"; 10 CFR 51.71, "Draft Environmental Impact Statement – Contents"; 10 CFR 51.95(c), "Postconstruction Environmental Impact Statements"; 10 CFR 51.73, "Request for Comments on Draft Environmental Impact Statement".
154. 10 CFR 51.74, "Distribution of Draft Environmental Impact Statement and Supplement to Draft Environmental Impact Statement; News Releases".
155. "Reactor License Renewal Process", *supra* note 59 (accessed: 10 Oct. 2018).

draft SEIS. In issuing the final SEIS, the NRC must make the ultimate determination as to "whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable."[156]

- 2. Safety review

The NRC's safety review proceeds in dual-track manner, with one track focussed on a safety review and audit of the LRA and the other track focussed on on-site inspections to determine whether the licensee "has implemented and complied" with the licence renewal regulations.[157] The NRC staff's SER provides the technical and legal basis for the NRC's conclusions on whether or not the LRA satisfies the 10 CFR 54.29(a), "Standards for issuance of a renewed license". All the documentation – the LRA and the staff's review, including the draft and final SER and inspection reports – are made publicly available, and the NRC's meetings with the licensee are open to the public. While the public is welcome to comment at the end of the meeting, "the highly technical nature of the staff's safety review does not lend itself to [the same type of] public involvement process such as that used for the environmental review."[158]

In addition to the staff's review, another body, the Advisory Committee for Reactor Safeguards reviews the LRA.[159] The ACRS is a statutorily-mandated federal advisory committee that is independent of the NRC staff and reports directly to the NRC Commission.[160] As part of the ACRS review, it will hold an open meeting where interested members of the public can provide oral statements that will be considered by the ACRS during its review.[161] The ACRS documents the results of its review of the safety aspects of the LRA as well as the staff's SER and provides a recommendation letter to the Commission.[162]

D. Administrative adjudicatory hearings

Separate and apart from the safety and environmental review process is the potential for an administrative adjudicatory hearing. While it is not mandatory to hold an administrative adjudicatory hearing as part of the licence renewal process, the NRC must offer the public an opportunity to request one. After the LRA is docketed, the NRC will publish a notice of opportunity for a hearing in the *Federal Register*.[163]

Interested members of the public that seek to participate as a party in an adjudicatory hearing must meet two conditions: first they must establish that they have standing to participate and second they must submit an admissible contention. Members of the public have two ways to demonstrate standing: they can either prove that they live within 50-miles of the plant in question, thus satisfying the "proximity presumption",[164] or they can satisfy traditional judicial concepts of standing as provided in 10 CFR 2.309(d)(1). If a state, local governmental body, or federally-recognised Indian Tribe seek to participate as a party, unlike general

156. 10 CFR 51.95(c)(4), "Postconstruction environmental impact statements".
157. NUREG-1850, *supra* note 109, p. 3-2.
158. *Ibid.*, p. 3-6.
159. 10 CFR 54.25, "Report of the Advisory Committee on Reactor Safeguards".
160. AEA, sec. 29, 42 USC 2039, "Advisory Committee on Reactor Safeguards".
161. NUREG-1850, *supra* note 109, p. 3-7.
162. *Ibid.*, p. 3-5.
163. 10 CFR 54.27, "Hearings". The *Federal Register* is the daily journal of the Federal government that contains agency regulations, proposed rules, notices of interest to the public and assorted Presidential documents.
164. See e.g. Florida Power & Light Co. (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138, 150.

members of the public, these entities do not have to demonstrate standing and must only provide an admissible contention, as provided in 10 CFR 2.309(f).

In addition to demonstrating standing to intervene, the prospective party must also submit at least one admissible contention. As described earlier, the scope of the safety and environmental review is more limited than at the operating licence stage; the same carries over to any potential adjudicatory hearing where the scope of litigable issues is also more limited. This is not intended to remove the public's ability to challenge an agency decision but rather to focus the scope of the hearing on issues uniquely associated with the period of extended operation. This is due in part to the fact that the agency already offered the public an opportunity to participate in other decision-making processes (like the Licence Renewal Rulemaking and the GEIS) and also to the fact that the public still has an opportunity to raise challenges on issues outside the scope of an adjudicatory hearing through other processes like petitions for rulemakings (under 10 CFR 2.802) and requests for enforcement action (under 10 CFR 2.206).

The flow of Figure 4 might indicate that there is a sequential nature to the staff's review and the administrative adjudicatory hearing process. But, rulings on contention admissibility and standing to intervene often occur while the staff is performing its safety and environmental review. This is because "The purpose and scope of a licensing proceeding is to allow interested persons the right to challenge the sufficiency of the application. The NRC has not, and will not, litigate claims about the adequacy of the Staff's safety review in licensing adjudications."[165] This, however, only applies to the safety review. A distinction is made for environmental contentions because in that case, "NEPA places legal duties on the NRC, not on license applicants" and therefore the staff's review is the subject of the contention.[166] This being said, the hearing itself generally does not occur until the staff's final SER and SEIS are issued.

The presiding officer in an LRA adjudicatory hearing is a three-member panel of the Atomic Safety and Licensing Board (ASLB or ASLBP if it is the three-member panel).[167] The ASLB is statutorily-mandated and independent of the NRC, even though they are technically employees of the NRC.[168] The ASLBP for licence renewal proceedings is made up of two technical judges and one legal judge.[169]

Generally speaking, the simplified hearing procedures of 10 CFR Part 2, Subpart L are used in licence renewal adjudications. This Subpart L procedure emphasises mandatory and continuous openness in document disclosures and written statements, testimony, questions and responses in advance of an oral hearing.[170] Questioning is done by the judges of the ASLBP based on proposed questions provided by the parties.[171] Following the hearing, each party is responsible for filing their own "findings of fact and conclusions of law", which will then be considered by the ASLBP in rendering their initial decision.[172]

165. AmerGen Energy Co., LLC (Oyster Creek Nuclear Generating Station) et al., CLI-08-23, 68 NRC 476 (2008).
166. *Ibid.* at 476-477, fn. 64.
167. 10 CFR 2.313, "Designation of presiding officer, disqualification, unavailability, and substitution".
168. AEA, sec. 191, "Atomic Safety and Licensing Board", 42 USC 2241.
169. *Ibid.*
170. 10 CFR 2.1207, "Process and schedule for submissions and presentations in an oral hearing".
171. *Ibid.*
172. 10 CFR 2.1209, "Findings of fact and conclusions of law"; 10 CFR 2.1210, "Initial decision and its effect".

Appeals and petitions for review from ASLBP initial decisions can be made to the five-member Commission of the NRC.[173] Although some Commissioners have legal training, not all do and therefore a separate office of lawyers (the Office of Commission Appellate Adjudication or OCAA) works to analyse appeals and petitions for review, propose options to address the appeals, and write the Commission adjudicatory decision. Appeals from Commission decisions can be brought before the US Court of Appeals. Appeals for further review can be made by petitioning the US Supreme Court for a *writ of certiorari*.

VIII. Conclusions

This article addressed in detail the regulatory history of the licence renewal regulations to shed light on the reasons behind the policy, safety and environmental decisions because, apart from inspection-related activity, subsequent licence renewal in the United States will follow essentially the same process. This decision was not made lightly, with years of work and study involved.[174] After re-analysing the initial bases for the Licence Renewal Rulemaking, as well as studying lessons learnt, operating experience, insights from international PSRs and safety improvements made over time, the NRC was able to determine that the current approach was adequate.[175] This long look back demonstrates that the process is fundamentally sound and that the United States can move forward with reviewing applications subsequent renewal.[176]

The current and upcoming applications for subsequent renewal are critical for maintaining nuclear's contribution to the world's climate change goals.[177] Each year, despite grid connections in China and Russia, the average age of operating nuclear power plants in the world has been steadily increasing, as has the number of reactors operating past the 40-year mark.[178] If sufficient numbers of reactors are not going to be connected to the grid,[179] regulators and operators have to be committed to ensuring safe continued operation.

173. 10 CFR 2.1212, "Petitions for Commission review of initial decision"; 10 CFR 2.341 "Review of decisions and actions of a presiding officer".
174. See e.g. SECY-14-0016, "Ongoing Staff Activities to Assess Regulatory Considerations for Power Reactor Subsequent License Renewal", 31 Jan. 2014.
175. It should be noted, however, that although the process will remain largely the same, the technical review will differ as there are unique aspects of ageing and material degradation that apply to the post-60-year period.
176. The concept of looking back to move forward was taken from an article by then-NRC Deputy General Counsel Stephen G. Burns from 2008 entitled "Looking Backward, Moving Forward: Licensing New Reactors in the United States", *Nuclear Law Bulletin*, No. 81, OECD, Paris, pp. 7-29.
177. See e.g. IEA/NEA (2015), *Technology Roadmap: Nuclear Energy*, OECD, Paris, p. 52 ("[The] 2D Scenario highlight[s] the significant role that nuclear energy has to play in the decarbonisation of the world's energy system."); NEA (2015), *Nuclear Energy: Combating Climate Change*, OECD, Paris, p. 8 ("Thus, if the present nuclear energy capacity were to be phased out and replaced by remaining technologies in the world's current energy mix, including fossil fuels as well as low-carbon sources such as hydro and other renewables, … global annual CO2 emissions from electricity supply would rise by 12%").
178. Schneider, M. and A. Froggatt (2018), *The World Nuclear Industry Status Report 2018*, A Mycle Schneider Consulting Project, Paris, available at: www.worldnuclearreport.org/IMG/pdf/20180902wnisr2018-hr.pdf, pp. 41-42.
179. NEA (2015), *supra* note 177, p. 10 ("In the absence of strong carbon pricing policies, with the current rate of construction of nuclear power plants, and the economics of long-term operation of the existing fleet challenged in many countries, by either low wholesale prices driven by subsidised renewables or by cheap fossil fuel alternatives, nuclear power is not on track to fulfil its potential as one of the main decarbonising technologies.").

Annex

Status of reactor licence renewal in the United States

Reactor	Application Received	Renewed License Issued	Date Entering Extended Operation
Calvert Cliffs 1	10 April 1998	23 March 2000	31 July 2014
Calvert Cliffs 2	10 April 1998	23 March 2000	13 August 2016
Oconee 1	7 July 1998	23 March 2000	6 February 2013
Oconee 2	7 July 1998	23 March 2000	6 October 2013
Oconee 3	7 July 1998	23 March 2000	19 July 2014
Arkansas Nuclear One 1	1 February 2000	20 June 2001	20 May 2014
Turkey Point 3	11 September 2000	6 June 2002	19 July 2012
Turkey Point 4	11 September 2000	6 June 2002	10 April 2013
Edwin I. Hatch 1	1 March 2000	15 June 2002	6 August 2014
Edwin I. Hatch 2	1 March 2000	15 June 2002	13 June 2018
Surry 1	29 May 2001	20 March 2003	25 May 2012
Surry 2	29 May 2001	20 March 2003	29 January 2013
North Anna 1	29 May 2001	20 March 2003	1 April 2018
North Anna 2	29 May 2001	20 March 2003	21 August 2020
Peach Bottom 2	2 July 2001	7 May 2003	8 August 2013
Peach Bottom 3	2 July 2001	7 May 2003	2 July 2014
St. Lucie 1	30 November 2001	2 October 2003	1 March 2016
St. Lucie 2	30 November 2001	2 October 2003	6 April 2023
Fort Calhoun ◊	11 January 2002	4 November 2003	9 August 2013
McGuire 1	14 June 2001	5 December 2003	12 June 2021
McGuire 2	14 June 2001	5 December 2003	3 March 2023
Catawba 1	14 June 2001	5 December 2003	5 December 2023
Catawba 2	14 June 2001	5 December 2003	5 December 2023
HB Robinson 2	17 June 2002	19 April 2004	31 July 2010
VC Summer	6 August 2002	23 April 2004	6 August 2022
RE Ginna	1 August 2002	19 May 2004	18 September 2009
Dresden 2	3 January 2003	28 October 2004	22 December 2009
Dresden 3	3 January 2003	28 October 2004	12 January 2011
Quad Cities 1	3 March 2003	28 October 2004	14 December 2012
Quad Cities 2	3 March 2003	28 October 2004	14 December 2012
Joseph M. Farley 1	15 September 2003	12 May 2005	25 June 2017
Joseph M. Farley 2	15 September 2003	12 May 2005	31 March 2021
Arkansas Nuclear One 2	15 October 2003	30 June 2005	17 July 2018
DC Cook 1	31 October 2003	30 August 2005	25 October 2014
DC Cook 2	31 October 2003	30 August 2005	23 December 2017
Millstone 2	22 January 2004	28 November 2005	31 July 2015
Millstone 3	22 January 2004	28 November 2005	25 November 2025
Point Beach 1	26 February 2004	22 December 2005	5 October 2010

Reactor	Application Received	Renewed License Issued	Date Entering Extended Operation
Point Beach 2	26 February 2004	22 December 2005	8 March 2013
Browns Ferry 1	2 January 2004	4 May 2006	20 December 2013
Browns Ferry 2	2 January 2004	4 May 2006	28 June 2014
Browns Ferry 3	2 January 2004	4 May 2006	2 July 2016
Brunswick 1	18 October 2004	26 June 2006	8 September 2016
Brunswick 2	18 October 2004	26 June 2006	27 December 2014
Nine Mile Point 1	27 May 2004	31 October 2006	22 August 2009
Nine Mile Point 2	27 May 2004	31 October 2006	31 October 2026
Monticello	24 March 2005	8 November 2006	8 September 2010
Palisades	31 March 2005	17 January 2007	24 March 2011
FitzPatrick	1 July 2006	8 September 2008	17 October 2014
Wolf Creek 1	4 October 2006	20 November 2008	11 March 2025
Harris 1	16 November 2006	17 December 2008	24 October 2026
Oyster Creek ⌑	22 July 2005	8 April 2009	9 April 2009
Vogtle 1	29 June 2007	3 June 2009	16 January 2027
Vogtle 2	29 June 2007	3 June 2009	9 February 2029
Three Mile Island 1	8 January 2008	22 October 2009	19 April 2014
Beaver Valley 1	28 August 2007	5 November 2009	29 January 2016
Beaver Valley 2	28 August 2007	5 November 2009	27 May 2027
Susquehanna 1	13 September 2006	17 November 2009	17 July 2022
Susquehanna 2	13 September 2006	17 November 2009	23 March 2024
Cooper	30 September 2008	29 November 2010	18 January 2014
Duane Arnold	1 October 2008	16 December 2010	21 February 2014
Kewaunee ✦	14 August 2008	24 February 2011	✦
Vermont Yankee ❖	27 January 2006	21 March 2011	21 March 2012
Palo Verde 1	15 December 2008	22 April 2011	1 June 2025
Palo Verde 2	15 December 2008	22 April 2011	24 April 2026
Palo Verde 3	15 December 2008	22 April 2011	25 November 2027
Prairie Island 1	15 April 2008	27 June 2011	9 August 2013
Prairie Island 2	15 April 2008	27 June 2011	29 October 2014
Salem 1	18 August 2009	30 June 2011	13 August 2016
Salem 2	18 August 2009	30 June 2011	18 April 2020
Hope Creek 1	18 August 2009	20 July 2011	11 April 2026
Columbia Generating Station	20 January 2010	22 May 2012	20 December 2023
Pilgrim 1	27 January 2006	29 May 2012	8 June 2012
Limerick 2	22 June 2011	20 October 2014	22 June 2029
Limerick 1	22 June 2011	20 October 2014	26 October 2024
Callaway 1	19 December 2011	6 March 2015	18 October 2024
Sequoyah 1	15 January 2013	24 September 2015	17 September 2020
Sequoyah 2	15 January 2013	24 September 2015	15 September 2021
Byron 1	29 May 2013	19 November 2015	31 October 2024

Reactor	Application Received	Renewed License Issued	Date Entering Extended Operation
Byron 2	29 May 2013	19 November 2015	6 November 2026
Davis-Besse 1	30 August 2010	8 December 2015	22 April 2017
Braidwood 1	29 May 2013	27 January 2016	17 October 2026
Braidwood 2	29 May 2013	27 January 2016	18 December 2027
LaSalle 1	9 December 2014	19 October 2016	17 April 2022
LaSalle 2	9 December 2014	19 October 2016	16 December 2023
Grand Gulf 1	1 November 2011	1 December 2016	2 November 2024
Fermi, Unit 2	30 April 2014	15 December 2016	21 March 2025
South Texas Project 1	28 October 2010	28 September 2017	21 August 2027
South Texas Project 2	28 October 2010	28 September 2017	16 December 2028
Indian Point 2	30 April 2007	17 September 2018	17 September 2018
Indian Point 3	30 April 2007	17 September 2018	17 September 2018
River Bend	31 May 2017	20 December 2018	30 August 2025
Waterford 3	23 March 2016	27 December 2018	19 December 2024
Crystal River 3 ‡	18 December 2008	‡	‡
Diablo Canyon 1 ∆	24 November 2009	∆	∆
Diablo Canyon 2 ∆	24 November 2009	∆	∆
Seabrook 1 ☐	1 June 2010	*under review*	*under review*
Perry 1 ◆	*[October – December 2020]*	*awaiting application*	*awaiting application*
Clinton 1 ◆	*[January – March 2021]*	*awaiting application*	*awaiting application*
Comanche Peak1 ◆	*[April – June 2022]*	*awaiting application*	*awaiting application*
Comanche Peak 2 ◆	*[April – June 2022]*	*awaiting application*	*awaiting application*

Chart created and slightly adapted from information and chart on the website NRC (2019), "Status of Initial License Renewal Applications and Industry Initiatives", www.nrc.gov/reactors/operating/licensing/renewal/applications.html (accessed 28 Jan. 2019) and supplemented by NRC (2019), "Waterford Steam Electric Station, Unit 3 – License Renewal Application", www.nrc.gov/reactors/operating/licensing/renewal/applications/waterford.html.

NOTES

Reactor permanently shut down

Withdrawn application with planned reactor shut down date

◊ Fort Calhoun Station was permanently shut down on 24 October 2016.

⌑ Oyster Creek was permanently shut down on 17 September 2018.

✦ Kewaunee was permanently shut down on 7 May 2013.

❖ Vermont Yankee was permanently shut down on 29 December 2014.

‡ The Crystal River 3 application was withdrawn by the licensee on 6 February 2013. The facility was permanently shut down on 20 February 2013.

∆ The Diablo Canyon 1 & 2 application was withdrawn by the licensee on 7 March 2018. The two units will continue operating until their current operating licenses expire (2 November 2024 for Unit 1 and 20 August 2025 for Unit 2.)

☐ Application received and under NRC review

◆ Licensee has submitted a letter of intent to pursue licence renewal with a planned submission date.

Euratom competence in the areas of nuclear security and nuclear safety: An impossible parallel?

by Athanase Popov[*]

I. Introduction

In the nuclear field, security and safety are not completely distinct concepts. Both share the "common … aim of protecting persons, property, society and the environment",[1] but do so in different ways. As explained by the IAEA, nuclear security addresses "the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities".[2] Nuclear safety, on the other hand, focuses on the "achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards".[3] The IAEA explains that:

> [t]here is not an exact distinction between the general terms safety and security. In general, security is concerned with malicious or negligent actions by humans that could cause or threaten harm to other humans; safety is concerned with the broader issue of harm to humans (or the environment) from radiation, whatever the cause.[4]

This connection is evident at the IAEA organisational level in that both safety and security are addressed in a single Department of Nuclear Safety and Security.

The close relationship between safety and security is also clear in the way these issues are addressed at a regional level by the European Atomic Energy Community (Euratom), as well as at a national level by some of its member states. As acknowledged by the Ad Hoc Group on Nuclear Security (AHGNS) of the Council of the European Union (EU), "[i]n some languages only one word applies to both safety and security to designate the prevention of hazards and the prevention of malicious acts".[5] For example, in Italian, the word *sicurezza* means both security and safety. In German, a language often thought to possess separate words for all existing concepts, *Sicherheit* means: (1) safeguards, (2) security and (3) safety. French law

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1. International Atomic Energy Agency (IAEA) (2013), *Objective and Essential Elements of a State's Nuclear Security Regime*, Nuclear Security Fundamentals, IAEA Nuclear Security Series No. 20, IAEA, Vienna, p. 1.
2. IAEA (2007), *IAEA Safety Glossary: Terminology used in Nuclear Safety and Radiation Protection*, 2007 Edition, IAEA, Vienna, p. 133.
3. *Ibid*. See also Convention on Nuclear Safety (1994), IAEA Doc. INFCIRC/449, 1963 UNTS 293, entered into force 24 October 1996 (CNS), Article 1, "Objectives".
4. IAEA (2007), *supra* note 2, pp. 133-134.
5. Council of the European Union (2012), *Final Report of the Ad Hoc Group on Nuclear Security*, 10616/12.

considers nuclear safety to be more largely integrated into nuclear security.[6] This is not because English is more precise, but simply reflects the fact that the IAEA terminology does not always mirror most European nuclear laws, including Euratom law.

This article seeks to address a paradox: although Euratom's competence in the field of nuclear security predates those specifically recognised in the field of nuclear safety and despite the *de facto* synergies between these fields, there is no Euratom secondary law (Regulations, Directives or other acts) in the field of nuclear security. While, "the Euratom Community has been setting up over the last decade a nuclear [safety] legal framework which is the most advanced legally binding and enforceable framework of this kind in the world",[7] the same has not been done for security. Why? The explanation is of a political nature. Legal solutions for the adoption of a Euratom nuclear security framework are readily available and could be aligned with what was already done in the field of nuclear safety.

This study begins by outlining the Euratom Community's competence in the area of nuclear security. Next, a parallel will be drawn between nuclear security and nuclear safety in Euratom law. Then, potential Euratom initiatives in the field of nuclear security will be discussed. Finally, the legal basis for the implementation of the Convention on the Physical Protection on Nuclear Materials (CPPNM)[8] in Euratom law will be analysed.

II. Euratom's competence in the area of nuclear security

The international framework governing nuclear security consists first of legally binding conventions such as the CPPNM and its associated 2005 Amendment,[9] as well as United Nations (UN) Security Council Resolutions (SCR), notably UNSCR 1540.[10] In addition, there are also non-binding initiatives and instruments

6. See Code de l'environnement, Article L. 591-1:
   "*La sécurité nucléaire comprend la sûreté nucléaire, la radioprotection, la prévention et la lutte contre les actes de malveillance ainsi que les actions de sécurité civile en cas d'accident. La sûreté nucléaire est l'ensemble des dispositions techniques et des mesures d'organisation relatives à la conception, à la construction, au fonctionnement, à l'arrêt et au démantèlement des installations nucléaires de base ainsi qu'au transport des substances radioactives, prises en vue de prévenir les accidents ou d'en limiter les effets*."
   [Nuclear security includes nuclear safety, radiation protection, prevention and combating of malicious acts, as well as civil security actions in the event of an accident. Nuclear safety is the set of technical provisions and organisational measures relating to the design, construction, operation, shutdown and decommissioning of basic nuclear installations, as well as to the transport of radioactive substances, taken for the purpose of preventing accidents or mitigating the effects thereof.]
7. Kuske, M. (2017), "Euratom Nuclear Safety Framework", *International Cooperation for Enhancing Nuclear Safety, Security, Safeguards and Non-Proliferation: 60 years of IAEA and Euratom*, Proceedings of the XX Edoardo Amaldi Conference, Accademia Nazionale dei Lincei, Rome, Italy, October 9-10, 2017, Springer Proceedings in Physics, Volume 206, Springer Open, p. 36.
8. Convention on the Physical Protection of Nuclear Material (1980), IAEA Doc. INFCIRC/274 Rev. 1, 1456 UNTS 125, entered into force 8 February 1987 (CPPNM).
9. Amendment to the Convention on the Physical Protection of Nuclear Material (2005), IAEA Doc. INFCIRC/274/Rev.1/Mod.1, entered into force 8 May 2016 (ACPPNM).
10. UNSCR 1540 (2004), "Non-proliferation of weapons of mass destruction", UN Doc. S/RES/1540, adopted 28 April 2004.

such as the Global Initiative to Combat Nuclear Terrorism (GICNT),[11] the Proliferation Security Initiative (PSI)[12] and the Nuclear Security Summit process.

From the beginning of the 1970s, the IAEA has served as a forum where experts have been able to exchange their national experiences in the field of physical protection of nuclear materials. The outcome of the different discussions and exchanges was circulated in a document entitled *Nuclear Security Recommendations on Physical Protection of Nuclear Material* (the scope of which was later expanded to also include nuclear facilities).[13] The IAEA's 1972 *Nuclear Security Recommendations on Physical Protection of Nuclear Material* (and later Nuclear Facilities) was followed by the adoption of the CPPNM in 1980 and its Amendment in 2005.

The 2005 Amendment extended the scope of protection of the CPPNM: whereas the obligations for physical protection under the CPPNM covered nuclear material during international transport, the 2005 Amendment made it legally binding for states parties to protect both nuclear facilities and material in peaceful domestic use, storage and transport. It also provides for expanded co-operation between and among states regarding rapid measures to locate and recover stolen or smuggled nuclear material, mitigate any radiological consequences of sabotage, and prevent and combat related offences. Thus, the ACPPNM constitutes an important milestone in the international efforts to improve the physical protection of nuclear material and facilities.[14]

There is, however, no international enforcement mechanism for the CPPNM or the 2005 Amendment. Instead, the consolidated Convention on the Physical Protection of Nuclear Material and Nuclear Facilities (CPPNMNF) contains a dispute resolution mechanism in Article 17 where parties should first attempt to settle their dispute and in the event such a settlement is not possible, such dispute shall "be submitted to arbitration or referred to the International Court of Justice for decision". Despite the lack of an enforcement mechanism at the IAEA level, legally speaking, both Euratom and its member states have jurisdiction to enforce the CPPNM according to Ruling 1/78 of the Court of Justice of the EU, dated 14 November 1978.[15]

11. The GICNT "is a voluntary international partnership of 88 nations and six international organizations that are committed to strengthening global capacity to prevent, detect, and respond to nuclear terrorism". GICNT (n.d.), www.gicnt.org/ (accessed 26 November 2018).
12. The PSI "is a global framework of states that commit to disrupt transfers of weapons of mass destruction (WMD), their delivery systems, and related items to and from states and non-state actors of proliferation concern. Not a formal organization, PSI states cooperate to prevent proliferation and strengthen national capacities for action." US Department of State (2017), "The Proliferation Security Initiative: A Global Cooperative Effort", www.state.gov/t/isn/rls/fs/2017/266977.htm (accessed 26 November 2018). As of November 2018, 105 countries have endorsed the PSI. US Department of State (n.d.), "Proliferation Security Initiative", www.state.gov/t/isn/c10390.htm (accessed 26 November 2018).
13. IAEA (1972), *Recommendations for the Physical Protection of Nuclear Material*, IAEA, Vienna. Since 1972, this document has been revised 5 times, in 1977, 1989, 1993, 1998, with the most recent version published in 2011 as IAEA (2011), *Nuclear Security Recommendations on Physical Protection of Nuclear Materials and Nuclear Facilities*, IAEA Nuclear Security Series No. 13, IAEA Doc. INFCIRC/225/Revision 5, IAEA, Vienna.
14. IAEA (2016), "IAEA, Member States to Mark Entry into Force of Key Nuclear Security Agreement", www.iaea.org/newscenter/mediaadvisories/iaea-member-states-to-mark-entry-into-force-of-key-nuclear-security-agreement-0 ("Director General [Yukiya] Amano ... has called the Amendment's entry into force 'the single most important step which the world can take to strengthen nuclear security.'").
15. Ruling of the Court of 14 November 1978 delivered pursuant to the third paragraph of Article 103 of the EAEC Treaty – Draft Convention of the International Atomic Energy Agency on the Physical Protection of Nuclear Materials, Facilities and Transports (Ruling 1/78), EU:C:1978:202, p. 02151.

Indeed, the competence to adopt measures on physical protection is, according to the Court of Justice of the EU, a competence concerning "in part the jurisdiction of the Member States and in part that of the Community".[16] This is permissible because "the concept of 'safeguards' within the meaning of the [Euratom] Treaty is sufficiently comprehensive to include also measures of physical protection".[17] That competence has not yet been exercised by Euratom.

Nonetheless, according to the Euratom declaration made upon accession to the ACPPNM, "Articles 8 to 13 and Article 14(2) and (3) of the [CPPNMNF] do not apply to [Euratom]".[18] Therefore, Articles 1, 2, 6, 7, 14(1) and 15 to 23 (i.e. most of the provisions of the CPPNMNF) are a source of Euratom law as part of the *acquis* (i.e. the overall set of Euratom provisions). Article 14(1) of the CPPNMNF provides that "[e]ach state party shall inform the depository of its laws and regulations which give effect to this Convention. The depository shall communicate such information periodically to all state parties". Since Euratom considers that this article does in fact apply, it thereby accepts that it would have to transpose the ACPPNM. And, within these applicable articles, an important aspect of nuclear security could be considered by Euratom under the new Articles 2A(1)(c) and (d), introduced by the ACPPNM, which requires state parties to "establish, implement and maintain an appropriate physical protection regime applicable to nuclear material and nuclear facilities under its jurisdiction, with the aim of … protecting nuclear material and nuclear facilities against sabotage", as well as "mitigating or minimizing the radiological consequences of sabotage".

III. The parallel between nuclear security and nuclear safety in Euratom law

In the framework of the 1978 CPPNM case (R 1/78), the European Commission:

> had taken the view that the participation by a Member State in the Convention without the participation of the Community would impede the application of the Treaty because it would interfere with the Euratom Supply Agency's discharge of its duties, would create obstacles to the nuclear

16. *Ibid*., para. 31. On that ruling, see Puissochet, J.P. (1978), "*À propos d'une délibération de la Cour de justice des Communautés européennes - Le régime des matières nucléaires et la capacité de la Communauté de conclure des accords internationaux*" [On a deliberation of the Court of Justice of the European Communities- the nuclear material regime and the Community's capacity to conclude international agreements], *Annuaire français de droit international* (AFDI) [French yearbook of international law], No. 24, pp. 977-988. The competence at issue is not a "shared competence" strictly speaking because pursuant to Article 106a(1) of the Euratom Treaty, Article 2(2) of the Treaty on the Functioning of the EU does not apply to Euratom. Treaty on the Functioning of the European Union, *Official Journal of the European Union* (OJ) C 115/47 (9 May 2008) (consolidated version) (TFEU) (consolidated version OJ C 202/47 (7 June 2016)). Pursuant to TFEU Article 2(2) (emphasis added):
    > When the Treaties confer on the Union a competence shared with the Member States in a specific area, the Union and the Member States may legislate and adopt legally binding acts in that area. *The Member States shall exercise their competence to the extent that the Union has not exercised its competence.* The Member States shall again exercise their competence to the extent that the Union has decided to cease exercising its competence.

    Therefore, Euratom's competence for physical protection may be defined as a *joint* competence, not precluding or impacting the exercise by the member states of the same competence.
17. Ruling 1/78, *supra* note 15, para. 21.
18. "Declarations/reservations made upon expressing consent to be bound and objections thereto", Amendment to the Convention on the Physical Protection of Nuclear Material, available at: www-legacy.iaea.org/Publications/Documents/Conventions/cppnm_amend_reserv.pdf.

> common market, would trespass on the Commission's responsibilities for safeguards, would deprive the Community of the power of disposal of its property and could affect the functioning of the Joint Research Centre. [19]

Therefore, Euratom had to accede to the CPPNM alongside its member states.

The same reasoning prompted Euratom to accede to the Convention on Nuclear Safety,[20] albeit at a later date. Strangely enough, although Euratom has been effectively exercising its competence in the field of nuclear safety internally for some time, this competence is more recent and even more contentious than that in the field of nuclear security. And the Euratom Treaty[21] does not explicitly mention nuclear safety any more than it does nuclear security.

But, it was nonetheless possible to adopt directives on nuclear safety using the legal basis of Euratom Chapter III,[22] more specifically Articles 31 and 32, as well as a ruling of the European Court of Justice.[23] The 2002 judgment states that because Chapter III implicitly covers nuclear safety, Euratom may accede to the CNS. Therefore, the CNS could be transposed using the same internal legal basis. In that case, the Commission was challenging Euratom's declaration of competence (as approved by the Council of the EU and required under Article 30(4)(iii) of the CNS) because the Commission considered that Euratom had more extensive competence than those accepted by the member states. The Court upheld the Commission's view because "it is not appropriate, in order to define the Community's competence, to draw an artificial distinction between the protection of the health of the general public and the safety of sources of ionising radiation".[24] The Council then had to modify its declaration of competence to list more provisions of the CNS as being applicable to Euratom.

No such legal dispute arose with the member states concerning the Council declaration about Euratom's competence in regard to the CPPNM. Why then has Euratom been abstaining from transposing the CPPNM in the same way as the Euratom nuclear safety legal framework transposes *mutatis mutandis* the CNS?

19. Allen, D. (1983), "The Euratom Treaty, Chapter VI: new hope or false dawn?", *Common Market Law Review*, No. 20, p. 483.
20. Convention on Nuclear Safety (1994), IAEA Doc. INFCIRC/449, 1963 UNTS 293, entered into force 24 October 1996 (CNS).
21. Treaty Establishing the European Atomic Energy Community (1957), 298 UNTS 167, entered into force 1 January 1958 (Euratom Treaty) (consolidated version OJ C 203 (7 June 2016)).
22. The English title of that chapter ("Health and safety") is an innovation that seems to be aimed at mirroring the IAEA terminology when translating from the original French version. Since a legal fiction in EU law renders all linguistic versions equally authentic, the IAEA terminology is also present in Euratom law but does not reflect the mainstream approach underpinning the Euratom Treaty. The French title *Protection sanitaire* literally means "sanitary protection", which was initially explicitly meant by the term "radiation protection".
23. Judgment of the Court of 10 December 2002, Commission of the European Communities v. Council of the European Union, C-29/99, EU:C:2002:734, on the application for annulment in part of the Council Decision of 7 December 1998 approving the accession of the European Atomic Energy Community to the Nuclear Safety Convention. This ruling came 24 years after the ruling on physical protection.
24. *Ibid.*, para. 82.

IV. Potential Euratom initiatives in the field of nuclear security

Under the ERTA case law,[25] where any of the European Communities has an internal competence in a given area, it also has an external competence to conclude an international agreement in the same area under the principle of parallelism between internal and external competences. As far as Euratom is concerned, it is endowed not only with legal personality, but also with treaty-making power "within the limits of its powers and jurisdiction" (Article 101(1) of the Euratom Treaty). It was precisely the absence of a provision such as Article 101(1) of the Euratom Treaty in the EC Treaty "that led the Court of Justice to the introduction of the principle of implied powers in *ERTA*, which then gave rise to a considerable body of case-law and an even more considerable volume of academic debate".[26]

Therefore, as far as Euratom is concerned, external competence in nuclear matters is rarely disputed. The issue is rather how to implement Euratom's international commitments internally. Because Euratom safeguards cover physical protection, Euratom had to accede to the CPPNM. It further follows from the case law of the Court of Justice of the EU,[27] which is applicable *mutatis mutandis* to Euratom, that international agreements concluded by the Community form an integral part of the Euratom law from the date of their entry into force. The so-called "mixed agreements" concluded by both Euratom and its member states, like the CPPNM, have the same legal status in Euratom law as the agreements concluded only by the Euratom.

Because Euratom is a party to the CPPNM alongside its member states, the CPPNM forms an integral part of Euratom law, as it contains provisions falling under the purview of Euratom competence. What this means in practice is that it is possible to rely on the CPPNM as a source of Euratom law. But, in order to bring infringement actions ("actions for failure to fulfil obligations"), it is necessary to establish a failure by a member state to fulfil an obligation arising from an internal Euratom act.[28] Nonetheless, under the CPPNM, the designated authority ought to be provided adequate power to enforce physical protection requirements.

This enforcement power could be in the form of two kinds of sanctions: first, a range of administrative sanctions for the unauthorised removal or use of nuclear material and for non-compliance with physical protection requirements; and, second, for more serious violations (such as sabotage), a range of criminal sanctions. Any party to the CPPNM needs to ensure that the actions listed in Article 7 of

25. Judgment of the Court of 31 March 1971, CJCE, 31 March 1971, Commission of the European Communities v. Council of the European Communities, European Agreement on Road Transport, Case 22/70, EU:C:1971:32 (ERTA case). See lately, among the abundant literature on that topic, Dony, M., "*Retour sur les compétences externes implicites de l'Union*" [Review of the implicit external competences of the Union], *Cahiers de droit européen* [Journal of European Law], No. 1/2018, pp. 109-176.
26. Koutrakos, P. (2004), "Case C-29/99 *Commission v. Council (re: Nuclear Safety Convention)*, Judgment of the Court of Justice (Full Court) of 10 December 2002, [2002] ECR I-11221", *Common Market Law Review*, No. 41, Kluwer Law International, Netherlands, p. 192.
27. See e.g. Judgment of the Court of 30 April 1974, R. & V. Haegeman v. Belgian State, Case 181/73, EU:C:1974:41, para. 5 and subsequent case law.
28. See, however, an isolated Second Chamber judgment of the Court, stating that an action for failure to fulfil obligations may be brought against a member state simply due to non-compliance with an international Convention. Judgment of the Court (Second Chamber) of 7 October 2004, Commission of the European Communities v. French Republic, C-239/03, EU:C:2004:598. This ruling does not provide sufficient authority for the statement that infringement actions may be brought against Euratom member states due to a breach of the CPPNM, although the situation could of course be clarified by new rulings of the Court of Justice of the EU.

CPPNM, which apply to Euratom, are offences punishable by appropriate penalties.[29] This could be achieved to a certain extent by the European Commission pursuant to Article 77(b) of the Euratom Treaty, which provides that "the Commission shall satisfy itself that, in the territories of the Member States, any particular safeguarding obligations assumed by the Community under an agreement concluded with an international organisation are complied with".

In order to achieve that objective, the European Commission could impose sanctions on nuclear operators under Article 83(1) of the Euratom Treaty[30] without having to bring enforcement actions against member states. This is so because infringements to Article 77(b) of the Euratom Treaty constitute "infringements on the part of persons or undertakings of the obligations imposed on them" by Chapter 7 of the Euratom Treaty. Sanctions under Article 83(1) of the Euratom Treaty for breach of the applicable provisions of the CPPNM would be based on a breach of the Euratom Community *acquis*, not on a breach of obligations imposed on state parties.

In order to be able to bring enforcement actions against member states who fail to implement the CPPNM, the European Commission would need to rely on a measure transposing the CPPNM in Euratom law.[31] The adoption of such a measure raises the question of the appropriate legal basis for so doing.

V. The legal basis for the implementation of the CPPNM in Euratom law

Under a restrictive view, Euratom could apply Article 203 of the Euratom Treaty, which provides: "If action by the Community should prove necessary to attain the objectives of the Community and this Treaty has not provided the necessary powers, the Council shall, acting unanimously on a proposal from the Commission [...] take the appropriate measures". According to Jürgen Grunwald, "the 'catch all' or 'implied' powers foreseen in Article 203 can only apply when there is no other empowering provision. In this case, however, a legal basis exists in Chapter III of the Treaty".[32] In fact,

> there can also be no doubt that the concepts of nuclear security and nuclear safety are to a large extent overlapping in that both of them are intended to give effect to the same objective, namely "to create the conditions of safety necessary to eliminate hazards to the life and health of the public". Since

29. Stoiber, C. et al. (2003), *Handbook on Nuclear Law*, IAEA, Vienna, pp. 152-153.
30. Article 83(1) of the Euratom Treaty provides:
    > In the event of an infringement on the part of persons or undertakings of the obligations imposed on them by this Chapter, the Commission may impose sanctions on such persons or undertakings. These sanctions shall be in order of severity: (a) a warning; (b) the withdrawal of special benefits such as financial or technical assistance; (c) the placing of the undertaking for a period not exceeding four months under the administration of a person or board appointed by common accord of the Commission and the State having jurisdiction over the undertaking; (d) total or partial withdrawal of source materials or special fissile materials.
31. Article 82 of the Euratom Treaty may not be used as a legal basis for infringements actions against member states other than those which are based on a breach of Article 79 of the Euratom Treaty. Therefore, the action for failure to fulfil the obligations imposed by the measure transposing the CPPNM would need to be based on Articles 258 and 259 of the TFEU.
32. Grunwald, J. (2016), "Peaceful Uses of Nuclear Energy under EURATOM Law", in J.L. Black-Branch and D. Fleck (eds.), *Nuclear Non-Proliferation in International Law, Vol. III, Legal Aspects of the Use of Nuclear Energy for Peaceful Purposes*, Springer, Chapter 6, p. 209 (read in typescript).

> Chapter 7 on Safeguards does not empower the Community to legislate on matters of physical protection for lack of an appropriate legal basis, autonomous measures in the field of physical protection can only be based on Articles 30 to 32. It is their ultimate common objective that shows that nuclear safety and nuclear security are, from the Treaty's perspective, in reality "false opposites" and should therefore be subject to the same rules. This being the case, the Community may legislate in matters of nuclear security by adopting uniform security standards which are binding on the Member States.[33]

The choice of Articles 30 to 32 of the Euratom Treaty (part of Chapter III) instead of Article 203 thereof for the implementation of the CPPNM in Euratom law makes it possible to avoid the requirement of unanimity at the Council since whenever the Euratom Treaty specifies no voting rule, a simple majority suffices as a matter of law.[34]

VI. Conclusion

While the IAEA lacks enforcement powers generally and as regards nuclear security in particular, Euratom does possess extensive enforcement powers in the field of physical protection, a component of nuclear security. The IAEA may only make non-binding recommendations in its Nuclear Security Reports,[35] while the European Commission may impose direct sanctions on nuclear operators. Such sanctions under Chapter 7 of the Euratom Treaty are normally imposed when operators have been violating the nuclear safeguards framework, but since safeguards implicitly cover physical protection, sanctions under Article 83 of the Euratom Treaty may also be imposed when the provisions of the CPPNM that apply to Euratom have been breached.

National sovereignty is equally at stake with nuclear safety as with nuclear security. Strangely enough, Euratom has been effectively exercising its competences in the field of nuclear safety, but not in the field of nuclear security, although the latter are older than the former. For the time being, there are no Commission initiatives in the field of nuclear security, and "it should be noted that the Council has repeatedly disagreed on any attempt by the Commission to get involved – on behalf of Euratom – in nuclear security matters".[36] This situation, however, may change in the future, especially considering the European Council conclusions of 22 March 2018 on the Salisbury attack.[37]

33. *Ibid*.
34. Errera, J. et al. (1958), *Euratom, Analyse et Commentaires du Traité* [Euratom: Analysis and Commentary on the Treaty], Bibliothèque de l'Institut belge de science politique [Library of the Belgian Institute of Political Science], Brussels, *Éditions de la Librairie encyclopédique* [Editions of the encyclopaedic bookshop], p. 203.
35. See e.g. the IAEA Nuclear Security Report of 6 August 2018, GOV/2018/36-GC(62)/10.
36. Answer given on 12 January 2018 to MEP Rachida Dati's Parliamentary Question E-006619/2017 by Commissioner Arias Cañete on behalf of the European Commission, available at: www.europarl.europa.eu/doceo/document/E-8-2017-006619-ASW_EN.html.
37. European Council conclusions of 22 March 2018 on the Salisbury attack, which state *inter alia*: "the European Union must strengthen its resilience to Chemical, Biological, Radiological *and Nuclear-related risks*, including through closer cooperation between the European Union and its Member States", available at: www.consilium.europa.eu/en/press/press-releases/2018/03/22/european-council-conclusions-on-the-salisbury-attack/, para. 11, emphasis added (accessed 26 November 2018).

Case law

France

Decision Nos. 410109, 410622, 410624 of 25 October 2018 of the French Council of State (Conseil d'État)[1]

Decree No. 2017-508 of 8 April 2017 provided for the revocation of the operating licence held by Électricité de France (EDF) for the Fessenheim Nuclear Power Plant (Bas-Rhin, France).[2] To comply with the 63.2 GW cap on total authorised nuclear electricity generating capacity in France, this licence revocation was due to take effect on the entry into service of the EPR unit (Flamanville 3) at the Flamanville Nuclear Power Plant site (Manche, France).

Pursuant to Article L. 311-5-5 of the Energy Code, a licence to operate a nuclear power plant cannot be granted if the grant of that licence would result in the cap on total authorised nuclear electricity generating capacity being exceeded. In assessing this total capacity, the administrative authority takes into account the revocations declared by decree at the request of a licensee. One of the notable effects of these provisions is that the revocation of a licence to operate an electricity generation facility can therefore only be issued at the request of the licensee.

The municipality of Fessenheim, as well as the trade unions, referred the matter to the French Council of State (Conseil d'État), which concluded that the decree of 8 April 2017 should be repealed on the grounds that the revocation of the licence to operate the Fessenheim Nuclear Power Plant had not been issued at EDF's request.

United States

Oglala Sioux Tribe v. US Nuclear Regulatory Commission, 896 F.3d 520 (DC Cir. 2018)

The Oglala Sioux Tribe filed a petition for review of a United States (US) Nuclear Regulatory Commission (NRC) decision issued during the NRC's administrative licensing adjudication for the Powertech (USA), Inc. Dewey-Burdock *in situ* uranium recovery project.[3] The petitioners in the case challenged the Commission's rejection of several contentions raised in the NRC adjudication by the Tribe, which claimed that the NRC staff had failed to comply with the National Environmental Policy Act[4] in several respects before issuing the Powertech licence. Petitioners also challenged the Commission's affirmance of the Atomic Safety and Licensing Board Panel's (ASLBP) decision to keep Powertech's already-issued licence in place despite the ASLBP's identification (which the Commission affirmed on appeal) of certain

1. *Journal officiel "Lois et Décrets"* [Official Journal of Laws and Decrees] (J.O.L. et D.), 28 Oct. 2018, text no. 42.
2. For more information, please see NEA (2018), "Decree No 2017-508 of 8 April 2017 revoking the licence to operate Fessenheim Nuclear Power Plant", *Nuclear Law Bulletin*, No. 100, OECD, Paris, p. 93.
3. In 2009, Powertech applied for a licence to construct and operate a uranium mining project in the Black Hills region of South Dakota. The NRC granted the licence on 8 April 2014.
4. National Environmental Policy Act of 1969, 42 United States Code (USC) 4321 et seq. (NEPA).

deficiencies related to: (1) the NRC staff's consideration of historic and cultural resources under NEPA and (2) its associated consultations with the Tribe under the National Historic Preservation Act of 1966.[5] The NRC moved to dismiss the petition for lack of jurisdiction, asserting that the decision under review did not constitute final agency action because of the ongoing consideration by the ASLBP of the NEPA and NHPA issues related to the Tribe's historic and cultural resources.

On 20 July 2018, the DC Circuit Court issued its decision.[6] The Court held that it lacked jurisdiction over most of the Tribe's NEPA challenges because the NRC adjudication was not yet complete. The Court did, however, exercise jurisdiction under the collateral order doctrine to consider one specific question: whether the Commission's decision to keep Powertech's licence in place pending completion of the NRC adjudication, despite the ASLBP's NEPA-noncompliance finding regarding the NRC staff's consideration of the Tribe's historic and cultural resources, violated NEPA.[7] On that issue, the DC Circuit held that because the NRC had itself identified the NEPA-compliance deficiency and considered it to be "significant," the NRC erred in requiring the petitioners to show irreparable harm in order to obtain *vacatur* or suspension of Powertech's licence.[8] The Court did not vacate the licence, however, citing various equitable considerations.[9] Instead, the Court remanded the case to the Agency for further proceedings consistent with its opinion. The administrative adjudication remains ongoing; the views of the parties have been sought as to how the Agency should respond to the Court's remand.

Texas v. United States, 891 F.3d 553 (5th Cir. 2018)

Texas (Petitioner) petitioned for relief under the Nuclear Waste Policy Act[10] alleging various federal entities and officials violated their obligations under the Act by neglecting to pursue the Yucca Mountain repository and instead pursuing a consent-based siting approach to building a repository.[11] Texas sought several remedies, including equitable relief to prohibit further consent-based siting and ordering completion of the licensing process for Yucca Mountain.[12] Nevada intervened and moved to dismiss.[13] The Court of Appeals for the Fifth Circuit granted the motion to dismiss, holding that the deadline for action under the Nuclear Waste Policy Act was not jurisdictional, the continuing violations doctrine did not apply to equitably toll

5. National Historic Preservation Act of 1966, Public Law (Pub. L.) 89-665, as amended by Pub. L. No. 96-515, 54 USC 300101 et seq. (NHPA).
6. Oglala Sioux Tribe v. US Nuclear Regulatory Commission, 896 F.3d 520 (DC Cir. 2018).
7. *Ibid.*, p. 527. By the time the court decided the case, the licensing board had already granted an NRC Staff motion for summary disposition of the Tribe's NHPA-compliance contention. Based on that development, the court determined that it did not need to address in its decision whether NRC's decision to leave the licence in place pending the remaining NRC adjudicatory proceedings was also contrary to the NHPA.
8. *Ibid.*, p. 538.
9. *Ibid.*
10. 42 USC 10101 et seq.
11. Original Action under the Nuclear Waste Policy Act (Petition), Texas v. United States, 891 F.3d 553 (5th Cir. 2018), available at: www.nrc.gov/docs/ML1708/ML17081A109.pdf.
12. *Ibid.*, pp. 25-27. Texas sought numerous other ancillary remedies such as civil contempt and appointment of a special master.
13. Nevada's Opposition to Texas's Motion for a Declaratory Judgement and a Preliminary Injunction and Nevada's Opposed Countermotion to Dismiss, Texas v. United States, 891 F.3d 553 (5th Cir. 2018), available at: www.state.nv.us/nucwaste/news2017/pdf/DKT-15_nvResponse.pdf.

deadline and actions occurring within limitations period were not sufficiently final for judicial review.[14]

By way of background, the US Department of Energy (DOE) submitted its application to the US Nuclear Regulatory Commission (NRC) for a geologic repository at Yucca Mountain in 2008. In 2010, then-President Barack Obama established the Blue Ribbon Commission on America's Nuclear Future to review policies for managing the back-end of the nuclear fuel cycle including "all alternatives for the storage, processing, and disposal" of nuclear fuel and nuclear waste.[15] One of the recommendations of the Blue Ribbon Commission in its final report was a "new, consent-based approach to siting future nuclear waste management facilities."[16] Subsequent to this report, DOE issued a framework for transporting, storing and disposing used nuclear fuel.[17] This framework included plans for DOE to initiate a consent-based siting process.[18] More recently, DOE published a draft report on consent-based siting with a public comment period that ended in April 2017.[19]

On 3 March 2010, DOE filed a motion with the Atomic Safety and Licensing Board asking to withdraw its application.[20] The Board denied that request on 29 June 2010.[21] In 2011, the NRC Commission announced that it was evenly divided as to whether the Commission should review, and reverse or uphold, the Board's denial of DOE's motion to withdraw.[22] The Commission directed the Board to "complete all necessary and appropriate case management activities, including disposal of all matters currently pending before it and comprehensively documenting the full history of the adjudicatory proceeding."[23] Consistent with the Commission's direction, the Board suspended the adjudicatory proceeding on 30 September 2011, documenting the proceeding's history and citing fiscal constraints.[24] In 2013, the US Court of Appeals for the District of Columbia Circuit granted a *writ of mandamus*, directing the NRC to resume the licensing process.[25]

14. Texas v. United States, 891 F.3d 553 (5th Cir. 2018), available at: www.ca5.uscourts.gov/opinions/pub/17/17-60191-CV0.pdf.
15. Obama, B. (2010), "Presidential Memorandum – Blue Ribbon Commission on America's Nuclear Future", https://obamawhitehouse.archives.gov/the-press-office/presidential-memorandum-blue-ribbon-commission-americas-nuclear-future.
16. Blue Ribbon Commission on America's Nuclear Future (2012), *Report to the Secretary of Energy*, available at: www.energy.gov/sites/prod/files/2013/04/f0/brc_finalreport_jan2012.pdf, p. viii.
17. US Department of Energy (2013), *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*, available at: www.energy.gov/sites/prod/files/2013%201-15%20Nuclear_Waste_Report.pdf.
18. *Ibid.*, p. 14
19. Request for Public Comment on Draft Consent-Based Siting Process for Consolidated Storage and Disposal Facilities for Spent Nuclear Fuel and High-Level Radioactive Wastes, 82 Fed. Reg. 4333 (13 Jan. 2017).
20. US Department of Energy (High Level Waste Repository), US Department of Energy's Motion to Withdraw, Docket No. 63-001 (3 March 2010), available at: www.energy.gov/sites/prod/files/edg/media/DOE_Motion_to_Withdraw.pdf.
21. US Department of Energy (High Level Waste Repository), LBP-10-11, 71 NRC 609 (29 June 2010).
22. See US Department of Energy (High-Level Waste Repository), CLI-11-07, 74 NRC 212, 212 (2011).
23. *Ibid.*
24. See US Department of Energy (High-Level Waste Repository), CLI-11-13, 74 NRC 635, 639 (2011); US Department of Energy (High-Level Waste Repository), LBP-11-24, 74 NRC 368, 370 (2011).
25. Petition, *supra* note 11, pp. 18-24. In re Aiken County, 725 F.3d 255 (DC Cir. 2013). In granting the *writ of mandamus*, the Court stated, "unless and until Congress authoritatively says otherwise or there are no appropriated funds remaining, the Nuclear Regulatory Commission must promptly continue with the legally mandated licensing process." *Ibid.*, p. 267.

Petitioner contended that DOE's stated intent to use consent-based siting was a violation of the Nuclear Waste Policy Act, which, Petitioner contended, required DOE to pursue Yucca Mountain as the only repository.[26] Petitioner further contended that holding the NRC proceedings associated with Yucca Mountain in abeyance violated the Nuclear Waste Policy Act and the Court's decision in In re Aiken County. Specifically, Petitioner brought its claims for relief under 42 USC Section 10139(a)(1), which prescribes a 180-day statute of limitations. Because the majority of the Petitioner's claims challenged actions and omissions that occurred well beyond the 180-day limitations period, the Court first addressed whether the Nuclear Waste Policy Act's 180-day limitation imposed a limit on the Court's subject matter jurisdiction, ultimately concluding that the statutory deadline was not jurisdictional.[27] Next, the Court addressed whether the 180-day deadline could be tolled under a "continuing violations" theory.[28] In determining whether equitable tolling is appropriate, the inquiry focuses on "what event, in fairness and logic, should have alerted the average lay person to act to protect his rights."[29] The Court noted that Petitioner itself had cited several federal actions that, "in fairness and logic, should have alerted it to act years ago."[30] Last, the Court addressed the discrete actions that Petitioner challenged that were not time-barred: DOE's decision to release a draft consent-based siting policy document and the solicitation of public comments on that document.[31] However, the Court concluded that policy document has "no legal consequence" and therefore Petitioner lacked any basis to challenge it under the Nuclear Waste Policy Act and that the policy document and the solicitation of public comments on it did not constitute a final decision or action subject to challenge under the Nuclear Waste Policy Act.[32] The Court, therefore, dismissed all of Petitioner's claims, concluding that they did not meet the statutory requirements of timeliness or finality.

City of Boston Delegation v. FERC, 897 F.3d 241 (DC Cir. 2018)

The Court of Appeals for the District of Columbia upheld the US Federal Energy Regulatory Commission's (FERC's) authorisation of a project to upgrade Algonquin Gas Transmission, LLC's natural gas pipeline.[33] The Court held that FERC adequately considered cumulative impacts of other projects in its analysis, did not act arbitrarily and capriciously by declining to consider three projects in a single environmental impact statement (EIS), and appropriately relied on another Federal agency's analysis in addressing safety concerns about project activities near a nuclear energy facility.[34]

In February 2014, Algonquin applied for a certificate of public convenience and necessity, commonly referred to as a Section 7 certificate,[35] from FERC to replace approximately 29 miles of existing pipeline with larger diameter pipe, construct a little over 8 miles of new pipeline, build 3 new meter stations, and make other

26. Petition, *supra* note 11, pp. 19-20, citing 42 USC Sections 10172(a)(1)-(2).
27. Texas v. United States, 891 F.3d 553, 561.
28. *Ibid*., pp. 561-564.
29. *Ibid*., p. 562.
30. *Ibid*.
31. *Ibid*., p. 565.
32. *Ibid*.
33. City of Boston Delegation v. FERC, 897 F.3d 241 (DC Cir. 2018).
34. See *ibid*.
35. 15 USC Section 717f(c).

upgrades, collectively called the "AIM Project".[36] In March 2015, FERC issued the certificate, subject to certain conditions.[37]

Several environmental and community groups requested a rehearing before FERC based on alleged NEPA violations and concerns about the project's proximity to the Indian Point Energy Center (a nuclear facility in Westchester County, New York) and the safety risks of pipeline construction adjacent to an active quarry.[38] In January 2016, FERC denied the request for rehearing and dismissed the requests for a stay.[39] The City of Boston Delegation, the Town of Dedham, Massachusetts, and Riverkeeper, Inc., with a coalition of environmental groups, community organisations, and individuals then sought judicial review of FERC's decision to issue the Section 7 certificate for the AIM Project to Algonquin.[40]

Petitioners raised two main NEPA arguments. First, Petitioners contended that FERC improperly segmented its environmental review by failing to evaluate three Algonquin projects (the AIM Project, the Atlantic Bridge project and the Access Northeast project) in a single EIS.[41] Relatedly, Petitioners asserted that FERC did not give adequate consideration to the cumulative environmental impacts of those three projects in the EIS for the AIM Project.[42] The court held that FERC's separate EIS for the AIM Project was permissible because the projects were not under simultaneous review, were unrelated, did not depend on one another for justification, and were financially and functionally independent.[43] The court also held that FERC appropriately considered the cumulative environmental effects of the Atlantic Bridge and Access Northeast projects based on the foreseeability of the projects and information available at the time the AIM Project was under review.[44]

Petitioners also challenged FERC's determination that the AIM Project did not pose an increased threat to the Indian Point Energy Center.[45] Specifically, Petitioners contended that FERC erred in accepting and relying upon safety findings by the NRC and Entergy (the operator of Indian Point) instead of competing expert analyses.[46] The court upheld FERC's finding that the AIM Project did not pose an increased threat to Indian Point because it found no reason to reject FERC's decision to credit the NRC's safety conclusions, stating, "[a]gencies can be expected to respect the views of such other agencies as to those problems for which those other agencies are more directly responsible and more competent".[47]

36. City of Boston Delegation, 897 F.3d 241, 246-47.
37. Order Issuing Certificate and Approving Abandonment, Algonquin Gas Transmission, LLC, 150 FERC para. 61,163 (2015), www.ferc.gov/CalendarFiles/20150303170720-CP14-96-000.pdf.
38. City of Boston Delegation, 897 F.3d 241, 247. See also Order Denying Rehearing, Algonquin Gas Transmission, LLC, 154 FERC para. 61,048 (2016), available at: www.ferc.gov/CalendarFiles/20160128180805-CP14-96-001.pdf.
39. Order Denying Rehearing, 154 FERC para. 61,048.
40. City of Boston Delegation, 897 F.3d 241, 247. See also Joint Final Brief of Petitioners, City of Boston Delegation, 897 F.3d 241. The Court first addressed standing of the parties, finding the City of Boston Delegation did not have standing, while the Town of Dedham, Riverkeeper, Inc., and other coalition members did have standing. City of Boston Delegation, 897 F.3d 241, 248-51.
41. *Ibid*., p. 251
42. *Ibid*.
43. *Ibid*., pp. 251-53.
44. *Ibid*., pp. 253-54.
45. *Ibid*., p. 254.
46. *Ibid*., p. 255.
47. *Ibid*., p. 255 (internal quotations omitted), citing City of Pittsburgh v. Fed. Power Commission, 237 F.2d 741, 754 (DC Cir. 1956).

National legislative and regulatory activities

France

Liability and compensation

Ministerial Order of 4 December 2017 amending the Annex of the amended Ministerial Order of 19 August 2016 listing the sites benefitting from a reduced amount of liability pursuant to Decree No. 2016-333 of 21 March 2016 implementing Article L. 597-28 of the French Environmental Code and relating to third party liability in the field of nuclear energy[1]

Article L. 597-28 of the French Environmental Code sets the amount for which the operator of a nuclear installation shall be liable for a given nuclear incident at EUR 700 million, which can be reduced to EUR 70 million for the same nuclear incident when only low risk installations are operated on a given site.

The Decree of 21 March 2016 sets out the characteristics of low risk installations. Pursuant to Article 3 of this Decree, the Annex to the Ministerial Order of 19 August 2016 lists the nuclear sites deemed to be low risk and entitling their operators to a reduced amount of liability. The Ministerial Order of 4 December amends this list by adding the maintenance and storage facility for machines and tools from nuclear power plants of Saint-Dizier (Base de Maintenance de Saint-Dizier) (BAMAS), operated by SOCODEI.

Nuclear safety and radiological protection (including nuclear emergency planning)

Decree No. 2018-434 of 4 June 2018 concerning various provisions on nuclear matters[2]

Decree No. 2018-437 of 4 June 2018 on the protection of workers against the risks arising from ionising radiation[3]

Decree No. 2018-438 of 4 June 2018 on the protection against the risks arising from ionising radiation to which some workers are exposed[4]

The main purpose of these three decrees is to transpose the Euratom Basic Safety Standards.[5] Decree No. 2018-434 amends the provisions of the French Public Health Code; the French Defence Code; the French Environmental Code; Decree No. 2007-1557 of 2 November 2007 concerning basic nuclear installations (*installations nucléaires de base*) (INBs) and the supervision of the transport of radioactive materials with respect to nuclear safety; and Decree No. 2006-649 of 2 June 2006 on mining

1. *Journal officiel "Lois et Décrets"* [Official Journal of Laws and Decrees] (J.O.L. et D.), 7 Dec. 2017, text no. 13.
2. J.O.L. et D., 5 June 2018, text no. 27.
3. J.O.L. et D., 5 June 2018, text no. 65.
4. J.O.L. et D., 5 June 2018, text no. 66.
5. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, *Official Journal of the European Union* (OJ) L 13 (17 Jan. 2014) (Euratom Basic Safety Standards).

operations, underground storage and the regulations governing them. These amendments concern in particular:

- the management of sources of ionising radiation and in particular the protection of these sources from malicious activities (theft, unauthorised use, degradation, etc.) and the monitoring thereof;
- the organisation of radiation protection, with the obligation for the head of a nuclear activity to appoint at least one expert in radiation protection to provide assistance and advice on all issues pertaining to the protection of the population and the environment from radiation;
- the creation of a registration system for nuclear activities in a list established by a decision of the Nuclear Safety Authority (Autorité de sûreté nucléaire) (ASN), ratified by the minister responsible for radiation protection. This registration system is in addition to the systems for permits and declarations;
- the conditions for protection against exposure to natural sources of ionising radiation such as radon.

Decree No. 2018-437 amends the French Labour Code as well as several decrees to strengthen the effectiveness of the risk prevention measures for workers, ensuring an approach that integrates all professional risks, and better graduating requirements concerning the nature and extent of risk.

Lastly, Decree No. 2018-438 amends the provisions in the French Labour Code regarding the protection against the risks arising from ionising radiation of certain categories of workers, pregnant women and young people.

The provisions of these various decrees came into force on 1 July 2018, subject to transitional arrangements.

Germany

General legislation, regulations and instruments

16th Act to Amend the Atomic Energy Act

- Background and history of the Act

By the 2002 Act on the Phase-out of Nuclear Power,[6] the German legislator decided to only allow further commercial use of nuclear energy for electricity generating purposes for a limited period of time. According to the 2002 Act, operating licences were to expire once the defined electricity volumes granted to the respective plant and listed in an annex to the Act had been produced; under certain conditions, the allocated electricity volume could be transferred to other plants.

6. Act on the Controlled Phasing Out of the Use of Nuclear Power for the Commercial Generation of Energy of 22 April 2002, *Bundesgesetzblatt* [Federal Law Gazette] (BGBl.) 2002 I, p. 1351 (2002 Act). See also Nuclear Energy Agency (NEA) (2002), "Act on the Phase-out of Nuclear Power (2002)", *Nuclear Law Bulletin*, No. 69, OECD, Paris, pp. 76-77 and Vorwerk, A. (2002), "The 2002 Amendment to the German Atomic Energy Act Concerning the Phase-out of Nuclear Power", *ibid.*, pp. 7-14. The Atomic Energy Act in its consolidated 2002 version is reproduced in the Supplement to NEA (2002), *Nuclear Law Bulletin*, No. 70, OECD, Paris.

By the 11th Act to Amend the Atomic Energy Act of 8 December 2010,[7] the legislator changed this approach, accepted nuclear energy as a "bridge technology" for a transitory period and permitted its further use beyond the limited electricity volumes established under the 2002 Act by increasing the individual electricity volumes. However, this decision was revoked after the 2011 Fukushima Daiichi nuclear power plant accident by the 13th Act to Amend the Atomic Energy Act of 31 July 2011,[8] which stipulated that the additional electricity volumes allocated by the 11th Amendment be revoked. The more restricted electricity volumes of the 2002 Act were made applicable again. Moreover, the commercial use of nuclear energy has to be ceased as early as possible and in the year 2022 at the latest.

Several constitutional complaints (*Verfassungsbeschwerden*) were filed against the 13th Amendment. The complaints challenge the Amendment, claiming a violation of the property rights of licence holders and owners of nuclear power plants.

The Federal Constitutional Court in its Judgement of 6 December 2016[9] confirmed that the 13th Amendment, in principle and in light of its overall scheme, is in conformity with the requirements of the Constitution (*Grundgesetz*, "Basic Law") including the constitutional property guaranty of Article 14 of the Basic Law. The Act is, however, in conflict with Article 14, paragraph 1 of the Basic Law and thus unconstitutional as it does not contain provisions to guarantee compensation for investments made in the period between 28 October 2010 and 16 March 2011 in legitimate reliance by the licence holders or owners upon the additional electricity volumes allocated by the 11th Amendment. Those investments were devalued by the 13th Amendment and the economic damage thus suffered needs to be compensated.

The Court further ruled that adequate compensation is due regarding the Brunsbüttel, Krümmel and Mülheim-Kärlich nuclear power plants where considerable parts of the electricity volumes allocated by the 2002 Act could not be used for electricity generation within group-owned plants.

According to the Judgement, the remedy of these complaints is part of the discretionary power (*Gestaltungsermessen*) of the legislator. The Judgement requires the legislator to adopt legislation with a view to correcting the constitutional deficiencies of the existing Act by 30 June 2018 at the latest. As such, the 16th Act to Amend the Atomic Energy Act of 10 July 2018 was adopted to implement the Court's

7. BGBl. 2010 I, p. 1814 (11th Amendment). For more information on the 11th Amendment, see NEA (2010), "Amendment to the Atomic Energy Act extending the operating lifetime of nuclear power plants (2010)", *Nuclear Law Bulletin*, No. 86, OECD, Paris, pp. 76-77.
8. BGBl. 2011 I, p. 1704 (13th Amendment). For more information on the 13th Amendment, see NEA (2011), "Legislative package on the change of energy policy; 13th Amendment to the Atomic Energy Act (2011)", *Nuclear Law Bulletin*, No. 88, OECD, Paris, pp. 78-79.
9. BGBl. 2016 I, p. 3451. For more information on the Court Judgement, see NEA (2018), "Judgement of the Federal Constitutional Court of 6 December 2016", *Nuclear Law Bulletin*, No. 100, OECD, Paris, pp. 85-87.

requirements.[10] The 16th Amendment entered into force on 4 July 2018, after the European Commission granted its state aid law approval.[11]

- Content of the 16th Amendment

The 16th Amendment consists of three Articles. Article 1 inserts three new sections into the Atomic Energy Act (AEA):[12] sections 7e, 7f and 7g. Article 2 adapts the Code of Administrative Court Procedure to the amended Atomic Energy Act by inserting a new section 48, paragraph 1, sentence 1a into the Code. Article 3 determines the date of the entry into force of the Act.

- Article 1 of the 16th Amendment

Compensation for failed investments

New AEA, section 7e establishes a claim for adequate monetary compensation (*angemessener Ausgleich in Geld*) by the owner or licence holder of a nuclear power plant provided that evidence is given that in the period between 28 October 2010 and 16 March 2011 and in reliance upon the legal position established under the 11th Amendment, necessary investments for the nuclear power plant were made and further provided that the investments became worthless exclusively as a consequence of the withdrawal of the additional electricity volumes granted under the 11th Amendment through the 13th Amendment (AEA, section 7e, paragraph 1).

If any economic advantages could have been gained by the licence holder or owner from the withdrawal of the additional electricity volumes, the amount has to be deducted from the compensation granted under paragraph 1. The economic advantages include advantages that the licence holder or owner did not take but which could have reasonably been taken by applying due care. The provision of the Civil Code on contributory negligence (*Bürgerliches Gesetzbuch*, section 254) applies analogously (AEA, section 7e, paragraph 2).

AEA, section 7e, paragraph 3 lists additional types of compensation that must be counted towards the compensation paid under paragraph 1. The list covers four cases where the person entitled to compensation under paragraph 1 has company law links with other companies that are involved in the compensation regime under the Act.

Compensation for electricity volumes

AEA, section 7f deals with special problems related to the Brunsbüttel, Krümmel and Mülheim-Kärlich nuclear power plants. According to paragraph 1, the licensees of

10. BGBl. 2018 I, p. 1122 (16th Amendment). The draft text with Explanatory Memorandum is available at: *Bundestags-Drucksache* 19/2508 and (with identical wording) *Bunderats-Drucksache* 205/18. In the course of the discussions in Parliament a public hearing took place before the Bundestags-Ausschuss für Umwelt, Naturschutz und nukleare Sicherheit [Bundestag Committee on the Environment, Nature Conservation and Nuclear Safety], 12th Session 13 June 2018, 19. *Wahlperiode Protokoll* No. 19/12 (available at: www.bundestag.de/ausschuesse/a16_umwelt/oeffentliche_anhoerungen#url=L2F1c3NjaHVlc3NlL2ExNl91bXdlbHQvb2VmZmVudGxpY2hlX2FuaG9lcnVuZ2VuL29lZmZlbnRsaWNoZS1hbmhvZXJ1bmctMTItc2l0enVuZy1hdG9tZ2VzZXR6LWluaGFsdC81NTcyODA=&mod=mod544426).
11. BGBl. 2018 I, p. 1124.
12. *Gesetz über die friedliche Verwendung der Kernenergie und den Schutz gegen ihre Gefahren (Atomgesetz)* [Act on the Peaceful Utilisation of Atomic Energy and the Protection against its Hazards (Atomic Energy Act)] of 23 December 1959, as amended and promulgated on 15 July 1985 (BGBl. I, p. 1565), as amended. An unofficial English translation can be found on the website of the Federal Office for Radiation Protection (Bundesamt für Strahlenschutz) at: www.bfs.de/SharedDocs/Downloads/BfS/EN/hns/a1-english/A1-01-16-AtG.pdf?__blob=publicationFile&v=7.

said plants have a monetary claim for adequate compensation if the electricity volumes allocated to one of the plants could not be used for intragroup electricity generation. The claim for compensation arises at the end of 31 December 2022 if the originally allocated electricity volumes (AEA, Annex 3, column 2) could not have been produced and transferred to another plant. To claim compensation, the entitled person must prove that serious measures were taken without delay to attempt to transfer electricity volumes under appropriate conditions in the period between 4 July 2018 and 31 December 2022 (AEA, section 7, paragraph 1b).

In accordance with AEA, section 7f, paragraph 2, the amount of compensation shall be determined according to the average standard market rates in the period between 6 August 2011 and 31 December 2022. From that amount, the expected electricity generation costs, including overhead costs, will be deducted. When determining the amount of compensation, omitted operating risks, omitted investment risks and omitted marketing risks have to be taken into account in an appropriate way. In this context, publicly available cost estimates may be used as a basis for evaluation.

AEA, section 7f, paragraph 3 lists four additional types of compensation that result in a deduction of the compensation granted under AEA, section 7, paragraph 1. These relate to cases where the entitled person has a company link with other entities involved.

Administrative procedure

AEA, section 7g provides the administrative procedure to apply for compensation. According to paragraph 1, claims for compensation for failed investments (AEA, section 7e) must be made in writing within one year of 4 July 2018 at the Federal Ministry competent for nuclear safety, which is currently the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit) (BMU). The claim expires if it is not made within that time. The person making the claim must provide all documents necessary to justify the claim, particularly evidence regarding the conclusion of contracts, orders, terminations, cancellations, payments, refund of payments and tax benefits received. The compensation will be granted by a decision of the competent Ministry in agreement with the Federal Ministry for Economic Affairs and Energy.

AEA, section 7g, paragraph 2 provides that compensation for electricity volumes under AEA, section 7g must be made in writing to the Federal Ministry competent for nuclear safety (currently the BMU) within one year of 31 December 2022. All claims expire after this time. The application shall contain information on the size of the electricity volumes, expressed in kilowatt hours, for which compensation is being claimed. The compensation will be granted by a decision in writing of the competent Ministry in agreement with the Ministry for Economic Affairs and Energy.

The competent Federal Ministry may, setting a deadline, impose an obligation on the claimant to present all documents and material necessary to determine and test the circumstances that justify a claim for compensation. Section 26 of the Administrative Procedure Act remains untouched (AEA, section 7g, paragraph 3).

- Article 2 of the 16th Amendment

Article 2 of the 16th Amendment amends section 48 of the Code of Administrative Court Procedure (*Verwaltungsgerichtsordnung*) and assigns the Higher Administrative Court (*Oberverwaltungsgericht*) the competence to hear first instance compensation claims under AEA, sections 7e and 7f.

Lithuania

Nuclear safety and radiological protection (including nuclear emergency planning)

Transposition of the Euratom Basic Safety Standards[13]

Lithuanian legislation on radiation protection was amended to transpose the Euratom Basic Safety Standards. The following new aspects were introduced into regulation on radiological protection of activities with sources of ionising radiation in nuclear energy area by an amendment to the Law on Radiation Protection:[14]

- justification of activities with the sources of ionising radiation. New Nuclear Safety Requirements BSR-1.9.5-2018[15] related to justification were adopted to further specify the procedure of applying for justification, assessing a justification application and publishing the list of justified activities.
- recognition of radiation protection experts. New Nuclear Safety Requirements BSR-1.9.6-2018[16] further detail procedural provisions on recognition of radiological protection experts (e.g. list of documents to be provided with the application, areas of consultation, etc.). The new requirements also require that those carrying out activities with sources of ionising radiation in the nuclear energy area consult with radiological protection expert.
- recognition of dosimetry services. New Nuclear Safety Requirements BSR-1.9.7-2018[17] were adopted to further specify procedural requirements for the recognition of dosimetry services (e.g. of documents to be provided with the application, etc.).

Furthermore, the system of licensing and enforcement measures was revised and a requirement to register when undertaking a practice with sources of ionising radiation was established in the Amendments to the Law on Radiation Protection.

In addition, the Law on the Management of Radioactive Waste was also amended as a part of the transposition of the Directive. The main objective of the

13. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, OJ L 13 (17 Jan. 2014) (Euratom Basic Safety Standards).
14. Law of the Republic of Lithuania amending the Law on Radiation Protection No. VIII-1019, available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/e233dc307eb511e8ae2bfd1913d66d57.
15. Order No. 22.3-182 (2018) of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-1.9.5-2018 "Assessment of Justification of Activities with the Sources of Ionising Radiation in the Nuclear Energy Area", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/2114f6409aff11e8b93ad15b34c9248c.
16. Order No. 22.3-204 (2018) of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-1.9.6-2018 "Recognition of Radiation Protection Expert for Activities with Sources of Ionizing Radiation in Nuclear Energy Area and Duties of Undertakings carrying out Aforementioned Activities to Consult with Radiation Protection Expert", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/c0552d30ac3211e88f64a5ecc703f89b.
17. Order No. 22.3-203 (2018) of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-1.9.7-2018 "Rules of Procedure for Recognition of Dosimetry Services", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/d4511a20ac3111e88f64a5ecc703f89b.

amendment[18] was to transpose new definitions of terms such as "disused source", "clearance levels", etc., and to include new requirements for disused sources. Regarding the regulation of clearance levels, existing Nuclear Safety Requirements were amended[19] to reflect provisions of the Directive on the matter.

Nuclear Safety Requirements for Ageing Management

New Nuclear Safety Requirements BSR-1.8.4-2018[20] were adopted to replace requirements on ageing management from 1999. The new requirements introduce revised provisions on the:

- content of a licensee's internal ageing management-related documents;
- aspects of ageing management that need to be considered in different stages of a nuclear facilities' lifetime;
- mandatory information to collect and store on the ageing of structures and components; and
- screening of structures and components for determination of which shall be a part of ageing management programme, etc.

Amendments of Nuclear Safety Requirements regarding Safety Improvement Measures and Periodic Safety Analysis

Amendments to Nuclear Safety Requirements BSR-3.1.2-2017,[21] Nuclear Safety Requirements BSR-3.2.2-2016[22] and Nuclear Safety Requirements BSR-3.1.1-2016[23] were adopted to:

- introduce a mandatory requirement to develop and maintain a programme for safety improvement measures, as well as to set its content and requirements for changes; and

18. Law of the Republic of Lithuania amending Articles 2, 8, 24, 25, the title of the ninth chapter and the appendix of Law on the Management of Radioactive Waste No. VIII-1190, available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/29b3b1707eb611e8ae2bfd1913d66d57.
19. Order No. 22.3-34 (2018) of the Head of State Nuclear Power Safety Inspectorate on the Amendment of Order No. 22.3-90, 27 September 2011, of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-1.9.2-2011 "Establishment and Application of Clearance Levels of Radionuclides for the Materials and Waste Generated During the Activities in the Area of Nuclear Energy", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/bdf2e5100bd211e8a5fc9d9b3a58917b.
20. Order No. 22.3-169 (2018) of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-1.8.4-2018 "Ageing Management of Structures, Systems and Components Important to Safety of Nuclear Facility", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/64cfd3c0900811e8b93ad15b34c9248c.
21. Order No. 22.3-150 (2018) of the Head of State Nuclear Power Safety Inspectorate on the amendment of Order No. 22.3-120, 31 December 2010, of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-3.1.2-2017 "Pre-disposal Management of Radioactive Waste at the Nuclear Facilities", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/20e2b1007aa511e8ae2bfd1913d66d57.
22. Order No. 22.3-151 (2018) of the Head of State Nuclear Power Safety Inspectorate on the amendment of Order No. 22.3-188, 30 November 2016, of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-3.2.2-2016 "Radioactive Waste Repository", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/656c02907aa511e8ae2bfd1913d66d57.
23. Order No. 22.3-149 (2018) of the Head of State Nuclear Power Safety Inspectorate on the amendment of Order No. 22.3-59, 21 July 2010, of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-3.1.1-2016 "General Requirements for Spent Nuclear Fuel Storage Facility of the Dry Type", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/cedaef807aa411e8ae2bfd1913d66d57.

- harmonise the requirements of the periodic safety analysis with new provisions on the matter introduced by the Amendments to the Law on Nuclear Safety (adopted in 2017), most notably, to amend the content of periodic safety analysis report.

Radioactive waste management

Amendments to the Law on the Management of Radioactive Waste

The Law on the Management of Radioactive Waste was amended[24] to streamline regulation concerning the designated manager of radioactive waste. Provisions on the status of the manager of radioactive waste and its main duties were amended; and State Enterprise Ignalina Nuclear Power Plant was designated as a manager of radioactive waste in Lithuania.

The Law was supplemented with provisions on review and authorisation of the final closure plan of the radioactive waste repository. The amendments come into force on 1 January 2019.

Licensing and regulatory infrastructure

Amended rules on the issuance of licences and permits

Resolution No. 722, 20 June 2012, on licensing and permitting was amended[25] to reflect recent amendments to the Law on Nuclear Safety. Namely, procedural provisions related to removing licence conditions from the appendix of the licence and subsequently providing that an application and its associated documents will serve as a basis for oversight were introduced. As prescribed in the Law on Nuclear Safety, the Resolution now includes a list of application documents, which, after the licence or permit are issued, must be provided to the regulatory body for approval prior to changing them, and a list of documents that may be changed without such prior approval (only providing information about the changes). The amendments also intended to reflect the most recent relevant licensing practice, therefore the list of application documents itself was changed.

Nuclear installations

Amendments of Nuclear Safety Requirements regarding lifting and handling equipment

Nuclear Safety Requirements BSR-3.1.1-2016[26] and Nuclear Safety Requirements BSR-3.1.2-2017[27] were supplemented with provisions on the design and use of lifting

24. Law of the Republic of Lithuania Amending Articles 2, 3, 4, 5, 7, 9, 10, 11, 15 and 21 of Law on the Management of Radioactive Waste No. VIII-1190 and Repealing Article 81, available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/dc187c607eb611e8ae2bfd1913d66d57.
25. Resolution No. 549 (2018) of the Government of the Republic of Lithuania on the amendment of Resolution No. 722, 20 June 2012, of the Government of the Republic of Lithuania regarding the approval of Regulations on the Issue of Licenses and Permits Necessary to Engage in Nuclear Energy Activities, available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/2ba8fe506b1911e8bbc2876081bf7fb5.
26. Order No. 22.3-29 (2018) of the Head of State Nuclear Power Safety Inspectorate on the amendment of Order No. 22.3-59, 21 July 2010, of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-3.1.1-2016 "General Requirements for Spent Nuclear Fuel Storage Facility of the Dry Type", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/cbc6d600065611e8b3e7ba9cffd043b1.
27. Order No. 22.3-28 (2018) of the Head of State Nuclear Power Safety Inspectorate on the amendment of Order No. 22.3-120, 31 December 2010, of the Head of State Nuclear Power Safety Inspectorate on the approval of Nuclear Safety Requirements BSR-3.1.2-2017 "Pre-disposal Management of Radioactive Waste at the Nuclear Facilities", available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/75c24460065611e8b3e7ba9cffd043b1.

and handling equipment designated for work with containers and other safety-related structures and components.

Amended Rules for Site Evaluation

Resolution No. 83, 25 January 2012, on the approval of Rules of Procedure of the Assessment of the Nuclear Facilities' Site Evaluation Report was amended[28] to be applicable for all nuclear facilities (previously it was only applicable to nuclear power plants). The Resolution includes procedural requirements for site evaluation of nuclear facilities, such as aspects to be reviewed by governmental institutions, requirements for format of the site evaluation report, etc.

Slovak Republic

Nuclear safety and radiological protection (including nuclear emergency planning)

New act on protection against radiation and amendments and alterations of several additional acts

New Act No. 87/2018 Coll. on the Protection against radiation and on amendment and alterations of several acts ("Act") came into force on 1 April 2018. The aim of this new Act was mainly to transpose the Euratom Basic Safety Standards.[29] In addition, the provisions of the previously transposed Council Directive 2013/51/Euratom[30] were included into this new legal provision on protection against radiation exposure. The focus of the Act was to revise and adapt the activities already in practice and to lay down new obligations in relation to state regulation of radiological protection.

The new, graded approach to the regulation and control of the usage of various sources of ionising radiation applies to the sources of ionising radiation and to the activities leading to radiation based on the possible risk of radiation exposure and on the impact on the health of workers or inhabitants. These range from the activities excluded from the scope of this Act, to activities with reporting obligations, to activities with an obligation to register and seek approval from the relevant body. The Act differentiates between exposure caused by a regularly-performed activity and that caused by an extraordinary radiation situation.

Radiation exposure limits are also established, mainly regarding the limits of exposure to the eye lenses to exclude work-related diseases caused by ionising radiation exposure. The Act encompasses safety requirements required for safe use of sources of ionising radiation; prevention of illegal manipulation with such sources; and prevention of their misuse for terrorist attacks.

This Act was executed by the following subsequent secondary legislation:

- Decree of the Ministry of Health of the Slovak Republic No. 96/2018 Coll. on establishment of details on activities of radiation monitoring network;

28. Resolution No. 790 (2018) of the Government of the Republic of Lithuania on the amendment of Resolution No. 83, 25 January 2012, of the Government of the Republic of Lithuania on the approval of Rules of Procedure of the Assessment of the Nuclear Facilities' Site Evaluation Report, available (in Lithuanian) at: www.e-tar.lt/portal/lt/legalAct/05422730a1ee11e8b93ad15b34c9248c.
29. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, OJ L 13 (17 Jan. 2014) (Euratom Basic Safety Standards).
30. Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption, OJ L 296 (7 Oct. 2013).

- Decree of the Ministry of Health of the Slovak Republic No. 98/2018 Coll. on establishment of details on limitation of exposure of workers and inhabitants to the ionising radiation;
- Decree of the Ministry of Health of the Slovak Republic No. 99/2018 Coll. on ensuring the protection against radiation;
- Decree of the Ministry of Health of the Slovak Republic No. 100/2018 Coll. on the limitation of exposure of inhabitants to ionising radiation from drinking water, from natural mineral water and spring water; and
- Decree of the Ministry of Health of the Slovak Republic No. 101/2018 Coll. on details of ensuring the protection against ionising radiation during medical treatment.

Additional secondary legislation, the Decree of the Nuclear Regulatory Authority of the Slovak Republic No. 76/2018 Coll., laying down the special materials and equipment falling under the supervision of the Nuclear Regulatory Authority of the Slovak Republic, came into the force on 1 April 2018. This decree relates to recent provisions in relation to dual-use goods.

International co-operation

The regular quadrilateral meeting of nuclear regulatory authorities of the Czech Republic, Hungary, the Slovak Republic and Slovenia was held from 3-4 May 2018 at the Hungarian Atomic Energy Authority (HAEA) in Budapest, Hungary. During the meeting, information on the developments, recent activities and international situation in the field of nuclear energy was exchanged and discussed. The next meeting will take place in one year in Slovenia.

From 22-25 May 2018, the Nuclear Regulatory Authority of the Slovak Republic hosted a regional workshop on periodic safety review programmes. The aim of the workshop was to exchange information on appropriate methods, criteria and procedures for the evaluation of safety factors; on the usage of international standards; and on the interaction between the involved parties. Representatives of the International Atomic Energy Agency as well as Armenia, Bulgaria, the Czech Republic, Hungary, Kazakhstan, Lithuania, Poland, Romania, Russia, the Slovak Republic, Slovenia and Ukraine participated.

The bilateral meeting of representatives of Austria and the Slovak Republic started on 7 June 2018 in Eisenstaedt, Austria. Topics of common interest of the parties included nuclear safety and radiological protection issues, according to the Agreement concluded between both countries. The delegation of the Slovak Republic was led by the Chairman of Nuclear Regulatory Authority, Ms Marta Žiaková and supported by the presence of the Ambassador of the Slovak Republic in Austria, Mr Peter Misik.

Slovenia

Nuclear safety and radiological protection (including nuclear emergency planning)

New regulations adopted on the basis of Ionizing Radiation Protection and Nuclear Safety Act from 2017

In December 2017, the National Assembly of the Republic of Slovenia adopted the new Act on the Protection against Ionising Radiation and Nuclear Safety (ZVISJV-1).[31] The 2017 Act extended the validity of certain executive regulations issued under the previous Act, last amended in 2015 (ZVISJV-D) and, on the other hand, it determined a nine-month (and exceptionally eighteen-month) deadline for the adoption of other new executive regulations, in particular those related to the transposition of the Euratom Basic Safety Standards Directive.[32]

By the end of July 2018, four Government Decrees (denoted by the abbreviation "UV"), two Rules of the Minister responsible for the Environment (denoted by the abbreviation "JV") and six Rules of the Minister responsible for Health (denoted by the abbreviation "SV") were adopted. The regulations adopted so far are:

- Decree on activities involving radiation – UV1 (*Official Gazette of the Republic of Slovenia*, No. 19/18);
- Decree on dose limits, reference levels and radioactive contamination – UV2 (*Official Gazette of the Republic of Slovenia*, No. 18/18);
- Decree on national radon programme regulation – UV4 (*Official Gazette of the Republic of Slovenia*, No. 18/18);
- Decree on the reduction of exposure due to natural radionuclides and existing exposure situations – UV5 (*Official Gazette of the Republic of Slovenia*, No. 38/18);
- Rules on the use of radiation sources and on activities involving radiation – JV/SV2 (*Official Gazette of the Republic of Slovenia*, No. 27/18);
- Rules on the monitoring of radioactivity – JV10 (*Official Gazette of the Republic of Slovenia*, No. 27/18);
- Rules on the criteria of using ionising radiation sources for medical purposes and practices involving non-medical imaging exposure – SV3 (*Official Gazette of the Republic of Slovenia*, No. 33/18);
- Rules on special radiation protection requirements and the method of dose assessment – SV5 (*Official Gazette of the Republic of Slovenia*, No. 47/18);
- Rules on approving of experts performing professional tasks in the field of ionising radiation – SV7 (*Official Gazette of the Republic of Slovenia*, No. 39/18);
- Rules on authorising radiation protection experts – SV7A (*Official Gazette of the Republic of Slovenia*, No. 47/18);

31. For more information, see NEA (2018), "New Ionising Radiation Protection and Nuclear Safety Act", *Nuclear Law Bulletin*, No. 100, OECD, Paris, pp. 100-101.
32. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, OJ L 13 (17 Jan. 2014) (Euratom Basic Safety Standards).

- Rules on the obligations of the person carrying out a radiation practice and person possessing an ionising radiation source – SV8 (*Official Gazette of the Republic of Slovenia*, No. 43/18); and
- Rules on radiation protection measures in controlled and monitored areas – SV8A (*Official Gazette of the Republic of Slovenia*, No. 47/18).

The majority of the regulations, although newly adopted on the basis of the 2017 Act, in practice represent amendments of previous regulations adopted on the basis of ZVISJV-D, which was in force before the entry into force of the 2017 Act. Due to legislative requirements, the regulations were adopted as new, rather than amended regulations. Because of this, users are generally familiar with the regulations and they do not introduce many new requirements.

On the basis of the transitional and final provisions of the 2017 Act, two other regulations (amendments of the Decree on the content and elaboration of protection and rescue plans and Decree on verification of radioactivity of shipments that may contain the radioactive sources of unknown origin) should be prepared, but their adoption is delayed.

All the above-mentioned regulations were prepared by the Slovenian Nuclear Safety Administration and the Slovenian Radiation Protection Administration.

Switzerland

Radioactive waste management

Clearance for drilling in the potential siting areas for future deep geological repositories by the Federal Department of the Environment, Transport, Energy and Communications (DETEC)

In 2016 and 2017, the National Cooperative for the Disposal of Radioactive Waste (NAGRA) submitted 22 applications for drilling permits in the potential siting areas for a future deep geological repository[33] to the Swiss Federal Office of Energy (SFOE): 8 for East Jura, 8 for northeast Zurich and 6 for North Lägern. All the requests were made available for public consultation, giving rise to 472 objections for East Jura, 99 for northeast Zurich and 132 for North Lägern.

The drilling will enable NAGRA to carry out in-depth examinations of the underground geological environment as of 2019. NAGRA will build on this analysis to announce in 2022 the sites for which it will prepare and submit a general licence application to construct deep geological repositories (repository for high-level waste, repository for low- and intermediate-level waste, combined repository). The number of boreholes that will actually have to be drilled to complete the geological picture will depend on the results. NAGRA will probably not drill all 22 boreholes.

Every application for a drilling permit continues to be subject to an individual authorisation procedure, the duration of which varies according to the number of objections, the arguments presented and the clarifications required.[34]

33. More information on the "Sectoral Plan for Deep Geologic Repositories" is available at: www.uvek-gis.admin.ch/BFE/storymaps/EA_SachplanGeologischeTiefenlager/?lang=en as well as NEA (2018), "Sectoral plan for deep geological repositories and Stage 2 consultation", *Nuclear Law Bulletin*, No. 100, OECD, Paris, pp. 102-103.
34. For the authorisation status of the application procedures for drilling permits as of 21 August 2018, please see: www.newsd.admin.ch/newsd/message/attachments/53309.pdf.

Nuclear installations

Decommissioning order for the Mühleberg nuclear power plant received on 20 June 2018

The Mühleberg nuclear power plant will be the first nuclear power reactor in Switzerland to be shut down and dismantled. In its 20 June 2018 decommissioning order for Mühleberg, DETEC stipulated that the decommissioning be carried out in accordance with the decommissioning project submitted by BKW Energie AG (BKW) in 2015. Various requirements will have to be met, in particular the technical, organisational and procedural conditions laid down by the Swiss Federal Nuclear Safety Inspectorate (ENSI) in its 30 August 2017 report. These conditions concern, in particular, the implementation of three phases for the organisation of the decommissioning and various authorisations.

After final shutdown of the nuclear power plant on 20 December 2019, the first step will be to establish safe post-operation conditions. To this end, all the fuel elements will be transferred from the reactor core into the spent fuel pool and all necessary measures taken to ensure a high level of safety. The work aimed at establishing safe post-operation conditions has been approved by ENSI on the basis of the existing operating licence, as part of the authorisation procedure and therefore is not regulated in the decommissioning order.

The decommissioning order covers the following decommissioning work: preparatory measures and the division of activities into three phases until official notification that the installation no longer represents a radiological risk. In its order, the DETEC stipulated that BKW must submit to the SFOE, by the end of 2027 at the latest, a decommissioning project for the conventional dismantling of the installation.[35]

As the decommissioning order was not appealed before the Swiss Federal Administrative Court, it has entered into force.

United States

General legislation, regulations and instruments

NRC Commissioners confirmed and sworn in

The US Nuclear Regulatory Commission (NRC) is headed by five Commissioners nominated by the President and confirmed by the US Senate.[36] The Commission is a collegial body that formulates policies, develops regulations, issues orders to licensees and adjudicates legal matters. Annie Caputo was sworn in as a Commissioner on 29 May 2018 and is currently serving the remainder of a five-year term ending 30 June 2021. David A. Wright was sworn in as a Commissioner on 30 May 2018 and is currently serving the remainder of a five-year term ending 30 June 2020. Jeffery Baran, who began his first term as Commissioner in October 2014, was confirmed by the Senate for a new term expiring 30 June 2023.

NRC publishes guidance on developing principal design criteria for non-light-water reactors

On 9 April 2018, the NRC published in the *Federal Register* a notice of the availability of Regulatory Guide 1.232 for developing principal design criteria (PDC) for proposed

35. For more information, please see the SFOE website on decommissioning (in French) at: www.bfe.admin.ch/themen/00511/06480/index.html?lang=fr.
36. The Commissioners serve five-year terms, with one term expiring every year on June 30. No more than three Commissioners may be of the same political party. One of the Commissioners is designated by the President as Chairman.

non-light water nuclear reactor designs.[37] This Regulatory Guide provides guidance on how to adapt the general design criteria (GDC) in Appendix A to 10 CFR Part 50 for non-light-water reactor designs.[38]

Nuclear installations

Construction permit issued for Northwest Medical Isotopes, LLC

Northwest Medical Isotopes, LLC (NWMI) submitted an application for a permit to construct a medical radioisotope production facility at the Discovery Research Ridge Research Park in Columbia, Missouri in 2015. Following the completion of the staff's review and a hearing before the Commission, on 9 May 2018, the NRC issued a construction permit to NWMI for a molybdenum-99 production facility in Columbia, Missouri.

Radioactive waste management

Holtec International, Inc. submits application for interim storage facility to the NRC

By letter dated 30 March 2017, as supplemented,[39] Holtec International, Inc. (Holtec) submitted an application for a specific independent spent fuel storage installation (ISFSI) licence to construct and operate a consolidated interim storage facility in Lea County, New Mexico. Holtec plans to use HI-Storm UMAX canisters to store up to 5 000 metric tons of commercial spent nuclear fuel for a 40-year licence term. On 28 February 2018, the NRC informed Holtec that its application contained sufficient information for docketing and the NRC to begin its detailed review.[40]

Radioactive materials (including physical protection)

Wyoming becomes an Agreement State

On 25 September 2018, the NRC entered into an agreement with the state of Wyoming, transferring regulatory authority to the state over certain radioactive materials. Wyoming becomes the 38th state to have such an agreement with the

37. "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors", 83 Fed. Reg. 15178 (9 Apr. 2018).
38. 10 Code of Federal Regulations (CFR) Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants". Under the provisions of 10 CFR 50.34, an application for a construction permit must include the PDC for a proposed facility. Similarly, under the provisions of 10 CFR 52.47, 52.79, 52.137 and 52.157, an application for a design certification, combined licence, standard design approval or manufacturing licence, respectively, must include the PDC for the proposed facility. The PDC establish the necessary design, fabrication, construction, testing and performance requirements for structures, systems and components (SSCs) important to safety; that is, SSCs that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public. The GDC in Appendix A to 10 CFR Part 50 establish minimum requirements for the PDC for water-cooled nuclear power plants similar in design and location to plants for which construction permits have been previously issued by the Commission.
39. Holtec supplemented its application multiple times. See Letter from E. Mayer to J. Cuadrado (13 Apr. 2017) (ADAMS Accession No. ML17109A386); Letter from K. Manzione to J. Cuadrado (6 Oct. 2017) (ADAMS Accession No. ML17310A218); Letter from K. Manzione to J. Cuadrado (21 Dec. 2017) (ADAMS Accession No. ML17362A097); Letter from E. Mayer to J. Cuadrado (22 Dec. 2017) (ADAMS Accession No. ML18011A158); and Letter from J. Tomlinson to M. Layton (23 Feb. 2018) (ADAMS Accession No. ML18058A617).
40. Letter from M.C. Layton to K. Manzione (28 Feb. 2018) (ADAMS Accession No. ML18059A251). More information on Holtec International's licence application can be found online at: www.nrc.gov/waste/spent-fuel-storage/cis/holtec-international.html.

NRC.[41] With the agreement, the NRC transfers to Wyoming the responsibility for licensing, rulemaking, inspection and enforcement activities necessary to regulate source material involved in uranium or thorium milling and the management and disposal of milling waste. Fourteen uranium recovery licences will be transferred to Wyoming's jurisdiction. The NRC retains jurisdiction over any commercial nuclear power plants (there currently are none in Wyoming), federal agencies using certain radioactive materials in the state, and uses of radioactive material other than in uranium and thorium milling activities.

41. By letter dated 14 November 2017, Governor Matthew Mead of Wyoming submitted a request to the NRC to become an Agreement State. Letter from M. Mead to K. Svinicki (14 Nov. 2017) (ADAMS Accession No. ML17319A923). Section 274 of the Atomic Energy Act of 1954, as amended, provides a statutory basis under which the NRC relinquishes to the states portions of its regulatory authority to licence and regulate by product materials (radioisotopes); source materials (uranium and thorium); and certain quantities of special nuclear materials. The mechanism for the transfer of the NRC's authority to a state is an agreement signed by the governor of the state and the chairman of the Commission, in accordance with section 274b. of the Atomic Energy Act. Before entering into an agreement, the NRC must first determine that the state's radiological control programme is adequate to protect the public health and safety and is compatible with NRC regulations.

Intergovernmental organisation activities

European Atomic Energy Community

Institutional relations

Notice to stakeholders: Withdrawal of the United Kingdom and the EURATOM acquis[1]

On 30 March 2019, the United Kingdom will leave the European Union (EU) (and the Euratom Community) and become a third country. Irrespective of the scenario envisaged, this will cause significant disruption for European citizens, businesses and administrations. The European Council has repeatedly underlined the need for preparedness action and on 29 June 2018 made a renewed call on member states, Union institutions and all stakeholders to step up their work on preparedness at all levels and for all outcomes.[2]

In areas in which member states or stakeholders need to take action, the EC started raising awareness at the end of 2017 through the publication of a large number of technical notices that set out the legal and practical implications of the withdrawal of the United Kingdom from the EU. On the 28 March 2018, a notice to stakeholders in the nuclear field concerning the withdrawal of the United Kingdom and the Euratom *acquis* was published on the Europa website, which reminds that preparing for the UK withdrawal is not just a matter for EU and national authorities but also for private parties. In view of the considerable uncertainties, in particular concerning the content of a possible withdrawal agreement and related repercussions, stakeholders in the nuclear field are reminded of certain legal effects that need to be considered when the United Kingdom becomes a third country. Not claiming to be exhaustive, the notice deals with some key issues in the context of the UK withdrawal: common supply policy, authorisations to dispose production outside the Community, consent of third parties and other special procedures, the Euratom Basic Safety Standards Directive[3] and the Euratom Radioactive Waste Directive.[4]

1. European Commission (EC), Directorate-General Energy (2018), "Notice to stakeholders: Withdrawal of the United Kingdom and the EURATOM *acquis*", available at: https://ec.europa.eu/energy/sites/ener/files/documents/notice_to_stakeholders_brexit_euratom_final.pdf.
2. For more information please see EC (2018), "Preparing for the withdrawal of the United Kingdom from the European Union on 30 March 2019", https://ec.europa.eu/info/publications/preparing-withdrawal-united-kingdom-european-union-30-march-2019_en; Communication from the Commission COM(2018)556final/2, Preparing for the withdrawal of the United Kingdom from the European Union on 30 March 2019 (27 Aug. 2018).
3. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, *Official Journal of the European Union* (OJ) L 13 (17 Jan. 2014) (Euratom Basic Safety Standards).
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, OJ L 199 (2 Aug. 2011) (Waste Directive).

Legislative and regulatory proposals

Budgetary support for nuclear safety and decommissioning

On 13 June 2018, the European Commission proposed to allocate EUR 1 178 million for nuclear safety and decommissioning in the next EU budget (2021-2027). This is part of the overall budget for security and defence (EUR 27.5 billion). Under the Commission proposals, EUR 552 million would be allocated to Lithuania (decommissioning of the Ignalina nuclear facility), EUR 118 million would be allocated to Bulgaria (decommissioning of units 1 to 4 of the Kozloduy nuclear power plant) and Slovakia (decommissioning of the Bohunice V1 nuclear power plant). Another EUR 348 million would be used for the decommissioning and radioactive waste management of the Commission's nuclear research facilities managed by the Joint Research Centre. Finally, EUR 160 million would be devoted to general nuclear safety and safeguards actions.[5] The Council (with the participation of the European Parliament) has launched a special legislative procedure for the adoption of the proposed regulations.

Proposal for a Council Decision on ITER

In its proposal of 7 June 2018 for a Council Decision amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER ("Fusion for Energy") and the Development of Fusion Energy and conferring advantages upon it,[6] the European Commission has proposed to allocate EUR 6.07 billion to the ITER investment project in the next Multiannual Financial Framework (2021-2027). Investing in ITER is in line with the EU's long-term strategies of decarbonisation and having sustainable and secure energy, as well as with boosting Europe's growth and competitiveness. The Commission's proposal is addressed to the member states and aims at amending the previous Council decision establishing the European Joint Undertaking Fusion for Energy. The proposal needs to be adopted by the Council of the EU, after informing the European Parliament.

Protection of persons reporting on breaches of European Union and Euratom Community law (whistleblower protection)

The Commission "Proposal for a Directive of the European Parliament and of the Council on the protection of persons reporting on breaches of Union law"[7] of 23 April 2018 explicitly covers nuclear safety. Recital No. 12 of the Proposal states that:

> enhancing the protection of whistleblowers would favour preventing and deterring breaches of Euratom rules on nuclear safety, radiation protection and responsible and safe management of spent fuel and radioactive [waste] and would reinforce the enforcement of existing provisions of the revised Nuclear Safety Directive on the effective nuclear safety culture and, in

5. See Commission Proposal of 13.6.2018 for a Council Regulation establishing the nuclear decommissioning assistance programme of the Ignalina nuclear power plant in Lithuania (Ignalina programme) and repealing Council Regulation (EU) No 1369/2013, COM(2018) 466 final; Commission Proposal of 13.6.2018 for a Council Regulation establishing a dedicated financial programme for decommissioning of nuclear facilities and management of radioactive waste, and repealing Council Regulation (Euratom) No 1368/2013, COM(2018) 467 final.
6. Proposal for a Council Decision amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it {SWD(2018) 325 final} – {SWD(2018) 326 final}, COM(2018) 445 final (7 June 2018).
7. Proposal for a Directive of the European Parliament and of the Council on the protection of persons reporting on breaches of Union law {SWD(2018) 116 final} – {SWD(2018) 117 final}, COM(2018) 218 final (23 Apr. 2018).

> particular, Article 8 b (2) (a), which requires, inter alia, that the competent regulatory authority establishes management systems which give due priority to nuclear safety and promote, at all levels of staff and management, the ability to question the effective delivery of relevant safety principles and practices and to report in a timely manner on safety issues.[8]

Article 1(a)(vi) of the Commission proposal states that the Directive lays down common minimum standards for the protection of persons reporting on unlawful activities or abuse of law characterised as breaches falling within the scope of Euratom Community acts in the area of nuclear safety. In that respect, the proposal is based on Article 31 of the Treaty establishing the European Atomic Energy Community (the Euratom Treaty).

Published reports

Euratom Supply Agency Annual Report

The Euratom Supply Agency (ESA) *Annual Report 2017* was been published on 19 June 2018.[9] According to the Report, in line with its statutory mission, the ESA continued during 2017 to assume responsibility for the EU nuclear common supply policy, in the interest of ensuring regular and equitable access to supply for EU users. Building further on close co-operation with its Advisory Committee, the ESA has promoted transparency and predictability in the field through the activities of the Nuclear Market Observatory.

Euratom report on the implementation of the Joint Convention[10]

The Euratom Community presented the latest developments on radioactive waste and spent fuel management in its "Report on the implementation of the obligations under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management". The Euratom Report was presented in the framework of the Sixth Review Meeting of Contracting Parties in Vienna in May 2018. The Euratom Report devotes particular attention to reporting on progress in the areas identified as challenges during the previous Review Meeting.

Commission report on the evaluation and implementation of the EU nuclear decommissioning assistance programmes in Bulgaria, Slovakia and Lithuania[11]

The Commission report on the evaluation and implementation of the EU nuclear decommissioning assistance programmes in Bulgaria, Slovakia and Lithuania concludes that, in line with the expectations set for the current Multiannual Financial Framework for 2014-2020, Bulgaria, Lithuania and Slovakia have made effective and efficient progress in decommissioning their reactors. There have been challenges and setbacks due to the complexity of the programmes, although the management system has increasingly proven that it can cope with them. Roadblocks

8. *Ibid.* (footnotes omitted).
9. EU (2018), *EURATOM Supply Agency: Annual Report 2017*, available at: http://ec.europa.eu/euratom/ar/last.pdf.
10. European Atomic Energy Community (2018), "Report on the implementation of the obligations under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management: Sixth Review Meeting of the Contracting Parties, Vienna, May 2018", available at: https://ec.europa.eu/energy/sites/ener/files/documents/jc_euratom_report_2018.pdf.
11. Report from the Commission to the European Parliament and the Council on the evaluation and implementation of the EU nuclear decommissioning assistance programmes in Bulgaria, Slovakia and Lithuania {SWD(2018) 344 final}, COM(2018) 468 final (13 June 2018).

from the previous financial framework have been removed and delays carried over have been recovered as far as possible.

International Atomic Energy Agency

Nuclear safety

The Sixth Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

The Sixth Review Meeting of the Joint Convention[12] was held in Vienna from 21 May to 1 June 2018 with the participation of more than 850 delegates from 69 contracting parties[13] and 4 observers: 2 signatory states of the Joint Convention, Lebanon and the Philippines, the Islamic Republic of Iran and the OECD Nuclear Energy Agency (NEA). The summary report is available on the Agency's website.[14]

The contracting parties reviewed national reports in country group sessions and identified that good progress was being made in many areas of spent fuel and radioactive waste safety. Open-Ended Working Group (OEWG) sessions were held to discuss proposals submitted by contracting parties. At the Plenary, the contracting parties adopted proposals to improve the effectiveness of the review process addressing the submission and the content of the national reports, the submission of proposals to be considered at review meetings, as well as videoconferencing. Finally, the contracting parties decided by consensus to hold an Extraordinary Meeting prior to the Organisational Meeting of the Seventh Review Meeting, with the view to discuss possible ways to improve procedural mechanisms of the Joint Convention.

During the second week of the Review Meeting, two sequential topical sessions were held. The first focussed on recent developments and challenges in the safe management of disused sealed radioactive sources. The second addressed general safety issues, challenges and public acceptance aspects associated with the storage and disposal of higher-level radioactive waste. In addition, a side event on Uranium Legacy Sites – The Environmental Remediation Programme in Central Asia was hosted by the European Union.

Guidance on the Management of Disused Radioactive Sources

In April 2018, the Agency published the *Guidance on the Management of Disused Radioactive Sources*,[15] supplementary to the Code of Conduct on the Safety and Security of Radioactive Sources as approved by the Board of Governors and endorsed by the General Conference. The Guidance is based on the Agency's safety standards and nuclear security guidance, and it addresses safety and security in an integrated manner.

12. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997), IAEA Doc. INFCIRC/546, 2153 UNTS 357, entered into force 18 June 2001 (Joint Convention).
13. The status of the Joint Convention is available on the IAEA's website at: www-legacy.iaea.org/Publications/Documents/Conventions/jointconv_status.pdf.
14. IAEA (2018), "Final Summary Report", IAEA Doc. JC/RM6/04/Rev.2, available at: www-ns.iaea.org/conventions/results-meetings.asp?s=6&l=40.
15. IAEA (2018), *Guidance on the Management of Disused Radioactive Sources*, IAEA/CODEOC/MGT-DRS/2018, IAEA, Vienna.

Open-ended Meeting of Legal and Technical Experts on the Implementation of the Guidance on the Import and Export of Radioactive Sources

The Agency held an Open-ended Meeting of Legal and Technical Experts on Implementation of the Guidance on the Import and Export of Radioactive Sources in Vienna, Austria, from 11 to 13 June 2018. The meeting provided an opportunity for exchange of information among member states and identified current needs to ensure safe and secure management of radioactive sources during import and export worldwide. The meeting concluded that there is currently no need to initiate the revision of the *Guidance on the Import and Export of Radioactive Sources*[16] and efforts should be focussed on the full and systematic implementation of its current provisions.

Nuclear and radiological incident and emergency preparedness and response

The Agency continued to encourage member states' adherence to the Convention on Early Notification of a Nuclear Accident[17] and to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.[18] In April 2018, Georgia adhered to the Assistance Convention. In September, at the Treaty Event, Syria deposited instruments of ratification to both the Early Notification Convention and the Assistance Convention.

In June 2018, the Agency organised the Ninth Meeting of the Representatives of Competent Authorities under both Conventions in Vienna, Austria.

Nuclear liability

The Secretariat continued to assist member states, upon request, in their efforts to adhere to the relevant nuclear liability instruments.

Workshops on civil liability for nuclear damage

The Agency held the seventh Workshop on Civil Liability for Nuclear Damage in Vienna, Austria, on 14 May 2018. This workshop provided an overview of the international legal regime on civil liability for nuclear damage and was attended by diplomats from 21 member states.

The International Expert Group on Nuclear Liability (INLEX)

The International Expert Group on Nuclear Liability (INLEX) held its 18th regular meeting in Vienna, Austria, from 15 to 17 May 2018. Individual members reported on the most recent developments in the field of civil liability for nuclear damage. The Group discussed liability issues relating to disposal facilities. In this context, INLEX reaffirmed conclusions of its previous meeting that during the period where institutional controls remain active (the duration of which will differ from country to country and with different classes of waste), there will still be an operator and the waste can be regarded as being in storage. The nuclear liability conventions would therefore continue to apply to such disposal facilities. Following the cessation of institutional controls over the site, however, INLEX noted that, in the absence of an operator, the nuclear liability conventions cannot be applied; therefore, the state

16. IAEA (2012), *Guidance on the Import and Export of Radioactive Sources*, IAEA/CODEOC/IMO-EXP/2012, IAEA, Vienna.
17. Convention on Early Notification of a Nuclear Accident (1986), IAEA Doc. INFCIRC/335, 1439 UNTS 276, entered into force 27 Oct. 1986 (Early Notification Convention).
18. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), IAEA Doc. INFCIRC/336, 1457 UNTS 134, entered into force 26 Feb. 1987 (Assistance Convention).

that has agreed to the closure of the installation would implicitly be expected to assume responsibility in the event of any nuclear incident.

INLEX also addressed the liability issues concerning the exclusion of radioisotopes that have reached the final stage of fabrication from the definition of "radioactive products or waste" in the nuclear liability conventions and therefore from the scope of such conventions. In this context, INLEX concluded that "materials which have not reached the final stage of fabrication so as to be usable for any industrial, commercial, agricultural, medical, scientific or educational purpose, and facilities where such materials are transformed into their final form, are covered by the nuclear liability conventions". INLEX also specifically considered the case of molybdenum-99 contained in "generators" sent to hospitals and medical clinics and noted that notwithstanding that the molybdenum-99 is not in itself "usable for any scientific, medical, agricultural, commercial or industrial purpose", the fact that it decays naturally results in it having reached its final stage of fabrication so as to be usable for any medical purpose and that molybdenum-99 "generators" hence fall outside the scope of the nuclear liability conventions.

INLEX also continued to discuss the issue of the application of the nuclear liability conventions to transportable NPPs and reiterated its conclusions that a transportable NPP (TNPP) in a fixed position (that is, in the case of a floating reactor, anchored to the seabed or the shore, and attached to shore by power lines) would fall under the definition of a "nuclear installation" and therefore be covered by the nuclear liability regime. INLEX also noted that in case of transport of a factory-fuelled reactor, the TNPP would also be covered by the nuclear lability conventions just as any other transport of nuclear material. INLEX will, however, come back to the issue at its next meeting, in particular with regard to factory-fuelled reactors transported and deployed in a host state not party to the same convention as the sending state.

62nd session of the IAEA General Conference

The 62nd regular session of the IAEA General Conference was held in Vienna, Austria, from 17 to 21 September 2018. Nearly 2 600 participants attended the Conference, including delegates from 153 of the IAEA's 170 member states. Throughout the week, delegates were able to also attend more than 77 side-events showcasing activities and special programmes by the IAEA Secretariat, as well as by several member states.

Resolutions of the Conference

A number of resolutions were adopted by the Conference. As in previous years, resolution GC(62)/RES/6 on "Measures to strengthen international cooperation in nuclear, radiation, transport and waste safety", as well as resolution GC(62)/RES/7 on "Nuclear Security", include sections that are of legal relevance. All resolutions adopted during the 62nd regular session of the General Conference are available on the IAEA website at www-legacy.iaea.org/About/Policy/GC/GC62/Resolutions/index.html

Measures to strengthen international cooperation in nuclear, radiation, transport and waste safety (GC(62)/RES/6)

Regarding the Convention on Nuclear Safety (CNS),[19] the General Conference urged "all Member States that have not yet done so, especially those planning, constructing, commissioning or operating nuclear power plants, or considering a nuclear power programme, to become Contracting Parties to the CNS". Concerning

19. Convention on Nuclear Safety (1994), IAEA Doc. INFCIRC/449, 1963 UNTS 293, entered into force 24 Oct. 1996 (CNS).

the Joint Convention, the Conference likewise urged "all Member States that have not yet done so, including those managing radioactive waste from the use of radioactive sources and nuclear energy, to become Contracting Parties to the Joint Convention". The Conference stressed "the importance of CNS and Joint Convention Contracting Parties fulfilling their respective obligations stemming from these Conventions and reflecting these in their actions to strengthen nuclear safety and in particular when preparing National Reports, and actively participating in peer reviews for CNS and Joint Convention Review Meetings".

In addition to that it requested "the Secretariat to provide full support for the dissemination of the outcomes of the 6th Joint Convention Review Meeting, and to consider addressing these in the Agency's activities, as appropriate and in consultation with Member States".

The Conference further urged "all Member States that have not yet done so to become Contracting Parties to the Early Notification Convention and the Assistance Convention", and stressed "the importance of Contracting Parties fulfilling the obligations stemming from these Conventions, and actively participating in regular meetings of the Representatives of Competent Authorities". In this context, the Conference requested "the Secretariat, in collaboration with regional and international organisations and Member States, to continue its activities to promote the importance of conventions concluded under the auspices of the IAEA, and to assist Member States, upon request, with adherence, participation and implementation as well as strengthening of their related technical and administrative procedures".

With respect to the Code of Conduct on the Safety and Security of Radioactive Sources,[20] its *Guidance on the Import and Export of Radioactive Sources*, and its *Guidance on the Management of Disused Radioactive Sources*, the General Conference encouraged all member states to make "political commitments", and to implement them, as appropriate, "in order to maintain effective safety and security of radioactive sources throughout their life cycle". It also requested the Secretariat to continue supporting member states in this regard. Similarly, the Conference urged "Member States with research reactors to apply the guidance of the Code of Conduct on the Safety of Research Reactors" and encouraged them "to freely exchange their regulatory information and experience with regard to research reactors".

Regarding civil liability for nuclear damage, the General Conference encouraged "Member States to work towards establishing a global nuclear liability regime and, as appropriate, to give due consideration to the possibility of joining the international nuclear liability instruments". In this context, the Conference requested the Secretariat, in co-ordination with the NEA when appropriate "to assist Member States, upon request, in their efforts to adhere to any international nuclear liability instruments concluded under the auspices of the IAEA or the OECD/NEA, taking into account the recommendations of the INLEX in response to the IAEA Action Plan on Nuclear Safety". In addition, it further stressed "the importance of having effective liability mechanisms to ensure prompt compensation for damage incurred during the transport of radioactive material, including maritime transport", and in this context noted "the application of the principles of nuclear liability, including strict liability".

Nuclear Security (GC(61)/RES/9)

In the context of nuclear security, the Conference reaffirmed "the central role of the Agency in strengthening the nuclear security framework globally and in

20. IAEA (2004), Code of Conduct on the Safety and Security of Radioactive Sources, IAEA Doc. IAEA/CODEOC/2004.

coordinating international activities in the field of nuclear security, while avoiding duplication and overlap". The Conference also reaffirmed "the importance of the Convention on the Physical Protection of Nuclear Material (CPPNM) and its 2005 Amendment extending its scope", welcomed "the entry into force of that Amendment", recognised "the importance of acceptance, approval or ratification by further States" and noted "the importance of its full implementation and universalization".

The Conference also encouraged "all Parties to the CPPNM and its 2005 Amendment to fully implement their obligations thereunder" and encouraged "States that have not yet done so to become party to this Convention and its Amendment". It further encouraged "the Agency to continue efforts to promote further adherence to the Amendment with the aim of its universalization". The Conference welcomed "the organization by the Secretariat of CPPNM meetings" and encouraged "all States Parties to the Convention to participate in relevant meetings".

IAEA Treaty Event

The yearly IAEA Treaty Event took place during the 62nd session of the IAEA General Conference. During the Event, Syria deposited instruments of ratification to the Early Notification Convention and to the Assistance Convention. Participants from several IAEA Member States were also briefed on the multilateral treaties relating to nuclear safety, security and civil liability for nuclear damage.

Legislative assistance

The Agency continued to provide legislative assistance to its member states to support the development of adequate national legal frameworks and to promote adherence to the relevant international legal instruments. Specific bilateral legislative assistance was provided to several member states through written comments and advice on drafting national nuclear legislation. Assistance in gaining more broadly a better understanding of the relevant international legal instruments was also provided to member states through awareness missions and workshops conducted in member states. In addition, the Agency continued to organise regional and training events in nuclear law, such as the Nuclear Law Institute (NLI) conducted annually since 2011.

OECD Nuclear Energy Agency

New member of the Generation IV International Forum Framework Agreement

The Generation IV International Forum (GIF) Framework Agreement for International Collaboration on Research and Development of Generation IV Nuclear Energy Systems has been ratified by the United Kingdom. The instrument of ratification to the Framework Agreement was signed by the UK Secretary of State for Foreign and Commonwealth Affairs and deposited to the NEA on 17 October 2018. The United Kingdom will start participating in GIF research and development activities in 2019. The GIF is a co-operative international endeavour that was established to carry out the research and development (R&D) needed to establish the feasibility and performance capabilities of the next generation of nuclear energy systems. More information on GIF is available at: www.gen-4.org.

Nuclear Law Committee meeting

The NEA Nuclear Law Committee (NLC) held its biannual meeting on 21-22 November 2018, bringing together 76 experts from member countries, the European Commission (EC) and the International Atomic Energy Agency (IAEA), as well as 5 non-member countries (Brazil, Bulgaria, China, Ukraine and the United Arab Emirates). Participants at the meeting discussed current activities conducted

under NLC auspices on nuclear liability for transport, the legal aspects of deep geological repositories and the legal aspects of nuclear safety, as well as recent developments relating to the international legal framework for public participation in nuclear decision making. In addition, two special sessions were held. The first session brought together three of the four previous heads of the Office of Legal Affairs and its successor offices to celebrate the 100th edition and 50th anniversary of the *Nuclear Law Bulletin*. The second session addressed the licensing process and nuclear third party liability regimes applicable to nuclear fusion projects in NEA member countries.

Two working group meetings took place on the margins of the NLC meeting. On 20 November 2018, the NEA Working Party on Nuclear Liability and Transport (WPNLT) held a meeting with 36 participants from 19 NEA member and non-member countries, the EC, the IAEA, the World Nuclear Transport Institute (WNTI) and the nuclear insurance pools. Participants reviewed and discussed the preliminary results from a WPNLT enquiry regarding national legislation and rules applicable to nuclear transport and transit and focused on potential deliverables to allow the public to access useful information regarding nuclear liability as applicable to transport. On 23 November 2018, the NEA Working Party on the Legal Aspects of Nuclear Safety (WPLANS) held a meeting, bringing together 31 representatives from 17 NEA member and non-member countries. In addition to adopting the working party's programme of work for 2019-2020, participants discussed in detail a draft report on the legal frameworks for long-term operation of nuclear power reactors.

Legal aspects of deep geological repositories

The NEA Working Party on Deep Geological Repositories and Nuclear Liability (WPDGR) held its first-ever meeting on 17-18 September 2018, bringing together experts representing member countries, the EC and the insurance industry. Participants discussed topics relating to the outcomes of the Workshop on Deep Geological Repositories and Nuclear Liability held in November 2016. These included the description of the deep geological repository life cycle, the definition of "operator" under the international nuclear liability conventions and nuclear liability coverage for deep geological repositories.

2018 International School of Nuclear Law (ISNL)

The 18th session of the International School of Nuclear Law (ISNL) was held from 27 August to 7 September 2018 in Montpellier, France, bringing together a diverse group of graduate students and professionals from across the world to learn more about the legal framework and major issues affecting the peaceful uses of nuclear energy. Organised by the NEA and the University of Montpellier, the ISNL is a unique educational programme that offers participants from the academic, private and governmental sectors an in-depth look at international nuclear law, focusing on areas such as nuclear safety, environmental law, security, safeguards and nuclear liability. This year's session was attended by 61 participants from 39 countries, including numerous non-NEA member countries, many of whom received support to attend the ISNL from the IAEA, which also provided several lecturers. The ISNL has attracted since 2001 more than 1 000 participants worldwide from an increasingly diverse range of countries, many of whom are now experts in the nuclear law field. A brochure commemorating this milestone and the nearly 20-year history of the ISNL was recently published that reflects on the school's programme, past lecturers and participants. In this new ISNL brochure, alumni and lecturers describe the spirit of Montpellier and the community atmosphere of the ISNL. The brochure also includes a yearbook of all previous class years.

First NEA International Radiological Protection School (IRPS)

For some time, NEA member country governmental and nuclear fuel cycle organisations have had difficulty recruiting sufficient numbers of appropriately qualified radiological protection professionals to replace those retiring. To address this, the NEA created the International Radiological Protection School (IRPS), in co-operation with the Swedish Radiation Safety Authority (SSM) and the Centre for Radiation Protection Research (CRPR) of Stockholm University. The first IRPS session took place from 20 to 24 August 2018 at Stockholm University. It was attended by 40 participants from 26 countries, selected on the basis of their education, experience and potential as future radiological protection leaders. The five-day training featured lectures and dialogues by renowned radiological protection experts on the history of the development and implementation of the international system of radiological protection, as promulgated by the International Commission on Radiological Protection (ICRP). The objective of the IRPS was to allow tomorrow's radiological protection leaders to appropriately apply the radiological protection system to address current and future radiological circumstances. Positive feedback from the participants of the first session suggests that the IRPS will be repeated.

NEA publications of interest

Since the publication of *Nuclear Law Bulletin* No. 100, the NEA has issued a number of publications of interest. The *Full Costs of Electricity Provision* draws on evidence from a large number of studies concerning the social costs of electricity and identifies proven instruments for internalising them so as to improve overall welfare. Research on the overall costs of electricity is an ongoing effort, as only certain costs of electricity provision are perceived directly by producers and consumers. Other costs, such as the health impacts of air pollution, damage from climate change or the effects on the electricity system of small-scale variable production are not reflected in market prices and thus diminish well-being in unaccounted for ways. Accounting for these social costs in order to establish the full costs of electricity provision is difficult, yet such costs are too important to be disregarded in the context of the energy transitions currently under way in OECD and NEA countries.

The Fifth International Nuclear Emergency Exercise (INEX-5) was developed in response to NEA member countries' desire to test and demonstrate the value of changes put in place following the Fukushima Daiichi nuclear power plant accident. INEX-5 was held during 2015 and 2016, and was followed by the INEX-5 Workshop in early 2017. Representatives from 22 member countries, the IAEA and the EC attended the workshop, where participants identified elements emerging from INEX-5 that would help improve international and national arrangements for notification, communication and interfaces related to catastrophic events involving radiation or radiological materials. The *Proceedings of the Fifth International Nuclear Emergency Exercise (INEX-5) Workshop* provide a summary of the proposals and recommendations for future work in emergency management. In addition to the Proceedings, a report on the *Experience from the Fifth International Nuclear Emergency Exercise (INEX-5)* was published that summarises the major evaluation outcomes of the national and regional exercises, policy level outcomes, recommendations and follow-up activities emerging from INEX-5 and the discussions at the INEX-5 International Workshop. A set of key needs were identified in areas such as real-time communication and information sharing among countries and international partners, improving cross-border and international co-ordination of protective measures and considering the mental health impacts on populations when implementing protective measures.

Finally, the report *Preparing for Decommissioning During Operation and After Final Shutdown* was published to inform regulatory bodies, policy makers and planners about the relevant aspects and activities that should begin during the last years of

operation and following the end of operation. The transition from an operating nuclear facility to the decommissioning phase is critical in the life cycle of every facility. A number of organisational and technical modifications are needed in order for the facility to meet new objectives and requirements, and a certain number of activities must be initiated to support the transition and preparation for the dismantling of the facility. Thorough preparation and planning is key for the success of global decommissioning and dismantling projects, both to minimise delays and undue costs and to ensure a safe and efficient decommissioning process. Compiling lessons learnt from experiences and good practices in NEA member countries, the report supports the further optimisation of transition strategies, activities and measures that will ensure adequate preparation for decommissioning and dismantling.

All four reports are available for free online at: www.oecd-nea.org/pub/.

Sixteenth Amendment to the Atomic Energy Act (16th Amendment) of 10 July 2018[1]

The German Bundestag has adopted the following Act:

Article 1. Amendment to the Atomic Energy Act

The following Sections 7e to 7g shall be inserted after Section 7d Atomic Energy Act in the version promulgated on 15 July 1985 (Federal Law Gazette I p. 1565), as most recently amended by Article 2(2) of the Act of 20 July 2017 (Federal Law Gazette I p. 2808):

"*Section 7e*

Financial settlement for investments made

(1) Whoever, in his capacity as owner of an installation for the fission of nuclear fuel for the commercial generation of electricity or as holder of a licence to operate this type of installation, furnishes proof that they have made investments between 28 October 2010 and 16 March 2011 in reliance on the Eleventh Amendment to the Atomic Energy Act of 8 December 2010 (Federal Law Gazette I, p. 1814) to an extent necessary for the purpose of producing the additional electricity volumes allocated to the nuclear power plant in Annex 3 Column 4, shall be entitled to an appropriate financial settlement, to the extent that these investments have been rendered worthless solely as a result of the withdrawal of the additional electricity volumes under the Thirteenth Amendment to the Atomic Energy Act of 31 July 2011 (Federal Law Gazette I, p. 1704).

(2) Any pecuniary benefits that, on the balance of probabilities, have accrued to those entitled to financial settlement as a result of the withdrawal of the additional electricity volumes, shall be counted against the amount of financial settlements. Any pecuniary benefits that those entitled to financial settlement could have enjoyed had they applied an adequate degree of due diligence shall be treated in the same manner. Section 254 Civil Code applies mutatis mutandis.

(3) This financial settlement shall be counted against any other financial benefit for investments rendered worthless within the meaning of (1) which has been paid

1. to those entitled to financial settlement or a company that directly or indirectly holds at least half of the shares in the legally independent company that is entitled to financial settlement;
2. to a company that used to be directly or indirectly entitled to at least half of the shares in the legally independent company which is entitled to financial settlement, or to its legal successor;
3. to a company that used to be directly or indirectly entitled to at least half of the shares in the legally independent company which used to own or hold the licence to operate the nuclear power plant, or to its legal successor;
4. to a legally independent company that used to own the nuclear power plant or hold the licence to operate the nuclear power plant, or to its legal successor.

1. Federal Law Gazette 2018 Part I No. 25, published at Bonn on 13 July 2018.

Section 7f

Financial settlement for electricity volumes

(1) The holders of the licences for the Brunsbüttel, Krümmel and Mülheim-Kärlich nuclear power plants shall be entitled to appropriate financial settlement to the extent that the electricity volumes originally allocated to these nuclear power plants pursuant to Annex 3 Column 2 have not been produced and not been transferred to another nuclear power plant by the end of 31 December 2022. The amount of the financial settlement shall be limited in the case of the Brunsbüttel nuclear power plant to two thirds and in the case of the Krümmel nuclear power plant to half of the electricity volumes within the meaning of Sentence 1. The claim to financial settlement pursuant to Section 7(1b) shall be subject to proof being furnished by those entitled to financial settlement that they have made serious efforts to transfer the electricity volumes for which financial settlement is payable under reasonable terms, and that these efforts were made immediately after 4 July 2018 and until the end of 31 December 2022.

(2) The amount of the financial settlement shall be determined based on the average market price for electricity between 6 August 2011 and 31 December 2022, minus the cost of electricity generation, including overheads which can be expected to accrue for electricity generation. The cost shall be calculated taking adequate account of the operational risks, investment risks and sales risks that no longer exist. It shall be possible for relevant cost estimates which are in the public domain to be used to calculate the costs that are to be expected.

(3) The financial settlement shall be counted against any other financial benefit provided for electricity volumes pursuant to Annex 3 Column 2

1. to those entitled to financial settlement or a company that directly or indirectly holds at least half of the shares in the legally independent company that is entitled to financial settlement;
2. to a company that used to be directly or indirectly entitled to at least half of the shares in the legally independent company which is entitled to financial settlement, or to its legal successor;
3. to a company that used to be directly or indirectly entitled to at least half of the shares in the legally independent company which held the licence for the Brunsbüttel, Krümmel or Mülheim-Kärlich nuclear power plant, or to its legal successor;
4. to a legally independent company that used to hold the licence for the Brunsbüttel, Krümmel or Mülheim-Kärlich nuclear power plant, or to its legal successor.

Section 7g

Administrative procedure

(1) The application for financial settlement pursuant to Section 7e must be lodged in writing with the Federal Ministry in charge of nuclear safety and radiation protection within one year after 4 July 2018. Claims for which no application is made within this deadline shall lapse. Those entitled to financial settlement shall be required to furnish documentation proving any orders made, contracts concluded, terminated or cancelled, of payments and reimbursements thereof, and declarations on tax benefits obtained. The [amount of] financial settlement payable shall be set by the Federal Ministry in charge of nuclear safety and radiation protection, which shall issue written notification of this, in agreement with the Federal Ministry for Economic Affairs and Energy.

(2) The application for a financial settlement pursuant to Section 7f must be lodged in writing with the Federal Ministry in charge of nuclear safety and radiation protection within one year from 31 December 2022. Claims for which no application is made within this deadline shall lapse. The total sum of the electricity volumes for which financial settlement is being claimed must be stated in the application (in kilowatt hours). The [amount of] financial settlement payable shall be set by the Federal Ministry in charge of nuclear safety and radiation protection, which shall issue written notification of this, in agreement with the Federal Ministry for Economic Affairs and Energy.

(3) The Federal Ministry in charge of nuclear safety and radiation protection shall be entitled to request that and set a time limit for those entitled to a financial settlement to

1. state facts or name the means of proof available and
2. furnish official documents and other movable goods, and electronic documents

that are material for the purpose of assessing and calculating claims for appropriate financial settlement pursuant to Section 7e or Section 7f.

Article 2. Amendment of the Code of Administrative Court Procedure

Section 48(1) Sentence 1 Code of Administrative Court Procedure in the version promulgated on 19 March 1991 (Federal Law Gazette I p. 686), as most recently amended by Article 5(2) of the Act of 8 October 2017 (Federal Law Gazette I p. 3536), shall be amended by insertion of the following Number 1a after Number 1:

"1a. the merits and amount of financial settlement claims pursuant to Section 7e and Section 7f of the Atomic Energy Act,"

Article 3. Entry into force

This Act shall enter into force on the day when the European Commission gives its approval under State-aid law or makes a binding declaration to the effect that no such approval shall be required; the Federal Ministry in charge of nuclear safety and radiation protection shall announce the date of the entry into force and do this by means of the Federal Law Gazette.

The constitutional rights of the Bundesrat are safeguarded.

The foregoing law is hereby drawn up. It shall be published in the Federal Law Gazette.

Berlin, 10 July 2018

Federal President

Steinmeier

Federal Chancellor

Dr. Angela Merkel

Federal Minister for the Environment, Nature Conservation and Nuclear Safety

Svenja Schulze

[Footer information on website of Federal Law Gazette omitted]

News briefs

Meeting between Commissioner Arias Cañete and Vice-President Salehi, Head of the Atomic Energy Organisation of Iran

Commissioner Arias Cañete and Vice-President Salehi met on 19 May 2018 to confirm the continuing commitment of the European Commission (EC) and of the Atomic Energy Organisation of Iran towards the implementation of the Joint Comprehensive Plan of Action (JCPOA) and in particular its Annex III, which addresses civil nuclear co-operation.[1] In their joint statement,[2] they emphasise that the continuing implementation of the JCPOA, which was unanimously endorsed by United Nations (UN) Security Council Resolution 2231, is crucial for the development and progress of the region as well as for the global peace and security.

Council Conclusions on the Reformed ITER Project[3]

On 12 April 2018, the Council of the European Union (EU) drew conclusions on the basis of the Communication from the Commission and reaffirmed the continued commitment of Euratom to the successful completion of the ITER project. The Council declared that it will endeavour to make available the resources for the Fusion for Energy activities within the Multiannual Financial Framework for the period 2021-2027. On this basis, the Council mandated the Commission to approve the new ITER project baseline (scope, schedule and costs) on behalf of Euratom at an upcoming ITER Council meeting at Ministerial level.

IAEA and EU review progress on co-operation

On 8 February 2018, the International Atomic Energy Agency (IAEA) and the EU reviewed progress achieved in working together on a range of nuclear activities and agreed to further enhance co-operation during their sixth annual Senior Officials Meeting in Vienna. The EU and the IAEA also reaffirmed their support for the JCPOA. The EU High Representative, as Co-ordinator of the Joint Commission established under the JCPOA, will remain in close contact with the IAEA regarding continued implementation of the agreement. The next Senior Officials Meeting is expected to take place in Luxembourg in early 2019.[4]

1. "Annex III – Civil Nuclear Cooperation", available at: https://eeas.europa.eu/sites/eeas/files/annex_3_civil_nuclear_cooperation_en.pdf.
2. EC, Press Release, "Joint Press Statement following today's meeting between Commissioner Arias Cañete and Vice President Salehi, Head of the Atomic Energy Organisation of Iran (AEOI)" (19 May 2018), available at: http://europa.eu/rapid/press-release_STATEMENT-18-3871_en.htm.
3. Council of the EU, "Annex: Council Conclusions on the Reformed ITER Project" (12 Apr. 2018), available at: http://data.consilium.europa.eu/doc/document/ST-7881-2018-INIT/en/pdf.
4. IAEA, Press Release, "IAEA and EU Review Progress on Cooperation, Agree on Next Steps at Annual Meeting" (8 Feb. 2018), IAEA Press Release No. 5/2018, available at: www.iaea.org/newscenter/pressreleases/iaea-and-eu-review-progress-on-cooperation-agree-on-next-steps-at-annual-meeting.

2019 International Nuclear Law Essentials (INLE) course in Paris

The next session of the NEA International Nuclear Law Essentials (INLE) will take place in Paris, France, from 18-22 February 2019. The five-day INLE course is designed to provide participants with a practical and comprehensive understanding of the various interrelated legal issues relating to the safe and peaceful use of nuclear energy. This intensive course in international nuclear law addresses the needs and interests of lawyers working in either the public or the private sector, but will also be of interest to scientists, engineers, policymakers, managers and other professionals working in the nuclear field.

2019 Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident

After two successful workshops on the Indemnification of Damage in the Event of a Nuclear Accident organised in France in November 2001 and in the Slovak Republic in May 2005 (proceedings available on the NEA website), the NEA organised the 3rd International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident in co-operation with the Nuclear Regulatory Authority of the Slovak Republic in October 2017. This Workshop assessed the practical implementation of currently applicable international nuclear third party liability conventions in conjunction, among others, with non-convention states' regimes, assuming all modernised international instruments have come into force. Over 170 participants from 33 NEA member and non-member countries attended the Workshop. The programme and discussions followed a specific scenario (a nuclear incident occurring at a nuclear installation that would cause transboundary damage) and the sessions were prepared based on responses to a tailored questionnaire gathered by the NEA Secretariat from 27 NEA member and non-member countries.

The 4th International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident will be held from 8-10 October 2019 in Lisbon, Portugal. This Workshop will be a unique opportunity to continue exploring the practical application of the international nuclear third party liability instruments, including with regard to non-convention states, in case a nuclear incident occurred at a nuclear installation. It will address, in much more details, topics identified by the 2017 Bratislava workshop participants for further discussion, e.g. the determination of the nuclear damage to be compensated, and transboundary claims handling.

23rd Nuclear Inter Jura Congress in Abu Dhabi, 2018

The 2018 Nuclear Inter Jura Congress of the International Nuclear Law Association (INLA) was held in the United Arab Emirates (UAE) at the Ritz Carlton Hotel, Abu Dhabi, from 4-8 November 2018. This was the first time that the Association organised its biennial conference in the Gulf region. The overarching theme of the 23rd Congress was "Nuclear Co-operation, Sustainability, Excellence and Innovation", the purpose being to exchange views on these key aspects beyond the review of traditional components of international nuclear law.

In his welcome message, Jacques Lavoie, INLA's President, stressed the significance of the event in the context of the development of the UAE Peaceful Nuclear Energy Program to sustain the country's economic and industrial growth. He expressed his appreciation to the Emirates Nuclear Energy Corporation, responsible for the success of this programme, as well as host and main sponsor of the Congress.

The Congress consisted of 8 topical sessions with about 55 speakers. There were a record number of participants, more than 300 from over 27 countries. Participants included representatives from nuclear operators and other nuclear institutions,

regulatory bodies, government officials, corporate lawyers and insurers, academics and students. There were also representatives from intergovernmental organisations such as the International Atomic Energy Agency, OECD Nuclear Energy Agency and the European Commission, leading to active and thought-provoking discussions throughout the event.

The working sessions addressed the latest domestic and international developments pertaining to radiation protection, with an emphasis on low dose exposure and emergency preparedness; radioactive waste management and an analysis of national programmes; new nuclear build, including challenges and approaches to financing nuclear projects; revisiting the central concepts of nuclear liability and an update on the compensation of Fukushima-related damage; a review of nuclear security and non-proliferation instruments, including cyber-security; international nuclear co-operation issues and Brexit; various issues confronting nuclear transport operators; recent developments in the area of nuclear safety and its regulation, including a panel discussion about the impact of major accidents on nuclear safety policies.

Most papers submitted and presentations made at the Congress are available on the Congress website at: https://inla2018uae.com/. There is a plan to edit the materials with an intention of preparing final Congress proceedings. More information will be provided as soon as possible.

It is also important to note that the INLA General Assembly, held during the Abu Dhabi Congress, elected its new Board of Management for the 2019-2020 term, and the new Board designated Mr William A. Horin, partner in the Washington, DC office of Winston & Strawn LLP, as the new President of the Association.

Certificate Course on "Nuclear Law and Energy", TERI School of Advanced Studies, New Delhi, 4-8 March 2019

The 6th edition of the Nuclear Law Association, India and TERI School of Advanced Studies Certificate Course on "Nuclear Law and Energy" will be held between 4-8 March 2019 at the TERI School of Advanced Studies, New Delhi, India. This week long course includes a site visit to the Narora Nuclear Power Plant on the last day. All information is available at: https://nuclearlaw.wordpress.com/2018/11/22/6th-certificate-course-on-nuclear-energy-and-law-monday-4-friday-8-march-2019/. Inquiries and participation forms should be sent to: secretary@nlain.org.

Recent publications

A Debate to Remember: The US-India Nuclear Deal (2018) by Chaitanya Ravi

A Debate to Remember: The US-India Nuclear Deal provides a comprehensive history of the debate over the landmark United States-India civil nuclear co-operation agreement, an important American foreign policy initiative announced in 2005 to accommodate the long-sanctioned Indian nuclear programme into the global nuclear order. The author describes the process by which top officials in the administration of US President George W. Bush came up with the idea of a grand nuclear rapprochement with India as the centrepiece of a strategic partnership that would draw India into the system of American alliances in Asia to balance a rising China. In return for US recognition of India's nuclear weapons and dismantling of sanctions to restore fuel-supply, reactors and dual-use technologies, India agreed to separate its nuclear programme into civilian and military spheres and place the civilian portion under permanent International Atomic Energy Agency (IAEA) safeguards.

The book focuses on the acrimonious political, scientific, strategic and media debates during the 2005-2008 period in India that nearly toppled the government of then-Prime Minister Manmohan Singh. The author provides a detailed description of multiple issues covered during the debate including the impact of the initiative on India's independent foreign policy, its ability to conduct underground thermonuclear weapon tests in the future, the number of civilian reactors to be placed under IAEA safeguards, the fate of the Iran-Pakistan-India (IPI) pipeline and Iran-India relations.

The book provides an alternative constructivist vantage point to understand the deal by drawing primarily from concepts in the science and technology studies (STS) field. Differences between powerful bureaucracies within the Indian state over the civilian/military status of India's fast breeder reactors and frictions between rival nuclear weapons scientists over the success/failure of India's 1998 nuclear tests are described in detail.

The author relies on newspaper articles, foundational references, government documents, critiques by independent researchers, 43 semi-structured interviews and leaked American diplomatic cables.

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Feature articles and studies in this issue include: "The impact of the major nuclear power plant accidents on the international legal framework for nuclear power"; "Today is yesterday's pupil: Reactor licence renewal in the United States"; and "Euratom competence in the areas of nuclear security and nuclear safety: An impossible parallel?".

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