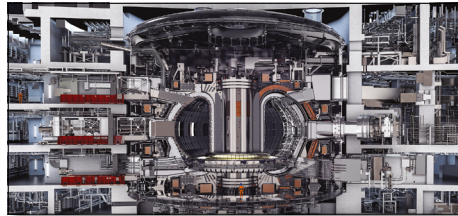


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NUCLEAR ENERGY AGENCY  
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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# Nuclear liability in respect of Ukraine's nuclear installations under Russian military control

by Nathalie L.J.T. Horbach and Omer F. Brown, II\*

## 1. Introduction

The occupation of two Ukrainian nuclear installations by armed soldiers of the Russian Federation (Russia) within the context of the armed conflict<sup>1</sup> in Ukraine presents complex issues about liability for nuclear damage that could be caused by any off-site and potentially transboundary radioactive release. The Chernobyl Nuclear Power Plant (Chernobyl Plant) (operated by the State Specialized Enterprise “Chernobyl Nuclear Power Plant”) and the Zaporizhzhia Nuclear Power Plant (ZNPP) (operated by the National Nuclear Energy Generating Company [Energoatom]) have been, and apparently continue to be, licensed by the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU).<sup>2</sup> However, the SNRIU had indicated that regulatory control over both nuclear installations became impossible to exercise and that the nuclear power plants’ staff was obstructed from

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1. International Law Commission (ILC) (2011), “Draft Articles on the Effects of Armed Conflicts on Treaties, with Commentaries”, *Yearbook of the International Law Commission*, 2011, Vol. II, Part 2, A/CN.4/SER.A/2011/Add. 1 (Part 2), United Nations (UN), New York and Geneva, p. 106. Draft Article 2 defines “armed conflict” as “a situation in which there is resort to armed force between States or protracted resort to armed force between governmental authorities and organized armed groups”.
2. Regardless of whether or not the ZNPP continues to be licensed by the SNRIU, this does not change the operator’s liability and/or the subsidiary liability of the Ukrainian state under the nuclear liability conventions. In the beginning of July 2023, the SNRIU issued regulatory orders to limit the operation of all six units to a cold shutdown state. IAEA, Press Release, “Update 173 – IAEA Director General Statement on Situation in Ukraine”, IAEA Press Release No. 71/2023 (12 July 2023).

traveling to and from the sites.<sup>3</sup> The IAEA Director General's Summary Reports on the situation at the ZNPP underlined that the "seven indispensable pillars for nuclear safety and security" had been compromised, thereby significantly raising the risk of a nuclear accident or incident.<sup>4</sup> The IAEA Director General called for the establishment of a nuclear safety and security protection zone around the ZNPP, which, having been subjected to continued shelling within Ukraine, represented "a constant threat to nuclear safety and security with potential impact on critical safety functions that may lead to radiological consequences with great safety significance".<sup>5</sup>

The IAEA Director General's statements and reports were supported by a European Union (EU) statement that underlined that the EU "has repeatedly stressed the need to consider also new legally binding international rules specifically prohibiting armed attacks against any nuclear installation devoted to peaceful purposes, as called for by the IAEA General Conference resolutions, which refer to the UN Charter."<sup>6</sup> In the meantime, IAEA teams were granted full access to the ZNPP and Chernobyl Plant for inspection and verification, and so far, no radiological release has occurred, as the IAEA Director General

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3. See SNRIU (2022) "Chornobyl NPP Facilities, Current Situation (March 24, 2022)", SNRIU: News <https://snriu.gov.ua/en/news/chornobyl-npp-facilities-current-situation-march-24-2022> ("As of 24 March 2022, all Chornobyl NPP facilities and facilities located in the Exclusion Zone remain under the control of the aggressor country's military. *The regulatory control over the state of nuclear and radiation safety at the Chornobyl NPP site and in the Exclusion Zone, as well as control over nuclear materials is currently impossible to exercise.*" [emphasis added]) (accessed 24 Jan. 2024); SNRIU (2022), "Information on the ZNPP Current Status (26.03.2022)"; SNRIU: News, <https://snriu.gov.ua/en/news/information-znpp-current-status-26032022> ("The Zaporizhzhia NPP and Enerhodar city are occupied by the Russian military units since 4 March 2022. [...] *The regulatory oversight over nuclear and radiation safety directly at the ZNPP site is currently impossible to exercise, but the SNRIU continues maintaining contact with the ZNPP management.*" [emphasis added]) (accessed 24 Jan. 2024). The regulator also informed the IAEA, which was closely monitoring the situation:

Out of the country's 15 operational reactors at four sites, the regulator said eight were continuing to operate, including two at Zaporizhzhya, three at Rivne, one at Khmelnytskyi, and two at South Ukraine. The other reactors are shut down for regular maintenance, it added. In relation to safeguards, the Agency said that the situation remained unchanged from that reported previously.

IAEA, Press Release, "Update 33 – IAEA Director General Statement on Situation in Ukraine", IAEA Press Release No. 47/2022 (26 Mar. 2022). On 31 March 2022 Russian forces, in writing, transferred control of the Chernobyl Plant to Ukrainian personnel. IAEA, Press Release, "Update 38 – IAEA Director General Statement on Situation in Ukraine, IAEA Press Release No. 54/2022 (31 Mar. 2022).

4. See IAEA (2023), "Nuclear Safety, Security and Safeguards in Ukraine: February 2022 – February 2023", IAEA, Vienna, Foreword. See also IAEA (2022) "Nuclear Safety, Security and Safeguards in Ukraine: Summary Report by the Director General, 24 February – 28 April 2022", IAEA, Vienna, pp. 5-6; IAEA (2022), "Nuclear Safety, Security and Safeguards in Ukraine: 2<sup>nd</sup> Summary Report by the Director General, 28 April – 5 September 2022", IAEA, Vienna, pp. 4-5 (Summary report for 28 April – 5 September 2022).
5. Summary report for 28 April – 5 September 2022, *supra* note 4, p. 13. See also Dahl, F. (2022), "IAEA Proposal for Ukraine Nuclear Safety and Security Protection Zone Wins Support as Talks Begin on Its Establishment", IAEA: News, [www.iaea.org/newscenter/news/iaea-proposal-for-ukraine-nuclear-safety-and-security-protection-zone-wins-support-as-talks-begin-on-its-establishment](http://www.iaea.org/newscenter/news/iaea-proposal-for-ukraine-nuclear-safety-and-security-protection-zone-wins-support-as-talks-begin-on-its-establishment) ("Further underlining the need for such a zone, there has been renewed shelling at the ZNPP site this week, damaging electrical cables and temporarily forcing one of the six reactor units to rely on emergency diesel generators.") (accessed 24 Jan. 2024); Nuclear Engineering International (2022), "Russia Reaffirms Support for ZNPP Security Zone", Progressive Media International, London, [www.neimagazine.com/news/newsrussia-reaffirms-support-for-znpp-security-zone-10419401](http://www.neimagazine.com/news/newsrussia-reaffirms-support-for-znpp-security-zone-10419401) (accessed 26 Apr. 2024).
6. Delegation of the European Union to the International Organisations in Vienna, Press Release, "EU Statement at IAEA BoG on Nuclear Safety, Security and Safeguards in Ukraine, as delivered on 17 November 2022" (17 Nov. 2022), available at: [www.eeas.europa.eu/delegations/vienna-international-organisations/eu-statement-iaea-bog-nuclear-safety-security-and-safeguards-ukraine-delivered-17-november-2022\\_en?s=66](http://www.eeas.europa.eu/delegations/vienna-international-organisations/eu-statement-iaea-bog-nuclear-safety-security-and-safeguards-ukraine-delivered-17-november-2022_en?s=66) (accessed 26 Apr. 2024).

confirmed, adding that “[a]ny military firepower directed at or from the facility would amount to playing with fire, with potentially catastrophic consequences.”<sup>7</sup>

However, in this context and as will be discussed below, should a nuclear incident occur at either of the nuclear installations (including from any other buildings on the site or any transport of nuclear materials to and from the site), Ukraine and the Ukrainian operators remain, in principle, liable for any resulting nuclear damage. This article examines in some detail the international nuclear liability conventions’ provisions on “war-like” acts and the conventions’ readily available *travaux préparatoires* to determine under what circumstances these were intended to exonerate operators of nuclear installations from liability.

Ukraine is a contracting party to the IAEA’s 1963 Vienna Convention on Civil Liability for Nuclear Damage,<sup>8</sup> and has enacted legislation to implement it.<sup>9</sup> A fundamental feature of the 1963 Vienna Convention and the other nuclear liability conventions is that the civil liability for nuclear damage is channelled exclusively to the operator, to the exclusion of any other person, and that this liability is “absolute”.<sup>10</sup> At the same time, the 1963 Vienna Convention and the other nuclear liability conventions include an exception to, or exoneration from, the operator’s absolute liability where nuclear damage is “directly due”

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7. IAEA, Press Release, “Director General Grossi Alarmed by Shelling at Ukraine NPP, says IAEA Mission Vital for Nuclear Safety and Security”, IAEA Press Release No. 124/2022 (6 Aug. 2022). The IAEA Director-General added in a statement that: “An increased risk of military activities near the Zaporizhzhya Nuclear Power Plant could potentially endanger nuclear safety and security at this major facility. I call on all sides to refrain from any action that could lead to a nuclear accident with potential consequences for public health and the environment.” IAEA, Press Release, “Update 176 – IAEA Director General Statement on Situation in Ukraine”, IAEA Press Release No. 76/2023 (29 July 2023).
  8. Vienna Convention on Civil Liability for Nuclear Damage (1963), IAEA Doc. INFCIRC/500, 1063 UNTS 266, entered into force 12 Nov. 1977 (1963 Vienna Convention). Ukraine signed the 1997 Protocol to Amend the Vienna Convention and the 1997 Convention on Supplementary Compensation for Nuclear Damage (CSC) on 19 September 1997, but it has not ratified either of the conventions and is thus not bound by their provisions. See IAEA (2023), “Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage”, available at: [www.iaea.org/sites/default/files/23/09/protamend\\_status.pdf](http://www.iaea.org/sites/default/files/23/09/protamend_status.pdf) (accessed 26 Apr. 2024); IAEA (2020), “Convention on Supplementary Compensation for Nuclear Damage” (last change of status as of 18 Sept. 2019), available at: [www.iaea.org/sites/default/files/22/06/supcomp\\_status.pdf](http://www.iaea.org/sites/default/files/22/06/supcomp_status.pdf) (accessed 26 Apr. 2024).
  9. As a contracting party to the 1963 Vienna Convention, Ukraine is in treaty relations with most nearby countries, including Russia, which is also a contracting party to the Vienna Convention. See IAEA (2023), “Vienna Convention on Civil Liability for Nuclear Damage” (last change of status as of 25 Sept. 2023), available at: [www.iaea.org/sites/default/files/23/09/63\\_vc\\_status.pdf](http://www.iaea.org/sites/default/files/23/09/63_vc_status.pdf) (accessed 26 Apr. 2024). Ukraine is also a contracting party to the 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). Since Ukraine ratified the Joint Protocol, contracting parties to the Paris Convention on Third Party Liability in the Field of Nuclear Energy and to the Joint Protocol are considered contracting parties for the application of the Ukrainian Law on Civil Liability for Nuclear Damage and its Financial Security. The Ukrainian Law does not address whether it applies to nuclear damage suffered in states with which Ukraine does not have nuclear liability treaty relations, which may be interpreted to mean that it would compensate damage wherever suffered. See NEA (2002), “Unofficial Translation of Ukraine Law on Civil Liability for Nuclear Damage and its Financial Security”, *Nuclear Law Bulletin*, No. 69, Supplement, OECD Publishing, Paris, pp. 11-17.
  10. See e.g. 1963 Vienna Convention, *supra* note 8, Article IV(1) (“The liability of the operator for nuclear damage under this Convention shall be absolute.”).

to war-like events.<sup>11</sup> Some possible scenarios can be envisaged. One scenario is where a nuclear power plant is controlled by occupying forces resulting in the operator being unable to secure safety measures, and there is a radioactive release. The question arises whether, under such a scenario, the release should be regarded as a nuclear incident directly linked with the armed conflict. Correlatively, where the intention of the occupation was to prevent rogue elements of the war from causing harm, then it likely cannot be said that the release was directly caused by the war-like event.

As discussed *infra*, the existing operators of the ZNPP and the Chernobyl Plant would remain absolutely liable for any off-site nuclear damage, unless they could show that such nuclear damage was directly due to “an act of armed conflict or hostilities” committed by the Russian military. This may be a high standard for an operator to satisfy. For example, the war-risk exclusion in many insurance policies applies to nuclear damage caused either directly or indirectly.<sup>12</sup> If insurance is not available in Ukraine for a war-like act committed indirectly (and thus no exoneration of liability is applicable under the nuclear liability conventions), then the conventions require the Ukrainian state to guarantee the compensation to cover the liability limit fixed for the operator within the national legislation.<sup>13</sup>

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11. See *ibid.*, Article IV(3)(a) (“No liability under this Convention shall attach to an operator for nuclear damage caused by a nuclear incident *directly* due to an act of armed conflict, hostilities, civil war or insurrection.”) (emphasis added). The 1997 Protocol to Amend the Vienna Convention (to which Ukraine is not a contracting party) amended Article IV(3)(a) to provide: “No liability under this Convention shall attach to an operator *if he proves that* the nuclear damage is *directly* due to an act of armed conflict, hostilities, civil war or insurrection.” Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (1997), IAEA Doc. INFCIRC/566, 2241 UNTS 302, entered into force 4 Oct. 2003 (1997 Protocol to Amend the Vienna Convention) (emphasis added). The 1960 and 2004 versions of the Paris Convention and the Convention on Supplementary Compensation for Nuclear Damage contain the same language as the 1963 Vienna Convention, i.e. they do not explicitly state the operator needs to prove the damage is directly due to a war-like offense, although the difference is unlikely to have much practical effect since, in any case, the burden of proof is reversed in case of absolute liability of the operator. See Convention on Third Party Liability in the Field of Nuclear Energy of 29<sup>th</sup> July 1960, as amended by the Additional Protocol of 28<sup>th</sup> January 1964 and by the Protocol of 16<sup>th</sup> November 1982 (1960), 1519 UNTS 329 (Paris Convention), Article 9; 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, by the Protocol of 16 November 1982, and by the Protocol of 12 February 2004, entered into force 1 Jan. 2022, unofficial consolidated text available at: NEA (2017), “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, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004”, NEA Doc. NEA/NLC/DOC(2017)5/FINAL (Revised Paris Convention), Article 9; Convention on Supplementary Compensation for Nuclear Damage (1997), IAEA Doc. INFCIRC/567, 36 ILM 1473, entered into force 15 Apr. 2015 (CSC), Article 5a.
  12. Insurance policies normally contain a “nuclear hazards clause”, which is a provision stating that all damage resulting from any type of nuclear activity or radioactive releases is not covered by the policy. See e.g. Kagan, J. (2023), “Nuclear Hazards Clause”, Investopedia, [www.investopedia.com/terms/n/nuclear-hazards-clause.asp](http://www.investopedia.com/terms/n/nuclear-hazards-clause.asp) (accessed 26 Apr. 2024).
  13. See 1963 Vienna Convention, *supra* note 8, Article VII(1):  
The operator shall be required to maintain insurance or other financial security covering his liability for nuclear damage in such amount, of such type and in such terms as the Installation State shall specify. The Installation State shall ensure the payment of claims for compensation for nuclear damage which have been established against the operator by providing the necessary funds to the extent that the yield of insurance or other financial security is inadequate to satisfy such claims, but not in excess of the limit, if any, established pursuant to Article V.

## 2. Responsibility under international nuclear law

The primary responsibility under international nuclear law in general and nuclear liability law specifically is, without exception, always placed on the authorised person responsible for the operation of the nuclear installation, i.e. the licensed operator.<sup>14</sup> This entity has primary responsibility for the safety and security of the nuclear installation as specified in national legislation, regulations and the licence (authorisation). It is also one of the reasons why the nuclear liability conventions have adopted channelling of “absolute” (no-fault) liability to the operator to the express exclusion of any other person, including suppliers or employees. A simple unforeseeable or unavoidable act (even an act of terrorism or sabotage) will therefore not exonerate the operator or the installation state that has a residual responsibility. Crucial in the situation of Ukraine is therefore the extent to which the regulatory authority and staff of the ZNPP and the Chernobyl Plant continue to be able to safely and securely regulate and operate the Ukrainian nuclear facilities without being obstructed in any manner or placed under undue pressure within the ongoing international conflict. This will also determine the extent to which the 1963 Vienna Convention (to which both Russia and Ukraine are contracting parties) is applicable in respect of nuclear liability for any possible nuclear damage resulting from a radioactive release, the exoneration of that liability if directly resulting from a war-like act and to what extent the concepts of “operator” and “installation state” remain *de facto* applicable. In addition, a differentiation is to be made between “war-like events” and an act of terrorism or sabotage committed within the context of an international conflict, which complicates matters even further.

## 3. Concept of absolute liability and war-like act exoneration

As far as the 1963 Vienna Convention is concerned, war-like act exoneration was only briefly discussed in its *travaux préparatoires*, and initially there was no full agreement on whether or not it should exonerate the operator at all.<sup>15</sup> The reasoning was based on the concept of absolute liability for ultra-hazardous activities adopted in international law, as fully adopted under the 1972 Convention on International Liability for Damage Caused by Space Objects.<sup>16</sup> So far, there has been only one incident that caused transboundary damage on a foreign territory that was resolved under that convention. This was the Cosmos 954 satellite of the Soviet Union that fell on Canadian territory, for which the Soviet Union paid CAD 3 million as compensation “in full and final settlement of all matters connected with the disintegration of the Soviet satellite Cosmos 954” under the convention

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Nuclear insurers have recently introduced a new clause on armed conflict, which provides that the insurance policy “does not cover loss or damage directly or indirectly occasioned by, happening through or in consequence of war, invasion, acts of foreign enemies, hostilities (whether war be declared or not), civil war, rebellion, revolution, insurrection”. It was also indicated that reinsurance for both the ZNPP and Chernobyl Plant has been cancelled, and that all other Ukrainian nuclear power plants’ insurance now have the new clause. This would therefore mean that the Ukrainian state will be liable with public funds in case of a nuclear incident, according to the 1963 Vienna Convention.

14. See 1963 Convention on Nuclear Safety (1994), IAEA Doc. INFCIRC/449, 1963 UNTS 293, entered into force 24 Oct. 1996 (CNS).
15. For a full discussion, see Horbach, N.L.J.T., O.F. Brown, T. Vanden Borre (2002), “Terrorism and Nuclear Damage Coverage”, *Journal of Energy & Natural Resources Law*, Vol. 20, No. 3, Taylor & Francis, Abingdon, UK, pp. 231-269. See also IAEA (1964), *Civil Liability for Nuclear Damage – Official Records*, IAEA Legal Series No. 2, IAEA Doc. STEI/PUB/54, IAEA, Vienna, p. 46.
16. Convention on International Liability for Damage Caused by Space Objects (1971), 961 UNTS 187, adopted by UN General Assembly Resolution 2777 (XXVI) (1971), entered into force 1 Sept. 1972.

(i.e. the expenses for the recovery of radioactive material under Operation Morning Light).<sup>17</sup> The discussion on the liability exoneration for the operator in the case of war-like acts was further based on the Convention on Liability of Operators of Nuclear Ships signed in Brussels on 25 May 1962.<sup>18</sup> Article VIII of that convention states that “[n]o liability under this Convention shall attach to an operator in respect to nuclear damage caused by a nuclear incident directly due to an act of war, hostilities, civil war or insurrection”.<sup>19</sup>

The second report (CN-12/2) of the Intergovernmental Committee on Civil Liability for Nuclear Damage states that:

Some members of the drafting committee suggested that the text of Article VIII of the Brussels Convention should be adopted, with the proviso that national law could provide exonerations from liability in the case of grave natural disasters, *although the full Committee had not decided that there should be an automatic exoneration in cases of acts of war, hostilities, civil war or insurrection as under the Brussels Convention*.<sup>20</sup>

The absolute liability for operators was therefore “not to be subject to the classical exonerations such as *force majeure*, acts of God or intervening of third persons, irrespective of whether or not they were reasonably foreseeable and avoidable.”<sup>21</sup> The *raison d’être* is that only the operator and state are in a position to take precautions, whereas potential victims could not. As provided in paragraph 48 of the *Exposé des Motifs* to the 1960 Paris Convention to which the Intergovernmental Committee explicitly referred and which served as the basis for negotiating the text of the Vienna Convention:

The only exonerations lie in the case of damage caused by a nuclear incident *directly due* to certain disturbances of an international character such as acts of armed conflict and hostilities, of a political nature such as civil war and insurrection, or grave natural disasters of an exceptional character, which are *catastrophic and completely unforeseeable*, on the grounds that all such matters are the *responsibility of the nation as a whole*. No other exonerations are permitted. The national legislation of the operator liable may, however, provide that he is to be liable even in the case of a grave natural disaster of an exceptional character [Article 9].<sup>22</sup>

This was reiterated in the comments on the draft articles of the Vienna Convention, with the addition that “[i]t is provided, however, that a State may, by national law, even further restrict the exonerations.”<sup>23</sup> This means that nothing prevents a country from

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17. See Article I of the Protocol between the Government of Canada and the Government of the Union of Soviet Socialist Republics (1981), on the Disintegration of Cosmos 954 over Canadian Territory in 1978, available at: [www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/bi-multi-lateral-agreements/can\\_ussr\\_001.html](http://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/bi-multi-lateral-agreements/can_ussr_001.html) (accessed 26 Apr. 2024).
  18. Convention on the Liability of Operators of Nuclear Ships (1962) (not in force), reprinted in 57 *American Journal of International Law*, No. 1, Cambridge Univ. Press, New York, p. 268 (Brussels Convention).
  19. Note that the word “hostilities” replaced the original term “invasion” in an earlier version of the 1963 Vienna Convention, Article III(3)(a). In reference to Article VIII of the Brussels Convention of Operators of Nuclear Ships, some members of the drafting committee stated that similar language should be incorporated in the Vienna Convention and because it was the general understanding that, in case of war-like acts against nuclear ships, “hostilities” would be a better concept than “invasion”. It was merely considered to be wider in the sense that “invasion” suggests military troops/ships or aircraft on a foreign territory, whereas “hostilities” could take place with no actual physical presence in the foreign country.
  20. IAEA (1964), *supra* note 15, p. 46, no. 24. (emphasis added).
  21. IAEA (2020), *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 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna, p. 10 (Explanatory Texts).
  22. NEA (1982), “Exposé des Motifs”, revised text approved by the OECD Council on 16 Nov. 1982, OECD Doc. C/M(82)24(Final), p. 53 (emphasis added), available at: [www.oecd-nea.org/jcms/pl\\_79227](http://www.oecd-nea.org/jcms/pl_79227) (accessed 26 Apr. 2024).
  23. IAEA (1964), *supra* note 15, p. 77, nos. 56-57.

making the operator liable even in case of war-like events, provided that compensation is guaranteed as a last resort by the state itself. However, the Ukrainian law did not provide for this.<sup>24</sup> The war-like exoneration was intended to cover only such exceptional circumstances under which, as described by the UK delegation at the 12<sup>th</sup> meeting on the Draft Convention on Minimum International Standards Regarding Civil Liability for Nuclear Damage, “law and order might break down” such as in war, hostilities, civil war, insurrection, revolutions and rebellion.<sup>25</sup> It was further clear that, within the context of the exonerations that were allowed, the manner in which it was possible to control, prevent or protect against any such unforeseeable catastrophic events, including during international conflict and war, was considered to be a determinative factor:

If war were considered a fair exception on the ground that the responsibility for it fell on the nation as a whole, the operator could not be held more responsible in case of a grave natural disaster for it was *humanly possible to prevent war* but not to prevent an earthquake. The Convention must ensure all possible protection for the public but *should not impose on the operator an unreasonable or undefined burden* which would cripple the development of peaceful uses of atomic energy in countries such as Japan. Insurance cover against natural disaster as against war would be exorbitant if indeed it could be obtained at all.<sup>26</sup>

It seems, therefore, that the liability exonerations were limited to those situations where operators have absolutely no control, and the issue becomes a responsibility of the “nation as a whole”.<sup>27</sup> The measure of actual and *de facto* control of not only the operator, but also the regulatory body and the state, therefore may be only determinative in whether or not exoneration of the operator due to war-like events can be applied, should a nuclear incident occur.<sup>28</sup> Furthermore, exonerating an operator from liability for nuclear damage, such as may be the case in grave natural disasters, could result in a situation where no one is liable and victims would be without a means to recover damages. This was considered to be undesirable in general. In this context, the situation of the war-exoneration was viewed differently from grave natural disasters, for instance, according to one of the representatives, “[i]n the case of an armed conflict civil war etc. the combatants would be liable provided they were liable in common law”.<sup>29</sup>

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24. See section 73 of the Law of Ukraine on the Use of Nuclear Energy and Radiation Safety, reproduced in NEA (1995), “Ukraine Law on the Use of Nuclear Energy and Radiation Safety”, *Nuclear Law Bulletin*, No. 56, Supplement, OECD Publishing, Paris, pp. 3-44.

25. IAEA (1964) *supra* note 15, p. 250, no. 12.

26. *Ibid.*, pp. 249-250, nos. 6-7 (emphasis added).

27. For instance, Japan’s Act on Compensation for Nuclear Damage, No. 147 of 1961, as amended by Act No. 19 of 17 April 2009, sec. 3, provides for an exoneration of the operator’s liability “where the damage is caused by a grave natural disaster of an exceptional character”. NEA (ed.) (2012), *Japan’s Compensation System for Nuclear Damage*, OECD Publishing, Paris, p. 62. This exoneration was not invoked for the 2011 Fukushima Daiichi accident, which resulted from a massive earthquake and tsunami. According to the Diet’s deliberations during enactment of the Act, such circumstances would only involve “situations that are completely beyond all imagination”, “a super-act of God”, something like a meteorite fall. Nomura T., T. Hukugo and C. Takenaka (2012), “Japan’s nuclear liability system”, in *ibid.*, p. 18.

28. As an example, in the United States, nuclear power plants are not required as a condition of construction permits to show effective protection against every conceivable form of attack or sabotage. See *Siegel v. Atomic Energy Commission*, 400 F.2d 778 (DC Cir. 1968). The case involved challenges to an order of the Commission authorising a public utility company to construct two nuclear reactors for the generation of electricity in Southern Florida, following opponents of the reactors citing the danger of an enemy attack following the Cuban Missile Crisis. The court found that the US Congress did not expect a construction permit applicant to demonstrate how its plant would be invulnerable to whatever destructive forces a foreign enemy might be able to direct against it. *Ibid.*, p. 784.

29. IAEA (1964), *supra* note 15, p. 226, no. 43.

The fact that no one would be liable for nuclear damage to the installation itself, even if caused intentionally, was also considered undesirable and resulted in the adoption of another exception to the channelling of liability principle to allow for liability of, and right of recourse against, any individual (physical person) acting with intent (including an omission to act) to cause nuclear damage (e.g. a terrorist).<sup>30</sup> This was based on the proposal by Sweden and Denmark resulting in Article IV(7)(a) of the Vienna Convention:

In respect of nuclear damage for which the operator by virtue of paragraph 3 of Article III is not liable under this Convention nothing in the Convention shall affect the liability of any individual who has caused the damage by an act or omission done with intent to cause damage.<sup>31</sup>

This proposal, as adopted, was intended to deal with cases where the operator was exempted from liability such as in case of war-like events:

The sponsors had particularly in mind cases where a serious nuclear incident might have been produced by an act intended to cause damage. In the absence of such a provision, insurrectionists, for example, who had intentionally caused nuclear damage might be brought to court and then exonerated under the Convention.<sup>32</sup>

From the *travaux préparatoires*, it can thus be discerned that the exoneration of liability of the operator applies only in exceptional situations in which a war-like act directly causes nuclear damage, e.g. in situations that are completely beyond human control and thus will become the responsibility of the nation as a whole.<sup>33</sup> This would include bombing or other military attacks directed against nuclear power plants within international conflict that are beyond the control of the operator and state. It would not include situations in which *de facto* operational control of the nuclear power plant has been compromised through foreign military occupation, but safe and secure operation is not otherwise jeopardised – unless, of course, the purpose of such occupation is not to prevent but to allow (by an act or omission to act) for any intentional intervention resulting in a nuclear incident. The latter, if perpetrated by non-state (or semi-state) actors, would rather be an act of terrorism that, whether international or domestic, would not exonerate the operator from liability. Should the operator be exonerated, then the “insurrectionists” or other war combatants may be held liable under general laws, or the states under international law (see *infra*), while, as mentioned above, the 1963 Vienna Convention does not affect the liability of any individual (terrorist or not) that acted with intent to cause nuclear damage and provides the operator with a right of recourse against any such individual.

#### 4. Need for factual determination of direct cause of damage

To be exonerated from its otherwise absolute liability in the event of off-site nuclear damage, the installation operator would need to show that the nuclear damage results from a nuclear incident that was directly due to one of the war-like acts listed in the 1963 Vienna Convention, Article IV(3)(a). This would require the court with jurisdiction over the nuclear damage claims to make a factual determination, which may be difficult or not depending upon the circumstances. For example, it was reported that, due to continued shelling, ZNNP

30. See 1963 Vienna Convention, *supra* note 8, Article IV(2) and X(b); Explanatory Texts, *supra* note 21, pp. 12-13.

Under Article X, a right of recourse is only granted to the operator in two cases: first, if a right of recourse is expressly provided for by a contract in writing; second, where the incident resulted from an act or omission done with intent to cause damage, against the ‘individual’ responsible. In this latter case, the right of recourse is limited to a right against the physical person who acts or omits to act with intent to cause damage, and there is no right of recourse against the employer of that person.

31. 1963 Vienna Convention, *supra* note 8, Article IV(7)(a).

32. IAEA (1964), *supra* note 15, p. 343, no. 18 (statement by Mr Spleth, Denmark delegation).

33. See also ILC (2011), *supra* note 1, p. 112, Article 4 (“Where a treaty itself contains provisions on its operation in situations of armed conflict, those provisions shall apply.”).



lost its last remaining external power source.<sup>34</sup> If that action had been caused by Russian military forces and had resulted in a nuclear incident that caused nuclear damage, it is likely the Zaporizhzhia operator would have been able to invoke the war-like exoneration. On the other hand, the Russian forces purportedly did not interfere with the plant's staff (e.g. by allowing the usual worker rotation) and, if there were a release causing off-site nuclear damage, it probably would be more difficult for the operator to show that the nuclear damage was directly due to a war-like act. In short, any exoneration of the operator based on the war-like act exception to the channelling principle would be fact-dependent.

## 5. Acts of terrorism and sabotage

From the *travaux préparatoires* of the 1963 Vienna Convention, it can be discerned that even acts of intentional terrorism or sabotage were not considered to fall within the exoneration of the absolute liability of the operator.<sup>35</sup> This was confirmed in the Explanatory Text to the 1997 Vienna Convention and confirmed by the IAEA's International Expert Group on Nuclear Liability (INLEX), which was established in September 2003.<sup>36</sup> Thus, the operator remains absolutely liable under the channelling principle for such acts (which usually involve non-state individuals). The operator has the obligation to have in place the nuclear security measures shielding the nuclear installation against any such acts and to install effective protective systems and measures to prevent possible escalation resulting in a nuclear incident. Therefore, the Russian military in control of the nuclear installation should refrain from any conduct that could compromise nuclear security and safety and prevent any possible situation that could result in nuclear damage and injury to innocent civilians, whether domestic or abroad.

Finally, there could be a situation where nuclear damage is a result of a nuclear incident jointly with another occurrence that causes an emission of ionising radiation not falling within the context of a "nuclear incident" and thus not covered by the 1963 Vienna Convention. The operator would still remain liable in such a situation, whether such an incident involves acts of terrorism by Ukrainian or Russian individuals,<sup>37</sup> but the 1963 Vienna

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34. IAEA, Press Release, "Ukraine's ZNPP Must Be Urgently Protected, IAEA's Grossi Says After Plant Loses All External Power Due to Shelling", IAEA Press Release No. 163/2022 (8 Oct. 2022). See also Reuters (2023), "Russia says Ukraine 'playing with fire' with drone attack near nuclear plant", Reuters, [www.reuters.com/world/europe/russia-says-ukrainian-drones-launched-an-attack-near-zaporizhzhia-nuclear-power-2023-11-02](http://www.reuters.com/world/europe/russia-says-ukrainian-drones-launched-an-attack-near-zaporizhzhia-nuclear-power-2023-11-02).
35. See IAEA (1964), *supra* note 15, p. 46; Explanatory Texts, *supra* note 21, p. 13. See also Horbach, N.L.J.T., O.F. Brown, and T. Vanden Borre (2002), "Terrorism and Nuclear Damage Coverage", *supra* note 15.
36. See Explanatory Texts, *supra* note 21, p. 46, referring to the confirmation in the fourth meeting (7–11 February 2005) of INLEX concluding that "the phrase '... armed conflict, hostilities, civil war or insurrection' ... was not intended to include acts of terrorism, as an exoneration."
37. For instance, at the beginning of March 2022, the Ukrainian Ministry of Defence claimed that the Russian army attacked the experimental nuclear reactor in Kharkiv at the National Research Centre of the Kharkiv Institute of Physics and Technology, whereas the Russian Ministry of Defence claimed that "Ukrainian sabotage groups" planted a mine in the area planning to blow up the reactor in order to blame Russia for it. See e.g. TASS, Press Release, "Russia Notifies OPCW of Ukraine's Plans To Stage Provocation at Kharkov's Nuclear Reactor" (9 Mar. 2022), <https://tass.com/politics/1419419>; News 18 (2022), "Russia Says Ukraine Attacking Nuclear Reactor In Kharkiv, To Pin Blame On Russian Army Later", News 18, [www.news18.com/news/world/russia-says-ukraine-attacking-nuclear-reactor-in-kharkiv-pin-blame-on-russian-army-4844984.html](http://www.news18.com/news/world/russia-says-ukraine-attacking-nuclear-reactor-in-kharkiv-pin-blame-on-russian-army-4844984.html). Had there been nuclear damage from a release in either scenario, liability under the 1963 Vienna Convention likely would be treated differently, depending upon a factual determination of the cause. If a release were directly due to a Russian army attack, it likely would exonerate the reactor operator under the 1963 Vienna convention as war-related. On the other hand, if the release were caused by "Ukrainian sabotage groups", the operator would remain liable.

Convention explicitly states that it will not affect the liability or rights of recourse in respect of those responsible for the related occurrence.<sup>38</sup>

## 6. Right of recourse

For intentional acts, the operator (state or insurer) will have a right of recourse for compensation paid against the perpetrator of the act of terrorism or sabotage, since Article IV(7)(a) of the 1963 Vienna Convention allows for claims against individuals (physical persons) that cause nuclear damage by their intentional acts, whether they are foreign or domestic. In this context, it is therefore also relevant to take into account the intention of any foreign occupation of the nuclear installation and whether or not such occupation actively ensures protective measures to prevent any possible escalation or acts of sabotage. Article X(b) of the 1963 Vienna Convention gives the operator a right of recourse if the nuclear incident results from “an act or omission done with intent to cause damage, against the individual [physical person] who has acted or omitted to act with such intent”. However, this provision may not have much practical effect, since it is unlikely the physical person involved would have the financial resources to compensate for the nuclear damage – i.e. they would likely be judgment proof. On the other hand, any person or entity directly or indirectly engaged in or sponsoring or financing an act of terrorism resulting in a radioactive release, can be held criminally as well as financially liable under the International Convention for the Suppression of the Financing of Terrorism (1999)<sup>39</sup> and the International Convention for the Suppression of Acts of Nuclear Terrorism (2005).<sup>40</sup> As provided in Article 2(1) of the Terrorist Financing Convention:

Any person commits an offence within the meaning of this Convention if that person by any means, directly or indirectly, unlawfully and wilfully, provides or collects funds with the intention that they should be used or in the knowledge that they are to be used, in full or in part, in order to carry out [...] any other act intended to cause death or serious bodily injury to a civilian, or to any other person not taking an active part in the hostilities in a situation of armed conflict, when the purpose of such act, by its nature or context, is to intimidate a population, or to compel a government or an international organization to do or to abstain from doing any act.<sup>41</sup>

As both Russia and Ukraine are parties to the Terrorist Financing Convention and the Nuclear Terrorism Convention, both have an international obligation to actively identify and prevent such acts defined within the conventions and ensure the identification, detection and freezing or seizure of any funds used or allocated for the purpose of committing any act of terrorism. In fact, Ukraine claimed that Russia had breached this

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38. 1963 Vienna Convention, *supra* note 8, Article IV(4), provides:

Whenever both nuclear damage and damage other than nuclear damage have been caused by a nuclear incident or jointly by a nuclear incident and one or more other occurrences, such other damage shall, to the extent that it is not reasonably separable from the nuclear damage, be deemed, for the purposes of this Convention, to be nuclear damage caused by that nuclear incident. Where, however, damage is caused jointly by a nuclear incident covered by this Convention and by an emission of ionizing radiation not covered by it, nothing in this Convention shall limit or otherwise affect the liability, either as regards any person suffering nuclear damage or by way of recourse or contribution, of any person who may be held liable in connection with that emission of ionizing radiation.

39. International Convention for the Suppression of the Financing of Terrorism (1999), 2178 UNTS 229, entered into force 10 Apr. 2002 (Terrorist Financing Convention).

40. International Convention for the Suppression of Acts of Nuclear Terrorism (2005), 2445 UNTS 137, entered into force 7 July 2007 (Nuclear Terrorism Convention).

41. See also *ibid.*, Articles 2 and 18.

obligation in its case brought before the International Court of Justice in 2017.<sup>42</sup> In addition, both states are obligated to establish criminal, civil or administrative liability, while ensuring that such “criminal acts within the scope of this Convention are under no circumstances justifiable by considerations of a political, philosophical, ideological, racial, ethnic, religious or other similar nature”.<sup>43</sup>

## 7. Concept of “operator” and “Installation State”

The *de facto* control of the operator and the state may have some relevance in respect of the determination of the (liable) “operator” and (responsible) “Installation State” and to whom nuclear liability is to be channelled under the nuclear liability conventions, i.e. to the extent that *de facto* control lies with a person other than the licensee and the nuclear installation is operated under the “jurisdiction or authority” of a state. *In casu*, both concepts could be relevant and employed as an argument to determine the *de facto* liable person. In the context of liability of transport of nuclear materials, for instance, the shift of liability from the sending to the receiving operator, and *vice versa*, was also based on the concept of “physical control”. In the absence of a written contract, liability remains with the sending operator (responsible for safety and security of packaging) until the receiving operator “takes charge” of the nuclear material and/or in case of material sent to non-contracting states, after the material is “unloaded” from the means of transport.<sup>44</sup> Both refer to a shift in “physical control”, relevant to determine the shift in liability, which is also based upon the fact that from that moment on, the receiving operator will be in the position to ensure safety and security of the material. This interpretation was clarified during the negotiations of the 1963 Vienna Convention.<sup>45</sup> The 1963 Vienna Convention defines “operator” in relation to nuclear installation as “the person designated or recognized by the Installation State as the operator of that installation”.<sup>46</sup> As to the definition of “operator”, the *travaux préparatoires* of the Vienna Convention did not depart from those of the 1960 Paris Convention (Article 1(a)(vi)) and the 1963 Brussels Supplementary Convention (Article I(4))<sup>47</sup> – i.e. the person with the authorisation (licence) to operate a nuclear installation and responsible for nuclear safety and security should thus be liable for any nuclear damage. The negotiators of the Vienna Convention noted that in the absence of any official authorisation by the state, “*de facto* control” may be a determinative factor:

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42. On 16 January 2017, the government of Ukraine filed in the Registry of the Court an application instituting proceedings against Russia with regard to alleged violations of the Terrorist Financing Convention. The proceedings are not finalised. See Application of the International Convention for the Suppression of the Financing of Terrorism and of the International Convention on the Elimination of All Forms of Racial Discrimination (Ukraine v. Russian Federation), Provisional Measures, Order of 19 April 2017, ICJ Reports 2017, p. 104 and *ibid.*, Preliminary Objections, Judgment, ICJ Reports 2019, p. 558, available at: [www.icj-cij.org/en/case/166](http://www.icj-cij.org/en/case/166) (accessed 26 Apr. 2024).
43. Terrorist Financing Convention, *supra* note 39, Article 6.
44. See generally Bukhari, K. (2022), “The international regulatory framework governing the safe and secure transport of nuclear and radioactive materials”, in NEA, (ed.), *Principles and Practice of International Nuclear Law*, OECD Publishing, Paris, p. 333.
45. A Dutch proposal was to change the “taken charge”, as used in the 1960 Paris Convention, to “physical control”, i.e. “before physical control over the nuclear material has been assumed by the operator of another nuclear installation in its territory”. This was not approved, but the discussion clarified what the delegates understood under “take charge”. See proposal CN-12/CW/1 amendment 25 and related statement made by Mr Scheffer of the Netherlands delegation. IAEA (1964), *supra* note 15, pp. 197-198. See also *ibid.*, pp. 214-220.
46. 1963 Vienna Convention, *supra* note 8, Article I(c).
47. 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).

This definition identifies the person who is liable for nuclear damage. In most instances a person will have been authorized to operate a nuclear installation. If, however, no express authorization has been given, the law of the Installation State will – by a special provision or by the application of general principles – identify the person who will be considered the operator. This person may be the owner, the possessor of the installation or *the person who has de facto control over it*.<sup>48</sup>

Within this context, it is crucial to determine to what extent the regulatory authority and the nuclear power plant's staff continue to be able to safely and securely regulate and operate the Ukrainian nuclear facilities, without being obstructed in any manner or placed under “undue pressures” that would jeopardise the exercise of *de facto control*.<sup>49</sup>

Another approach is taken with respect to the determination of the “Installation State”, which Article I(1)(d) of the 1963 Vienna Convention defines, in relation to nuclear installation, as “the Contracting Party within whose territory that installation is situated or, if it is not situated within the territory of any State, the Contracting Party by which or under the authority of which the nuclear installation is operated”.<sup>50</sup> As reflected in the record of the development of the 1963 Vienna Convention,

The term “Installation State” is necessary to designate the State *that has legislative competence* with regard to nuclear damage. Reactors and other nuclear installations may conceivably be operated outside the territory of any State – e.g. on the High Seas or in the Antarctic regions. It is therefore provided that any State which operates or which has authorized such installations shall be considered the Installation State.<sup>51</sup>

So, unless a state operates, or has authorised the operation of, a nuclear installation not situated within its own territory or any other state, the designated Installation State under the Vienna Convention remains to be in line with the interpretation of “operator” and “Installation State”, despite the military occupation and *de facto control* of the nuclear installation will provide an insufficient basis to shift liability away from the Ukrainian operator and state under the 1963 Vienna Convention.

## 8. Liability and responsibility outside of the 1963 Vienna Convention

Under the state responsibility rules, both the Russian and Ukrainian states may be held responsible and liable for injurious consequences and must ensure prompt and adequate compensation under international law, should these countries be responsible through their attributable conduct (both action and omission) for a radioactive release resulting from nuclear material or a nuclear incident at a nuclear power plant.<sup>52</sup> The nuclear liability

48. IAEA (1964), *supra* note 15, p. 70 (emphasis added).

49. IAEA Director General Rafael Mariano Grossi outlined seven indispensable pillars of nuclear safety and security in a meeting on the Ukrainian situation, emphasising notably Pillar 3, which states: “The operating staff must be able to fulfil their safety and security duties and have the capacity to make decisions free of undue pressure”. IAEA, Press Release, “Update 13 – IAEA Director General Statement on Situation in Ukraine”, IAEA Press Release No. 22/2022 (6 Mar. 2022).

50. 1963 Vienna Convention, *supra* note 8, Article I(1)(d).

51. IAEA (1964), *supra* note 15, p. 70, no. 30 (emphasis added).

52. See ILC (2007), “Responsibility of States for Internationally Wrongful Acts” (“Responsibility of States”), in *Yearbook of the International Law Commission 2001*, Vol. II, Part Two, Doc. A/CN.4/SER.A/2001/Add.1 (Part 2), UN, New York and Geneva, p. 31. See also ILC (2000), “Draft International Liability for Injurious Consequences Arising out of Acts not Prohibited by International Law” (“Draft Articles”), in *Yearbook of the International Law Commission 1997*, Vol. II, Part One, Doc. A/CN.4/SER.A/1997/Add.1 (Part 1), UN, New York and Geneva, p. 1. This was later split into the “Draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities”, [https://legal.un.org/ilc/texts/instruments/english/draft\\_articles/9\\_10\\_2006.pdf](https://legal.un.org/ilc/texts/instruments/english/draft_articles/9_10_2006.pdf) (accessed 24 Apr. 2024) and draft articles on “Prevention of Transboundary Harm from Hazardous Activities”, [https://legal.un.org/ilc/texts/instruments/english/draft\\_articles/9\\_7\\_2001.pdf](https://legal.un.org/ilc/texts/instruments/english/draft_articles/9_7_2001.pdf) (accessed 26 Apr. 2024).

conventions explicitly state that they do not affect the general rules of public international law, including rules on state responsibility.<sup>53</sup> In this context, the remarks of Mr Arangio-Ruiz, the representative of Italy taking part in the negotiations on the 1963 Vienna Convention and the Special Rapporteur in respect of the draft articles on state responsibility within the International Law Commission, may shed some light. The Italian delegation put forward a proposal to explicitly deal with the problem of international responsibility of states for nuclear damage,<sup>54</sup> leading to the inclusion of Article XVIII of the 1963 Vienna Convention, which states: “This Convention shall not be construed as affecting the rights, if any, of a Contracting Party under the general rules of public international law in respect of nuclear damage.” Mr Arangio-Ruiz explained that:

A State might be an operator, and as such would be liable under the Convention, it was also liable as a public authority responsible for nuclear operations in the Installation State and as such was liable for violations of the Convention when it came into force. These obligations were actionable before the competent courts, or, if an international dispute arose concerning the application of the Convention, they would be determined through negotiations, arbitration or any other means provided for in the Convention. Nevertheless, those obligations did not cover all the rights and duties of States and their responsibility under the international law of torts, as distinct from non-compliance with conventions, should also be mentioned.

The law of nations might be invoked in cases of *omission or negligence by a State*, for instance where governmental controls over a nuclear installation were inadequate, or where a State tended to favour placing installations in frontier areas with a view to limiting damage occurring in its own territory. In such cases, although the State might not be the operator and might not be violating the Convention, it might nevertheless be liable under international law for damage caused to nationals of another State. The Convention should not be interpreted so as to prevent a State from acting through diplomatic channels or through an arbitral or judicial authority to obtain compensation for damage caused by another State.<sup>55</sup>

Finally, the “law of war”, or international humanitarian law, which applies to governmental forces and non-state armed groups and aims to reduce suffering and save lives in case of (international) armed conflicts, should also be taken into account. The Geneva Conventions of 12 August 1949 (specifically, the 1977 Additional Protocol I) are the

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53. See 1963 Vienna Convention, *supra* note 8, Article XVIII. This article was somewhat rephrased in Article 16 of the 1997 Vienna Convention; Article XV of the CSC, and Annex II to the 1960 Paris Convention, the latter of which reads: “This Convention shall not be interpreted as depriving a Contracting Party, on whose territory damage was caused by a nuclear incident occurring on the territory of another Contracting Party, of any recourse which might be available to it under international law.” Convention on Third Party Liability in the Field of Nuclear Energy of 29<sup>th</sup> July 1960, as amended by the Additional Protocol of 28<sup>th</sup> January 1964 and by the Protocol of 16<sup>th</sup> November 1982 (1960), 1519 UNTS 329.

54. IAEA (1964), *supra* note 15, pp. 343-344 (Statement by Mr Arangio-Ruiz, Italian delegation).

55. *Ibid.* (emphasis added).

core element of international humanitarian law ratified by 196 states.<sup>56</sup> Any grave breaches of those rules of war, which include the causation of a nuclear incident or radiological release involving nuclear material<sup>57</sup> resulting in widespread nuclear damage, will amount to war crimes that can be prosecuted before international tribunals, including each responsible individual (occupiers of the plant) able to be held criminally liable under universal jurisdiction (i.e. they can be sued in any jurisdiction).<sup>58</sup> As for any nuclear damage caused, the Russian and the Ukrainian states can both be held responsible under the state responsibility rules of the International Law Commission, if and to the extent an international tribunal determined that the conduct involved that violates an international rule (e.g. not preventing the occurrence of transboundary nuclear damage) is attributable to the state and provided there is no other circumstance that precludes the wrongfulness (e.g. self-defence, distress, state of emergency, provided it is not self-induced) but does not necessarily relieve the state from the obligation to compensate for any material loss caused.<sup>59</sup> States have a strict international obligation to prevent any activities under their

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56. Articles 55 and 56 of the Additional Protocol (I) to the Geneva Conventions of 1949 and relating to the protection of victims of international armed conflicts, which was ratified by both Ukraine (25 Jan. 1990) and Russia (29 Sept. 1989), specifically address the prohibition in warfare to cause “widespread, long-term and severe damage to the natural environment”, which includes nuclear damage (Article 55), or to make “nuclear electrical generating stations” subject to reprisals or an attack “if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population” (Article 56). The key issue here appears to be, in conformity with the 1963 Vienna Convention, the actual causation of nuclear damage by a nuclear incident directly resulting from a war-like event. See Protocol Additional to the Geneva Conventions of 12 Aug. 1949, and relating to the protection of victims of international armed conflicts (Protocol I) (8 June 1977), 1125 UNTS 3, entered in force 7 Dec. 1978. See also the commentary on Article 56 explaining that the special protection granted by that provision to dams, dykes and nuclear electrical generating stations includes also “other military objectives located at or in the vicinity of these works or installations” but “does not refer to military forces assigned to guard or defend the works or installation”. See Sandoz, Y., C. Swinarski and B. Zimmermann (eds.) (1987), *Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949* (1987), Int’l Committee of the Red Cross (ICRC), Martinus Nijhoff Publishing, Geneva, p. 670. It is noteworthy that on 23 October 2019, Russia also withdrew its earlier declaration to recognise “*ipso facto* and without special agreement, in relation to any other High Contracting Party accepting the same obligation, the competence of the International Fact-Finding Commission”. See ICRC (n.d.), “Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I) (1977): Russian Federation”, International Humanitarian Law Databases, <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/state-parties/ru> (accessed 26 Apr. 2024).
57. Nuclear material includes special fissionable material and source material of plutonium, thorium and uranium (including depleted uranium), as defined in the Nuclear Safety and Security Glossary. IAEA (2022), *IAEA Nuclear Safety and Security Glossary, 2022* (Interim) Edition, IAEA, Vienna, pp. 137-139.
58. Similarly, should international humanitarian law not apply, then Articles 7 and 11 of the Convention on the Physical Protection of Nuclear Material and Nuclear Facilities, as amended in 2005, provide for a state’s obligation regarding threats of sabotage and to make any act, or attempt thereof, directed against a nuclear facility, or an act interfering with the operation of a nuclear facility, a punishable and extraditable offence. Convention on the Physical Protection of Nuclear Material and Nuclear Facilities (1980), INFCIRC/274/Rev.1, 1456 UNTS 125, entered into force 8 Feb. 1987; 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. As an essential part of nuclear security regime, states are also to develop a Design Basis Threat (DBT), that often include beyond DBT for threats from which the operator cannot defend the nuclear facility. See IAEA (n.d.), “Design Basis Threat (DBT)”, IAEA, [www.iaea.org/topics/security-of-nuclear-and-other-radioactive-material/design-basis-threat](http://www.iaea.org/topics/security-of-nuclear-and-other-radioactive-material/design-basis-threat).
59. See “Responsibility of States”, *supra* note 51, Articles 1-2, 27. Article 27 states that “The invocation of a circumstance precluding wrongfulness is without prejudice to [...] (b) the question of compensation for any material loss caused by the act in question.”

jurisdiction or control from causing transboundary damage and are required to ensure prompt, adequate and effective compensation for such damage, should it occur.<sup>60</sup>

## 9. Conclusions

In conclusion, if a nuclear incident were to occur, the existing operators of the ZNPP and the Chernobyl Plant would be liable for any off-site nuclear damage under the 1963 Vienna Convention, as implemented by Ukraine, unless they could meet the burden of showing that such nuclear damage was directly due to a war-like act by the Russian military. If nuclear damage is shown to have been directly due to a war-like act by the Russian military, it is the Russian state that may need to provide compensation for nuclear damage under international humanitarian law. Short of a war-like act (military attack) directed against the nuclear installation and directly resulting in a nuclear incident, the Ukrainian operator would remain liable for any nuclear damage and would have to compensate all victims within and outside Ukraine, including potential Russian victims under the 1963 Vienna Convention, in accordance with the 1963 Vienna Convention as implemented in Ukrainian domestic law and to the extent determined by the competent court. Should insurance policies fail to cover such compensation, then the Ukrainian state would have a residual responsibility to cover the compensation under the state guarantee provision of the 1963 Vienna Convention. Whether or not there exists a right of recourse or liability outside of the 1963 Vienna Convention depends on the conduct by the Russian military and the extent to which any action causing nuclear damage can be successfully interpreted as “an act of sabotage or terrorism”. Relevant considerations in this respect are the *de facto* control of the operation of the nuclear installation and inherent intentions by the Russian military or any non-state actors.

Should the control of the installation be used or intended to be used to cause nuclear damage or a radioactive release, whether or not part of a military intervention or international conflict, any individual intentionally acting or omitting to act, whether Russian or of any other nationality, would be subject to civil, financial and criminal liability under domestic and international law. Conversely, the conduct (including an omission to act) of the Ukrainian operator or state (including the regulatory authority) should be consistently focused on actively preventing any possible situation that could result in a nuclear incident causing (transboundary) nuclear damage, short of which even a right of recourse for an individual's intentional act or omission may fail. Ergo, both the Russian and the Ukrainian states, the Russian military occupants, the Ukrainian military and combatants, the Ukrainian operator and regulatory authority, as relevant and appropriate, have the responsibility to employ utmost effective efforts to prevent any situation that may result in a radioactive release from the nuclear power plant and any other structure or building where nuclear material is present on the site. This also means that the Russian military should refrain from preventing the ZNPP and Chernobyl Plant's staffs and the Ukrainian regulatory authority from continuing to be able to safely and securely operate and regulate the Ukrainian nuclear facilities, and to the extent possible, further facilitate all actions necessary to ensure nuclear safety and security by not obstructing the ZNPP or Chernobyl Plant's staffs or the regulatory body in any manner or by placing them under undue pressure. The same obligations apply to the Ukrainian military or any individual or group purporting to act on behalf thereof, involved in the ongoing hostilities.

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60. “Draft articles on prevention of transboundary harm from hazardous activities” and “Principles on the Allocation of Loss in the Case of Transboundary Harm Arising out of Hazardous Activities” of the ILC, *supra* note 51. For an in-depth historical analysis, see Lefeber, R. (1996), *Transboundary Environmental Interference and the Origin of State Liability*, Kluwer Law International, The Hague; Horbach, N.L.J.T. (1996), *Liability versus responsibility under international law: Defending strict state responsibility for transboundary damage* (doctoral thesis), Leiden University, Leiden, Netherlands.

Finally, since the 1963 Vienna Convention and its *travaux préparatoires* do not provide any room for nuance in the current (and perhaps future) situation where a nuclear installation is occupied by foreign armed forces out of control of an operator but not relieving its nuclear liability, it may be useful to revisit the abstract war-like provision in the conventions in order to address such issues by appropriate recommendations.



## **The modern nuclear liability regime’s concept of “environmental damage”: How national courts may apply it and what remedies they may provide for such damage**

*by Sandra Knopp Pisi\**

### **Introduction**

The protection of the environment has become an increasingly important issue in the eyes of the public in recent years and has been implemented in more and more legal frameworks. The notion of environmental protection and sustainability will continue to be of great interest, including in international nuclear law and in nuclear liability law.

As a result of the Chernobyl nuclear accident, the world became more aware of the potential extent of damage from nuclear accidents and, in particular, the fact that borders do not stop the spread of radioactivity. In response, the international nuclear liability regimes were amended to better protect victims. Among other changes, new heads of damage, the so-called “environmental damages” were introduced. This article aims to explore several questions surrounding these heads of damage. What is environmental damage as envisioned in the nuclear liability regimes? Is it something completely new? Which specific requirements must be fulfilled in order to receive compensation? Who will be entitled to claim environmental damage? Who will decide on the extent of damage and how will they do so?

This article will also discuss how national courts can apply the concept of environmental damage as defined in the modern nuclear liability regimes. We will see that national courts have great discretion in assessing damage claims and deciding on the remedies that they may provide for such damage. In this sense, they also have a great responsibility. Part I of this article offers a brief overview of the international nuclear liability regimes, addressing the question of why there is a special nuclear liability regime. It will further point out the basic principles of international nuclear liability and give a brief examination of the three nuclear liability regimes, including the amendments to the applicable conventions. Part II addresses the notions of “environment” and “environmental damage” before covering in more detail two heads of damage: (1) cost of measures for reinstatement of an impaired environment, and (2) loss of income deriving from an economic interest in any use or enjoyment of the environment. Finally, the article briefly addresses the head of damage of “costs of preventive measures” to show that it is, in a certain sense, related to environmental damage.

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## Part I: International nuclear liability or third-party liability, respectively – an overview

### 1. International nuclear liability

The principle of “*casum sentit dominus*” (or “the loss falls on the owner”) – from Roman law – holds that, in principle, everyone must bear the risk of any accidental loss or damage suffered to themselves or their property.<sup>1</sup> Both the injured party and the general public would probably consider it unfair if the injured party had to bear the damage caused by another party. Accordingly, the legal system stipulates that the injuring party must compensate for the damage. This is the function of tort law.<sup>2</sup> In order for a party (usually the injuring party) to be liable for such damage, a legal basis is required.<sup>3</sup> This can be, for example, pursuant to civil liability law or public environmental law. For instance, the “polluter-pays” principle, which was derived from public environmental law, attributes damage from pollution to the person that produced the pollution.<sup>4</sup> Though nuclear liability is principally regulated by civil liability law,<sup>5</sup> the new heads of environmental damage incorporate components of the polluter-pays principle derived from environmental law (as we will see below). In this first part, we will have a brief overview of the special regime of nuclear liability and the improvements brought about by the three modern nuclear liability regimes.

#### 1.1 A special liability regime

The *Exposé des Motifs* of the Revised Paris Convention<sup>6</sup> gives an overview of the reasons for the special regime:

The production and use of nuclear energy for peaceful purposes involve hazards of a special character and potentially far-reaching consequences. Despite the high level of safety achieved in this field, the possibility remains that incidents capable of causing considerable damage can occur. The magnitude of that damage, the fact that an incident occurring in one country can cause significant damage in several neighbouring countries, and the recognition that damage caused by ionising radiation may not manifest itself until many years after the incident which caused

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1. See Adler, D.O. (2011), “Das Verhältnis zwischen Verursacherprinzip und Haftpflicht im Umweltrecht” [The relationship between the polluter-pays principle and liability in environmental law], *Schriftenreihe zum Umweltrecht*, Vol. 24, Schulthess Verlag, Zürich, p. 1, (with reference to Oftinger K. and E.W. Stark (1995), *Schweizerisches Haftpflichtrecht, Band 1: Allgemeiner Teil* [Swiss Liability Law, Volume 1: General Part], Schulthess Juristische Medien, Zürich, p. 9); and Roberto, V. (2022), *Haftpflichtrecht* [Tort Law], 3<sup>rd</sup> edition, Stämpfli Verlag, Bern, p. 5.
  2. See Oftinger K. and E.W. Stark., *supra* note 1, p. 12.
  3. See *ibid.*, p. 10.
  4. See Adler, D.O., *supra* note 1, p. 2.
  5. That nuclear liability is principally regulated by civil liability law can be seen in the name of one of the Conventions, i.e. the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963, as amended by the Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (1997), IAEA Doc. INF/CIRC/566, 2241 UNTS 302, entered into force 4 Oct. 2003 (Revised Vienna Convention).
  6. 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, by the Protocol of 16 November 1982, and by the Protocol of 12 February 2004, entered into force 1 Jan. 2022, unofficial consolidated text available at: NEA (2017), “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, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004”, NEA Doc. NEA/NLC/DOC(2017)5/FINAL (Revised Paris Convention).

it, have led many States to conclude that general tort law is not well suited to deal with the particular risks involved in nuclear energy production and use.<sup>7</sup>

There are different interests to consider, namely the protection of “the public from the exceptional risk posed by the production of nuclear energy, the economic benefits of a developed nuclear power industry, and the need to protect investors and suppliers from ruinous liability claims”.<sup>8</sup> Those concerns have been integrated in three international nuclear liability regimes:

- the Paris-Brussels regime (under the auspices of the Organisation for Economic Co-operation and Development [OECD]), with the Revised Paris Convention<sup>9</sup> and the Revised Brussels Supplementary Convention;<sup>10</sup>
- the Vienna regime (under the auspices of the IAEA) with the Revised Vienna Convention;<sup>11</sup> and
- the Convention on Supplementary Compensation for Nuclear Damage (CSC) (under the auspices of the IAEA).<sup>12</sup>

The Paris and the Vienna Conventions are connected by the 1988 Joint Protocol relating to the application of the Vienna Convention and the Paris Convention.<sup>13</sup> This Protocol has a bridging function for the adhering parties. The territorial scope of the operator’s liability is mutually extended, and the Protocol eliminates “conflicts arising from the simultaneous applications of both Conventions to a nuclear incident”.<sup>14</sup> For the purposes of this article, the Revised Paris Convention, Revised Vienna Convention and the CSC will be referred to collectively as “the Conventions”.<sup>15</sup>

## 1.2. *The basic principles of the Conventions*

As mentioned above, nuclear liability law is governed by specific principles:<sup>16</sup>

- **Strict liability:** If a nuclear incident results in damage, the operator is liable because they operate a nuclear installation or transport nuclear material, which are dangerous activities. The person claiming compensation does not have to prove fault or negligence, which would be a challenge given the complexity of a nuclear

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7. NEA (2020), “Exposé des Motifs of the Paris Convention as amended by the Protocols of 1964, 1982 and 2004”, adopted by the Contracting Parties to the Paris Convention on 18 Nov. 2016, NEA Doc. NEA/NLC/DOC(2020)1/FINAL (*Exposé des Motifs*), p. 2.
  8. Schwartz, J. (2022), “Liability and compensation for third party damage resulting from a nuclear incident”, in NEA (ed.), *Principles and Practice of International Nuclear Law*, OECD Publishing, Paris, p. 409.
  9. Revised Paris Convention, *supra* note 6.
  10. Convention of 31 January 1963 Supplementary to the Paris Convention of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004, entered into force 1 Jan. 2022, unofficial consolidated text available at: NEA (2017), “Convention of 31 January 1963 Supplementary to the Paris Convention of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004”, NEA Doc. NEA/NLC/DOC(2017)6/FINAL (Revised Brussels Supplementary Convention).
  11. Revised Vienna Convention, *supra* note 5.
  12. Convention on Supplementary Compensation for Nuclear Damage (1997), IAEA Doc. INFCIRC/567, 36 ILM 1473, entered into force 15 Apr. 2015 (CSC).
  13. 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).
  14. *Ibid.*, Preamble.
  15. The 1963 version of the Vienna Convention [Vienna Convention on Civil Liability for Nuclear Damage (1963), IAEA Doc. INFCIRC/500, entered into force 12 Nov. 1977 (Vienna Convention)] is still in force but does not include the new heads of damage. Therefore, it will not be examined in this article.
  16. For detailed information see: Schwartz, J., *supra* note 8, p. 409.

power plant. A few exceptions to this principle exist. For instance, the operator is not liable for nuclear damage caused by a nuclear incident directly resulting from an act of armed conflict, hostilities, civil war or insurrection.<sup>17</sup> Further, the operator has no right of recourse except in two cases. First, against an individual acting or failing to act with the intent to cause damage, if the nuclear damage caused by a nuclear incident results from their act or failure to act.<sup>18</sup> Second, if a right of recourse is provided expressly by contract.<sup>19</sup>

- Exclusive liability (legal channelling): It is solely the operator of a nuclear facility who bears liability for damage to third parties resulting from a nuclear incident, and not its suppliers.<sup>20</sup> This makes it easier for victims to assert claims for compensation, as it avoids “difficult and lengthy questions of complicated legal cross-actions to establish in individual cases who is legally liable”.<sup>21</sup> Furthermore, this fact “obviates the necessity for all those who might be associated with the construction or operation of a nuclear installation other than the operator itself to also take out insurance, and thus allows a concentration of the insurance capacity available.”<sup>22</sup>
- Limited liability in amount: “Under ordinary tort law rules there is no limit on the amount of compensation payable for damage caused by an accident; the person liable for the damage will have to pay the full amount of any judgment or settlement. However, in many countries wishing to develop, expand or maintain their nuclear industry, relieving operators from the burden of ruinous liability claims is practically a necessity and their national laws therefore impose a limit upon the amount for which an operator may be held liable for third party damage.”<sup>23</sup> All three Conventions stipulate the amount of the operator’s liability as a minimum amount.<sup>24</sup> This gives the contracting parties the option of providing for limited liability or unlimited liability (the latter is the case, for example, in Germany, Japan and Switzerland).<sup>25</sup>
- Compulsory coverage of liability (financial security):<sup>26</sup> The Conventions provide that the liable operator must cover its liability by insurance or other financial security.<sup>27</sup> This prerequisite of compulsory coverage is to ensure that the operator’s liability will be covered should a nuclear incident occur. This results in a

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17. Revised Paris Convention, *supra* note 6, Article 9; Revised Vienna Convention, *supra* note 5, Article IV(3); and CSC, *supra* note 12, Annex, Article 3(5)(a).
  18. Revised Paris Convention, *supra* note 6, Article 6(f)(i-ii); Revised Vienna Convention, *supra* note 5, Article X(a); and CSC, *supra* note 12, Annex, Article 10(a).
  19. *Ibid.*
  20. IAEA (2020), *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 (Rev. 2) (Explanatory Texts), IAEA, Vienna, p. 1.
  21. *Ibid.*
  22. *Ibid.*
  23. Schwartz, J., *supra* note 8, p. 415.
  24. Revised Paris Convention, *supra* note 6, Article 7(a); Revised Vienna Convention, *supra* note 5, Article V(1); CSC, *supra* note 12, Annex, Article 4(1).
  25. Schwartz, J., *supra* note 8, p. 415.
  26. For a comprehensive overview on cover and the insurance industry see Quéré, A. (2014), “Challenges facing the insurance industry since the modernisation of the international nuclear third party liability regimes”, *Nuclear Law Bulletin*, No. 94, OECD Publishing, Paris, pp. 77-104.
  27. Revised Paris Convention, *supra* note 6, Article 10(a); Revised Vienna Convention, *supra* note 5, Article VII(1)(a); and CSC, *supra* note 12, Annex, Article 5(1)(a).

congruence between liability and cover, i.e. corresponding financial resources in the amount of the liability are effectively available to compensate victims.<sup>28</sup>

- Limited liability in time: As in many areas of law, the Conventions also provide a time limit, or prescription period, that potential claimants have for raising claims. The Revised Paris Convention<sup>29</sup> and the Revised Vienna Convention<sup>30</sup> stipulate a period of 30 years for claims regarding loss of life or personal injury and 10 years for other nuclear damage, during which a claim for compensation might be brought against the operator. The CSC provides for a prescription period of ten years for all heads of damage.<sup>31</sup> However, all three conventions stipulate that national law may also provide for longer prescription periods.<sup>32</sup> The Conventions provide for the possibility of a discovery rule for the contracting states. This discovery rule requires that a claim must be filed within a determined period, not less than three years after the victim acquires knowledge of both the damage and the liability of the operator.<sup>33</sup>
- Exclusive jurisdiction: “Exclusive jurisdiction is granted to the courts of one State, to the exclusion of the courts in other States.”<sup>34</sup> This competent court has jurisdiction over claims for compensation following a nuclear incident, regardless of the place of residence or nationality of the injured victims.<sup>35</sup>
- Equal treatment: Applying the relevant Convention or the applicable national law shall be done without any discrimination based upon nationality, domicile or residence.<sup>36</sup>

### 1.3. An overview of the amendments to the Paris and Vienna Conventions

The triggering event for the amendments of the 1963 Vienna Convention<sup>37</sup> and the 1960 Paris Convention (as amended in 1964 and 1982),<sup>38</sup> as with the elaboration of the CSC, was the 1986 nuclear accident at the Chernobyl nuclear power plant in the former Union

28. Since unlimited cover will obviously not be available, there can be no congruence between liability and cover in the case of unlimited liability. In such a case, the Conventions stipulate that the contracting party must establish a corresponding level of cover, which must at least correspond to the minimum cover in accordance with the conventions (see: Revised Paris Convention, *supra* note 6, Article 10 (b); Revised Vienna Convention, *supra* note 5, Article VII(1)(a); and CSC, *supra* note 12, Annex, Article 5(1)(a)). Swiss nuclear liability law, for example, provides for unlimited liability of an operator. The financial security to cover this unlimited liability has been set by the legislator to EUR 1.2 billion (plus ten per cent of the total amount for interests and judicially awarded costs).

29. Revised Paris Convention, *supra* note 6, Article 8(a).

30. Revised Vienna Convention. *supra* note 5, Article VI(1)(a).

31. CSC, *supra* note 12, Annex, Article 9(1).

32. A longer prescription period is subject to the condition that the national law provides, that the liability of the operator is covered by insurance or other financial security including State funds for this longer period, see: Revised Paris Convention, *supra* note 6, Article 8(b); Revised Vienna Convention, *supra* note 5, Article VI(1)(b); CSC, *supra* note 12, Annex, Article 9(1).

33. Revised Paris Convention, *supra* note 6, Article 8(d); Revised Vienna Convention, *supra* note 5, Article VI(3); CSC, *supra* note 12, Annex, Article 9(3).

34. *Explanatory Texts*, *supra* note 20, p. 1.

35. Revised Paris Convention, *supra* note 6, Article 13(g); Revised Vienna Convention, *supra* note 5, Article XI. A. The CSC has no comparable provision.

36. Revised Paris Convention, *supra* note 6, Article 14(a) and (c); Revised Vienna Convention, *supra* note 5, Article XIII(1); and CSC, *supra* note 12, Annex, Article 3(2).

37. Vienna Convention, *supra* note 15.

38. 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, 1519 UNTS 329 (this version of the Paris Convention was in force until the amending Protocol of 12 February 2004 entered into force on 1 January 2022).

of Soviet Socialist Republics.<sup>39</sup> The extensive damage incurred was a wake-up call for the world and made clear that victims of nuclear accidents have to be better protected.

Many actions were taken in various areas of international nuclear law after the Chernobyl accident. Regarding international nuclear liability, a first reaction to this accident was the implementation of the aforementioned Joint Protocol to achieve a mutual extension of the operators' liability for the Paris Convention and Vienna Convention parties in order to offer compensation to more victims.<sup>40</sup>

The revisions to the Vienna and Paris Conventions, and the adoption of the CSC, brought better protection for victims of nuclear incidents. Indeed, liability and coverage amounts were increased, additional funds were made available, new categories of compensable damage were introduced<sup>41</sup> (economic loss, environmental damage and preventive measures), and geographical scope and prescription periods were extended. Seeking broader adherence to the liability regimes by attracting new contracting parties was a goal and viewed as a means to achieve a more global nuclear liability regime.<sup>42</sup>

#### 1.4. The new heads of damage in the Conventions

The heads of damage pursuant to the three regimes are the following:<sup>43</sup>

- loss of life or personal injury;
- loss of or damage to property;
- economic loss arising from loss or damage referred to in the previous two heads of damage;
- costs of measures of reinstatement of impaired environment;
- loss of income deriving from an economic interest in any use or enjoyment of the environment (for the Revised Paris Convention, such economic interest shall be direct);
- costs of preventive measures, and further loss or damage caused by such measures; and
- any other economic loss, other than that which was caused by the impairment of the environment (only for the Revised Vienna Convention and the CSC).

39. See generally Burns, S. (2022), "The Impact of the Major Nuclear Power Plant Accidents on the International Legal Framework for Nuclear Power", in NEA (ed.), *Principles and Practice of Nuclear International Nuclear Law*, OECD Publishing, Paris, pp. 93-96; Dussart-Desart, R. (2006), "The Reform of the Paris Convention on Third Party Liability in the Field of Nuclear Energy and of the Brussels Supplementary Convention, An Overview of the Main Features of the Modernisation of the Two Conventions", in IAEA and NEA, *International Nuclear Law in the Post-Chernobyl Period*, OECD Publishing, Paris, pp. 216-218.

40. At the time of writing, 12 (out of 16) Paris Convention parties have adhered to the Joint Protocol, whereas only 22 of the 44 Vienna Convention or Revised Vienna Convention states have adhered, with most of the latter ones being states outside of Europe.

41. Even under the existing category of property damage, the national court determines according to its national law what is covered by this term. It was therefore already possible that environmental damage would be compensated, See Emmerechts, S. (2008), "Environmental Law and Nuclear Law: A Growing Symbiosis", *Nuclear Law Bulletin*, No. 82, OECD Publishing, Paris, p. 91.

42. Burns, S., *supra* note 36, pp. 103-104. See also IAEA (2011), "IAEA Action Plan on Nuclear Safety", available at: [www.iaea.org/topics/nuclear-safety-action-plan](http://www.iaea.org/topics/nuclear-safety-action-plan) (accessed 26 Apr. 2024), p. 5; Schwartz J. (2006), "International Nuclear Third Party Liability Law: The Response to Chernobyl", in NEA (ed.), *International Nuclear Law in the Post-Chernobyl Period*, OECD Publishing, Paris, p. 41-42.

43. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(1-6); Revised Vienna Convention, *supra* note 5, Article I(1)(k); and CSC, *supra* note 12, Article I(f).

The definitions of “nuclear damage” are functionally identical in all three Conventions. Although the Revised Paris Convention does not explicitly include damage for “any other economic loss”, as is included in the Revised Vienna Convention and the CSC, this has no material significance. “The Paris Convention States were simply not convinced that this head of damage was not already covered by other heads of damage included in the definition.”<sup>44</sup> The *Exposé des Motifs* of the Revised Paris Convention also notes that “any differences between them are of a drafting nature only”.<sup>45</sup>

The new heads of damage have a limitation, however, as they only have to be compensated to “the extent determined by the law of the competent court”.<sup>46</sup> The “classical” heads of personal injury or property damage do not include this limitation. The Conventions give, in this case, an important role to the applicable national law. The competent court has wide discretion, especially since many descriptions in the new heads of damage require interpretation. This issue is discussed in greater detail below.

### 1.5. A few thoughts on the existing nuclear liability system

Without going into detail, a few critical questions and thoughts on the existing nuclear liability system are listed here.

#### ▪ 1.5.1. Are there sufficient financial resources to cover damage?

After a major accident a primary question will inevitably be: Are there sufficient financial resources to cover the whole scope of damage incurred? The following statement in the *Explanatory Texts* to the Revised Vienna Convention and the CSC brings this question to the fore:

From the beginning of the negotiations on the revision of the Vienna Convention, there was “general agreement” that the definition used in the Convention was “ambiguous and inadequate” and that a “more appropriate definition” should be developed. On the other hand, it was clear to all delegations that a wider definition of nuclear damage could only have practical effect if sufficient financial resources were made available on the basis of the operator’s liability or on some other basis. The issue was, therefore, closely linked to that of the increase of the amount of compensation, [...]. Moreover, it was feared that the inclusion of almost all possible types of damage in the new definition might seriously jeopardize compensation of damage for loss of life or personal injury. [...] [T]he Protocol tries to deal with this problem by giving priority to claims for loss of life or personal injury in cases where the damage to be compensated exceeds the amount of money available for compensation.<sup>47</sup>

Dealing with the Fukushima Daiichi Nuclear Power Plant accident, TEPCO has so far spent JPY 11 265 billion (about EUR 68.3 billion) on compensation payments.<sup>48</sup> With this sum in mind, it quickly becomes clear that the new higher compensation amounts under the Conventions will never be enough, not even under today’s highest compensation amount of a total of EUR 1.5 billion under the Paris-Brussels regime. It can be assumed that the state will ultimately bear the costs in the event of a major nuclear accident.

It would be beneficial if states endeavoured to increase liability limits and cover and/or provided further financial resources, while always hoping that there will never be a nuclear accident again and that the issues discussed in this article will never have to be discussed in regard to a future nuclear incident.

44. NEA (2004), *Final Act of the Conference on the Revision of the Paris Convention and of the Brussels Supplementary Convention, Explanatory Report*, OECD Publishing, Paris, p. 6.

45. *Exposé des Motifs*, *supra* note 7, p. 20, para. 18.

46. Revised Paris Convention, *supra* note 6, Article 1(a)(vii); Revised Vienna Convention, *supra* note 5, Article I(1)(k); and CSC, *supra* note 12, Article I(1)(f).

47. *Explanatory Texts*, *supra* note 20, p. 34.

48. From: *Records of Applications and Payouts for compensation of Nuclear Damage*, as of 26 April 2024; [www.tepco.co.jp/en/hd/responsibility/revitalization/pdf/comp\\_result-e.pdf](http://www.tepco.co.jp/en/hd/responsibility/revitalization/pdf/comp_result-e.pdf).

▪ 1.5.2. Is limited liability justified?

Germany, Japan and Switzerland have, for example, implemented unlimited liability.<sup>49</sup> The question arises whether limited liability is justified. As we have seen, in the case of a major nuclear accident, liability and cover will not suffice to compensate all damage incurred. In the end, it will potentially be the installation state of the operator liable that will need to jump in as a sort of insurer of last resort. The question remains whether this result is justified.

▪ 1.5.3. Are the Conventions an improvement for victims?

As mentioned, the Conventions provide for higher liability and financial security amounts, and a wider geographical scope. A disadvantage could be that, with the additional heads of damage and the wider geographical scope of the Conventions, the financial resources available will be even more strained, and thus likely insufficient.

▪ 1.5.4. What will insurance cover?

The environmental and related heads of damage discussed in this article do not fall under the classic concept of damage in the civil liability law sense. While the issue of liability for environmental damage has become increasingly important in recent decades (see Part II, below) and some countries do have civil liability mechanisms for environmental damage,<sup>50</sup> the environmental and related heads of damage discussed in this article do not fall under the concept of damage in the classic civil liability law sense. As we will see in this article, the terms describing these heads of damage in the Conventions are vague and require interpretation. Therefore, it is difficult to estimate how a court will assess such damages, and it is correspondingly difficult for insurance companies to clearly identify the risks to be able to provide cover. Nevertheless, since the amendment of the Paris Convention in 2004, environmental damage has been covered in an increasing number of contracting states.<sup>51</sup>

## Part II: Environmental damage

The Conventions have the objective of ensuring adequate compensation not only for damage caused to persons and property, but also for damage caused to the environment.<sup>52</sup> However, the term “environment” is not defined in the Conventions. Therefore, the concepts of environment and environmental damage in general will be discussed in this part before further analysing how the new heads of damage address environmental damage, namely the head for costs of “measures of reinstatement of impaired environment”. The new heads of damage for “loss of income deriving from an economic interest in any use or enjoyment of the environment” and for “preventive measures” will also be introduced, even if they do not remediate actual environmental damages.

### 1. Environment and environmental damage

To understand the environment that surrounds us, we need to understand how it works. Ecology gives us the answers. “Ecology is the study of the relationships between living organisms, including humans, and their physical environment”.<sup>53</sup> Furthermore, “ecological damage can be defined as a significant and sustained intervention in the environmental

49. Schwartz, J., *supra* note 8, p. 415.

50. See for example: § 16 of the German Environmental Liability Act (Umwelthaftungsgesetz) of 10 December 1990 [BGBl. I p. 2634, which was last amended by Article 6 of the Act of 17 July 2017 [BGBl. I p. 2421]] or Article 292.1 (1) of the Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33).

51. NEA (2024), *CPPC – Availability of Financial Security to Cover Heads of Damage as Required Under the Paris Convention (non-official)* (updated January 2024, OECD Publishing, Paris).

52. *Exposé des Motifs*, *supra* note 7, p. 2.

53. The Ecological Society of America (ESA) (n.d.), “What is Ecology”, ESA, [www.esa.org/about/what-does-ecology-have-to-do-with-me](http://www.esa.org/about/what-does-ecology-have-to-do-with-me) (accessed 26 Apr. 2024).



media – soil, water, air – in the flora and fauna including micro-organisms, in the climate, and in the network of interactions between them”.<sup>54</sup> It is important to see that environmental damage does not occur to a single plant or animal but to “the ability of the environment to regenerate and sustain such animal or plant life for a certain period of time in the future. Due to the dynamics of ecological balances, it is extremely difficult to determine the extent of current damage for the future.”<sup>55</sup> Moreover, it is difficult to predict how nature will respond effectively to radioactivity. Does nature have the power to regenerate itself or do significant radiological effects persist in the long run?<sup>56</sup>

### 1.1. Interpreting the terms “environment” and “environmental damage”

As discussed, it is the competent national court that will decide nuclear damage claims, and to do so the court will need to apply the relevant law, namely the applicable nuclear liability convention and its national legislation. If the applicable law does not provide a clear definition of the concept of environment, it is the responsibility of the court to interpret the concept. Towards this end, the court will likely not only consider its national legislation but also international instruments and international case law, if only because it must interpret terms from an international convention. The court will do so by applying the general principles of interpretation, looking for the meaning of a term, considering wording and context, history and purpose, among other potential factors.<sup>57</sup>

#### 1.1.1. The term “environment” in national law in the context of Swiss law

This article will not broadly analyse existing national legislation but will highlight a few interesting points based on Swiss environmental law.

Environmental law gives the standards that serve to preserve or improve the natural foundations of life. In doing so, environmental law primarily makes use of administrative instruments (such as codes of conduct, emission limitations, incentive taxes, licensing requirements, etc.) that are intended to avoid environmental pollution.<sup>58</sup>

This statement was focused on Swiss environmental law, but it is generally applicable. Even if environmental laws do not explain or prescribe how a damaged environment is to be reinstated after a (nuclear) incident, it can nevertheless serve as starting point.

Swiss environmental law has a dualistic concept. If the environment is affected, damage can trigger liability claims under private law on the one hand, and on the other hand authorities become involved where general interests are affected and will pass on the costs pursuant to the “polluter-pays” principle.<sup>59</sup> The Swiss Federal Act on the Protection of the Environment<sup>60</sup> states in Article 1 that the “Act is intended to protect

54. Furrer A. and M. Müller-Chen (2018), *Obligationenrecht Allgemeiner Teil* [Code of Obligations, General Part], Schulthess Juristische Medien Verlag, Zürich, p. 430 (translated from original German text).

55. *Ibid.*

56. *Ibid.*

57. See Vienna Convention on the Law of Treaties (1969), 1155 UNTS 332, entered into force 27 Jan. 1980, (VCLT), Article 31 ff.

58. Gähwiler, F. (2016), “Kommentar zu den Schweizer Haftpflichtbestimmungen” [“Commentary on the Swiss Liability Provisions”], in Fischer, W, and Luterbacher, T. (eds.), *Haftpflichtkommentar, Kommentar zu den schweizerischen Haftpflichtbestimmungen* [Liability Commentary, Commentary on the Swiss Liability Provisions], Dike Verlag, Zurich, p. 2038 (translated from original German). The quoted statement is made in connection with the liability provisions of the Federal Fisheries Act.

59. Mettler, C., N. Moser, and P. Starke (2016), “Umwelthaftung und Versicherung von Umweltrisiken” [Environmental liability and insurance of environmental risks], in *HAVE Haftung und Versicherung*, No.4, Schulthess Juristische Medien Verlag, Zürich, p. 401.

60. Federal Act on the Protection of the Environment (Swiss Environmental Protection Act) (1983), Classified Compilation 814.01, unofficial English translation available at: [www.fedlex.admin.ch/eli/cc/1984/1122\\_1122\\_1122/en](http://www.fedlex.admin.ch/eli/cc/1984/1122_1122_1122/en) (accessed 26 Apr. 2024).

people, animals and plants, their biological communities and habitats against harmful effects or nuisances and to preserve the natural foundations of life sustainably, in particular biological diversity and fertility of the soil. Early preventive measures must be taken in order to limit effects which could become harmful of a nuisance.”<sup>61</sup> With a view to a nuclear incident, the following (non-exhaustive) elements can be extracted:

- “Soil pollution is the physical, chemical and biological modification of the natural condition of the soil”, meaning “the unsealed top layer of land where plants may grow”.<sup>62</sup>
- The “[d]isposal of waste includes its recovery or deposit in a landfill as well as the preliminary stages of collection, transport, storage and treatment. ‘Treatment’ is any physical, chemical or biological modification of the waste.”<sup>63</sup>
- The Environmental Protection Act further states that the “cost of measures taken by the authorities to prevent imminent pollution of the environment, to establish its existence, or to remedy it are charged to the person responsible for the pollution”.<sup>64</sup> This shows that, after an accident, the costs for measures for the remediation of the environment must include prior measurements and clarifications to be able to determine the damage and the appropriate measures to be taken.

Although the Swiss Environmental Protection Act has a liability disposition,<sup>65</sup> pure environmental damage is not covered by this provision. It can only be covered if a law expressly prescribes it (which is the case for the Revised Paris Convention, whose provisions are directly applicable in Switzerland).<sup>66</sup> Pure environment damage in this sense is understood to mean the deterioration of common goods such as air, water, plants or animals. At the time, the legislator assumed that a general liability law would be introduced in which this issue would be dealt with.<sup>67</sup> Unfortunately, this legislative project was not pursued further. Nevertheless, the Swiss Federal Supreme Court has allowed compensation for environmental damage in two cases. In a case from 1964, the Federal Supreme Court qualified costs incurred by the public authorities (cantons of Fribourg and Vaud), for the removal of dead fish and the release of new fish into the public waterway, as damages.<sup>68</sup> The public waterway in that case had been polluted due to accidental chemical discharge.<sup>69</sup> In addition, the Federal Supreme Court has qualified compensable tree damage, finding that “in the event of the destruction of a tree, the costs incurred for the removal of the damaged tree, for the planting of a replacement tree, for any additional maintenance measures required and for the restoration of the surrounding area are to be compensated.”<sup>70</sup>

There is not much information regarding measures to be taken to redress environmental damage or the question of what remediation a Swiss court would award; however, costs for measures in the area of environmental damage have been granted under current law and will be helpful in interpreting the new environmental damages pursuant to the Conventions.

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61. *Ibid.*, Article 1.

62. *Ibid.*, Article 7, para. 4bis.

63. *Ibid.*, Article 7, para. 6bis.

64. *Ibid.*, Article 59.

65. *Ibid.*, Articles 59a-59d.

66. Mettler C., Moser, N. and Starke P., *supra* note 59, p. 404.

67. Botschaft zu einer Änderung des Bundesgesetzes über den Umweltschutz (USG) vom 7. Juni 1993 [Federal Council's dispatch on the amendment of the Federal Act on the Protection of the Environment], published in German: Bundesblatt 1993 II, p. 1546-1547, available at: [www.fedlex.admin.ch/eli/fga/1993/2\\_1445\\_1337\\_1213/de](http://www.fedlex.admin.ch/eli/fga/1993/2_1445_1337_1213/de).

68. Entscheidung des schweizerischen Bundesgerichts [Decision of the Federal Supreme Court] Dec. 15 1964, published in: [BGE] 90 II 417.

69. *Ibid.*

70. BGE, Jan. 19 2001, BGE 127 III 73 (Switz.), p. 77

▪ 1.1.2. The term “environment” in international law as related to nuclear law

As mentioned at the beginning of this article, protection of the environment and sustainability have become increasingly important in recent years and are frequently included in international legal frameworks and considered in cases before international tribunals. However, in the nuclear-specific conventions, “environment” is not well-defined. A look at how other international instruments and international tribunals have defined the term can help inform how a court may interpret the term in the context of the Conventions.

Of particular interest to this discussion are two cases in which the International Court of Justice (ICJ) has made authoritative statements on the environment and related obligations of states.<sup>71</sup> In its 1996 advisory opinion on the Legality of the Threat or Use of Nuclear Weapons, the ICJ recognised that “the environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn.”<sup>72</sup> Further, the ICJ stated that the “general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.”<sup>73</sup> In a 1997 case, *Gabčíkovo-Nagymaros Project*, the ICJ considered that “in the field of environmental protection, vigilance and prevention are required on account of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage.”<sup>74</sup>

As to the interplay between environmental protection and the international nuclear law frameworks, ensuring the safety of operating nuclear power plants and the transport of nuclear material are key prerequisites for protecting the environment. A number of legal instruments related to nuclear safety were adopted after the Chernobyl accident under the auspices of the IAEA. For example, reference can be made to the 1994 Convention on Nuclear Safety, in which the preamble states the importance of “ensuring that the use of nuclear energy is safe, well-regulated and environmentally sound” and the objective provided in Article 1(ii) is to “protect individuals, society and the environment from harmful effects of ionizing radiation”.<sup>75</sup> Another safety instrument is the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.<sup>76</sup> In response to the Fukushima Daiichi Nuclear Power Plant accident, the non-binding 2015 Vienna Declaration on Nuclear Safety was adopted to underscore the principles in the CNS, with an aim to “prevent accidents with radiological consequences and mitigate such consequences should they occur”.<sup>77</sup>

Another important matter for safety, and thus, ultimately, environmental protection, is the dissemination of information. The faster and more transparently information is provided after a nuclear accident, the greater the chances that damage – including environmental damage – can be avoided or at least to some extent be reduced. For this reason, the Convention on Early Notification of a Nuclear Accident was negotiated

71. For a comprehensive overview see: Nick, K.S. and P. Bowden (2022) “Nuclear activities and environmental protection: The international legal framework”, in NEA (ed.) *Principles and Practice*, OECD Publishing, Paris, pp. 211-276.

72. *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion of 8 July 1996, ICJ Reports 1996, p. 241.

73. *Ibid.*, p. 242.

74. *Gabčíkovo-Nagymaros Project (Hungary v. Slovakia)*, Judgment of 25 September 1997, ICJ Reports 1997, p. 78.

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

76. *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).

77. IAEA (2015), “*Vienna Declaration on Nuclear Safety: On principles for the implementation of the objective of the Convention on Nuclear Safety to prevent accidents and mitigate radiological consequences*”, IAEA Doc. INFCIRC/872, pp. 2-3.

immediately after the Chernobyl accident happened and entered into force on 27 October 1986.<sup>78</sup> At the time of writing, 133 states have adopted this convention.<sup>79</sup> The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, with 128 parties at the time of writing, was also negotiated and adopted in 1986 and serves a complementary purpose.<sup>80</sup> Assistance and support from other states may also help a state coping with a nuclear incident prevent or mitigate damage.

In addition, two conventions and a protocol on environmental matters – all three elaborated under the auspices of the United Nations (UN) Economic Commission for Europe (UNECE) – cover nuclear activities. These are the 1991 Convention on Environmental Impact Assessment in a Transboundary Context,<sup>81</sup> the 1998 Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters<sup>82</sup> and the 2003 Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context.<sup>83</sup> Their aim is to inform and consult with citizens and other states at an early stage. This serves the purpose of considering the environment in the decision-making process and therefore also serves to prevent or mitigate environmental damage.<sup>84</sup>

All of these instruments mention the environment or have the purpose of protecting it. They may therefore be considered by a competent court as illustrative of the important role of the environment in international law. However, these instruments provide no concrete indication as to what measures are to be taken to restore an environment after an accident. Therefore, the instruments are not of great significance to resolving the issue of defining the term “environment” for the competent courts in the liability context.

▪ 1.1.3. The term “environment” or “environmental damage” in other international instruments

A selection of international instruments relating to the environment are listed below.<sup>85</sup> Such instruments may be helpful to a national court in interpreting the concept of the environment or environmental damage.

- Stockholm Declaration:<sup>86</sup> This Declaration on the Human Environment was adopted at the UN Conference on the Human Environment, held on 16 June 1972 in Stockholm and comprises 26 Principles. It was the “first world conference to

78. 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).

79. IAEA (2023), “Latest Status: Convention on Early Notification of a Nuclear Accident”, [www.iaea.org/sites/default/files/23/11/not\\_status.pdf](http://www.iaea.org/sites/default/files/23/11/not_status.pdf) (accessed 26 Apr. 2024).

80. 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). As of 29 February 2024, there are 128 parties to the convention. IAEA (2023), “Latest Status: Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency”, [www.iaea.org/sites/default/files/22/06/cacnare\\_status.pdf](http://www.iaea.org/sites/default/files/22/06/cacnare_status.pdf) (accessed 26 Apr. 2024).

81. Convention on Environmental Impact Assessment in a Transboundary Context (1991), 1989 UNTS 310, entered into force 10 Sept. 1997 (Espoo Convention).

82. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (1998), 2161 UNTS 450, entered into force 30 Oct. 2001 (Aarhus Convention).

83. Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (2003), 2685 UNTS 140, entered into force 11 July 2010 (SEA Protocol).

84. Espoo Convention, *supra* note 81, Preamble; Aarhus Convention, *supra* note 82, Preamble.

85. There are a large number of conventions and protocols in the environmental sector. An overview can be found on the ECOLEX website: [www.ecolex.org/result/?type=treaty](http://www.ecolex.org/result/?type=treaty) (accessed 26 Apr. 2024).

86. UN (1973), “Stockholm Declaration on the Human Environment”, in *Report of the United Nations Conference on the Human Environment*, UN Doc.A/CONF.48/14, p. 3.

make environment a major issue”.<sup>87</sup> With regard to the term environment, the Stockholm Declaration states that the natural resources of the earth to be safeguarded include “air, water, land, flora and fauna and especially representative samples of natural ecosystems” (Principle 2), and that there is a responsibility to safeguard “the heritage of wildlife and its habitat” (Principle 4).<sup>88</sup>

- Rio Declaration:<sup>89</sup> The Rio Declaration on Environment and Development was adopted at the UN Conference on Environment and Development, held 1992 in Rio de Janeiro and includes 27 principles. The declaration does not contain a description of the term “environment”. However, it introduces the precautionary principle (Principle 15) and the polluter-pays principle<sup>90</sup> (Principle 16). The precautionary principle is not defined in the Rio Declaration or other instruments. It generally consists of the following elements: (1) the need for (environmental or health) protection, (2) the presence of a threat or risk of serious damage, (3) the understanding that a lack of scientific certainty should not be used to avoid taking action to prevent that damage, and (4) the need to provide evidence of safety (“reverse burden of proof”).<sup>91</sup> The precautionary principle pursuant to the IAEA is the “concept of preventing foreseeable harm”.<sup>92</sup> It serves the fundamental safety principle, which is probably the most important principle in nuclear law, and should ensure the protection of public health, safety, security and the environment.<sup>93</sup>
- Convention on Biological Diversity:<sup>94</sup> This convention was opened for signature at the 1992 Rio UN Conference on Environment and Development. Its objective is “the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources”.<sup>95</sup> Biological diversity is described as “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”.<sup>96</sup> Ecosystem means “a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit”.<sup>97</sup>
- International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea:<sup>98</sup> The 2010 HNS Convention contains a description of environmental damage that is similar to that in the Conventions.<sup>99</sup>

87. UN (n.d.), “United Nations Conference on the Human Environment, 5-16 June 1972, Stockholm”, [www.un.org/en/conferences/environment/stockholm1972](http://www.un.org/en/conferences/environment/stockholm1972) (accessed 26 Apr. 2024).

88. UN (1973), *supra* note 86.

89. UN (1993), “Rio Declaration on Environment and Development”, in *Report of the United Nations Conference on Environment and Development*, UN Doc. A/CONF.151/26 (Vol. I), adopted June 14, 1992.

90. The polluter-pays principle is described in Part I.1 above.

91. OECD (2023), *Understanding and Applying the Precautionary Principle in the Energy Transition*, OECD Publishing, Paris, p. 21.

92. Stoiber, C. et al. (2003) *Handbook on Nuclear Law*, IAEA, Vienna, p. 6.

93. *Ibid.*, p. 6

94. Convention on Biological Diversity (1992), 1760 UNTS 79, entered into force 29 Dec. 1993.

95. *Ibid.*, Article 1.

96. *Ibid.*, Article 2.

97. *Ibid.*

98. Consolidated text of the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996, and the Protocol of 2010 to the Convention (2010 HNS Convention), available at: [www.hnsconvention.org/wp-content/uploads/2019/05/2010-HNS-Convention-English.pdf](http://www.hnsconvention.org/wp-content/uploads/2019/05/2010-HNS-Convention-English.pdf) (accessed 26 Apr. 2024)

99. *Ibid.*, Article 1(6).

- Protocol on Civil Liability and Compensation for Damage caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters:<sup>100</sup> This Protocol was adopted and signed on 21 May 2003 in Kyiv and is open for ratification by state parties to one or both of the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the 1992 Convention on the Transboundary Effects of Industrial Accidents. The Protocol has not yet entered into force. Nevertheless, this protocol is of interest, as it also covers environmental damage and describes it in a similar way to the Conventions.<sup>101</sup> Also interesting is the definition for “measures of reinstatement”; pursuant to the Protocol it means “any reasonable measures aiming to reinstate or restore damaged or destroyed components of transboundary waters to the conditions that would have existed had the industrial accident not occurred, or, where this is not possible, to introduce, where appropriate, the equivalent of these components into the transboundary waters. Domestic law may indicate who will be entitled to take such measures”.<sup>102</sup>
- European Union (EU) Environmental Liability Directive:<sup>103</sup> The EU Environmental Liability Directive of 2004 entered into force in the same year the 2004 Protocol to the Paris Convention was adopted and after the adoption of the Revised Vienna Convention and the CSC, both in 1997. The Directive, however, does not apply to nuclear damage, which falls instead within the scope of the Conventions.<sup>104</sup> Nevertheless, the EU Environmental Liability Directive may be of great interest regarding the notion of environmental damage and its approach to related measures. It is quite likely that when the EU Environmental Liability Directive was negotiated, it was known that the Revised Vienna Convention and the CSC also covered environmental damage and that the negotiations for the amendment of the Paris Convention went in the same direction.<sup>105</sup> It can further be assumed that the negotiating parties of the 2004 Protocol to the Paris Convention also had to be aware of the Directive, for the sole reason that the majority of the contracting parties to the Paris Convention are EU member states. As EU member states, the parties must implement this Directive.<sup>106</sup> The respective provisions become national law and will be considered by competent national courts when deciding on nuclear liability claims. It is striking that the terminology used for the new environmental damage provisions corresponds to that used in the Directive. Therefore, a closer look at this Directive is required.

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100. UNECE (2003), Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and to the 1992 Convention on the Transboundary Effects of Industrial Accidents, ECE/MP.WAT/11-ECE/CP.TEIA/9, UNECE, Geneva.

101. *Ibid.*, Article 2(2)(d).

102. *Ibid.*, Article 2(2)(g).

103. Council Directive 2004/35/CE of 21 April 2004 on environmental liability regarding the prevention and remedying of environmental damage, *Official Journal of the European Union* (OJ) L 143, pp. 56-75 (EU Environmental Liability Directive).

104. *Ibid.*, p. 61, Article 4.

105. 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, An overview of the main features of the modernization of the two Conventions”, *Nuclear Law Bulletin*, No. 75, OECD Publishing, Paris, pp. 11, 15-16.

106. EU Environmental Liability Directive, *supra* note 103, p. 65, Article 19; Commission Notice Guidelines providing a common understanding of the term “environmental damage” as defined in Article 2 of Council Directive 2004/35/EC of 7 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, OJ C 118, p. 1, para. 1.

#### 1.1.4. EU Environmental Liability Directive – Measures regarding impaired environment

A large number of the signatory states to the Paris Convention and some signatory states to the Vienna Convention are EU member states and must therefore transpose this directive into national law. The EU Environmental Liability Directive aims to prevent and remedy environmental damage, as expressed in the title. The following is an overview of certain points that seem to be relevant to the term “environmental damage” in the modern nuclear liability Conventions. Certain points in the Directive will be addressed directly in regard to the corresponding elements of environmental damage.

As previously mentioned, the Directive is based on the polluter-pays principle and “aims at preventing and remedying environmental damage”.<sup>107</sup> It states that “not all forms of environmental damage can be remedied by means of the liability mechanism”.<sup>108</sup> Even if the Directive does not apply to nuclear damage, this statement may be of interest to those interpreting the new environmental damage head in the modern nuclear liability conventions. The principle provided in the Directive that the competent authority may make prioritisations where it cannot ensure that all necessary remedial measures for environmental damage are taken at the same time is also important.<sup>109</sup>

The Directive defines environmental damage and splits it into three categories: (1) damage to protected species and natural habitats, (2) damage to water and (3) damage to land.<sup>110</sup> Furthermore, it states that damage means a “measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly”.<sup>111</sup> Article 2(3) of the Directive is interesting for the purpose of environmental damage, as it defines what “protected species and natural habitats” mean. To this end, Article 2(1) refers to two specific directives and annexes and states that “any habitat or species, not listed in those Annexes which the Member State designates for equivalent purpose as those laid down in these two Directives” are also considered as protected species and natural habitat.<sup>112</sup>

Even if the EU Environmental Liability Directive is not applicable to non-EU countries, it may nevertheless be consulted by a competent national court when the new head of environmental damage, pursuant to the Conventions, must be interpreted. Of course, this only applies if national law does not have its own definition of environmental damage.

## 1.2 The notion of remediation

The notion of remediation is sometimes defined as “[t]he restoration of polluted land, water, or air to its former state, or as nearly so as is practical.”<sup>113</sup> As Dr Norbert Pelzer explains: “This definition describes a scope which is limited to environmental restoration. It mainly deals with the restoration of goods which are in nobody’s property ownership but

107. EU Environmental Liability Directive, *supra* note 103, pp. 56-57, Preamble.

108. *Ibid.*, p. 57, Preamble.

109. *Ibid.*

110. *Ibid.*, p. 59, Article 2(1).

111. *Ibid.*, p. 59, Article 2(2).

112. The two directives referenced are: (1) Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds, OJ L 20 (26 Jan. 2010), pp. 7-25 (Birds Directive), and (2) the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ L 206 (22 July 1992), pp. 7-50. The Birds Directive is one of the oldest instruments concerning the environment under EU legislation and one of its cornerstones. European Commission (n.d.), “The Birds Directive”, [https://environment.ec.europa.eu/topics/nature-and-biodiversity/birds-directive\\_en](https://environment.ec.europa.eu/topics/nature-and-biodiversity/birds-directive_en) (accessed 26 Apr. 2024). As noted, the Birds Directive was amended in 2009 and became the Directive of the European Parliament and of the Council on the conservation of wild birds.

113. Pelzer, N. (2016), “Nuclear Accidents: Models for Reparation”, in Black-Branch, J.L. and D. Fleck (eds.), *Nuclear Non-Proliferation in International Law, Volume III, Legal Aspects of the Use of Nuclear Energy for Peaceful Purposes*, TMC Asser Press, The Hague, p. 360 (citing Garner, B.A. (ed.) (2004), *Black’s Law Dictionary*, 9<sup>th</sup> ed., Thomson Reuters, Saint Paul, MN, p. 1407).

are common goods.”<sup>114</sup> The NEA defines remediation as “the process of reducing radiation exposure from contamination through remedial actions to remove the contamination itself (decontamination) or to affect the exposure pathways”.<sup>115</sup> This definition seems a bit narrow here, as it is only about decontamination and not about environmental restoration. In this article the notion of “compensation” is used for the civil law approach and the term “remediation” for the public law approach.

## 2. New head of damage for “costs of measures of reinstatement of impaired environment”

The head of damage for costs of measures of reinstatement of impaired environment is a new head of damage under the Conventions. So far, the heads of damage were limited to the traditional categories of loss of life or personal injury or loss of or damage to property.<sup>116</sup> Therefore – based on Swiss legislation – we will have a brief look at civil liability law to better understand the difference in this new head of damage and its significance. A prerequisite for liability for damage is an interference with the physical integrity of a natural person or with the property of a natural or a legal person.<sup>117</sup> Rudimentarily, and without going into detail about civil liability law, it can be said for the Swiss system that the consequence of such an interference is a reduction in the claimants’ assets, and this difference between the value of their assets before and after the interference is the damage to be compensated (in Switzerland called the difference method).<sup>118</sup> A limitation in potential damages is that the damage claimed cannot exceed the value of the damage incurred.<sup>119</sup> If you are personally injured, you may, for example, have healthcare costs you must pay (and your health insurance doesn’t reimburse you), or you may not be able to work and may therefore get a diminution in your salary. If your property is damaged, its worth may be reduced, you may have to replace it or incur costs for decontamination. If there is insurance that pays for such risks, the damage will become correspondingly smaller. This difference in the value of a person’s assets before and after the interference are to be compensated. Furthermore, in many legal systems it is incumbent on a person claiming compensation to mitigate or avoid their losses.<sup>120</sup>

In contrast, the new head of damage of costs of measures of reinstatement of an impaired environment deviates from this traditional civil law approach. As we will see, the claimant need not be necessarily the owner of the land or other property affected by environmental damage. As the value of the environment is exceedingly difficult to determine,<sup>121</sup> remediation is based on the costs of measures of reinstatement.

There are two circumstances that must be distinguished where measures are taken or are to be taken concerning elements of the environment. The first circumstance concerns damage to elements of the environment that cannot be owned, meaning parts of the environment that cannot be the subject of property rights, or, in other words, that are not owned by anyone (referred to as *res nullius* in private Roman law). This is, for example, the case with wild animals, such as birds and fish. This view is supported by the relevant articles in the Conventions expressly stating that the costs of these measures must not be

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114. *Ibid.*

115. NEA (2022), *Building a Framework for Post-Nuclear Accident Recovery Preparedness*, OECD Publishing, Paris, p. 53.

116. *Exposé des Motifs*, *supra* note 7, p. 20, para. 54; Dussart-Desart R. (2005), *supra* note 105, p. 13. The fact that nuclear liability under the Conventions is based on civil liability law is made clear by the title of the Vienna Convention, which reads the “Vienna Convention on Civil Liability for Nuclear Damage”.

117. See Roberto, V., *supra* note 1, p. 10.

118. *Ibid.* p. 231.

119. See, for Switzerland, BGE, 13.6.2008, BGE 134 III 489, p. 491, that states, that a prohibition of enrichment applies in liability law. This means that the injured party should not receive more from the compensation payment than they would have had without the claim.

120. *Exposé des Motifs*, *supra* note 7, p. 25, No. 62(a); *Explanatory Texts*, *supra* note 20, p. 37.

121. *Explanatory Texts*, *supra* note 20, p. 38.



included in the head of damage of loss of or damage to property.<sup>122</sup> This can only mean that either a private or legal person has ownership of the damaged “environment” and potential damage can be claimed pursuant to the yet existing heads of property damage (loss of or damage to property) or economic loss deriving from this head of damage<sup>123</sup>, or, that the “environment” is meant to be the flora, fauna or biota that no one can own and that are so-called common goods.<sup>124</sup>

The second circumstance concerns damage to elements of the environment owned by a person. This will most often be the case. But, deviating from the civil liability law approach, measures are taken and paid for not by the owner or on his behalf but by another party. This circumstance will concern, first and foremost, land in private or public ownership and measures taken for its decontamination, for example by state authorities. Here, we are dealing with measures that concerned owners could, theoretically, take themselves and assert as property damage, claiming the corresponding compensation.<sup>125</sup>

## 2.1. Costs of measures of reinstatement of impaired environment

This head of damage is formulated practically identically in the three Conventions.<sup>126</sup> The small differences are not significant. The description of this head of damage is rather long, and several conditions must be fulfilled. As an example, the relevant text of the Revised Paris Convention provides that:

“Nuclear damage” means,

1. Loss of life or personal injury;
2. Loss of or damage to property;

and each of the following to the extent determined by the law of the competent court,

...

4. the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in sub-paragraph 2 above;

...

in the case of sub-paragraphs 1 to 5 above, to the extent that the loss or damage arises out of or results from ionising radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear substances coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.

122. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(4); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(iv); and CSC, *supra* note 12, Article I(f)(iv).

123. *Exposé des Motifs*, *supra* note 7, p. 23, para. 58, regarding the head of damage “economic loss”.

124. Theoretically, land can also fall under this situation. However, it is rather rare that there are no ownership rights to a piece of land. See Dussart-Desart, R. (2005), *supra* note 105, p. 14.

125. For a different and narrower opinion, see Pelzer, N. (2010) “Deliberations on Compensation and Remediation of Nuclear Damage to the Environment”, *Nuclear Law Bulletin*, No. 86, OECD Publishing, Paris, pp. 49-57.

126. The only differences in the wording of the Revised Paris Convention, compared to the Revised Vienna Convention and the CSC, are the terms “nuclear substances” versus “nuclear material” and “legislation of the State” versus “law of the State”.

Furthermore, the notions of “measures of reinstatement” and “reasonable measures” are paraphrased in Article 1(a) of the Revised Paris Convention:<sup>127</sup>

viii) “Measures of reinstatement” means any reasonable measures which have been approved by the competent authorities of the State where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment. The legislation of the State where the nuclear damage is suffered shall determine who is entitled to take such measures.

...

x) “Reasonable measures” means measures which are found under the law of the competent court to be appropriate and proportionate, having regard to all the circumstances, for example:

1. the nature and extent of the nuclear damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage;
2. the extent to which, at the time they are taken, such measures are likely to be effective; and
3. relevant scientific and technical expertise.

There are a larger number of prerequisites for this head of damage, and they are not easy to grasp. The following is an attempt to briefly summarise the required prerequisites and is only to give an idea of how many terms used in this head of damage are subject to interpretation by the competent court. Subsequently, we will elaborate on the meaning of these elements:

- measures;
- that are reasonable;
- that have been approved by the competent authority;
- for the reinstatement of environment;
- of an environment that is impaired;
- the measures must aim to reinstate or restore damaged or destroyed components of the environment or introduce the equivalent of these components into the environment – where reasonable;
- this impairment must not be insignificant;
- the measures are actually taken or are to be taken;
- the claimant is entitled to take such measures;
- these measures generated costs;
- these costs are not included in the head of damage “loss of or damage to property”;
- the damage must arise out of or result from “ionising radiation”; and
- to the extent determined by the law of the competent court.

All these conditions must be fulfilled. If this is the case, it can be assumed that there is nuclear damage, and the court may award a remediation.

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127. See also Revised Vienna Convention, *supra* note 5, Article I(1)(m) and (o); and CSC, *supra* note 12, Article I(g) and (l).

### ▪ 2.1.1. Measures

A first step is to look at possible measures that may be taken to reinstate an impaired environment. Whether a court will award remediation for such measures depends on the conditions that must be met. As discussed, there are two different circumstances under which damage may arise from an impaired environment. The first concerns environment that cannot be owned, like fauna, flora and biota. The second circumstance concerns environment subject to private or public ownership. Measures envisaged in both contexts are measures taken with the aim to reinstate the environment, in other words to return it to its original state if possible or at least to the greatest degree possible. The possibility of taking no measures, if it is to be assumed that the environment will recover by itself, is also important to consider by the national court.

In both circumstances, such measures will include, as an early step, the collecting of measurable data to assess the impact on the environment. A prerequisite for deciding whether and which measures must be taken is the knowledge of the exact state of the environment and the deviation in the sense of deterioration from the previously existing condition. Today, countries regularly collect data on the environment to provide decision makers and the public with reliable and timely information on the environment.<sup>128</sup> This environmental data should therefore be available to enable such a comparison to be made. Of course, it is important that after a nuclear accident data be collected on an ongoing basis to keep an eye on developments and, if necessary, take further measures or adapt existing measures.<sup>129</sup>

Regarding the first circumstance, measures may include specific protection rules so that birds, plants or microorganisms can recover on their own, if this seems possible. These measures may, for instance, be supported with a ban on hunting, capturing or gathering. The reintroduction of animals into the impaired environment may be envisaged, for example, in the case of fish. Further, plants can be reseeded or grown elsewhere and replanted in the impaired environment. These can be of the same variety or varieties of species more suitable to the environment. Decontaminating land is surely of great help for the environment, too. In general, it can be stated that such measures would be included within “any action, or combination of actions, including mitigating or interim measures to restore, rehabilitate or replace damaged natural resources and/or impaired services, or to provide an equivalent alternative to those resources or services”.<sup>130</sup>

Measures relating to the environment under the second circumstance will especially consist of decontamination measures. The accident at the Fukushima Daiichi Nuclear Power Plant and its consequences can provide an overview of the process. Soil decontamination was a major issue in the Fukushima Daiichi accident (as it was after the Chernobyl accident).<sup>131</sup> More than 9 000 km<sup>2</sup> of land was decontaminated by the Japanese authorities.<sup>132</sup>

The feedback on decontamination processes following the Fukushima nuclear accident is unprecedented (...) because it is the first time that such a major clean-up effort has been made following a nuclear accident. The Fukushima accident

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128. Pursuant to Article 2, para. 3(a) of the Aarhus Convention, *supra* note 82, the 47 parties to the Convention have to provide information on the “state of elements of the environment, such as air and atmosphere, water, soil, land, landscape and natural sites, biological diversity and its components, including genetically modified organisms, and the interaction among these elements”. In this sense such data is collected for example within the transnational system of the European Environment Information and Observation Network Eionet with its 38 member and cooperating countries; [www.eionet.europa.eu](http://www.eionet.europa.eu) (accessed 26 Apr.2024).

129. NEA (2022), *supra* note 115, p. 18

130. EU Environmental Liability Directive, *supra* note 103, p. 57, Preamble.

131. Another major issue was the evacuation of persons and the many consequences for the persons concerned. Evacuation is not a measure of interest in this head of damage, though.

132. European Geosciences Union (2019), “Fukushima Soil Decontamination: Lessons learned”, SciTechDaily, <https://scitechdaily.com/fukushima-soil-decontamination-lessons-learned> (accessed 26 Apr 2024).

gives us valuable insights into the effectiveness of decontamination techniques, particularly for removing cesium from the environment.<sup>133</sup>

The decontamination techniques included, in cultivated areas within the special decontamination zone, removing the surface layer of the soil to a depth of 5 cm and replacing it with a new “soil” made of crushed granite available locally. In areas further from the plant, substances known to fix or substitute for radiocaesium (potassium fertilisers, zeolite powders) were applied to the soil. As far as woodland areas are concerned, only those that were within 20 metres of the houses were treated (by cutting branches and collecting litter). Residential areas were also cleaned (ditch cleaning, roof and gutter cleaning, etc.), and (vegetable) gardens were treated as cultivated areas.<sup>134</sup> As to the efficacy and costs of these measures:

[R]emoving the surface layer of the soil to a thickness of 5 cm (2 in), the main method used by the Japanese authorities to clean up cultivated land, has reduced cesium concentrations by about 80% in treated areas. Nevertheless, the removal of the uppermost part of the topsoil, which has proved effective in treating cultivated land, has cost the Japanese state about €24 billion. This technique generates a significant amount of waste, which is difficult to treat, transport and store for several decades....<sup>135</sup>

Further, even if the soil is decontaminated, “the re-cultivation of farmland after decontamination raises additional questions associated with the fertility of remediated soils and the potential transfer of residual radiocaesium to the plants.”<sup>136</sup>

Another major issue is the disposal of waste. As an example, reference can again be made to the Fukushima Daiichi experience. The decontaminated soil is not the only aspect of waste that is of concern but also the treated water that was collected and stored and began to be released into the sea in August 2023.<sup>137</sup> This could lead to further damage to the environment.

“Recovery from a nuclear or radiological accident is a long, complex and resource-intensive process.”<sup>138</sup> National emergency response and preparedness frameworks will be of great importance for national authorities to assess and decide what measures will be taken and in which order. After the accident at Chernobyl, improvements have also been made in this area. Recovery measures aim to ensure health and well-being, support the economy, and protect the environment.<sup>139</sup>

#### ▪ 2.1.2. Reasonable measures

The term “reasonable”, mentioned in this head of damage, is further defined in the Conventions:

“Reasonable measures” means measures which are found under the law of the competent court to be appropriate and proportionate, having regard to all the circumstances, for example:

1. the nature and extent of the nuclear damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage;

133. *Ibid.*

134. *Ibid.*

135. *Ibid.*

136. Evrard, O., Laceby, J.P., and Nakao, A. (2019), “Effectiveness of landscape decontamination following the Fukushima nuclear accident: a review”, *SOIL*, Vol. 5, Issue 2, Copernicus GmbH, Göttingen, Germany, p. 333, <https://doi.org/10.5194/soil-5-333-2019> (accessed 26 Apr. 2024).

137. IAEA (n.d.), “Fukushima Daiichi ALPS Treated Water Discharge”, [www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident/fukushima-daiichi-alps-treated-water-discharge](http://www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident/fukushima-daiichi-alps-treated-water-discharge) (accessed 26 Apr. 2024).

138. NEA (2022), *supra* note 115, p. 11.

139. *Ibid.*

2. the extent to which, at the time they are taken, such measures are likely to be effective; and
3. relevant scientific and technical expertise.<sup>140</sup>

It was important for the drafters of the Conventions that implicated measures be reasonable; therefore, this definition was included, making clear “that the competent court is responsible for determining whether a measure is reasonable under its national law, taking into account all relevant factors.”<sup>141</sup> The terms “reasonable measures”, “appropriate” and “proportionate” are undefined legal terms that must be interpreted by the national court. Roland Dussart-Desart can be quoted here as saying: “This framework is even rounded off by a definition of reasonable measures which could well appear shocking to judges who apply the principle of proportionality on a daily basis, but they will be consoled by the fact that the circumstances to be taken into account are given for information only.”<sup>142</sup>

#### 2.1.2.1 Measures found under the law of the competent court to be appropriate and proportionate

The competent court must assess whether measures to reinstate the environment are appropriate and proportionate. It must be pointed out that in the process of adopting the Revised Vienna Convention “there was also some movement towards allowing compensation even when reinstatement is impossible.”<sup>143</sup> As this suggestion was not, ultimately, incorporated into the Conventions, a competent court may view this as an indicator that a measure may only be reasonable when reinstatement is possible. However, this should not be taken to mean that reinstatement of the environment to its original state must be possible. Nature cannot be replaced one-to-one. It is likely that competent courts would impose a certain degree of restraint on themselves when examining the appropriateness and proportionality of measures implemented by competent administrative authorities. In Switzerland, according to the case law of the Federal Supreme Court, this would be the case especially when an authority has special expertise, that the court itself lacks. In such a case the court should respect this technical discretion of the competent authority.<sup>144</sup> Certainly, any determination as to the reasonableness of a measure should be based on the information available at the time the measure was taken.<sup>145</sup> In the initial phase after a major nuclear accident, there is a great urgency to respond quickly and take measures to mitigate damage. However, what would be considered reasonable in the moment may not be viewed as such with the benefit of hindsight.

A competent court would likely refer to its national environmental laws to ascertain whether measures are reasonable. The European Union member states, for example, have implemented the provisions of the EU Environmental Liability Directive in their national laws, as discussed above and therefore will apply the provisions of the Directive. In Switzerland, radioactive substances and ionising rays are not covered by environmental law but by radiation protection laws and nuclear energy laws. The purpose of both legislations is to protect people and the environment from hazards caused by radiation<sup>146</sup>.

140. The quoted text appears in the Revised Paris Convention, *supra* note 6, Article 1(a)(x) and the CSC, *supra* note 12, Article I(1) and is virtually identical to the Revised Vienna Convention, *supra* note 5, Article I(1)(o).

141. See *Explanatory Texts*, *supra* note 20, p. 2.

142. Dussart-Desart, R. (2005), *supra* note 105, p. 15.

143. *Explanatory Texts*, *supra* note 20, pp. 34-36.

144. Decision of the Federal Supreme Court, March 28, 2013, published in: *Entscheidungen des schweizerischen Bundesgerichts* [BGE] 139 II 85, p. 199.

145. This is evident from the wording in all three conventions, where it is expressly stated that all circumstances must be taken into account, including for example “the extent to which, at the time they are taken, such measures are likely to be efficacies” (Paris Convention, *supra* note 6, Article 1(a)(x), para. 2; Revised Vienna Convention, *supra* note 5, Article I(1)(o)(ii); CSC, *supra* note 12, Article I(1)(l)(ii)).

146. Swiss Environmental Protection Act, *supra* note 60, Article 1, para. 1; Nuclear Energy Act of 21 March 2003, Article 1, Classified Compilation 732.1, (unofficial English translation available at: [www.fedlex.admin.ch/eli/cc/2004/723/en](http://www.fedlex.admin.ch/eli/cc/2004/723/en) (accessed 26 Apr. 2024)).

However, neither law defines the term “environment” or “protection of the environment”. It is therefore expected that a Swiss court will rely on environmental law to interpret these terms.

A competent court must consider all circumstances when assessing the reasonableness of a measure.<sup>147</sup> The following three elements are explicitly enumerated in the Conventions as examples: (1) the nature and extent of the nuclear damage incurred; (2) the extent to which, at the time they are taken, such measures are likely to be effective; and (3) the relevant scientific and technical expertise. As to the first, the nature and extent of the nuclear damage incurred, reference may be made to the statements regarding the significance or insignificance of an environmental damage (see section 2.1.8., below). If the damage is insignificant, no remedy will be awarded by the court.

The second element emphasises the likely effectiveness of a measure. Even if a prognosis seems sufficient, it must be based on scientific facts or previous experience. It is therefore unlikely that new, unproven measures would be compensable unless the remediating effect could be predicted based on previous experience. As already mentioned, according to the wording, the knowledge at the time the measures are taken is decisive. How the effectiveness of measures is to be examined, must be read together with the third element (see next bullet point). Preventive measures<sup>148</sup> (another new head of damage under the Conventions) must also be reasonable and approved by the competent national authority, but they may be compensated even in the case when the measures turn out to be ineffective.<sup>149</sup> Preventive measures are meant to prevent or minimise nuclear damage in general. Authorities will take such preventive measures first and foremost in the interest of the health of people, without paying much attention to the fact that they are also cost-effective or cost-reducing. As a by-product, they can also reduce the damage to be compensated and thus also be in the interest of the liable person.<sup>150</sup>

Finally, as to the relevant scientific and technical expertise, the accident at Chernobyl happened more than 30 years ago. Despite the enormous radiological consequences to the contaminated area still present, there are also interesting developments. For instance, a 2022 article from the UK Centre for Ecology & Hydrology states that the current Chernobyl radiation levels do not directly impact soil organisms and points out that “as soil organisms play an essential role supporting other wildlife, (...) [this] provides further important evidence that the most radioactively contaminated ecosystem on Earth is in a good position to continue to recover following the 1986 disaster” and that their “finding that soil organisms are not directly affected by current radiation doses is good news for the ecosystem as a whole.”<sup>151</sup> An article from GEO magazine states, that “in the spring of 1987, the populations of the already very fertile rodents had recovered” and “[e]lk, foxes, eagles, and wolves reproduce rapidly in the contaminated area where the Chernobyl nuclear disaster occurred 35 years ago. The astonishing thing: The radiation exposure seems to harm the animals less than the humans” and adds that “this phenomenon can only be explained by a kind of radiation resistance that many animal species must have developed.”<sup>152</sup>

147. Paris Convention, *supra* note 6, Article 1(a)(x); Revised Vienna Convention, *supra* note 5, Article I(1)(o); CSC, *supra* note 12, Article I(1)(l).

148. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(6) and (ix); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(6); and CSC, *supra* note 12, Article I(1)(h).

149. *Explanatory Texts*, *supra* note 20, p. 39.

150. *Ibid.*

151. Beresford, N.A. et al. (2022), “Current Chernobyl Radiation Levels do not Directly Impact Soil Organisms”, UK Centre for Ecology & Hydrology, [www.ceh.ac.uk/current-chernobyl-radiation-levels-do-not-directly-impact-soil-organisms](http://www.ceh.ac.uk/current-chernobyl-radiation-levels-do-not-directly-impact-soil-organisms).

152. Wahnbaeck, C. (n.d.), “Wie das Leben in die Todeszone um Tschernobyl zurückkehrte” [How Life Returned to the Death Zone around Chernobyl], GEO, [www.geo.de/natur/tierwelt/77-rtkl-tschernobyl-wie-das-leben-die-todeszone-zurueckkehrte#:~:text=Wer%20sich%20heute%20in%20die,Eisv%C3%B6gel%2C%20im%20Wasser%20schwimmen%20Fischoter](http://www.geo.de/natur/tierwelt/77-rtkl-tschernobyl-wie-das-leben-die-todeszone-zurueckkehrte#:~:text=Wer%20sich%20heute%20in%20die,Eisv%C3%B6gel%2C%20im%20Wasser%20schwimmen%20Fischoter) (accessed 26 Apr. 2024).

These findings suggest that, in certain circumstances, it may not be reasonable in the sense of the condition referred to in this paragraph to take environmental measures without delay, or at all, as it may be that the environment will restore by its own over time. A competent court will probably consider such relevant scientific and technical data. And it will of course take other points into consideration, such as how long it will take for such an area to be restored, which area is involved (residential area, agricultural land, inhospitable land, forests), how large the area is in absolute terms and in relation to the area of the affected country, what financial resources are available and whether there are other areas where restoration would appear to make more sense. It is clear from this that all specific circumstances must be considered. It is not possible at this point to set a criterion – not even a time limit – for deciding whether a contaminated area should be left to its own or whether it should be restored. Considering all the circumstances, it can only be said that early measures may not be appropriate according to the competent court, nor may they be later.

If, because of the lack of reasonableness, no remedy is possible for such damage to the environment, a competent court may award compensation under another head of damage, for example “loss of income deriving from an economic interest in any use or enjoyment of the environment” (discussed below), if the relevant conditions are met.

### ▪ 2.1.3. Approval by the competent authority

Pursuant to the Conventions, measures must be approved by the competent authority of the state where the measures intended to reinstate impaired environment were taken.<sup>153</sup> It is incumbent upon the national law of the state to identify which national authority or authorities are competent to approve such measures. As measures of reinstatement “mostly cover components of the environment which are not owned by anyone, but rather are available for the benefit of the general public, it will normally be the competent public authorities who are entitled to take such measures and claim compensation therefor”.<sup>154</sup> The wording of the provision in the Conventions does not exclude the possibility that such an authorisation may only be granted retrospectively, i.e. at the time when the competent national court deals with the claim for compensation. Moreover, a lack of authorisation should not lead to a claim for compensation being rejected for this reason alone. This view is underpinned by the *Explanatory Texts*, which state:

As for the need for a previous authorization, this clearly refers to measures taken by private persons; the fact that such measures have been authorized by a competent public authority indicates that such measures are considered, at least prima facie, to be reasonable; on the other hand, if such approval is not required by the law of the State where the measures are taken, the fact that these measures have not been previously authorized does not prevent compensation if they, nevertheless, appear to be reasonable.<sup>155</sup>

This statement was made with regard to preventive measures (see section 4, below), but there is no reason why the statement should not also apply here. These considerations should apply all the more so in the case where national law does not provide for prior approval. The prerequisite of approval certainly makes sense regarding co-ordination of

153. Article 1(a)(viii) Paris Convention, *supra* note 6; Article I(1)(m) Revised Vienna Convention, *supra* note 5; Article 1(g) CSC, *supra* note 12.

154. *Exposé des Motifs*, *supra* note 7, p. 24, para. 59(c).

155. *Explanatory Texts*, *supra* note 20, p. 39. See also n. 135: “No reference was made to prior authorization in the original proposal discussed within the Standing Committee. The suggestion that preventive measures should only be covered if they were authorized by the competent authority was first made within the Drafting Committee during the eleventh session. At that time, however, it was pointed out that ‘it would be for the court to decide whether preventive measures were reasonable’ and the suggestion was not adopted.” Even if the requirement for approval has subsequently been included in the text of the conventions, it would be disturbing if a lack of approval were to lead to a rejection of compensation claims.

measures, which may increase the likelihood that the measures are effective. The approval should also make it easier for the national court, which may not have the necessary expertise, to assess the reasonableness for a measure.

▪ 2.1.4. Reinstatement of environment

The reinstatement of the environment encompasses all measures that will lead to, or at least towards, the conditions as they were before the accident.<sup>156</sup> These baseline conditions will have to be assessed. The environment is already monitored in many countries, which is why there should already be sufficient relevant data.<sup>157</sup>

▪ 2.1.5. An environment that is impaired

The impairment may occur directly or indirectly. As for example “air pollution does not in itself constitute environmental damage” but damage to natural resources may arise as a result of air pollution.<sup>158</sup> In order to determine whether and to what extent the environment has been impaired, the situation before and the situation after the damaging occurrence, in which radioactivity was released, must be compared. Radioactivity cannot always be seen; likewise, its effects on nature will not always be seen, or may be seen only after years of the release of radioactivity. The impairment has to be assessed with reference to the baseline condition.<sup>159</sup> The baseline is the condition that would have existed had the environmental damage (caused by the release of radioactivity) not occurred.<sup>160</sup> The impairment is usually established by measurements and monitoring of the environment over a long period of time.<sup>161</sup> After a nuclear incident there will be comprehensive environmental monitoring in the response phase and it will continue long into the recovery phase.<sup>162</sup>

▪ 2.1.6. Measures that aim to reinstate or restore damaged or destroyed components of the environment or introduce the equivalent of these components into the environment – where reasonable

Some examples of measures that might be taken to reinstate the environment have been discussed, above (section 2.1.1.). It is important to emphasise that the environment cannot be restored to its exact, original state. Rather the goal is to restore it as a functional ecosystem. Nature is composed of components that need and support each other so that the ecosystem can function as a whole. “An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life.”<sup>163</sup> “Every factor in an ecosystem depends on every other factor, either directly or indirectly.”<sup>164</sup> Measures can therefore only cover components of the system, as

156. The Conventions do not define, what reinstatement of the environment is. The *Explanatory Texts*, *supra* note 20, p. 38, and European Geosciences Union (2019), *supra* note 132, state that the concept is “based on similar solutions adopted by other international conventions”. See para. 2.1.1, *supra*; the EU Environmental Liability Directive, for instance, sets out a common framework to be followed in order to choose the most appropriate measures to ensure the remedying of environmental damage. EU Environmental Liability Directives *supra* note 103, p. 15, Annex II,

157. See section 2.1.2.1.

158. Judgment of the Court (Second Chamber) of 13 July 2017, *Túrkevei Tejtermelő Kft. V. Országos Környezetvédelmi és Természetvédelmi Főfelügyelőség*, C-129/16, EU:C:2017:136. para. 41.

159. EU Environmental Liability Directive, *supra* note 103, Article 2, para. 1, Annex I.

160. *Ibid.*, Article 2, para. 14.

161. NEA (2022), *supra* note 115, p. 12.

162. *Ibid.*, p. 61; see also IAEA (2015), *Preparedness and Response for a Nuclear or Radiological Emergency*, IAEA Safety Standards Series, General Safety Requirements, No. GSR Part 7, IAEA, Vienna.

163. National Geographic, Education (n.d.), “Encyclopedic Entry: Ecosystem”, <https://education.nationalgeographic.org/resource/ecosystem> (accessed 26 Apr. 2024).

164. *Ibid.*



it is also described in the Conventions (“reinstate or restore damaged or destroyed components of the environment”, “equivalent of these components”). It is therefore important to choose the right components, and in the relevant order, to have the greatest possible effect. “Once an ecosystem has been proven to be degraded or broken, restoring its ability to support life comes in stages. The first step in fixing a degraded ecosystem [will be] soil stabilization.”<sup>165</sup> As seen in the Fukushima Daiichi nuclear accident, the decontamination of land will be such a first step to help further the restoration of the environment. Afterwards, microorganisms, plants or animals that have disappeared due to radioactive contamination can be reintroduced. Equivalent of these components could be reintroduced instead if these are better suited to attract or support other components and thus support the regeneration of the environment.

#### ▪ 2.1.7. The impairment must not be insignificant

The Conventions do not further explain the terms “insignificant” or “significant”. This issue – as with many others – is left to the interpretation of the competent national court,<sup>166</sup> which must decide if the environment damage is insignificant or not. Thus, the court will have to assess the specific circumstances of the individual case and it must decide upon which criteria the significance is to be assessed. Is it related to an environment that is to be protected for its own sake? Or is the environment assessed based on its utility to mankind, with a focus on minimising environmentally harmful effects on humans?

Guidance may be found in Annex I of the EU Environmental Liability Directive, which provides criteria for determining the significance of environmental damage. Although not directly applicable to nuclear damage, the Directive could nonetheless serve as a persuasive authority for a competent court assessing the significance of impairment to the environment. This assessment should be determined by means of measurable data, as previously discussed. The Directive enumerates, for example, the number of individuals and their density, the rarity of the species or habitat, the species’ “capacity for propagation” and their “habitat’s capacity for natural regeneration”. It is of interest that damage with a proven effect on human health is explicitly considered as significant damage under the Directive.<sup>167</sup> The question of whether damage is significant or not for the environment would, therefore, not need to be further assessed once it is determined that there is a proven effect on human health. This view will probably also apply within the Conventions. Furthermore, Annex I to the Directive enumerates some situations that do not have to be classified as significant. Such is the case for “damage to species or habitats for which it is established that they will recover, within a short time and without intervention, either to the baseline condition or to a condition which leads, solely by virtue of the dynamics of the species or habitat, to a condition deemed equivalent or superior to the baseline condition.”<sup>168</sup>

In contrast, civil liability law does not focus on the insignificance or significance of damage. There is no such restriction for the heads of damage loss of life or personal injury, or loss of or damage to property in the Conventions.<sup>169</sup> If there is personal injury or property damage, compensation will be generally awarded (up to the value of the property and provided other required conditions are met). Nevertheless, restrictions are also possible here. Pursuant to the Conventions, the nature, form and extent of the compensation, within the limits of the Conventions, as well as the equitable distribution thereof, shall be governed by national law.<sup>170</sup> Accordingly, national jurisdictions can apply the principle of

165. Aturu, T.A. (2022), “How to Fix a Broken System”, reNature, [www.renature.co/articles/how-to-fix-a-broken-ecosystem](http://www.renature.co/articles/how-to-fix-a-broken-ecosystem) (accessed 26 Apr. 2024).

166. *Exposé des Motifs*, *supra* note 7, p. 23, para. 59(a); *Explanatory Texts*, *supra* note 20, pp. 34-39, nn. 118, 123 and 134 (discussions concerning wording of new damage heads).

167. EU Environmental Liability Directive, *supra* note 103, Annex I.

168. *Ibid.*; see also section 2.1.2.1, *supra*.

169. Paris Convention, *supra* note 6, Article 1(a)(vii)(1 and 2); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(i and ii); and CSC, *supra* note 12, Article I(1)(f)(i and ii).

170. Paris Convention, *supra* note 6, Article 11; Revised Vienna Convention, *supra* note 5, Article VIII(1); and CSC, *supra* note 12, Annex, Article 11.

*de minimis non curat praetor*, which means that a court can, for example, for reasons of procedural economy, refrain from examining and taking into account minor items when calculating damages.<sup>171</sup> Furthermore, national law can also take measures for equitable distribution and reduce or exclude compensation if the available financial resources are not sufficient to compensate all damages.<sup>172</sup>

▪ 2.1.8. The measures are actually taken or are to be taken

This condition also differs greatly from civil liability law, under which victims are typically free to use awarded compensation however they like. For example, if in the aftermath of a nuclear accident, an evacuated person is awarded a sum equal to the value of their house, this person is not compelled to buy a new house with that compensation. If the person buys a new house that costs less than the received compensation, the difference does not need to be given back.

In the case of measures of reinstatement of impaired environment, costs are only remedied when measures are actually taken or to be taken.<sup>173</sup> In other words, that is, when measures are taken costs will arise, and only these costs are awarded. By implication, this must mean that if a remedy for measures still to be taken is awarded, and it is higher than the effectively spent costs, the difference may be required to be returned.

▪ 2.1.9. The claimant is entitled to take such measures

It is the state where the nuclear damage occurred that can determine who is entitled to take such measures.<sup>174</sup> In principle, state authorities will probably be entitled to take such measures pursuant to the emergency response and preparedness framework (see also section 2.1.4, *supra*) and pursuant to their role as owner of public property. The Conventions don't exclude non-governmental organisations or private or legal persons. For them, it will be beneficial to seek approval by the competent authority before taking measures so as to make sure costs will be remedied.<sup>175</sup> Clean-up and decontamination work – as it involves handling radioactivity – will generally be carried out with well-trained private persons or organisations. It is not the same situation as after a storm or an earthquake, for instance, where a large number of people help clean up. For this reason, too, state approval is beneficial so that the requirements of radiation protection can be met. In areas where radioactivity no longer poses a threat, these concerns no longer apply and private individuals can also help to restore the environment, for example with animal husbandry programmes or native plant re-seeding programmes.

▪ 2.1.10. The measures' generated costs

It is difficult, if not impossible, to determine the value of the environment in monetary terms.<sup>176</sup> The environment cannot be sold and has therefore no market value. This is the reason why this head of damage is based on costs. If there are no measures taken, there are no costs and consequently no remediation.

A prerequisite for deciding whether, and which, measures should be taken is an understanding of the state of the environment prior to the nuclear incident and the degree

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171. For Switzerland: Brehm, R., (2021), *Berner Kommentar, Die Entstehung durch unerlaubte Handlungen, Articles 41–61 OR, Obligationenrecht, Allgemeine Bestimmungen* [Berne Commentary, obligations in tort, Art. 41-61 Swiss Code of Obligations, General Provisions], Stämpfli Verlag, Berne, note 69a (translated from original German).

172. See *Exposé des Motifs, supra* note 7, p. 35, paras. 89-90; Article VIII para. 2 of the Vienna Convention, *supra* note 5.

173. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(4); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(4); and CSC, *supra* note 12, Article I(1)(f)(iv).

174. Revised Paris Convention, *supra* note 6 Article 1(a)(viii); Revised Vienna Convention, *supra* note 5, Article I(1)(m); and CSC, *supra* note 12, Article I(g).

175. See section 2.1.3.

176. *Explanatory Texts, supra* note 20, p. 38.

of deterioration from that previously existing condition (due to the release of radioactivity). This understanding is principally accomplished by taking extensive measurements and monitoring. The corresponding costs should be considered as part of the costs of the measures under this head of damage and should be remedied.<sup>177</sup>

- 2.1.11. Costs that are not included in the head of damage “loss of or damage to property”

A competent court must ensure that damage is not asserted twice. Accordingly, the Conventions state that the costs of measures of reinstatement of an impaired environment are to be remedied insofar as they are not included in the head of damage of “loss of or damage to property”.<sup>178</sup>

The question of interest here arises when environment that is privately owned, such as farmland, gardens or woods, is concerned (the second circumstance, as explained in section 2, *supra*). Only if a state authority (or a third person that is not the landowner) takes measures which also impact private property (e.g. decontamination measures), and the cost of which is not charged to the owner, do they fall under this head of damage.<sup>179</sup> If the authority were to impose all or part of the costs on the owner, then these costs should, in turn, be recoverable from the owner as compensation under the head of property damage. This does not preclude the injured owner from claiming other damage to the same property (e.g. a diminution in the value of their land despite the decontamination measures). As an example, to illustrate this: agricultural land is decontaminated by transporting away and disposing of the radioactive topsoil layer. These measures are taken by a state authority and the costs are not charged to the property owner. After the decontamination, the landowner replaces the top layer of soil with earth at their own costs. The landowner may be compensated for the related costs under the head of damage “loss of or damage to property”. If the owner decontaminates his property himself or commissions someone else to do so, the costs incurred for this are deemed to be property damage.

- 2.1.12. The damage has to arise out of or result from ionising radiation

“If there is no emission of radiation then there cannot be any nuclear damage.”<sup>180</sup> The condition of ionising radiation is applicable to all heads of damage in the Conventions except for preventive measures.<sup>181</sup>

- 2.1.13. The extent of the damage is determined by the law of the competent court

It is important to stress, that “the question of the admissibility of claims for most of the new heads of damage, (...) is not left to the discretion of national law” and “the law of the competent court will have to be referred to primarily in order to determine their precise meaning, especially in relation to the concept of property damage”.<sup>182</sup> The inclusion of the new heads of damage “was intended to require the competent court to consider such damage”:

The addition of the phrase “to the extent determined by the law of the competent court” was intended to emphasize that the breadth of such coverage continued to be left to the competent court to determine. The Group [INLEX] felt that it was

177. EU Environmental Liability Directive, *supra* note 103, p. 2.; see also section 2.1.5, *supra*.

178. Paris Convention, *supra* note 6, Article 1(a)(vii)(4); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(iv); and CSC, *supra* note 12, Article I(f)(iv).

179. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(3); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(iv); and CSC, *supra* note 12, Article I(f)(iv).

180. *Exposé des Motifs*, *supra* note 7, p. 25, para. 61.

181. Revised Paris Convention, *supra* note 6, Article 1(a)(vii); Revised Vienna Convention, *supra* note 5, Article I(1)(k); and CSC, *supra* note 12, Article I(f).

182. *Explanatory Texts*, *supra* note 20, p. 35.

desirable to leave this discretion as to the exact coverage of nuclear damage to national law and the competent court, recognizing at the same time that this may result in different coverage in different situations.<sup>183</sup>

▪ 2.1.14. Concluding remarks

As seen, a competent national court must consider multiple questions when assessing the head of damage of costs of measures of reinstatement of impaired environment. There are numerous elements to assess, elements that are not defined in the Conventions and must therefore be interpreted. The competent court will probably have great discretion in doing so. In its interpretation of the indeterminate legal terms, other non-legal considerations will likely also be taken into account. This may influence whether this head of environmental damage will ultimately be interpreted more narrowly or broadly by a competent court. For example, it will be relevant whether a country supports nuclear energy or not and whether its laws give high priority to environmental protection or not. In addition, how high the expected total damage will be in relation to the available financial resources is also decisive. In this sense, unequal applications between countries are all but assured. This is somewhat offset, however, by the fact that, as a general principle, as in the Revised Paris Convention and in the Revised Vienna Convention, only the competent court of the state in whose territory the nuclear incident occurs has jurisdiction over all compensation and remediation claims arising from the incident. So, the same considerations apply to all<sup>184</sup> victims of a given nuclear incident and accordingly the principle of equal treatment of victims can be complied with.

**3. The new head of damage of “loss of income deriving from an economic interest in any use or enjoyment of the environment”**

This new head of damage is commonly known as the “economic loss” head. In civil liability law, economic loss is usually an indirect damage because with this head of damage neither a claimant nor their property rights need be directly affected. Rather, they suffer damage to their assets. In the causal chain, the economic loss comes only after personal injury or property damage has occurred. The loss is dependent on these. What is unique about this new head of damage is that the economic loss is not linked to personal or property damage but to nuclear damage to the environment to which the injured party does not have a property right. Therefore, it is not really a question of environmental damage as discussed before (and therefore the terminology “compensation” and not “remediation” is used here). It is above all a question of whether the claimant incurred indirect damage and if it is to be compensated or not.

Nevertheless, it is one of the new heads of damage referring to, and involving, the environment. In the beginning of the discussions concerning the amendment to the Vienna Convention, a provision regarding economic loss was included in the provision of costs of measures of reinstatement.<sup>185</sup> Only after discussions did they become two independent types of damage.<sup>186</sup> Therefore, we will discuss this head of damage here.

With this new head of damage in the Conventions, it is made clear that a person incurring such damage may be granted compensation by a competent court. In the absence of such a regulation, competent national courts were not prohibited from including such damage pursuant to their national laws.

Moreover, it is for the applicable law to determine the precise meaning of loss of, or damage to, property, and the extent to which environmental damage can be compensated under those heads. The wide discretion thus given to the national

183. *Ibid.*, p. 34, n. 120 (citing the fourth meeting of INLEX, held 7-11 February 2005).

184. “All victims” are those that fall within the scope of application of the respective Conventions.

185. *Explanatory Texts*, *supra* note 20, p. 37, n. 123.

186. *Ibid.*

legislation of the Contracting Parties may give rise to uncertainties as to the extent of compensation to be paid in case of a nuclear incident.<sup>187</sup>

As we know, the competent courts have great discretion when qualifying a situation as damage falling under the Conventions. However, with the new head of damage, it is expressly made clear that the contracting parties want to provide remedy for such damages, and this leads (or should lead) to a certain harmonisation among countries.

In contrast to the head of damage of costs of measures of reinstatement of an impaired environment, discussed *supra*, the elements here are less numerous. However, there are nevertheless various terms that are not self-explanatory and must be interpreted. As before, the relevant article from the Revised Paris Convention must be cited.

“Nuclear damage” means,

1. Loss of life or personal injury;
2. Loss of or damage to property;

and each of the following to the extent determined by the law of the competent court,

...

5. loss of income deriving from a direct economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in sub-paragraph 2 above;

...

to the extent that the loss or damage arises out of or results from ionising radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear substances coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.<sup>188</sup>

This head of damage is defined in the same way in the Revised Vienna Convention and in the CSC, with one difference: the Revised Paris Convention states that a “direct economic interest”<sup>189</sup> is required, whereas in the Revised Vienna Convention and in the CSC the word “direct” is missing.<sup>190</sup> The significance of this difference is discussed below.

The elements of this head of damage that must be fulfilled to be compensated are:

- loss of income;
- economic interest (which must be “direct” under the Paris Convention);
- economic interest in any use or enjoyment of the environment;
- significant impairment of the environment; and
- not included in the head of damage of loss of or damage to property.

We will now take a closer look at these individual elements and discuss some examples.

187. *Ibid.*, p. 34.

188. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(5).

189. *Ibid.* (emphasis added).

190. Revised Vienna Convention, *supra* note 5, Article I(1)(k); and CSC, *supra* note 12, Article I(f).

### 3.1. The notion of “loss of income”

First, we will compare the wording here with that of the head of damage of economic loss. Economic loss arising from damage to persons or property is explicitly included as damage in all three Conventions.<sup>191</sup> The Revised Vienna Convention and the CSC also provide a catch-all clause covering “economic loss arising from” damages to persons or property.<sup>192</sup> This is in contrast to the Revised Paris Convention, where this form of loss is not mentioned but “is generally considered to be covered” by the other heads of damage.<sup>193</sup> We will not go further into the content of this type of damage. The text for the head of damage of interest here expressly speaks of “loss of income”. This term is distinguishable from the aforementioned “economic loss”, as loss of income is narrower than economic loss since it only encompasses total or partial loss of earnings related to damage to the environment. So, “anyone who merely has rights of enjoyment of the environment without earning money from it has no right to be compensated.”<sup>194</sup>

There may be a case of loss of income when a fisher, who earns a living from the profession, cannot fish anymore because the fish in the lake or in the sea are contaminated.<sup>195</sup> In contrast, the fisher who fishes only as a hobby will suffer no loss of income. The same applies to a person who collects forest mushrooms or herbs, or to the beekeeper who cannot let their bees fly, because the surrounding environment is irradiated. In all cases the question of whether an activity is engaged in for a living or only as a hobby (i.e. not earning money with it) is decisive.<sup>196</sup> On the basis of the obligation to mitigate damages, it could be interpreted that claimants under this head of damage may be required to move, either temporarily or in the longer term, to other areas, if doing so would mitigate their loss of income. This would be for the competent court to determine.

### 3.2. The notion of “direct economic interest”

As stated earlier, the caveat that the affected economic interest must be “direct” appears only in the Revised Paris Convention. It is absent in the Revised Vienna Convention and in the CSC. The *Exposé des Motifs* to the Revised Paris Convention explains that the inclusion of the term “direct” economic interest was intended “to ensure that compensation will not be awarded for nuclear damage that is too remote.”<sup>197</sup> However, the necessity of establishing a causal chain is already an important prerequisite in civil liability law and it must be assumed that the term “direct” is only an indication that there must be sufficient causation in a claim, and that the term does not imply a further limitation. The materials and the examples mentioned in the *Exposé des Motifs* do not indicate otherwise. As the Revised Vienna Convention and the CSC list the same examples, it is to be assumed that there is no material difference among the Conventions.

In the previous examples, the fisher and the mushroom collector both have a direct economic interest. The competent national court will have to decide if the supplier of fishing rods and bait, or of baskets, or outdoor clothing, respectively, whose income has also decreased because the fisher or the mushroom collector do not work anymore, is too remote in the chain of causation or not. The Paris Convention leaves the court with less discretion on this question, which is answered in the negative in the *Exposé des Motifs*.<sup>198</sup> The *Explanatory Texts* to the Revised Vienna Convention and the CSC state “a court always had to consider at what point damage becomes too remote to recover and that the inclusion of “direct” [in the

191. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(3); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(3); and CSC, *supra* note 12, Article I(f)(iii).

192. Revised Vienna Convention, *supra* note 5, Article I(1)(k)(vii); and CSC, *supra* note 12, Article I(f)(vii).

193. *Exposé des Motifs*, *supra* note 7, p. 23, para. 56.

194. See Dussart-Desart, R. (2006), *supra* note 39, p. 223.

195. See *Exposé des Motifs*, *supra* note 7, p. 24, para. 60(a); *Explanatory Texts*, *supra* note 20, p. 37.

196. Dussart-Desart, R. (2005), *supra* note 105, p. 15.

197. *Exposé des Motifs*, *supra* note 7, p. 24, para. 60(b).

198. *Ibid.*

Paris Convention] provides guidance on how a court should consider remoteness but still leaves the ultimate determination with the competent court”.<sup>199</sup>

### 3.3. *The notion of “economic interest in any use or enjoyment of the environment”*

As mentioned before, under this head of damage the environment in question does not belong to the claimant. The environment in this sense – forests, lakes, rivers, mountains, etc. – is owned by the public. The claimant uses and enjoys the environment almost as if they had (some) ownership rights to it as we have seen in the previous examples of the fisher and the mushroom collector, where their interest is of an economic nature. This means that they intend to generate an income based on this environment. Another example can be found in the tourism sector. The explanatory materials to the Conventions speak expressly of the case, where:

tourists may stay away from a particular holiday resort because the public beach used by the resort is contaminated by radiation. Once again, since the proprietor of the resort is not the owner of the beach, the fact that the beach is contaminated does not constitute a loss of or damage to the resort owner’s property. Yet it will almost certainly result in a loss of income to the resort owner who will be entitled to compensation if he can show a sufficient direct, economic interest in the use or enjoyment of the damaged environment.<sup>200</sup>

In this example, it is primarily the tourists who use and enjoy the beach. They will not have a loss of income because of an impairment of the environment, and therefore no corresponding claim for damages, but the example shows that the term “any” (in “any use or enjoyment of the environment”) is probably intended to broaden the meaning. Therefore, the resort owner, who benefits economically from the existing environment or from the location of the hotel in such an environment, is also included and may file a claim for loss of income accordingly. In this respect, the owner acts as one who makes this environment “available” to their guests.

Another question a competent national court will have to consider is how far away such a resort can be from an impaired environment and still assert a basis for compensation for loss of income. The case that a resort located adjacent to a contaminated beach is not itself contaminated seems somewhat unlikely. But what about a resort that is several hundred metres away from the beach or several kilometres? Should it be treated differently just because it is not near the beach? The tourism of an entire region can be affected if a beach on a lake or, for example, a natural recreation area is contaminated and can no longer be entered. Hotels, restaurants and organisers of hiking or boat tours may all be affected. These cases will probably also fall under the term of “economic interest of any use and enjoyment of the environment” and claimants suffering lost revenue will be able to claim compensation. As previously mentioned, in order to mitigate damage, the persons concerned could be required to move to another area where practicable. This could concern providers of professional hikes, painting courses, yoga courses, etc.

### 3.4. *The impairment of the environment is significant*

The term “significant” is not defined in the Conventions. However, as the term is identical to that used in the head of damage of cost of measures of reinstatement of an impaired environment and the explanatory materials to the Conventions are silent on this element, “significance” should be interpreted in the same way for both heads of damage. Reference can therefore be made to section 2.1.8, *supra*. However, it should be noted here that there is probably no difference for a guest whether the radioactive contamination is significant or not. When it comes to radioactivity, the fear is great, regardless of the level of radiation. Accordingly, guests will be absent in both cases and, depending on the court’s assessment, the hotel owner and the organisers of tours and courses may receive compensation.

199. *Explanatory Texts*, *supra* note 20, p. 37 and n. 126.

200. *Exposé des Motifs*, *supra* note 7 p. 24, para. 60(a); see also *Explanatory Texts*, *supra* note 20, p. 37.

### 3.5. *The damage is not already included in the head of damage of loss of or damage to property*

As already mentioned, this head of damage assumes that the environment is impaired. It does not apply when the property of the claimant is damaged. However, if, in the cases mentioned where the resort itself or the entire equipment of the organisers of hiking tours is contaminated, the owner may claim economic loss.<sup>201</sup> Since the term is broader than loss of income, this will be advantageous for the owner. In any case, the court must ensure that the damage is compensated only once.

### 3.6. *Concluding remarks*

The new head of damage of loss of income deriving from an economic interest in any use or enjoyment of the environment is not an environmental damage *per se* but falls under the category of economic loss and claims ultimately derive from a damaged environment. The notion of loss of income is narrower than economic loss and the competent court must decide how broad the scope should be. The principle of equal treatment of equal situations will also play a role, as seen in the different hypothetical examples discussed above.

## 4. **The head of damage of “costs of preventive measures”**

This head of damage is also a new head of damage in the Conventions but does not directly compensate for environmental damage resulting from a nuclear incident. It is briefly discussed here to show that the types of damage interact in a certain way. With preventive measures, the impact on environmental (and other) damage can be mitigated or prevented. It is therefore the only head of damage in the Conventions that does not have to arise out of or result from ionising radiation. This is “consistent with the objectives of the Conventions to provide, that, if there is a nuclear incident, any claim for damage resulting therefrom must be brought within the framework of the Conventions and cannot be brought outside it.”<sup>202</sup> Furthermore, preventive measures – which must, of course, be reasonable and approved by the relevant competent authorities<sup>203</sup> – may be compensated even if they turn out to be ineffective (this is in contrast to the previously discussed costs of measures for reinstatement of impaired environment).<sup>204</sup> Taking the example of the fishers, it is possible that the fishers are prevented from catching or selling fish because the fish are radioactively contaminated or, alternatively, that they are prevented from doing so due to preventive measures in place prohibiting the catching or sale of fish from certain waters (regardless of whether contaminated or not). Depending on the circumstances, compensation may be paid, but under a different head of damage.

## 5. **The competences and duties of the national courts**

The Conventions require the competent national courts to include the following elements in their adjudication:

201. Revised Paris Convention, *supra* note 6, Article 1(a)(vii)(3); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(iii); and CSC, *supra* note 12, Article I(f)(iii).

202. *Explanatory Texts*, *supra* note 20, p. 40, n. 137.

203. Regarding the requirements for the compensation of preventive measures, see Paris Convention, *supra* note 6, Article 1(a)(vii)(6) and (ix); Revised Vienna Convention, *supra* note 5, Article I(1)(k)(vi) and (n); and CSC, *supra* note 12, Article I(f)(vi) and (h).

204. *Explanatory Texts*, *supra* note 20, p. 39; Particularly in the case of precautionary measures that have to be ordered at the very beginning of a nuclear incident under time pressure and where not all the circumstances have been clarified at the time they are issued, it may turn out in retrospect that certain measures were perhaps not necessary at all or not to the same extent.



### 5.1. *The extent of the heads of damage discussed here*<sup>205</sup>

The court must decide, in accordance with its national law, whether a situation falls within one of the new heads of damage. As we have seen, in the realm of compensable environmental damage, a national court will encounter a great many vague legal concepts that need to be interpreted. On the one hand, the court is granted a great deal of discretion. On the other hand, unless the court is composed of appropriate specialists, it will probably impose a certain restriction on itself when it comes to measures taken by specialist authorities within the framework of the head of damage of costs of measures of reinstatement of an impaired environment. In any case, as mentioned in section 2.1.14 *supra*, non-legal considerations will also influence the court's interpretations and considerations. So, as of today, it is very difficult to determine how these new types of damage would be applied.

### 5.2. *The nature, form and content of the compensation, as well as its equitable distribution*

The Conventions also have another provision addressed to the courts which is generally applicable. This provision states that the nature, form and extent of the compensation, within the limits of the particular Convention, as well as the equitable distribution thereof, shall be governed by national law.<sup>206</sup> This is about whether monetary compensation or non-monetary compensation is awarded, how compensation is calculated and whether there is satisfaction. Further, the court must consider whether there is a one-off payment or a pension payment and what measures are taken if the available financial resources are insufficient (e.g. prioritisation or reduction of compensation).

This includes, for example, the question of whether a fisher who can no longer catch fish in a certain body of water is awarded compensation for the loss of income. If this is the case, then the question remains whether this loss will be financially compensated and, if so, how exactly the amount of compensation will be calculated. However, the fisher may alternatively, or additionally, be granted the right to fish in another water.

## Part III. Conclusion

The notion of environmental damage is not new but there is no precise definition for the term environmental damage. We have seen that recovery of the costs of remediation of environmental damage depends on a large number of conditions that must be met. These conditions are defined by indeterminate legal terms, which in turn must be interpreted by national courts. While the competent court will probably have great discretion in doing so, unless the court is composed of appropriate specialists, it will probably apply a degree of deference when assessing measures taken by competent authorities. In its interpretation of the indeterminate legal terms, numerous considerations will be taken into account and may influence whether the new heads of environmental damage will ultimately be interpreted narrowly or broadly. This means that unequal applications between countries are all but assured. This fact is somewhat offset by the fact that, as a general principle, in the Revised Paris Convention and in the Revised Vienna Convention, only the competent court of the state in whose territory the nuclear incident occurs has jurisdiction over all compensation and remediation claims arising from the incident. So, the same considerations will apply to all victims of a given nuclear incident who are entitled to claim compensation or remediation on the basis of the Conventions. Accordingly, countries can comply with the principle of equal treatment of victims.

205. Revised Paris Convention, *supra* note 6, Article 1(a)(vii); Revised Vienna Convention, *supra* note 5, Article I(1)(k); and CSC, *supra* note 12, Article I(f).

206. Revised Paris Convention, *supra* note 6, Article 11; Revised Vienna Convention, *supra* note 5, Article VIII; and CSC, *supra* note 12, Article III (2)(a).



## Nuclear fusion: Legal aspects

by Wolfram Tonhauser and Karoly Tamas Olajos\*

### I. Background

Energy produced by nuclear fusion devices promises many advantages and, although these devices are still on the horizon in terms of commercial deployment and needs significant engineering and materials advances,<sup>1</sup> nuclear fusion has been for many years – and remains – the most promising long-term solution for the world’s energy needs without carbon dioxide pollution.<sup>2</sup> It does not emit carbon dioxide or other greenhouse gases into the atmosphere, so when fully developed, fusion energy can be the most powerful tool to mitigate climate change.<sup>3</sup>

According to the International Atomic Energy Agency’s (IAEA) Fusion Device Information System, at the time of writing, there are more than 130 experimental fusion devices and testing facilities in operation, under construction or being planned, and a dozen demonstration plant or pilot plant designs under development.<sup>4</sup> Controlled nuclear fusion and plasma physics research is currently carried out in more than 50 countries,<sup>5</sup> with the world’s most advanced and largest fusion experiment in development at ITER in Saint-Paul-lez-Durance, France.<sup>6</sup> Fusion has also attracted significant venture capital investment in

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1. See House of Commons, Science, Innovation and Technology Committee (2023), *Delivering nuclear power – Eighth Report of Session 2022-23*, Doc. HC 626, House of Commons, London, p. 58.
2. See IAEA (2023), *IAEA World Fusion Outlook 2023 – Fusion Energy: Present and Future*, 1<sup>st</sup> ed., IAEA, Vienna, p. 9.
3. See Barbarino, M. (2023), “Fusion Technology Concepts”, slideshow presented at the at the International School of Nuclear Law, OECD Nuclear Energy Agency (NEA) and University of Montpellier, SaintPaul-lez-Durance, France, 25 August 2023.
4. IAEA (n. d.), “FusDIS: Fusion Device Information System”, IAEA, <https://nucleus.iaea.org/sites/fusionportal/Pages/FusDIS.aspx> (accessed 26 Apr. 2024).
5. *Ibid.*
6. With seven international members (the People’s Republic of China, the European Union, India, Japan, Korea, the Russian Federation and the United States), the International Thermonuclear Experimental Reactor (ITER) project is based on the tokamak concept (using a device that confines plasma through a magnetic field). It is designed to achieve a fusion power gain of at least 10-fold and produce 500 megawatts (MW) of fusion power from 50 MW of input heating power. It will also test key technologies necessary for a fusion pilot plant. See ITER International Fusion Energy Organization (ITER Organization) (n. d.), “What will ITER do?”, [www.iter.org/sci/Goals](http://www.iter.org/sci/Goals) (accessed 26 Apr. 2024).

recent years around the globe.<sup>7</sup> In the United States (US) alone, there are approximately 25 private companies pursuing fusion technology.<sup>8</sup> While the inclusion of fusion energy in the power generation mix still may be some time away, the commercial investment starts now, which in turn requires predictable legal frameworks. It is therefore timely to take stock and consider how fusion is currently addressed both from an international and national legal perspective.<sup>9</sup>

## II. Legal frameworks

### A. Nuclear safety

It is safe to say that because fusion is a self-limiting process, the hazards associated with future fusion power plants are not comparable with those of large traditional fission-based power plants.<sup>10</sup> The main radiological hazards from a fusion energy system derive from the inventories of radioactive material at the site and the radiation produced during operation.<sup>11</sup> The main radiological hazard to the public will be the ionising radiation coming from tritium and materials activated during the fusion process.<sup>12</sup>

#### 1. The Convention on Nuclear Safety (CNS)<sup>13</sup>

One of the key elements of the international nuclear safety legal framework is the CNS. Its objectives are “to achieve and maintain a high level of nuclear safety worldwide, [...] to establish and maintain effective defences in nuclear installations against potential radiological hazards in order to protect individuals, society and the environment from harmful effects of ionising radiation from such installations, [and] to prevent accidents with radiological consequences and to mitigate such consequences should they occur”.<sup>14</sup> The CNS requires contracting parties operating nuclear installations to maintain a high level of safety by establishing fundamental safety principles to which states must adhere.<sup>15</sup> It defines a “nuclear installation” as “any land-based civil nuclear power plant” for the purpose of the CNS,<sup>16</sup> leaving the question of the technology open. The definition therefore appears to be sufficiently broad as to include future nuclear fusion power plants within the scope of application of the CNS. Under the CNS, a “nuclear installation”, however, “ceases to be a nuclear installation when all *nuclear fuel elements* have been removed permanently from the reactor core”.<sup>17</sup> While the term “nuclear fuel elements” is not defined under the CNS, nuclear fuel is commonly understood as fissionable nuclear material, and this in turn

7. Fusion Industry Association (2023), *The Global Fusion Industry in 2023 – Fusion Companies Survey by the Fusion Industry Association*, Fusion Industry Association, Washington, p. 3.

8. *Ibid.*, p. 4.

9. See Tonhauser, W. (2023), “It is Time to Accelerate the Regulation of Fusion Technology – Next Steps”, presentation at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

10. See Forbes, S. (2022), “The Regulatory Journey for Fusion Power Plant”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022.

11. *Ibid.*

12. *Ibid.*

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

14. *Ibid.*, Article 1, (i)-(iii).

15. *Ibid.*, Preamble (viii).

16. *Ibid.*, Article 2(i).

17. *Ibid.*, (emphasis added).

suggests – and was certainly the intention of the drafters at the time – that the CNS is only meant to apply to nuclear fission power plants.<sup>18</sup>

It is important to recall in this context, however, that, in view of the safety objectives of the CNS, the contracting parties agreed already in 2015 on the voluntary reporting of the safety of other types of civilian nuclear power reactors. In particular, contracting parties started to report on research reactors in view of the non-binding nature and lack of peer review under the corresponding Code of Conduct.<sup>19</sup> Given that the contracting parties are the “masters” of the CNS, they may take a similar approach with respect to fusion “reactors”.<sup>20</sup> Up to now, however, the contracting parties have not formally considered any fusion facility or activity to be within the scope of the CNS.

## 2. *The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention)*<sup>21</sup>

Another important consideration is the safe management of radioactive waste and the possible application of the Joint Convention. While fission power plants generate considerable amounts of long-lived radioactive waste, a fusion device produces helium, which is an inert gas, and tritium (the half-life of which is short and is used only in low amounts, so, unlike long-lived radioactive nuclei, cannot produce any serious danger).<sup>22</sup> Under the Joint Convention, radioactive waste is defined as “radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the contracting party or by a natural or legal person whose decision is accepted by the contracting party, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the contracting party”.<sup>23</sup> Hence, the definition of radioactive waste under the Joint Convention appears to be broad enough to cover fusion facilities and related radioactive waste management activities, both in terms of tritium and in terms of waste activated by the operation of the fusion device.<sup>24</sup> However, until now, the contracting

18. While it may be doubtful that the permanent removal of all tritium breeding blankets from a tritium-fuelled fusion power plant qualifies as permanent removal of nuclear fuel elements from the reactor core, tritium breeding blankets are indeed components that produce fusion fuel in the core of a fusion power plant.

19. See IAEA (2015), “Guidelines Regarding National Reports Under the Convention on Nuclear Safety”, IAEA Doc. INFCIRC/572/Rev.5, p. 19; and IAEA (2006), *Code of Conduct on the Safety of Research Reactors*, IAEA Doc. IAEA/CODEOC/RR/2006, IAEA, Vienna.

20. The fact that as part of the implementation of their obligations under the CNS, Euratom and France regularly report, in accordance with Article 5 of the CNS, on fusion research and development (R&D) results and ITER as “nuclear research and training activities” and as a “research reactor”, respectively, may suggest that contracting parties to the CNS may be willing to add fusion facilities to their exchanges during review meetings. See General Secretariat of the Council of the European Union (2022), “European Atomic Energy Community Report on the implementation of the obligations under the Convention on Nuclear Safety – 8<sup>th</sup> and 9<sup>th</sup> Joint Review Meeting of Contracting Parties to the Convention on Nuclear Safety (CNS), Vienna, 20-31 March 2023”, available at: <https://data.consilium.europa.eu/doc/document/ST-10821-2022-INIT/en/pdf> (accessed 26 Apr. 2024), p. 46. See also Autorité de Sûreté Nucléaire (ASN) (2019), *Convention on Nuclear Safety, Eighth National Report for the 2020 Review Meeting*, ASN, available at: [www.french-nuclear-safety.fr/asn-informs/news-releases/french-national-report-for-the-review-meeting-of-the-convention-on-nuclear-safety-2020](http://www.french-nuclear-safety.fr/asn-informs/news-releases/french-national-report-for-the-review-meeting-of-the-convention-on-nuclear-safety-2020) (accessed 26 Apr. 2024), pp. 9, 10, 22, 29, 34-35, 81-83.

21. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997), IAEA Doc. INFCIRC/546, 2153 UNTS 303, 357, entered into force 18 June 2001 (Joint Convention).

22. See Forbes, S. (2022), *supra* note 10.

23. Joint Convention, *supra* note 21, Article 2(h).

24. See Johnson, P.L. (2023), “Fusion and Nuclear Law and: A New Legal Paradigm?”, in K.T. Olajos (ed.), *Fusion for Energy Contracting Professionals Roundtable Proceedings*, Fusion for Energy, Barcelona, p. 33.

parties to the Joint Convention have not discussed fusion facilities and related radioactive waste management activities in relation to the Joint Convention peer review meetings.<sup>25</sup>

### **B. Emergency preparedness and response**

While the CNS and the Joint Convention cover some aspects of emergency preparedness and response (EPR), such as requiring the establishment of on-site and off-site emergency plans, there is also a need to have a closer look at the directly relevant international EPR conventions and their underlying operational systems.<sup>26</sup>

The facilities and activities listed in Article 1 of the Convention on Early Notification of a Nuclear Accident (Notification Convention) to which the Notification Convention applies – notably by reference to “any nuclear reactor” – seem broad enough to cover fusion facilities.<sup>27</sup> At the same time, however, the Notification Convention stipulates that it applies only to an accident “from which a release of radioactive material occurs or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another State”, a scenario which appears to be unlikely in respect of accidents or incidents involving fusion facilities.<sup>28</sup>

The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency does not contain a definition of a “nuclear accident” or “radiological emergency” and therefore appears to be broad enough to apply to potential accidents from fusion facilities.<sup>29</sup> Assistance under this convention would thus be available also in respect of a radiological emergency at a fusion facility. The same considerations apply to the associated operational international EPR system, which is based on and has been developed in support of these two conventions.<sup>30</sup>

### **C. Nuclear security**

Regarding nuclear security, the Convention on the Physical Protection of Nuclear Material<sup>31</sup> and its Amendment<sup>32</sup> apply to the physical protection of “nuclear facilities” and of “nuclear material” used for peaceful purposes, amongst others, in domestic use, storage and transport, and provide for the criminalisation of offences in this regard. The scope of application of the CPPNM and its Amendment, however, is limited to such facilities and material and therefore excludes tritium, fusion facilities and other radioactive material, which may be generated in such facilities.<sup>33</sup>

At the same time, the International Convention for the Suppression of Acts of Nuclear Terrorism,<sup>34</sup> adopted under the auspices of the United Nations, is broader in scope than the CPPNM and its Amendment. It applies to “all radioactive material”, including nuclear

25. *Ibid.*

26. CNS, *supra* note 13, Article 16; Joint Convention, *supra* note 21, Article 25.

27. Convention on Early Notification of a Nuclear Accident (1986), IAEA Doc. INFCIRC/335, 1439 UNTS 275, entered into force 27 Oct. 1986, Article 1.2.

28. *Ibid.*, Article 1.1 (emphasis added).

29. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), IAEA Doc. INFCIRC/336, 1457 UNTS 133, entered into force 26 Feb. 1987, Articles 1.1 and 2.1.

30. See IAEA (n. d.), “Emergency notification and reporting”, IAEA, [www.iaea.org/topics/notification-and-reporting](http://www.iaea.org/topics/notification-and-reporting) (accessed 12 Dec. 2023).

31. Convention on the Physical Protection of Nuclear Material (1980), IAEA Doc. INFCIRC/274 Rev. 1, 1456 UNTS 124, entered into force 8 Feb. 1987 (CPPNM).

32. Amendment to the Convention on the Physical Protection of Nuclear Material (2005), IAEA Doc. INFCIRC/274/Rev.1/Mod.1, 3132 UNTS A-24631, entered into force 8 May 2016.

33. See Olajos, K.T. (2016), “International Regulation of Nuclear Fusion”, in Nuclear Law Association of India (NLA) and INLA (eds.), *XXII Nuclear Inter Jura Congress, The Future of Nuclear Law: Addressing Societal, Environmental and Business Expectations*, NLA, New Delhi, pp. 12-13.

34. International Convention for the Suppression of Acts of Nuclear Terrorism (2005), 2445 UNTS 89, 137, entered into force 7 July 2007 (Nuclear Terrorism Convention).

material<sup>35</sup> and, while the Nuclear Terrorism Convention does not require contracting parties to establish and implement national physical protection regimes for fusion facilities, it does require them to criminalise acts involving radioactive material, which in turn would include acts that may be connected to fusion energy systems.<sup>36</sup>

In contrast to the CPPNM and its Amendment, the guidance documents in the IAEA Nuclear Security Series not only cover nuclear material and facilities, but also radioactive material and associated facilities. They are based on the principle of technology neutrality and are, therefore, generally applicable to future fusion power plants.<sup>37</sup>

#### **D. Nuclear fusion materials control**

The focus of the IAEA safeguards agreements – whether comprehensive safeguards agreements, voluntary offer agreements or item-specific safeguards agreements – is on nuclear material, i.e. source or special fissionable material as defined in Article XX.3 of the IAEA Statute,<sup>38</sup> and fission-related technology. Tritium and deuterium are not defined as nuclear material under the IAEA’s safeguards agreements and, from this perspective, fusion facilities do not appear to be subject to IAEA safeguards measures.

However, while the proliferation risk in fusion is significantly lower than in fission technologies, fusion activities do give rise to proliferation concerns due to the potential of plutonium breeding, tritium circumvention, and the knowledge necessary to develop and operate inertial confinement fusion technologies.<sup>39</sup> Consideration should therefore be given to addressing such risks – however limited they might be – with a view to providing assurances through the application of IAEA safeguards that fusion technology is not being misused, and the question arises whether one should be so absolute about fusion activities not being subject to IAEA safeguards.

In this context, it is important to bear in mind that the IAEA’s safeguards activities are not limited – either under the comprehensive safeguards agreements or additional protocols – to sites where nuclear material is located.<sup>40</sup> While detecting and deterring the diversion of nuclear material to nuclear weapons or other nuclear explosive devices is the focus of comprehensive safeguards agreements, it can be argued that this does not imply that the application of safeguards is limited to such material. Indeed, much of the Model Additional Protocol relates to activities and locations that do not involve the direct use or presence of nuclear material.<sup>41</sup> Thus, it may be misleading to conclude that because tritium is not defined as nuclear material, safeguards do not apply to fusion. An argument could in fact be made that, since a “reactor” is defined as a facility under the comprehensive safeguards agreements and fusion facilities are also referred to as “reactors”, such facilities could also be considered “facilities” under the comprehensive safeguards agreements and, hence, be subject to certain safeguards procedures.<sup>42</sup> If there is a potential for plutonium

35. *Ibid.*, Article 1.1.

36. See Olajos, K.T. (2016), *supra* note 33.

37. See IAEA (n.d.), “IAEA Nuclear Security Series”, IAEA, [www.iaea.org/resources/nuclear-security-series](http://www.iaea.org/resources/nuclear-security-series) (accessed 26 Apr. 2024).

38. Statute of the International Atomic Energy Agency (1956), 276 UNTS 3, 38, entered into force 29 July 1957 (IAEA Statute).

39. See Sauter, P. (2022), “Nuclear Fusion and its Inherent Risks of Nuclear Weapon Proliferation”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

40. IAEA (1972), “The Structure and Content of Agreements between the Agency and States required in connection with the Treaty on the Non-Proliferation of Nuclear Weapons”, IAEA Doc. INFCIRC/153 (Corrected), IAEA, Vienna.

41. IAEA (1997), “Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards”, IAEA Doc. INFCIRC/540 (Corrected), IAEA, Vienna (Model Additional Protocol).

42. For example, ITER is termed as the International Thermonuclear Experimental Reactor; and the terms of “fusion reactor”, “fusion machine” or “fusion device” to describe a fusion facility are used interchangeably in the literature to date.

breeding at fusion facilities, there is even more support for the conclusion that such facilities should be treated as subject to safeguards under the comprehensive safeguards agreements, regardless of whether the proliferation risk is lower with fusion activities than with fission activities.

Also, with respect to tritium, the Annexes to the Model Additional Protocol could be amended to include the production of tritium.<sup>43</sup> Including procedures for the safeguarding of tritium in subsidiary arrangements might be an effective approach to address its significance without changing the definition of nuclear material.<sup>44</sup> Further, the idea of either a new protocol for the safeguarding of tritium or for covering tritium in a new type of safeguards agreement concluded under Article III.A.5 of the IAEA Statute might be an option. However, pending the implementation of any of these approaches to the safeguarding of fusion activities, strengthening export control measures that apply, amongst others, to deuterium, tritium, lithium 6, and laser technologies, for example, through updating the export control requirements of the Nuclear Suppliers Group<sup>45</sup> may be a pragmatic and efficient intermediate approach.<sup>46</sup>

### **E. Nuclear fusion liability**

Regarding nuclear liability, fusion facilities are not, at present, covered under either the Vienna or the Paris nuclear liability regimes.<sup>47</sup> An important question is whether they should be included in the scope of the nuclear liability conventions or whether there is a need to adopt a specific regime, either at the international or at the national level, to deal with liability for damage caused by nuclear fusion facilities and related activities.<sup>48</sup> So far, it is considered that the low risk and limited transboundary impact posed by fusion facilities would not justify the application of the special nuclear liability regime.<sup>49</sup> The hazard posed by fusion facilities is of a different magnitude than that posed by large fission reactors and is more akin to the hazard posed by a large chemical plant or by uranium mining and milling operations, which fall outside the scope of the conventions.<sup>50</sup>

43. For example, tritium breeding and related activities could be listed in Annex I to be reported under Article 2.a (iv) of the Model Additional Protocol while tritium could be listed in Annex II, the export and import of which ought to be reported under Article 2.a (ix) of the Model Additional Protocol.

44. See Olajos, K.T. (2016), *supra* note 33, p. 13.

45. See Nuclear Suppliers Group (n.d.), “Guidelines”, NSG, <https://nuclearsuppliersgroup.org/en/guidelines> (accessed 26 Apr. 2024).

46. See Sauter, P. (2023), “Nuclear Proliferation Concerns for Fusion Technologies: Is Export Control a Solution?”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

47. 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, by the Protocol of 16 November 1982, and by the Protocol of 12 February 2004, entered into force 1 Jan. 2022, unofficial consolidated text in NEA (2022), “Paris Convention on Third Party Liability in the Field of Nuclear Energy, Unofficial Consolidated Text And Exposé Des Motifs”, OECD Publishing, Paris; Vienna Convention on Civil Liability for Nuclear Damage (1963), IAEA Doc. INFCIRC/500, 1063 UNTS 266, entered into force 12 Nov. 1977; the Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (1997), 2241 UNTS 270, entered into force 24 Oct. 2003; Convention on Supplementary Compensation for Nuclear Damage (1997), IAEA Doc. INFCIRC/567, 3038 UNTS 41, entered into force 15 Apr. 2015.

48. See Portier, C. (2022), “Nuclear Liability and Fusion Facilities”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022.

49. See IAEA (2020), *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 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna, pp. 10, 27.

50. See Tonhauser, W. (2022), “Fusion, Nuclear Law and the IAEA”, keynote delivered at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022.



Concerns were also expressed that the inclusion of fusion facilities within the scope of the existing nuclear liability conventions might lead the public to believe that they posed hazards of a similar nature to large fission reactors.<sup>51</sup> At the same time, it was noted that the existing nuclear liability regimes do cover facilities of a similarly low level of hazard as fusion facilities, for example research reactors or radioactive waste storage facilities, and that the nuclear liability system offered greater protection to victims than general tort law.<sup>52</sup> However, no definitive conclusion has been reached on this issue so far and, therefore, at least for the time being and absent specific applicable national legislation, general tort law would apply to nuclear fusion installations.<sup>53</sup>

## F. National regulation

At the national level in most countries, the regulatory body for nuclear fission currently also covers fusion. This is the case in Canada, the People's Republic of China (China), France, Germany, Italy, Japan, and Korea, for instance.<sup>54</sup> The reason for this approach is often that the regulator covers all radioactive materials and all radiological hazards, such as sources used in industry or research and x-ray generators in hospitals.<sup>55</sup> ITER is an example of a fusion facility that was expressly agreed, by the ITER members, to fall within the French (primarily fission-based) nuclear regulatory framework,<sup>56</sup> being regulated by ASN, the French nuclear regulatory body.<sup>57</sup> However, this is not entirely the case in some other countries, such as the United Kingdom, where the government recently decided that future fusion energy facilities will continue to be regulated by the Environment Agency and the Health & Safety Executive as a "radioactive substance" activity, whereas fission power plants continue to be covered by the Office for Nuclear Regulation.<sup>58</sup> In April 2023, the US Nuclear Regulatory Commission (NRC) decided that fusion energy would be regulated in the United States by the NRC (and the Agreement States authorised under federal law to do so) under the same regulatory regime as radioactive materials and sources, which in turn would separate the regulatory oversight of fusion from the regime that regulates nuclear fission energy.<sup>59</sup>

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51. See de Boissieu, E. (2023), "The Paris Convention and Fusion", slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
  52. See Tonhauser, W. (2022), *supra* note 50. See also Portier, C. (2022), *supra* note 48.
  53. See de Boissieu, E. (2022), "Nuclear Third-Party Liability Conventions and Fusion", slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022. See also Tyler, A. (2023), "Export Control and Nuclear Liability at ITER", slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
  54. See Tonhauser, W. (2022), *supra* note 50.
  55. *Ibid.*
  56. Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project (2006), *Official Journal of the European Union (OJ) L 358* (16 Dec. 2006) entered into force 24 Oct. 2007, p. 62, Article 14.
  57. ITER in France is the first fusion installation for which, due to its radioactive (tritium and radioactive-waste) inventory qualifying it as a laboratory-type basic nuclear installation, a complete safety case had to be prepared under the scrutiny of a nuclear regulatory body in formal licensing. See Articles 2.2 and 2.4, *Décret n°2007-830 du 11 mai 2007 relatif à la nomenclature des installations nucléaires de base (JORF du 12 mai 2007, p. 249)*, which are today codified in Articles R593-2 II 2 and R593-2 III 1 of the *Code de l'environnement*; Olajos, K.T. (2016), *supra* note 33, p. 11.
  58. See Energy Act 2023, c 52, s 156; Department for Business, Energy and Industrial Strategy (2022), *Towards Fusion Energy – The UK Government's response to the consultation on its proposals for a regulatory framework for fusion energy*, Controller of Her Majesty's Stationery Office, London.
  59. See Memorandum to D. Dorman, NRC Executive Director for Operations, from B. Clark, NRC Secretary (13 Apr. 2023), "Staff Requirements – SECY-23-0001 – Options for Licensing and Regulating Fusion Energy Systems" (NRC Agencywide Documents Access and Management System Doc. ML23103A449).

The difference in approaches between the various countries seems to be based on the inherent differences between fusion energy systems and nuclear fission facilities and the position of some governments that it would not be appropriate to utilise the regulatory framework and approach for fission given the differences in underlying risk and maturity of fusion technology.<sup>60</sup> Moreover, trying to regulate fusion in the same way as fission may impact its social acceptance. A fission approach to its regulation could overburden fusion at a very early stage of its commercialisation.<sup>61</sup> Conversely, fission-based nuclear power plants have a long history of development and operational experience, which should not be lost.<sup>62</sup> The most promising approach may be to build on the many decades of experience that regulators have with fission and make sure that all applicable knowledge is transferred to those that regulate fusion; in this way, an efficient and effective regulatory fusion framework could be developed.<sup>63</sup>

### G. IAEA Safety Standards and Nuclear Security Series

In view of the divergence in regulatory approaches to fusion and the consequential lack of potential harmonisation in this field,<sup>64</sup> the question of whether and to what extent the IAEA safety standards and nuclear security guidance documents are applicable to fusion facilities becomes even more relevant. At this point, there are no safety standards or security guidance documents that have been developed to specifically apply to fusion.<sup>65</sup>

While the IAEA is in the process of developing such specific standards and guidance,<sup>66</sup> most of the IAEA standards are applicable to any endeavour involving radiation exposure, including fusion facilities.<sup>67</sup> This is particularly true for the IAEA Fundamental Safety

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60. See Wagner, R. (2023), “IAEA Activities on the Applicability of Nuclear Regulations to Fusion Facilities”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
61. See Tonhauser, W. (2022), *supra* note 50.
62. See Calle Vives, P. (2022), “IAEA Activities on Fusion Safety and Regulation”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022.
63. See Olajos, K.T. (2022), “Towards an International Approach to Regulate Nuclear Fusion”, slideshow presented at the First International Conference on Nuclear Law – The Global Debate, IAEA, Vienna, 25-29 April 2022.
64. See Calle Vives, P. (2022), *supra* note 62; Johnson, P.L. (2023), *supra* note 24, p. 37. Nevertheless, the desire to harmonise legal and regulatory frameworks for fusion technologies was re-confirmed by regulators and experts at the first IAEA Technical Meeting on Fusion Design Safety and Regulation held on 23-25 October 2023. See Choi, G. and D. Watson (2023), “IAEA hosts the First Meeting Focusing on Safety and Regulation of Fusion”, IAEA, [www.iaea.org/newscenter/news/iaea-hosts-the-first-meeting-focusing-on-safety-and-regulation-of-fusion](http://www.iaea.org/newscenter/news/iaea-hosts-the-first-meeting-focusing-on-safety-and-regulation-of-fusion) (accessed 26 Apr. 2024).
65. *Ibid.* See also González, A.J. (2022), “Fusion: Do the IAEA Safety Standards Apply?”, slideshow presented at the First International Conference on Nuclear Law – The Global Debate, IAEA, Vienna, 25-29 April 2022.
66. The IAEA is in the process of finalising an IAEA-TECDOC on the International Experience in the Regulation of Fusion Facilities and another IAEA-TECDOC on the Experiences on Design Safety and Safety Assessment for Fusion Facilities, which gather IAEA member states’ experiences. These IAEA-TECDOCs will be followed by fusion safety reports that will lay down principles for safety and regulation. These safety reports will pave the way to fusion safety standards in the second half of this decade that will serve as a framework for fusion design safety, safety assessment and regulation. See IAEA (2023), “Technical Meeting on Fusion Design Safety and Regulation”, Information Sheet, IAEA, available at: [www.iaea.org/sites/default/files/23/06/information\\_sheet\\_evt2102804.pdf](http://www.iaea.org/sites/default/files/23/06/information_sheet_evt2102804.pdf) (accessed 26 Apr. 2024), pp. 1-2.
67. See Tonhauser, W. (2023), “The Impact of IAEA Safety Standards and Security Guidance Documents on Procurement and Contracts”, presentation at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

Principles and the General Safety Requirements of the IAEA Safety Standards<sup>68</sup> and, as mentioned above, the IAEA Nuclear Security Series, which are both based on the principle of technology neutrality and, therefore, cover both nuclear and radioactive material and associated facilities. The IAEA Statute makes the IAEA safety standards binding on the IAEA in relation to its own operations;<sup>69</sup> therefore, any state entering into an agreement with the IAEA concerning IAEA assistance is required to comply with the requirements of the safety standards – and security guidance – that pertain to the activities covered by the agreement. Also, the IAEA safety standards and security guidance form the basis for all the IAEA safety and security review services, such as the Integrated Regulatory Review Service, the Operational Safety Assessment Review Team, the International Physical Protection Advisory Service, and others.<sup>70</sup>

As a last point, states will incorporate safety standards and security guidance documents in one form or another in their respective legislation.<sup>71</sup> Some states formally incorporate safety standards and security guidance documents into their national legislation, while others directly use them to establish their respective national regulations, and, in fact, all of them use safety standards as references for their review of national standards.<sup>72</sup>

### III. Contracts and procurement

#### A. Technology and construction risks

Construction risk is intimately tied to technology risk<sup>73</sup> and, as the complexity of fusion technologies is several orders of magnitude higher than the complexity of fission technologies,<sup>74</sup> fusion power plants are expected to be one of the most capital-intensive projects to be implemented, the final cost of which will largely depend on the construction time and the weighted average capital cost applied.<sup>75</sup> Minimising overall project risk – essentially by reducing construction duration to contain costs – will therefore be a key issue in fusion infrastructure construction.<sup>76</sup> While fusion infrastructure construction can benefit from the lessons learnt from other first-of-a-kind nuclear projects,<sup>77</sup> fusion infrastructure construction will likely have a long design, manufacturing and construction time until fusion technology matures and replica projects are built to optimise design,

68. See González, A.J. (2022), *supra* note 65. See also IAEA (n.d.), “Safety Standards”, IAEA, [www.iaea.org/resources/safety-standards](http://www.iaea.org/resources/safety-standards) (accessed 26 Apr. 2024).

69. IAEA Statute, *supra* note 38, Article III.A.6,

70. See Tonhauser, W. (2023), *supra* note 67.

71. *Ibid.*

72. *Ibid.*

73. See Qureshi, A. and R. Msulwa (2023), “Structuring Fusion Infrastructure Projects”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

74. See Energy Committee of the Royal Swedish Academy of Sciences (2007), *Statements on Energy from Nuclear Fusion*, Royal Swedish Academy of Sciences, Stockholm, p. 5.

75. See Olajos, K.T. (2022), *supra* note 63.

76. See Qureshi, A. and R. Msulwa (2023), *supra* note 73.

77. See Vaya Soler, A. (2022), “Effective Contractual Structures for Nuclear New Build: Key Findings from the REDCOST Report”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022. These lessons learnt can be grouped in the categories of design maturity; effective project management; stability and predictability of regulation; and multi-unit and series effects. Other elements may be add-ons to reduce the cost of fusion infrastructure even further via future design optimisation; technology and process innovation; re-examination of regulatory interactions, and international harmonisation of licensing requirements, and codes and standards.

manufacturing and construction processes.<sup>78</sup> Indeed, fusion infrastructure construction will remain mostly bespoke and built on location until fusion technology components can become modular and repeatable, bringing a huge accumulation of learning that can reduce cost and time to construct.<sup>79</sup>

While reducing the cost of key components through innovation will have the most impact on making fusion competitive,<sup>80</sup> the impact of regulation on contracts and procurement strategies cannot be overstated. For example, instructions from the regulatory body may deeply affect construction contract performance because, in certain jurisdictions, the regulatory body will play a key role in the engineering, procurement, construction and commissioning process of fusion infrastructure<sup>81</sup> given its responsibilities for developing, interpreting, and applying the regulatory requirements for fusion facilities.<sup>82</sup>

## **B. Fusion procurement and contracting**

Reducing the cost of capital will require a risk-allocation and mitigation strategy that contracts can formalise.<sup>83</sup> However, contracts – being risk-allocation documents – should not be expected to manage a fusion infrastructure construction project.<sup>84</sup> The idea that all risks can be allocated to the contractor will not likely be successful because allocation of a risk to a party with little or no control over the risk means that the risk will remain unmanaged.<sup>85</sup> Therefore, the party most capable of managing and controlling a risk should be allocated the risk.<sup>86</sup> In the case of most complex fusion technology development projects, this will be the project owner.<sup>87</sup>

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78. See Flyvbjerg, B. and D. Gardner (2023), *How Big Things Get Done – The Surprising Factors Behind Every Successful Project, from Home Renovations to Space Exploration*, MacMillan, London, pp. 157-184.
  79. See Flyvbjerg, B. (2021), “Make Megaprojects More Modular”, *Harvard Business Review*, November-December 2021 Issue, Harvard Business Publishing, Boston, pp. 58-63.
  80. See Olajos, K.T. (2022), “Changing the Perspective in Fusion R&D to Deliver the Promise of Fusion Energy to All”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022.
  81. See Giraud, S. (2023), “Managing Instructions of Regulatory Bodies under FIDIC Contracts”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
  82. Therefore, the interface mechanism with the regulatory body, and the impact of a regulatory body’s instructions will need to be clearly described in the contract documentation to ensure legal certainty. Certain standard forms suggest, in this respect, that regulatory bodies could become stakeholders in fusion infrastructure construction contracts and would need to be consulted before certain decisions could be made.
  83. See Makovsek, D. and A. Chao (2023), “Enabling Success of Megaprojects through Procurement Strategy: the STEPS Method”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
  84. See Merrow, E. D. (2022), *Contract Strategies for Major Projects – Mastering the Most Difficult Element of Project Management*, John Wiley & Sons, Inc., Hoboken, New Jersey, pp. 57-58.
  85. *Ibid*, p. 222.
  86. *Ibid*, p. 221.
  87. See Chao, A. and A. Calmes (2023), “Updates on the FIDIC Collaborative Contract and Early Contractor Involvement”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023. Project owners can only choose a maximum of two objectives from the quality, time, and cost triangle.

Even so, as supply chain requirements for fusion infrastructure construction are already demanding, suppliers may not be expected to bear more risk than they can reasonably carry.<sup>88</sup> To guard against supply chain disruptions in fusion infrastructure construction, commercial models that do not impose excessive risk on the supply chain should be adopted.<sup>89</sup> The biggest asset of this “supplier-friendly” approach would be the ability to empower involved parties to communicate transparently with one another, thereby decreasing the likelihood of failure.<sup>90</sup> Decreasing delay is key for fusion infrastructure construction, which will have no time for mistakes and will require collaborative work and innovation in a highly complex environment.<sup>91</sup> Therefore, in procurement for fusion infrastructure construction, the focus should be on the technical approach of the bidder rather than on the price alone.<sup>92</sup> Since price overruns are almost universal in construction projects, the price offered in a tender has usually little impact on the actual outturn cost for the project owner.<sup>93</sup> This is also why applying a guaranteed maximum price would not be beneficial for fusion infrastructure construction because fusion infrastructure construction involves a new technology.<sup>94</sup> A guaranteed maximum price requirement is likely to lead to either fewer tenders or to excessive pricing.<sup>95</sup> Using a structured, data-driven process to determine the best way to do a procurement and contracting strategy, involving and engaging multiple disciplines, will be crucial.<sup>96</sup>

### C. Transforming the fusion supply chain

As the fusion supply chain will need to eventually produce up to one gigawatt of fusion capacity a day, an ecosystem capable of supplying, delivering and maintaining the key components will be required to initiate commercial fusion deployment.<sup>97</sup> A robust supply chain of component manufacturers, technology vendors and advanced structural material

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88. See Qureshi, A. and R. Msulwa (2023), *supra* note 73. Supply chain requirements include, amongst others, manufacturing of specialised components and materials to tight specifications, ensuring highest level of quality, continuous improvement, innovation and compliance with safety standards, continuous dialogue and collaboration with owners, suppliers, and the regulatory body, and providing scale and production capacity while achieving cost efficiency and scalability.
89. *Ibid.* Vertical integration also could limit the transaction costs, so there are certain scenarios where vertical integration could substitute contractual relationships.
90. See Chao, A. and A. Calmes (2023), *supra* note 87.
91. See Olajos, K.T. (2023), “Legal innovations to fulfil the promise of fusion energy”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023. Indeed, the nature of fusion technology development with first-of-a-kind procurements imposes uncertainties and influences cost and schedule in an environment where quality is not to be compromised.
92. See Chao, A. and D. Aranyi (2023), “Potential Set Up of an International Procurement Programme for Fusion Technology Development”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
93. See Hebsgaard Muff, S. (2023), “Early Contractor Involvement and Long-Term Collaboration”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.
94. *Ibid.*
95. OECD (2023), *Construction Risk Management in Infrastructure Procurement: The Loss of Appetite for Fixed-Price Contracts – Summary of the expert meeting held on 17 May 2023 at the OECD, Paris (France) and online*, OECD Publishing, Paris, p. 2.
96. See Makovsek, D. and A. Chao (2023), *supra* note 83.
97. See Olajos, K.T. (2023), *supra* note 91. See also *Theory to Reality: The Limitless Potential of Fusion Energy: Hearing Before the House Committee on Science, Space, and Technology, Energy Subcommittee*, 117<sup>th</sup> Congress, pp. 28-40 (2023) (written testimony of David Kirtley, Co-Founder and Chief Executive Officer, Helion Energy).

suppliers that will have to comply with stringent quality requirements to achieve the required precision of fusion technologies will be a necessity.<sup>98</sup>

In this respect, business as usual is not an alternative for developing a competitive industrial base for the future fusion economy when the ambitious goal of commercial fusion power requires timely development of co-ordinated and integrated technical capabilities beyond national borders.<sup>99</sup> Yet, splitting industrial contracts – and the knowledge that accompanies them – among various stakeholders in fusion infrastructure construction does not favour, in general, industry and, in particular, knowledge development objectives.<sup>100</sup> While the linear policy would be to foster open competition to secure best-value-for-money procurement outcomes, it seems idealistic to chase competition with austere cost containment objectives in a market that is limited and where technical monopolies exist, as it presumes the existence of an efficient market and a mature industry. This does not exist just yet for fusion technologies.<sup>101</sup> It therefore seems that, under an arm’s length approach to the nascent industry, there would be no long-term profit-generating business opportunity available for the industry.<sup>102</sup>

#### **D. Collaborative and agile approaches**<sup>103</sup>

Complex environments in fusion infrastructure construction will necessitate a multidisciplinary approach, trust and collaboration between stakeholders, and a willingness to fulfil the project objectives first, which the chosen contract form will need to underpin.<sup>104</sup>

While good contract administration practices in linear contracts can lead to collaboration, they may not be sufficient; therefore, collaborative contracts may be needed for complex fusion infrastructure construction to provide goal-directed project management tools that increase the chance of collaboration and eliminate the linear path to adverse behaviour.<sup>105</sup> To ensure alignment between project owners, contractors, engineers and the supply chain, a collaborative team needs to be in place.<sup>106</sup> In addition, the contract should be prepared to allow for the adoption of parts of the contract in the supply chain contracts (as if they were building blocks) to ensure contractual alignment,

98. See Olajos, K.T. (2023), “Innovative Contracting to Devise a more Human Centred ITER Project”, slideshow presented at the King’s College Open Forum Conference, King’s College, London, 23 February 2023.

99. See Olajos, K.T. (2022), “Delivering Megaprojects in this Decade of Action – The ITER project”, keynote delivered at the Official FIDIC International Contract Users’ Conference 2022, International Federation of Consulting Engineers, London, 29-30 November 2022.

100. *Ibid.*

101. *Ibid.*

102. *Ibid.*

103. Procurement of a collaborative contract, which implies procurement of a process with a series of foreseen review clauses instead of contracting for a specific design or a product, is possible under the EU Procurement Directives, e.g. Directive 2014/24/EC of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, OJ L 94 (28 Mar. 2014), p. 65. Similarly, to ensure compliance with procurement regulations, the agile approach used in the project will need to be specified in the tender documents, but procurement regulations do not hinder agile approaches. See Vornicu, R. (2022), “Collaborative Construction Standard Contract Forms and Improved Value: FAC-1 and TAC-1”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022. See also Spassova, A. (2023), “Innovative Project Delivery with FIDIC Contracts”, slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

104. See Hebsgaard Muff, S. (2023), *supra* note 93.

105. See Chao, A. and A. Calmes (2023), *supra* note 87. For goal-directed project management, see also Assad, M. G. and G. P. J. Pelsler (1983), “Project Management: A Goal-Directed Approach”, *Project Management Quarterly*, Vol. 14, Issue 2, Project Management Institute, Drexel Hill, pp. 49-58.

106. *Ibid.*

information flow, and integration of work streams between supply chain parties; however, they may need to include different pricing provisions.<sup>107</sup>

Contracts in fusion infrastructure megaprojects involving R&D and first-of-a-kind components, prone to modifications, will also require agility during contract implementation.<sup>108</sup> In this respect, cost transparency in collaborative contracts entails that contractors need to present open cost calculations during the design phase, where the design and price are fixed on an ongoing basis.<sup>109</sup> These calculations can then be the basis of a dialogue on price, whereas, to encourage openness, project owners maintain the option of resorting to market testing.<sup>110</sup>

### **E. Contractual liability and insurance**

A strict control of who does what during the design phase in fusion infrastructure construction and the potential for liability in making proposals and suggestions may discourage the free exchange of ideas.<sup>111</sup> It may also be difficult to establish exactly who did what at a later stage and thus be difficult to decide who is responsible for rectifying any defect.<sup>112</sup> In order to address these issues, the design responsibility and contractual liability of each party may need to be clearly defined, independently of who actually made the effort.<sup>113</sup>

Clear lines of liability should be combined with the establishment of a joint construction all risk insurance policy for the fusion infrastructure construction that the project owner would take out to co-insure all contractors and supply chain parties onsite, without any recourse from the insurers.<sup>114</sup> This would help to eliminate disputes at the fusion infrastructure construction site.<sup>115</sup>

At the same time, the early involvement of insurers in setting up the fusion infrastructure construction may be essential to secure insurance coverage, because when it comes to first-of-a-kind fusion facilities or components, the insurers will not be able to base their assessment on risk and, more importantly, there will be no volume of similar

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107. *Ibid.* Therefore, fusion infrastructure construction may need a standard form of contract for its specific needs to create a level-playing field in the supply chain, the essential elements of which should be associated with the process of fusion infrastructure construction delivery more than the legal language. See also Hebsgaard Muff, S. (2023), *supra* note 93.

108. See Olajos, K.T. (2018), “ITER – An International Project for the Construction of a First-of-a-Kind Fusion Nuclear Installation Licensed in France” in L. Klee (ed.), *International Construction Contract Law*, 2<sup>nd</sup> ed., John Wiley & Sons Ltd., Hoboken, New Jersey, pp. 405-423. Agile approaches could contribute to successful fusion infrastructure delivery because fusion technology is a new nuclear technology that still requires a lot of R&D; it involves exploratory, not-done-before, high-quality work produced by many problem-solving engineers, has high rates of change, and has unclear requirements with uncertainty centred on fusion energy’s technical feasibility and performance.

109. See Hebsgaard Muff, S. (2023), *supra* note 93.

110. *Ibid.* While working iteratively in the construction phase would not work where costs involved in amending an iteration are high, the design phase where costs remain comparatively low could benefit from agile approaches. For example, while introducing intermediate milestones in a design phase is not new, the linear approach has been to base these on a certain level of design completion rather than the achievement of overall objectives, which reduces flexibility and shifts focus from the objectives of the project to the immediate task.

111. See Olajos, K.T. (2023), *supra* note 98. As noted in the foregoing, in terms of nuclear (third-party) liability, general tort law would apply, absent specific applicable national legislation and pending application of the international nuclear liability regime.

112. *Ibid.*

113. *Ibid.*

114. See Hebsgaard Muff, S. (2023), *supra* note 93. Alternatively, subrogation should be waived by the insurers.

115. *Ibid.*

policies to fund potential losses.<sup>116</sup> Yet, until the insurance market is ready to provide insurance coverage for fusion facilities, self-insurance, captive insurance or mutual insurance may need to be considered by project owners.

#### **F. Performance measurement and incentives**

While quality, time and cost may be useful metrics for the progress in fusion R&D, the larger and more complex the fusion infrastructure delivery system becomes, the more the critical success factors will lean on the human aspect.<sup>117</sup> Therefore, introducing collaborative contracting to fusion infrastructure construction may require new methods of performance measurement. People in the fusion infrastructure delivery team must be kept inspired, because while making fusion energy a reality has the potential to make people's lives exponentially better, it will be impossible without inspired people to make fusion energy work on time.<sup>118</sup> As project owners will be competing for a finite pool of talent capable of delivering fusion infrastructure construction, and that pool of talent will be in very high demand, it will be of strategic importance to identify, retain and incentivise talent at all stages of fusion infrastructure construction.<sup>119</sup>

#### **G. Intellectual property**

Managing intellectual property equitably is and will remain a fundamental challenge for fusion contracting. Because fusion R&D is an intergenerational effort and fusion intellectual property requires extensive collaboration, to avoid intellectual property disputes that may cause fusion infrastructure construction projects to be cancelled, the ownership of fusion-related intellectual property needs to be secured in contracts.<sup>120</sup>

An obvious means of incentivising the creation of generated intellectual property in fusion R&D, which will be a key asset to commercial fusion technology deployment, would be to allow those who create generated intellectual property to own it, so that they can exploit it to their commercial advantage in the future.<sup>121</sup> However, in a highly collaborative design environment such as fusion infrastructure construction, it may be the case that there will be no single "creator" of generated intellectual property; therefore, as an alternative, joint ownership of generated intellectual property, or mandatory access rights and licensing (with a right to sub-license) may need to be considered.<sup>122</sup> In addition, a regime for identifying and monitoring the use of background intellectual property and a regime for mitigating the risk of unknowingly embedding third-party intellectual property in the fusion infrastructure design, which may cause commercial difficulties later, should be also embedded in contracts.<sup>123</sup>

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116. See Knott, Z. (2023), "Panel on Insuring Fusion Installations", presentation at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022.

117. See Olajos, K.T. (2023), *supra* note 98.

118. See Olajos, K.T. (2022), *supra* note 99.

119. *Ibid.* See also Alty, G. (2022), "Eyes on the Prize – Alignment of Contract Goals in Nuclear Contracting", slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Aix-en-Provence, France, 7-9 June 2022. While legal entities are party to a contract, all actual work will be carried out by individuals; therefore, it is important to realise that incentivisation should not stop at an entity level, and the strategic interests of every single – legal or natural – person participating in the fusion infrastructure construction should be aligned.

120. See Olajos, K.T. (2022), *supra* note 63.

121. See Olajos, K.T. (2023), *supra* note 98.

122. See Pfaff, E. (2023), "Intellectual property management from the industry perspective", slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

123. *Ibid.*



## H. Building information modelling and fusion facility upgrades

Today, boundaries separate a project owner's fusion infrastructure delivery organisation from its supply chain.<sup>124</sup> These will need to be broken down so that individuals are able to work together by following an established protocol where expertise and networks may be shared in a flexible manner.<sup>125</sup> A multi-party-building, information-modelling protocol may be a good solution to achieve integration, which will be a key challenge in fusion infrastructure construction because such a protocol can help ensure greater collaboration between contractors throughout the project lifecycle.<sup>126</sup>

In this vein, fusion infrastructure could be designed and built taking into consideration that fusion facilities will require care after completion.<sup>127</sup> In addition, because the lifecycle of specific technologies used in a fusion facility may not be congruent with the duration of early fusion infrastructure construction, the capacity to deal with technology obsolescence and this kind of innovation also needs to be factored in the design and construction process of fusion facilities.<sup>128</sup> Similarly, as the interface between existing fusion facilities and new contracts for their refurbishment or enhancement (i.e. upgrades) is already foreseeable, it should be anticipated in the chosen contract.<sup>129</sup>

## I. Boundaryless organisation

Today, the employment impacts of work on fusion infrastructure construction are linked closely to the procurement contract implementation; therefore, to avoid the participating supply chain from considering fusion infrastructure construction as a one-off "transaction", project owners should aim to establish long-term partnerships with key technology providers who are willing to accompany project owners throughout the journey of fusion technology development.<sup>130</sup>

To this end, with the help of appropriate contracting frameworks,<sup>131</sup> strategic human capital management could transform the network of transactional, bilateral relationships with key suppliers into collaborative, multilateral partnerships where human capital can be identified, attracted and managed as if the project owner's fusion infrastructure delivery

124. See Olajos, K.T. (2023), *supra* note 98.

125. *Ibid.*

126. *Ibid.*

127. See Hök, S. (2023), "How to manage the interface between green and brown field projects: lessons for ITER", slideshow presented at the Fusion for Energy Contracting Professionals Roundtable, Fusion for Energy, Saint-Paul-lez-Durance, France, 26-28 June 2023.

128. *Ibid.*

129. *Ibid.*

130. See Olajos, K.T. (2023), *supra* note 99. See also Scrum Alliance (n.d.), "4 Values of the Agile Manifesto", Scrum Alliance, [www.scrumalliance.org/agile-organizations/manifesto](http://www.scrumalliance.org/agile-organizations/manifesto) (accessed 26 Apr. 2024). This would be supported by an agile mindset because, if developing a competitive industrial base for the future fusion economy were considered one of the several objectives of fusion infrastructure delivery, the supply chain realising the fusion infrastructure would also be, in fact, customers of the project owner's fusion infrastructure delivery organisation. As the Agile Manifesto values customer collaboration over contract negotiations, the linear risk allocation-based contracting approach could be changed to a collaborative risk management-based approach, pursuing a shared risk-reward relationship in an alliance in which both sides win.

131. For example, no-poaching agreements could be considered as a way to set up a legal framework on human capital collaboration, to be supplemented with planned career progression and mobility arrangements within the partnership, to root the industrial culture, prerequisite to the future of fusion technology development, combining stability with agility in sync with the supply chain. This could be a promising way to cement the project owner's fusion infrastructure delivery organisation as a truly boundaryless organisation in the long term.

organisation and its key suppliers were virtually integrated into a boundaryless organisation<sup>132</sup> with the aim of becoming the “lifetime employer” of choice.<sup>133</sup>

### J. Standardisation

As a last point, a competent infrastructure delivery team with a good track record that can be deployed to follow-on fusion R&D projects will be crucial for the success of fusion infrastructure delivery.<sup>134</sup> Because only the most experienced owners may succeed in having a roster of companies and contractors that they hire,<sup>135</sup> a specific and formal partnering agreement that is not limited to a particular project could ensure that multiple firms can gain experience, promote investments by firms and their supply chain, and result in a positive learning curve.<sup>136</sup>

In this sense, the more a partnering model can be adopted, the better the results of fusion infrastructure construction will be (provided that there will be experienced contractors and experienced project owners in the fast-developing fusion ecosystem).<sup>137</sup> To this end, standardisation will be necessary to ensure predictability in tender documents and contract conditions, acceptability of the tender process and contract conditions by the industry, red tape reduction by developing the appropriate contract form, and reduction of tendering cost by using agile contract management processes.<sup>138</sup>

## IV. International Group of Legal Experts on Fusion Energy (FELEX)

In view of the foregoing, it becomes clear that national efforts alone will not lead to success. All stakeholders – international and national – will have to work together. With this in mind, legal experts are needed to sustain the momentum and to proactively address legal issues, notably those issues that rise at the international level and, ultimately, those that are described in this paper, by developing a common reference document.<sup>139</sup>

To this end, Fusion for Energy<sup>140</sup> invited professionals from the fusion industry, international law firms, international organisations, regulators, and specialists in international regulation development – selected based on their demonstrated knowledge and experience in the legal or regulatory fields and their commitment to the development of fusion energy for peaceful purposes – to form FELEX as an informal international expert

132. See Ashkenas, R., et al. (2002), *The Boundaryless Organization: Breaking the Chains of Organization Structure*, 2<sup>nd</sup> ed., Jossey Bass Publishers, San Francisco, pp. 179-242.

133. See Olajos, K.T. (2023), *supra* note 98.

134. See Flyvbjerg, B. and D. Gardner (2023), *supra* note 78, pp. 80-96.

135. *Ibid.*

136. See Chao, A. and D. Aranyi (2023), *supra* note 92.

137. See Flyvbjerg, B. and D. Gardner (2023), *supra* note 78, pp. 143-156.

138. See Chao, A. and D. Aranyi (2023), *supra* note 92. See also Olajos, K.T. (2023), *supra* note 98. The application of nuclear regulation to the ITER supply chain – inspected by the French nuclear regulator and the ITER Organization anywhere in the world – has helped create a global platform to standardise tokamak fusion technology components by contract.

139. See Tonhauser, W. (2023), *supra* note 9.

140. Fusion for Energy, established by Council Decision 2007/198/Euratom of 27 March 2007, OJ L 90 (30 Mar. 2007), p. 58, is the European Union organisation managing Europe’s contribution to ITER. In addition to ITER, Fusion for Energy is involved in other major fusion R&D projects that include implementation of the Broader Approach Agreement, entered into between Euratom and Japan, and preparation for the construction of the European demonstration fusion plant. See Fusion for Energy (n.d.) Fusion for Energy: About F4E, <https://fusionforenergy.europa.eu> (accessed 12 Dec. 2023).

panel of scientific independence.<sup>141</sup> As immediate tasks, the initial members of FELEX – acting in their personal capacity – have analysed and revised the key issues document prepared by the Secretary of the Roundtable, taking into consideration the inputs of delegates; reviewed the relevant legal, regulatory, and procurement and contract issues; proposed appropriate amendments; and made recommendations to move forward in finding appropriate solutions to the identified issues.<sup>142</sup> FELEX’s findings are expected to become a common reference document, to be published as part of the Proceedings of the 2022-2023 Fusion for Energy Contracting Professionals Roundtables.<sup>143</sup>

## V. Next steps

It is an exciting time for fusion as fusion technology breakthroughs, developing regulatory frameworks for fusion technologies, and introducing collaborative contracting in early fusion infrastructure construction are all happening at the same time.

With these considerations in mind, work commenced in December 2021 on creating a platform that would connect interested communities to exchange views and share ideas, knowledge and experiences. This platform is known today as the Fusion for Energy Contracting Professionals Roundtable.<sup>144</sup> During its first two years, the Roundtable has managed to bring together the different perspectives of legal, contracting, procurement and project management professionals, policymakers, regulators, technology developers, supply chain members and investors in the iconic meeting room of the ITER Council and get them engaged in the long journey of fusion technology development.

Also only recently, IAEA Director-General Rafael Grossi announced the creation of the IAEA’s World Fusion Energy Group, which will bring together scientists and engineers, policymakers, financiers, regulators and civil society as the “next leg of the fusion energy journey”.<sup>145</sup> In addition, it is expected that the IAEA will work closely with experts in the field to outline “Fusion Key Elements”, such as fusion-related definitions, characteristics and criteria for fusion energy to help develop a common understanding among stakeholders, which is essential for global deployment.<sup>146</sup> These are in fact also topics that have been discussed both at the Roundtable and at FELEX. Further, the desire to harmonise

141. FELEX was established at the Fusion for Energy Contracting Professionals Roundtable, organised by Fusion for Energy in collaboration with INLA and the ITER Organization at the ITER Headquarters in Saint-Paul-lez-Durance, France on 26-28 June 2023. See Articles 1 and 2, FELEX (2023), “Terms of Reference of the International Group of Legal Experts on Fusion Energy (FELEX)”, in K.T. Olajos (ed.), *Fusion for Energy Contracting Professionals Roundtable Proceedings*, Fusion for Energy, Barcelona, p. 10.

142. See FELEX (2023), “Key Issues – Outcome of the First Round of Deliberations of the International Group of Legal Experts on Fusion Energy (FELEX)”, in K.T. Olajos (ed.), *Fusion for Energy Contracting Professionals Roundtable Proceedings*, Fusion for Energy, Barcelona, pp. 12-28.

143. At the time of writing, the Fusion for Energy Contracting Professionals Roundtable Proceedings are in the process of publication. In their current form (December 2023), they may be consulted at [https://drive.google.com/file/d/1c6GXzFx7bH9noSWqwb8IHBFji3c\\_q6Br/view?usp%20=sharing](https://drive.google.com/file/d/1c6GXzFx7bH9noSWqwb8IHBFji3c_q6Br/view?usp%20=sharing) (accessed 2 May 2024).

144. The Fusion for Energy Contracting Professionals Roundtable is a Fusion for Energy Legal Lab event that was created to co-develop innovative legal thinking with key legal, contract and regulatory experts in the field to enable successful delivery of fusion megaprojects for the benefit of all humankind. See Fusion for Energy, “F4E Contracting Professionals Roundtable brings together more than 300 participants”, <https://fusionforenergy.europa.eu/news/f4e-contracting-professionals-roundtable-brings-together-more-than-300-participants> (accessed 2 May 2024); Olajos, K.T. (2023), “Foreword”, in K.T. Olajos (ed.), *Fusion for Energy Contracting Professionals Roundtable Proceedings*, Fusion for Energy, Barcelona, pp. 7-9.

145. Midgley, E. (2023), “New IAEA Initiative to Enhance Fusion Energy Collaboration”, IAEA, [www.iaea.org/newscenter/news/new-iaea-initiative-to-enhance-fusion-energy-collaboration](http://www.iaea.org/newscenter/news/new-iaea-initiative-to-enhance-fusion-energy-collaboration) (accessed 12 Dec. 2023).

146. *Ibid.*

legal and regulatory frameworks for fusion technologies was re-confirmed by regulators and experts at the first IAEA Technical Meeting on Fusion Design Safety and Regulation.<sup>147</sup>

To make use of everything that has been achieved at the Roundtable and by FELEX thus far, it seems that the time is right to hold a dedicated conference for fusion project owners, policymakers and regulators that addresses the various legal aspects of fusion technology development.<sup>148</sup> In addition, a specific contract drafting workshop, where delegates of the Roundtable would develop a standard form of contract with a fair allocation of risk for fusion infrastructure construction, seems to be a timely undertaking.

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147. The first IAEA Technical Meeting on Fusion Design Safety and Regulation (EVT 2102804) took place in Vienna on 23-25 October 2023 with the participation of 102 delegates from 23 IAEA members states and three international organisations. See Choi, G. and D. Watson (2023), *supra* note 64. The meeting has provided essential inputs for the development of principles and key concepts for fusion safety and regulation, which will serve as a basis for the development of IAEA fusion safety reports. See also Johnson, P.L. (2023), *supra* note 24, pp. 32, 37; Calle Vives, P. (2022), *supra* note 62.

148. The planned dates for the next Fusion for Energy Roundtable are 25-28 June 2024.

## CASE LAW

### Slovak Republic

#### **Global 2000 v. ÚJD SR**

Public participation in decision making within the nuclear sector in the Slovak Republic is part of environmental protection as covered by the Aarhus Convention,<sup>1</sup> the Espoo Convention,<sup>2</sup> the EIA Directive,<sup>3</sup> Act No. 24/2006 Coll. on Environmental impact assessment, as amended, Act No. 71/1967 Coll. on Administrative proceedings, as amended, and Act No. 541/2004 Coll. on the Peaceful use of nuclear energy, as amended. A general act governing free access to information in the Slovak Republic is Act No. 211/2000 Coll. on Free access to information and on amendment and supplement to certain acts, as amended (Freedom of Information Act). Its philosophy is that all information is accessible with certain exceptions stipulated by some acts.

The plaintiff, Global 2000, lodged a request with the Nuclear Regulatory Authority of the Slovak Republic (Úrad jadrového dozoru Slovenskej republiky, ÚJD SR), the defendant, for information and documentation related to the application and permit for the Mochovce Nuclear Power Plant, Units 3 and 4.<sup>4</sup> The ÚJD SR, as the first instance authority, decided to “partially withhold the requested information as it contains sensitive information”.<sup>5</sup> The plaintiff appealed this decision to the second instance authority, the Chairperson of the ÚJD SR, who confirmed the first instance decision.<sup>6</sup>

The plaintiff then filed a lawsuit with the Regional Court in Bratislava (the Court) arguing that there was a compelling public interest in the public having access to the requested information and that the plaintiff had a right of access pursuant to the Freedom of Information Act and the Aarhus Convention.<sup>7</sup> The ÚJD SR argued that it had followed domestic and international law and its own internal regulations in partially denying the plaintiff’s request for information and, further, disputed that there was a compelling public interest, noting that only five persons reviewed the application documentation during the period when it was available for public consultation.<sup>8</sup> The Court found that the ÚJD SR acted in accordance with the Aarhus Convention and the Freedom of Information Act, as the information at issue is sensitive because it relates to “ensuring the physical security of

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1. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (1998), 2161 UNTS 450, entered into force 30 Oct. 2001 (Aarhus Convention).
  2. Convention on Environmental Impact Assessment in a Transboundary Context (1991), 1989 UNTS 310, entered into force 10 Sept. 1997 (Espoo Convention).
  3. 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, *Official Journal of the European Union (OJ)* L 124 (25 Apr. 2014) (EIA Directive).
  4. Global 2000 v. ÚJD SR, Proc. No. IS/305/2017, Regional Court of Bratislava, paras. 1-2 (2023) (Slovak Republic). A redacted English translation of the judgment is available on the ÚJD SR website at: [www.ujd.gov.sk/wp-content/uploads/2023/09/Judgement\\_1S\\_305\\_2017\\_redacted.pdf](http://www.ujd.gov.sk/wp-content/uploads/2023/09/Judgement_1S_305_2017_redacted.pdf) (accessed 15 May 2024).
  5. *Ibid.*, para. 3.
  6. *Ibid.*, paras. 7-9.
  7. *Ibid.*, para. 10.
  8. *Ibid.*, para. 35.

a nuclear power plant and thus to ensuring the protection of the health of employees and the public, as well as the protection of the work environment and life environment”, thereby outweighing the plaintiff’s interest.<sup>9</sup> On these grounds, in addition to others, the Court dismissed the case without awarding costs of the proceedings to the defendant.<sup>10</sup> The judgment in the case, No. 1S/305/2017, was delivered on 16 February 2023 and came into force on 23 March 2023.<sup>11</sup>

## United States

### **Spent fuel storage litigation**

There continues to be significant litigation activity in the United States (US) federal courts concerning challenges to two licences issued by the US Nuclear Regulatory Commission (NRC) providing for the temporary storage of spent nuclear fuel.

#### *Texas v. NRC*

On 25 August 2023, the Court of Appeals for the Fifth Circuit vacated a licence the NRC previously issued to Interim Storage Partners, LLC (ISP), which had authorised the construction and operation of a consolidated interim storage facility (CISF) in Andrews County, Texas.<sup>12</sup> That licence, issued by the NRC in September 2021, authorised ISP to receive and store up to 5 000 metric tons of spent nuclear fuel in above ground canisters and casks for a licence term of up to 40 years. The NRC issued this licence to ISP pursuant to its regulations in the US *Code of Federal Regulations* (CFR) Title 10, Part 72, which were first promulgated in 1980 for the licensing of both onsite and away-from-reactor private spent nuclear fuel storage facilities.<sup>13</sup>

The legality of the NRC’s issuance of the CISF licence was challenged in the Fifth Circuit by the US State of Texas and two organisations representing property owners and oil and gas interests in the vicinity of the facility (collectively referred to as “Fasken”). In its decision (issued by a panel of three judges), the court agreed with the primary argument advanced by the State of Texas and held that the NRC lacked authority under the US Atomic Energy Act of 1954, as amended, to “issue licenses for private parties to store spent nuclear fuel away-from-the-reactor”.<sup>14</sup>

In reaching its decision, the court explained that although the NRC has authority under the Atomic Energy Act to issue licences for the possession of “special nuclear material”, “source material” and “byproduct material” (which are the constituent elements of spent nuclear fuel), the statute only authorises the issuance of such licences for specific enumerated purposes, “none of which encompass storage or disposal of material as radioactive as spent nuclear fuel”.<sup>15</sup> The court also determined that the NRC’s assertion of authority to license the storage of spent nuclear fuel at a location away from the reactor where it was generated “cannot be reconciled with the Nuclear Waste Policy Act” (NWPA).<sup>16</sup> The court explained that the NWPA “creates a comprehensive statutory scheme for addressing spent nuclear fuel accumulation”, which “prioritises construction” of a permanent federal spent fuel repository at Yucca Mountain and “plainly contemplates

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9. *Ibid.*, para. 77.

10. The Court did not award costs because the defendant was an administrative body and did not submit costs incurred to the Court. *Ibid.*, para. 92.

11. *Ibid.*, Certification Clause.

12. *Texas v. NRC*, 78 F.4<sup>th</sup> 827 (5th Cir. 2023).

13. Licensing Requirements for the Storage of Spent Fuel in an Independent Fuel Spent Storage Installation, 45 *Federal Register* (Fed. Reg.) 74693 (12 Nov. 1980).

14. *Texas*, *supra* note 12, p. 831.

15. *Ibid.*, pp. 840-841 (citing 42 *United States Code* (USC) 2073, 2093 and 2111).

16. *Ibid.*, p. 842.

that, until there's a permanent repository, spent nuclear fuel is to be stored onsite at-the-reactor or in a federal facility."<sup>17</sup>

The court acknowledged that its reading of the NRC's lack of authority in this regard contrasted with prior decisions issued by two other courts of appeals, which had held that the NRC did possess authority to license storage of spent nuclear fuel at privately owned, away-from-reactor facilities. However, the court determined these prior decisions were unpersuasive because they "essentially assumed" that the Atomic Energy Act vested the NRC with this authority rather than "provid[ing] a textual analysis of the Atomic Energy Act and whether it allows away-from-reactor spent nuclear fuel storage".<sup>18</sup> The court also declared that decisions surrounding the disposal of nuclear waste was a "major question" of "great economic and political significance" and "public concern", and thus even if there were ambiguity in the Atomic Energy Act or the NWPA as to the scope of the Agency's authority, the Commission's interpretation of its own authority to issue the CISF licence was not entitled to deference and that a clear delegation of authority is absent from the Atomic Energy Act.<sup>19</sup>

### Holtec CISF

On 9 May 2023 (prior to the *Texas v. NRC* decision, discussed above), the NRC issued a second CISF licence to Holtec International, authorising the construction and operation of a facility in Lea County, New Mexico, for the receipt and storage of over 8 000 metric tons of spent nuclear fuel for a licence term of 40 years. As a result of the NRC's issuance of the licence, a consolidated proceeding that had been pending in the Court of Appeals for the District of Columbia (DC) Circuit was no longer held in abeyance.<sup>20</sup> This proceeding involves multiple environmental and non-profit organisations as well as the same Fasken organisations that challenged the ISP licence in *Texas v. NRC*. Each petitioner had previously sought to intervene as parties in the Holtec CISF licensing proceeding while the application was still pending before the NRC, but were denied intervention for failure to submit an admissible contention under the NRC's procedural rules.<sup>21</sup> Upon denial of their requests to intervene in the administrative proceeding, each petitioner sought judicial review of that denial within 60 days, as required by the statute governing judicial review of final orders in NRC licensing proceedings.<sup>22</sup> However, since October 2020 the DC Circuit had been holding the case in abeyance, in part because the NRC's final decision on whether to issue the licence was not expected until 2022 or 2023.

With the issuance of the CISF licence to Holtec in May 2023, the DC Circuit removed the case from abeyance and the parties began briefing, which will conclude in January 2024. The petitioners argued that the issuance of the CISF licence violates the NWPA and also

17. *Ibid.*, pp. 843-44.

18. *Ibid.*, p. 841 (citing *Bullcreek v. NRC*, 359 F.3d 536 (DC Cir. 2004); *Skull Valley Band of Goshute Indians v. Nielson*, 376 F.3d 1223 (10th Cir. 2004)).

19. *Ibid.*, p. 844 (citing *West Virginia v. EPA*, 142 S. Ct. 2587 (2022)). The court also rejected the NRC's arguments for dismissal of the petitions for review on procedural grounds. First, the court determined that each petitioner had "standing" under the US Constitution to bring their claims in federal court because both petitioners "successfully assert[ed] an injury resulting from the license." *Ibid.*, pp. 835-837. And the court determined that each petitioner could seek judicial review of the issuance of the licence, notwithstanding that neither had intervened as a party in the licensing proceeding before the Agency, because both parties asserted that the NRC had acted beyond its statutory authority. *Ibid.*, pp. 839-840.

20. *Beyond Nuclear, Inc. v. NRC*, DC Cir. No. 20-1187 (consolidated with Nos. 21-1225, 21-1104 and 21-1147).

21. See *Holtec International (HI-STORE Consolidated Interim Storage Facility)*, CLI-20-04, 91 NRC 167 (2020); *Holtec International (HI-STORE Consolidated Interim Storage Facility)*, CLI-21-04, 93 NRC 119 (2021); *Holtec International (HI-STORE Consolidated Interim Storage Facility)*, CLI-21-07, 93 NRC 215 (2021) (upholding dismissal of all contentions).

22. 28 USC 2344. The venue for such challenges is appropriate either in the judicial circuit "in which the petitioner resides or has its principal office", or in the Court of Appeals for the DC Circuit. 28 USC 2343.

raised multiple challenges concerning the sufficiency of the discussion of safety risks and environmental impacts within Holtec's application. The NRC filed its response on 9 November 2023.

On 11 July 2023, Fasken also filed a separate petition for review in the Court of Appeals for the Fifth Circuit, challenging the Holtec CISF licence.<sup>23</sup> Unlike its petition for review in the DC Circuit (challenging the NRC's denial of its request to intervene as a party in the licensing proceeding), discussed above, Fasken's challenge in the Fifth Circuit seeks direct review of the NRC's May 2023 issuance of the licence to Holtec. Shortly after Fasken's petition for review was filed, the NRC filed a motion to dismiss the petition for lack of jurisdiction, arguing that Fasken could not challenge the issuance of the licence and that its sole remedy under the federal statute governing judicial review of NRC licensing decisions was to challenge the NRC's denial of its request to intervene as a party. Alternatively, the NRC argued that the Fifth Circuit should transfer Fasken's petition to the DC Circuit, where Fasken had already filed a jurisdictionally proper petition for review concerning the Holtec CISF. On 25 August 2023, the Fifth Circuit denied the NRC's motion to transfer the petition for review and on 13 September 2023 the Court ordered that the motion to dismiss be "carried with the case", meaning it will be considered in conjunction with a full briefing on the merits. Briefing has not commenced at the time of writing.

### **Commission denial of hearing concerning export licence application**

On 11 September 2023, the NRC denied a request for hearing and intervention concerning an export licence application filed by the US Department of Energy and National Nuclear Security Administration (DOE/NNSA).<sup>24</sup> The licence, issued by the NRC on the same day, allows DOE/NNSA to export up to 130 kilograms of highly enriched uranium (HEU) in the form of broken metal to Framatome for fabrication into fuel for use in the High Flux Reactor at the Institut Laue-Langevin (ILL) in Grenoble, France. The NRC received a petition from Dr Alan J. Kuperman, co-ordinator of the Nuclear Proliferation Prevention Project (NPPP) at the University of Texas at Austin, seeking intervention and a hearing on the export licence application and requesting that the NRC reduce the amount of HEU that DOE/NNSA may export under the licence.<sup>25</sup>

The Atomic Energy Act of 1954, as amended by the Nuclear Non-Proliferation Act of 1978, requires that the Commission provide opportunities for public participation in nuclear export licensing proceedings.<sup>26</sup> Under NRC regulations, the Commission will grant a request for a hearing on an export licence application when the Commission finds the hearing will be in the public interest and will assist the Commission in making the statutory determinations required by the Atomic Energy Act of 1954, as amended. In addition, where a person requests a hearing and asserts an interest that may be affected by the issuance or denial of an export licence, the Commission will consider the nature of the alleged interest; how that interest relates to the issuance or denial of the export licence application; and the possible effect of any order on that interest.<sup>27</sup>

In its order denying the request for a hearing, the Commission found that Dr Kuperman's request failed to meet these standards. Dr Kuperman asserted that both institutional interests and personal interests would be affected by approval of the export licence application. First, he asserted that NPPP's institutional interest in providing information to the public on nuclear proliferation, terrorism and the use of HEU would be "significantly and adversely impaired" unless there was a hearing on the application.<sup>28</sup> The Commission rejected this argument, stating that an institutional interest in providing

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23. Fasken Land and Minerals, Limited v. NRC, 5th Cir. No. 23-60377.

24. US Department of Energy (Export of 93.20% Enriched Uranium), CLI-23-02, 98 NRC (2023) (slip op. at 2).

25. *Ibid.*, p. 3.

26. 42 USC 2155a.

27. 10 CFR 110.84(b).

28. CLI-23-02, slip op., *supra* note 25, p. 5.



information to the public was not sufficient to show an affected interest and that Dr Kuperman had not shown how the specific export licence in question would hinder his ability to carry out educational activities through NPPF.<sup>29</sup> Second, Dr Kuperman asserted that his individual interests would be affected because approval of the application could increase “global risks of nuclear proliferation and nuclear terrorism, thereby increasing the likelihood that an adversary’s nuclear weapon will be detonated in the United States” and by consequence adversely affecting Dr Kuperman’s health, safety and well-being.<sup>30</sup> The Commission rejected this argument as well, stating that Dr Kuperman had failed to provide any evidence of a specific risk or credible threat that would arise from the export. Thus, the Commission concluded that Dr Kuperman had not demonstrated an interest that may be affected by the Commission’s consideration of the application.<sup>31</sup>

The Commission also determined that Dr Kuperman had not demonstrated that a hearing would be in the public interest or would assist the Commission in making the required statutory and regulatory determinations because he had not shown that a hearing would bring new information to light.<sup>32</sup> After the petition for a hearing was submitted, DOE/NNSA provided specific information that Dr Kuperman had identified as necessary for the Commission to make an informed determination on the application.<sup>33</sup> The NRC also obtained additional technical information from the Executive Branch of the US government related to the amount of HEU requested in the application.<sup>34</sup> With this additional information available to the Commission and the public, the Commission concluded that Dr Kuperman had failed to adequately specify what new information would be provided at a hearing that was not already available to the Commission and had failed to adequately explain how a hearing would add clarity to the assertions made in the petition.

NRC regulations governing public participation in export licensing proceedings also allow members of the public to submit written comments that the NRC will consider and respond to, if appropriate.<sup>35</sup> Thus, while the Commission denied Dr Kuperman’s hearing request, it referred the petition to the NRC’s Office of International Programs for the NRC staff to address as a public comment on the export licence application.

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29. *Ibid.*

30. *Ibid.*, p. 6.

31. *Ibid.*

32. *Ibid.*, p. 7.

33. *Ibid.*

34. *Ibid.*, p. 3. The NRC is required to seek and obtain views from other elements of the Executive Branch (including the Departments of State, Energy, Defence, and Commerce, as appropriate), prior to taking action on certain export licence applications. See 10 CFR 110.41.

35. 10 CFR 110.81(a).



## NATIONAL LEGISLATIVE AND REGULATORY ACTIVITIES

### Japan<sup>1</sup>

#### General legislation, regulations and instruments

##### Enactment of the GX Decarbonization Power Supply Act

- Background

Japan is determined to address climate change with an international commitment to reduce greenhouse gas emissions by 46% compared to 2013 by 2030 and to achieve net zero greenhouse gas (GHG) emissions by 2050.<sup>2</sup> While the global trend towards decarbonisation is accelerating, the Russian invasion of Ukraine, which began in February 2022, has brought significant changes to the global energy landscape regarding the security and cost of energy supplies. As most of Japan's energy resources are imported from abroad, these events have made securing energy supply and dealing with soaring energy prices an urgent issue in Japan.

Under these circumstances, the Basic Policy for the Realisation of GX (Basic Policy) was approved by the Cabinet on 10 February 2023. GX is a term unique to Japan that refers to the “Green Transformation” of the entire economic and social system to meet GHG emission reduction targets by 2030 and achieve net zero GHG emissions by 2050. Japan views these efforts as an opportunity for economic growth while achieving emission reductions and enhancing industrial competitiveness. To ensure a stable energy supply, the Basic Policy calls for a shift to decarbonised power sources that contribute to energy self-sufficiency, such as renewable energy and nuclear power. This represents Japan's recognition that nuclear, as well as renewables and other power sources that contribute to national energy security and are highly effective for decarbonisation, will be used to their maximum potential to overcome the current crisis. While reiterating that safety is the top priority, the Basic Policy clearly states that “a necessary amount of nuclear power will be continuously utilized on the major premise of ensuring safety and public trust”.<sup>3</sup> In line with the Strategic Energy Plan, efforts will be made to develop and construct innovative nuclear reactors with built-in safety mechanisms and to facilitate the restart of existing nuclear power plants “that have passed safety reviews by the Nuclear Regulation Authority and have gained local understanding”.<sup>4</sup>

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1. This report is the outcome of analysis and research conducted by the Japan Energy Law Institute and does not reflect or represent the views and official position of the Government of Japan. The institution alone is responsible for the facts and opinions described in this report.
  2. Ministry of Economy, Trade and Industry (METI) (2023), “The Basic Policy for the Realization of GX – A Roadmap for the next 10 Years”, p. 2, available at: [www.meti.go.jp/english/press/2023/pdf/0210\\_003a-2.pdf](http://www.meti.go.jp/english/press/2023/pdf/0210_003a-2.pdf) (accessed 26 Apr. 2024).
  3. METI (2021), “Outline of Strategic Energy Plan”, p. 5, available at: [www.enecho.meti.go.jp/en/category/others/basic\\_plan/pdf/6th\\_outline.pdf](http://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/6th_outline.pdf) (accessed 26 Apr. 2024)
  4. METI (2023), *supra* note 2, 8-9.

In addition to the Basic Policy, the Cabinet also proposed an Act for Partial Revision of the Electricity Business Act and Other Acts for Establishing an Electricity Supply System for Realizing a Decarbonized Society (GX Decarbonization Power Supply Act),<sup>5</sup> which amended several laws, including the Electricity Business Act;<sup>6</sup> the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (Reactor Regulation Act);<sup>7</sup> the Atomic Energy Basic Act;<sup>8</sup> the Act on Special Measures Concerning Promotion of Utilization of Electricity from Renewable Energy Sources;<sup>9</sup> and the Act on the Implementation of Reprocessing of Spent Fuel in Nuclear Power Generation (Reprocessing Act).<sup>10</sup> These amendments further Japan's policy of maximising the use of highly decarbonised power sources that contribute to energy security, as indicated in the Basic Policy.<sup>11</sup>

The GX Decarbonization Power Supply Act was approved by the Diet on 31 May 2023. The Act:

- clarifies the principles governing the use of nuclear power in the Atomic Energy Basic Act:
  - by amending the Atomic Energy Basic Act to clarify the top priority of safety and the value of nuclear energy use in contributing to stable electricity supply and realisation of a decarbonised society); and
  - by amending the Atomic Energy Basic Act to clarify the responsibilities of the state and operators (acceleration of back-end processes such as decommissioning and final disposal, voluntary safety improvement and disaster prevention measures).
- creates requirements for ageing nuclear power reactors under the Reactor Regulation Act:
  - by amending the Reactor Regulation Act to oblige nuclear power operators to carry out a technical evaluation of the deterioration of their facilities every 10 years, when they intend to operate their facilities for more than 30 years from the start of the operation; and
  - by amending the Reactor Regulation Act to oblige nuclear power operators to develop a long-term facility management plan based on the results of the abovementioned evaluation and obtain approval from the Nuclear Regulation Authority (NRA).
- establishes rules governing the operational period of nuclear power plants in the Electricity Business Act:
  - by amending the Electricity Business Act to set forth that an extension of the period of operation of a nuclear power plant (in principle, stipulated to be 40 years) is permitted only if the Minister of Economy, Trade and Industry approves: (1) securing a stable supply; (2) contributing to realisation of a decarbonised society; and (3) voluntary safety improvements and constant improvement of disaster prevention measures; and
  - by amending the Electricity Business Act to set forth that the extension period

5. Act No. 44 of 2023.

6. Act No. 170 of 1964.

7. Act No. 166 of 1957.

8. Act No. 186 of 1955.

9. Act No. 108 of 2011.

10. Act No. 48 of 2005.

11. METI (2023), "Datsutanso Syakai no Jitsugen ni Muketa Denki Kyoukyu Taisei no Kakuritsu I Hakaru Tameno Denkijigyo Ho Nado no Itiblwo Kaiseisuru Houritsu An (GX Datsutanso Dengen Ho) no Gaiyou" [Summary of the Bill to Amend the Electricity Business Act and Other Acts to Establish an Electricity Supply System for a Decarbonized Society (GX Decarbonization Power Supply Act)] (in Japanese), available at: [www.meti.go.jp/press/2022/02/20230228005/20230228005-1.pdf](http://www.meti.go.jp/press/2022/02/20230228005/20230228005-1.pdf) (accessed 26 Apr. 2024).

shall be 20 years. Additional extensions are allowed only for the period during which the reactor operation is suspended due to reasons unforeseeable by the nuclear operator (e.g. changes in systems and operations related to safety regulations, provisional disposition orders).

- promotes smooth and steady decommissioning under the Reprocessing Act:
  - to cope with full-scale decommissioning in the future, by amending the Reprocessing Act to authorize the Nuclear Reprocessing Organization of Japan (NuRO) to provide: (1) comprehensive co-ordination of nationwide decommissioning; (2) joint implementation of research and development, equipment co-ordination; and (3) financial management for decommissioning; and<sup>12</sup>
  - by amending the Reprocessing Act to obligate nuclear operators to make decommissioning contributions to the NuRO.

#### ▪ Clarification of national responsibilities

The Atomic Energy Basic Act, enacted in 1955, stipulates that the research, development and utilisation of nuclear energy is limited to peaceful purposes, and specifies the importance of ensuring safety and information transparency. The amendments to the act stipulate the principle of “safety-first”, based on reflection on the Fukushima Daiichi Nuclear Power Plant accident, and they also proclaim a “national responsibility” to secure a stable supply of electricity, realise a decarbonised society and contribute to enhance autonomy of the electricity supply. The act also stipulates basic measures for appropriate utilisation of nuclear energy, such as maintaining the industrial base and improving the business environment in Japan.

#### ▪ Amended regulations for ageing nuclear power reactors

The amended Reactor Regulation Act, which will enter into force on 6 June 2025, obliges a nuclear power operator to develop, every 10 years after the first 30 years of operation, a plan for long-term management of a nuclear power reactor (“long-term facility management plan”), which is required to obtain approval from the NRA.

The current Reactor Regulation Act stipulates two mechanisms:

- the “Approval of Extending Operational Period” system, which allows a one-time-only extension of the operating period of a nuclear power reactor by up to 20 years if approved by the NRA before the expiration of the operating period of 40 years; and
- the “Technical Aging Evaluation” system, which nuclear power operators are required to carry out every 10 years after the first 30 years of operation.<sup>13</sup>

As a matter of fact, nuclear power operators need to conduct overlapping works, because both systems require them to carry out the same technical evaluation of degradation before 40 years of operation. For this reason, the amended Reactor Regulation

12. NuRO is a licensed corporation to which a nuclear operator contributes funds to cover the cost of reprocessing spent nuclear fuel. In the past, a nuclear operator had a reserve fund system under which the nuclear operator paid the necessary funds for reprocessing operations based on the amount of spent nuclear fuel generated. However, in the case of the reserve fund system, the funds belonged to the operators, and if an operator went bankrupt, there was a risk that reliable payment of costs could not be guaranteed. Therefore, the Reprocessing Act, *supra* note 10, was enacted, and a licensed corporation (NuRO) was established to be responsible for steady reprocessing, and nuclear operators were obliged to contribute reprocessing costs to NuRO.

13. For an overview of the current process for plant life extension, see NRA (2022), “Convention on Nuclear Safety National Report of Japan for 9<sup>th</sup> Review Meeting”, pp. 32-33, 86-93, available at: [www.nra.go.jp/data/000402611.pdf](http://www.nra.go.jp/data/000402611.pdf) (accessed 26 Apr. 2024).

Act, which stipulates the approval system for the long-term facility management plan, integrates the two mechanisms to avoid duplication.

Compared to the “Approval of Extending Operational Period” system under the current Reactor Regulation Act, the amendment to the act increases the frequency of confirmation from only one application for a 20-year extension at 40 years of operation to every 10 years from 30 years after operation. In terms of the comparisons with the “Technical Aging Evaluation” system under the current Act, if nuclear power operators cannot maintain compliance with regulatory standards, the amended Reactor Regulation Act obligates them to stop operating. In this regard, the amended legal system is more direct and has a stronger legal basis.<sup>14</sup>

According to one interpretation of the current Reactor Regulation Act, if a nuclear power operator does not receive permission for a change to a reactor installation, approval of the Design and Construction Plan and approval for extending the operational period by the end of the 40<sup>th</sup> year of operation, the NRA must terminate the review of the licence, and the operator will not be able to extend the plant’s operation.<sup>15</sup> This interpretation created a concern that the time limit for the review of the approval of extending operational period of Kansai Electric Power Company’s Mihama Unit 3 and Japan Atomic Power Company’s Tokai No. 2 could not be met by the end of the plants’ 40<sup>th</sup> year of operation and the time limit for the review of the extension of licence operation would expire. However, the long-term facility management plan, which is provided by the amended law, does not stipulate a deadline for application, thereby eliminating the systemic irrationality of decommissioning due to the expiry of time.<sup>16</sup>

- Extension of the operational period of nuclear power plants

Pursuant to the GX Decarbonization Power Supply Act, the provisions on operating periods contained in the Reactor Regulation Act will be transferred to the Electricity Business Act. This amendment is in response to the NRA’s opinion that “the utilization period of nuclear power reactor facilities is a matter of policy judgment regarding the use of nuclear energy and is not a matter for which the NRA should express its opinion”.<sup>17</sup>

This maximum operating period of 40 years, with the possibility of a 20-year extension, was established by an amendment to the Reactor Regulation Act in 2012 following the accident at the Fukushima Daiichi Nuclear Power Station. In the discussions on the amendment in 2012, the legislator who proposed the legislation stated, “First of all, the

14. NRA (2023), “Choki Shisetsu Kanri Keikaku no Ninka Seido ni Kansuru Q & A” [Q&A on the approval system for the long-term facilities management plan] (written in Japanese), p. 11, available at: [www.nra.go.jp/data/000440836.pdf](http://www.nra.go.jp/data/000440836.pdf) (accessed 15 Jan. 2024).

15. Specifically, in the review of the extension of the operating period, the current Reactor Regulation Act does not have clear provisions on how to handle the situation where the initial operating period (40 years) expires during the review, and there has been some discussion on the operation of the law. See Shibata, T. (2019), “Wagakuni no Genshiryoku Hatsudensyo Unten Encho Tetsuzuki to Sono Kadai – Kankei Hourei ▪ Unyou ni Kansuru Bunseki to Kokusai Hikaku” (“Procedures for Extending the Operation Period of Nuclear Power Plants in Japan and Related Topics – Analysis of Related Laws and International Comparison”), Institute of Energy Economics, Japan (IEEJ), *IEEJ Energy Journal*, Vol. 14, No. 1, IEEJ, Tokyo, available at: <https://eneken.ieej.or.jp/data/8097.pdf> (in Japanese) and <https://eneken.ieej.or.jp/data/8291.pdf> (English version) (accessed 26 Apr. 2024).

16. Furusawa, T., Yamauchi, T. (1 June 2023), “Kaisetsu: GX Datsutanseu Dengen Houan Seiritsu / Chuchoki Houshin, Dou Shimesu” [Commentary: the GX Decarbonization Power Supply Bill passed / medium- and long-term policy, how to implement] (in Japanese), *The Denki Shimbun (The Electric Daily News)*, Japan Electric Association, Tokyo, p. 1.

17. Translated from original Japanese in NRA (2020), “Unten Kikan Encho Ninka no Shinsa to Choki Teishi Kikan Chu no Hatsuden You Genshiro Shisetsu no Keinen Rekka tonon Kankei ni Kansuru Kenkai” (“Opinion on the relationship between the review of the authorization of an extension of the operation period and the ageing of power reactor facilities during a long-term shutdown period”), available at: [www.nra.go.jp/data/000323916](http://www.nra.go.jp/data/000323916) (accessed 26 Apr. 2024).

setting of the figure of 40 years is very political and not based on any scientific basis.”<sup>18</sup> In addition, a few other countries have set an upper limit on the operating period.<sup>19</sup> At the time this proposed amendment was considered, several experts called for the abolition of the upper limit, saying that the upper limit of the operating period should be determined scientifically. However, as a result of comprehensive consideration of the concerns raised by the local communities in which the nuclear power plants are located, and the lessons learnt and reflections on the accident at the Fukushima Daiichi Nuclear Power Station, this amendment finally took the form of a self-restrictive policy decision to maintain the “40 years + 20 years” framework for the operational period.<sup>20</sup>

Importantly, the GX Decarbonization Power Supply Act amends the Electricity Business Act to exclude periods of “shutdown due to reasons unforeseeable to nuclear operators” from calculations of the length of a nuclear power plant’s operation.<sup>21</sup> Some examples of such exempt shutdown periods enumerated in the amendment are:

- periods of shutdown resulting from changes in legislation (including periods of review and preparation following changes in circumstances);
- periods of shutdown resulting from administrative orders, recommendations and administrative guidance (excluding those caused by improper conduct of an operator); and
- periods of shutdown caused by court orders for provisional dispositions or other reasons unforeseeable to an operator (only if overturned by a higher court).

This list is not comprehensive, but merely indicative of those reasons for shutdown specifically envisaged at the time of the drafting of the amendment. It is recognised that this amendment is a catch-all clause to exclude from the calculation of a reactor’s operating period any time during which its operation is suspended to cope with “reasons unforeseeable to a nuclear operator”, as specified by a ministerial ordinance. For example, there could be a case, as a result of an administrative disposition, that the use of port facilities managed by a local government is not permitted under the Port and Harbour Act,<sup>22</sup> and it thus becomes impossible to unload equipment necessary for the operation of the nuclear power plant and the operation of the nuclear reactor has to be suspended.<sup>23</sup>

The development of the above-mentioned amendment concerning the extension of the operation period of a nuclear reactor can be attributed to the fact that many nuclear lawsuits have been filed that have affected the operation of nuclear power plants in Japan. There have been several provisional dispositions ordering an injunction against operation

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18. Translated from original Japanese in Minutes of the Committee on Environment, House of Representatives, 180<sup>th</sup> Diet Session, No. 6, Statement by Liberal Democratic Party MP Kazunori Tanaka, p. 8, (in Japanese) at: <https://kokkai.ndl.go.jp/#/detailPDF?minId=118004006X00620120615&page=1&spkNum=0&current=2> (accessed on 26 Apr. 2024).
  19. See NEA (2019), *Legal Frameworks for Long-term Operation of Nuclear Power Reactors*, OECD Publishing, Paris, pp. 26-27, Table 2.1.
  20. Minutes of the Committee on Economy, Trade and Industry, House of Councillors, 211<sup>th</sup> Diet Session, No. 9., Statement by Yasutoshi Nishimura, Minister of Economy, Trade and Industry (written in Japanese), pp. 20-21, available in Japanese at: <https://kokkai.ndl.go.jp/#/detailPDF?minId=121114080X00920230516&page=20&spkNum=137&current=2> (accessed 26 Apr. 2024).
  21. Translated from original Japanese, in Council of Ministers for Nuclear Energy (2023), “*Kongo no Genshiryoku Seisaku no Houkousei to Koudou Shishin*” [“Future Direction of Nuclear Power Policy and Action Guidelines”], p. 7, available in original Japanese at: [www.meti.go.jp/press/2023/04/20230428005/20230428005-2.pdf](http://www.meti.go.jp/press/2023/04/20230428005/20230428005-2.pdf) (accessed 26 Apr. 2024).
  22. Act No. 218 of 1950.
  23. Minutes of the Committee on Economy, Trade and Industry, House of Councillors, 211<sup>th</sup> Diet Session, No. 10, Statement by Yasuhiro Matsuyama, Director-General, Electricity and Gas Industry Department of Agency for Natural Resources and Energy (in Japanese), p. 4, available at: <https://kokkai.ndl.go.jp/#/detailPDF?minId=121114080X01020230518&page=4&spkNum=40&current=1>.

of a nuclear power plant, all of which have been overturned by the higher courts. As already mentioned, under the revised law, the period during which the operation of a nuclear power plant is suspended due to such provisional dispositions is considered to be a suspended period with reasons unforeseeable to a nuclear operator, and the operation of the nuclear power plant may be extended by this amount of time.

Considering that there have been several provisional dispositions against nuclear power plants, it is anticipated that the amendment will be met with strong opposition from opponents of nuclear power, including plaintiffs' groups. In addition, there is an issue as to what reasons fall under the vague phrase "reasons unforeseeable to a nuclear operator". Considering the legislative intent, which is to allow extension of the operation period while maintaining the existing framework of the operation period, as a result of taking into account the perspective of nuclear energy utilisation policy and the lessons learnt from the Fukushima Daiichi accident, it is necessary in the future to list more specific reasons in a ministerial ordinance to ensure transparency for the public, and to establish clear examination criteria to clarify the standards for applications for approval of operational extension by operators.

In addition to these amendments to the law made by the GX Decarbonization Power Supply Act, there is also a proposal to make the cost of safety measures eligible for the Long-Term Decarbonization Power Supply Auction<sup>24</sup> to increase the predictability of the payback of safety measures investments, based on the policy of making the best use of existing nuclear power. However, only some of the critical issues in the nuclear policy set out in the aforementioned Basic Policy for the Realisation of GX and the Future Nuclear Policy Directions and Course of Action decided by the Ministerial Conference on Nuclear Energy in April 2023 have been addressed explicitly in the current GX Decarbonization Power Supply Act. A significant challenge is to promote the replacement of nuclear power plant sites planned for decommissioning with the next generation of innovative reactors to implement the medium- to long-term policy of realising the value of nuclear energy as a driving force in GX.

## Slovak Republic

### General legislation, regulations and instruments

*Decree of the Nuclear Regulatory Authority of the Slovak Republic (ÚJD SR)  
No. 355/2023 Coll. of 28 August 2023 amending the Decree of the ÚJD SR No. 52/2006  
Coll. on professional qualification, as amended*

The 2023 amendments to the 2006 Decree on professional qualification were prompted by Act No. 310/2021 Coll. amending and supplementing Act No. 177/2018 Coll. on certain measures to reduce administrative burdens by using public administration information systems and on the amendment and supplement of certain acts (Anti-bureaucratic Act), as amended. Changes were also triggered by application practice of the Act No. 541/2004 Coll. on the Peaceful use of nuclear energy (Atomic Act) and on the amendments and supplements to some acts as amended, where data from reference registers were used for verification of data contained within the application for a certificate of professional qualification to employees of licence holders.

24. This is the bidding system promoting new investment for decarbonisation power supply, which began in 2023. METI (21 June 2023), "Choki Datsu Tanso Dengen Auction ni Tsuite" [Regarding the Long-Term Decarbonization Power Supply Auction] (written in Japanese), METI, available in original Japanese at: [www.meti.go.jp/shingikai/enecho/denryoku\\_gas/denryoku\\_gas/seido\\_kento/pdf/081\\_07\\_00.pdf](http://www.meti.go.jp/shingikai/enecho/denryoku_gas/denryoku_gas/seido_kento/pdf/081_07_00.pdf) (accessed 15 Jan. 2024).



## **International co-operation**

### *Quadrilateral meeting of nuclear regulatory authorities hosted in the Slovak Republic*

The regular annual quadrilateral meeting of nuclear regulatory authorities of Czechia, Hungary, the Slovak Republic and Slovenia took place on 14-15 June 2023 in Oponice, Slovak Republic. Following the rotation principle, the meeting was hosted by the Slovak Republic upon the invitation of the ÚJD SR.

During the two-day meeting, the partner countries discussed and exchanged views on the current topics of mutual interest in the field of nuclear safety and regulatory activities, as well as on other matters within their competence. ÚJD SR Chair Dr Marta Žiaková provided information on the ongoing process of commissioning Unit 3 of the Mochovce Nuclear Power Plant. The partner countries further reflected on common existing and future challenges, in particular those related to long-term operation of nuclear power plants, fuel diversification, knowledge management and licensing of new innovative nuclear technologies, such as small modular reactors. The meeting also touched upon the European Instrument for Nuclear Safety and Cooperation and European Nuclear Safety Regulators Group-related assistance and activities aimed at further strengthening global nuclear safety.

Upon invitation of the quadrilateral members, the Finnish Radiation and Nuclear Safety Authority (STUK) also attended the meeting. The partner countries decided to invite Finland to become a permanent member.

### *Bilateral meeting between the Slovak Republic and Austria*

The 30<sup>th</sup> annual bilateral meeting of the delegations of the Slovak Republic and Austria on issues of common interest in the field of nuclear safety and radiological protection took place in St. Pölten, Austria on 28-29 June 2023. The partner countries informed each other of current developments in nuclear safety and radiological protection, activities of the regulatory authorities and other relevant institutions, operation of nuclear facilities, amendments to related legislation, international peer review missions and developments in the field of radiation monitoring. The topics also included issues of emergency preparedness, decommissioning of nuclear facilities and the issue of a new nuclear power plant in the Slovak Republic.

The Slovak delegation was led by the Chairperson of ÚJD SR, Dr Marta Žiaková, and was composed of representatives of the ÚJD SR, the Public Health Authority of the Slovak Republic, the Ministry of Economy of the Slovak Republic, the Ministry of Environment of the Slovak Republic, the Ministry of Foreign and European Affairs of the Slovak Republic, the National Nuclear Fund, Slovenské elektrárne, a.s., Jadrová a vyradovacia spoločnosť, a.s. and Jadrová energetická spoločnosť Slovenska, a.s.

The meeting provided a beneficial opportunity for discussion and information sharing regarding the Slovak nuclear programme among the experts present.

## **Slovenia**

### **Nuclear installations**

#### *Establishment of the working group for the co-ordination of activities related to the construction of a new nuclear power plant in Slovenia*

At the beginning of September 2023, the government of Slovenia appointed a working group responsible for the co-ordination of activities related to the construction of a new nuclear power plant (the JEK2 project). The JEK2 project is the most important strategic investment in a low-carbon source of electricity in Slovenia.

To co-ordinate the activities of the JEK2 project, with the aim of establishing a suitable regulatory framework and speeding up the implementation of the project, the working group:

- ensures the co-ordinated and continuous co-operation of the members and active participants of the working group in the implementation of the JEK2 project;
- monitors and co-ordinates the processes of placement, licensing, selection of a business model, closing of the financial structure and strategic selection of the equipment supplier;
- prepares starting points and professional bases for the national capacity building policy in support of the JEK2 project;
- creates starting points for the legislation and regulation of issues related to the implementation of the JEK2 project;
- monitors the preparation of national strategic documents that deal with or have an impact on the JEK2 project or the long-term use of nuclear energy in Slovenia and, if necessary, gives opinions in this regard;
- monitors and learns about the international practice of new nuclear construction; and
- designs content and co-ordinates the preparation of foundations and feasibility studies for the JEK2 project.

A State Secretary from the Cabinet of the Prime Minister presides over the working group. Its members include high-level representatives from various ministries, as well as the chairpersons of the Slovenian Nuclear Safety Administration, GEN energija d.o.o. (the potential investor), Krško Nuclear Power Plant and ELES (the operator of Slovenia's electric power transmission network). The working group reports on its work to the government of Slovenia at least once every six months and will prepare a final report on the performance of its tasks once it ceases to operate. The first meeting of the working group was held on 25 September 2023.

## United States

### **Environmental protection**

#### *Revisions to the National Environmental Policy Act*

On 3 June 2023, President Biden signed into law the Fiscal Responsibility Act of 2023 (the Act).<sup>25</sup> Although the Act's primary purpose relates to federal government spending, the Act also includes provisions substantively amending the United States (US) National Environmental Policy Act of 1969 (NEPA).<sup>26</sup> Since its enactment in 1970, NEPA has required all federal agencies to assess the environmental effects of their proposed actions prior to making decisions. Specifically, NEPA requires federal agencies, prior to taking any "major Federal actions significantly affecting the quality of the human environment", to prepare a "detailed statement", referred to as an environmental impact statement (EIS). An EIS must describe, among other things, the environmental impacts of the proposed action; any adverse environmental effects that cannot be avoided if the action is taken; and alternatives to the proposed action. The US Nuclear Regulatory Commission (NRC) has implemented NEPA into its regulations at Part 51 of Title 10 of the *US Code of Federal Regulations* (CFR), "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions". These regulations identify what NRC regulatory actions

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25. Public Law (Pub. L.) No. 118-5, 137 Stat. 10.

26. *Ibid.*, sec. 321, 137 Stat. 38-46. NEPA is codified at 42 *United States Code* (USC) 4321 *et seq.*

require the preparation of an EIS and the process by which an EIS is prepared by the NRC staff, including procedures for public participation.

Some of the Act's notable amendments to NEPA include:

- defining “major federal action” (the threshold for triggering the applicability of NEPA), a term that previously was not defined in the legislation;<sup>27</sup>
- providing new guidelines for agencies to make threshold determinations of whether a NEPA review is required at all, including (among others) whether preparation of a NEPA document would “clearly and fundamentally conflict with the requirements of another provision of law” or whether the proposed agency action is “nondiscretionary” such that the agency “does not have authority to take environmental factors into consideration in determining whether to take the proposed action”;<sup>28</sup>
- codifying the requirement for an EIS to consider the “reasonably foreseeable” environmental effects of a proposed action, the “reasonably foreseeable” effects that cannot be avoided, and a “reasonable range” of alternative actions that are “technically and economically feasible”;<sup>29</sup>
- providing judicially enforceable time limits for the completion of an EIS (no later than two years after the agency determines that the EIS is required) or the completion of an environmental assessment<sup>30</sup> (one year after determining the assessment is required);<sup>31</sup>
- requiring that an environmental assessment not exceed 75 pages and that an EIS not exceed 150 pages (or 300 pages if a proposed agency action is “of extraordinary complexity”)<sup>32</sup>;
- codifying the practice of designating a “lead agency” with primary responsibility for the NEPA review where two or more federal agencies qualify as a “participating federal agency” with respect to the same major federal action;<sup>33</sup> and
- requiring that agencies develop procedures for the applicant or sponsor of a project to prepare the EIS or environmental assessment under the federal agency's supervision, with the agency maintaining responsibility to independently evaluate its contents.<sup>34</sup>

The NRC is implementing these legislative changes and reviewing its procedures to determine what, if any, further changes to the agency's current NEPA practices may be warranted.

27. *Ibid.*, sec. 111(10), 137 Stat. 45.

28. *Ibid.*, sec. 106(a), 137 Stat. 39.

29. *Ibid.*, sec. 106(b), 137 Stat. 39.

30. An “environmental assessment” is a concise public document, shorter than an EIS, that an agency uses to determine whether a proposed federal action has the potential to cause significant environmental impacts. If the environmental assessment concludes that an action will not have significant environmental impacts, the agency issues a Finding of No Significant Impact and its NEPA review is complete. If the environmental assessment concludes that the environmental impacts of the proposed federal action will be significant, the agency then proceeds with an EIS.

31. Pub. L. No. 118-5, sec. 107(g), 137 Stat. 42.

32. These page limits do not include any citations or appendices.

33. Pub. L. No. 118-5, sec. 107(a), 137 Stat. 40.

34. *Ibid.*, sec. 107(f), 137 Stat. 42.

## **Nuclear safety and radiological protection (including nuclear emergency planning)**

### *Approval of final rule for emergency preparedness for small modular reactors and other new technologies*

The Commission has directed the NRC staff to issue a final rule (Final Rule) and associated regulatory guidance that provides an alternative, risk-informed, performance-based emergency preparedness regulatory framework for small modular reactors (SMRs) and other new technologies.<sup>35</sup> These technologies include non-light-water reactors, research and test reactors, and medical radioisotope facilities.

The Final Rule, was published in the *Federal Register*, Volume 88, No. 220, builds on the NRC's existing emergency preparedness programme for large, light-water-cooled nuclear power reactors. The Final Rule and related guidance addresses how state-of-the-art facility designs and safety research apply to future operation of SMRs and other new technologies.

The Final Rule's emergency preparedness framework adopts a technology-inclusive and consequence-oriented approach in recognition of the fact that potential hazards from SMRs or other new technologies could differ substantially from those posed by large light-water reactors (for example, smaller reactor core sizes, lower probability of severe accidents, slower accident progression and smaller accident offsite consequences). The Final Rule includes a scalable method to determine the size of the offsite emergency planning zone around a facility. Applicants and licensees for SMRs and other new technologies can use the Final Rule in developing a performance-based emergency preparedness programme as an alternative to the current radiological emergency planning requirements. The Final Rule does not change the emergency planning regulatory framework for large light-water reactors (greater than 1 000 megawatts thermal), fuel cycle facilities, or currently operating research and test reactors.

## **Licensing and regulatory infrastructure**

### *Decommissioning financial assurance rule for sealed and unsealed radioactive materials*

On 24 July 2023, the NRC staff sought Commission approval to publish a proposed rule concerning the NRC's regulations for decommissioning financial assurance for sealed and unsealed radioactive materials.<sup>36</sup> The purpose of decommissioning financial assurance regulations is to ensure that adequate funds are available for decommissioning of licensed nuclear facilities in a safe and timely manner. Existing NRC regulations require applicants for a licence to possess and use sealed and unsealed by-product material and special nuclear material in certain quantities to submit to the NRC a "decommissioning funding plan" (DFP) that contains, among other things, a detailed cost estimate for decommissioning and a description of the licensee's method for assuring the availability of decommissioning funds over the life of the facility.<sup>37</sup> To determine whether a DFP is required, NRC regulations direct

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35. Memorandum to Daniel H. Dorman, EDO, from Rochelle C. Baval, Acting Secretary (14 Aug. 2023), "SRM-M230814 – Affirmation Session – SECY-22-0001: Rulemaking: Final Rule: Emergency Preparedness for Small Modular Reactors and Other New Technologies", (ADAMS Accession No. ML23226A184) (ADAMS stands for Agencywide Documents Access and Management System, which is the NRC's official system for accessing publicly available documents. The documents referenced in this article with an ADAMS number can be accessed with the "Advanced Search" option and searching the "Accession Number" on the NRC's ADAMS website, at: <https://adams.nrc.gov/wba>); see also Memorandum for the Commissioners from Daniel H. Dorman, EDO (3 Jan. 2022), "Final Rule: Emergency Preparedness for Small Modular Reactors and Other New Technologies (RIN 3150-AJ68; NRC-2015-0225)", SECY-22-00001 (ADAMS Accession No. ML21200A059).
  36. Memorandum for the Commissioners from Daniel H. Dorman, EDO (24 July 2023), "Proposed Rule: Decommissioning Financial Assurance for Sealed and Unsealed Radioactive Materials (3150-AK52; NRC-2017-0031)", SECY-23-0062 (ADAMS Accession No. ML23010A168).
  37. See 10 CFR 30.35 (by-product material); *ibid.*, sec. 70.25 (special nuclear material).

applicants to Appendix B to 10 CFR Part 30, which is a table that lists radionuclides and quantity limits. An applicant must submit a DFP to the NRC when the quantity of sealed or unsealed radionuclides exceeds the value in Appendix B by a magnitude specified in NRC regulations. For radionuclides that are not specifically listed in Appendix B, the table provides default possession values.

The NRC's draft proposed rule would add radionuclides not currently listed in Appendix B, including radionuclides associated with existing and emerging industrial and medical applications, such as germanium-68. The draft proposed rule would also revise the NRC's decommissioning funding requirements so that they are more risk-informed<sup>38</sup> and based on the cost of disposal and relative risk to public health and safety. The draft proposed rule would also remove all radionuclides with a half-life of 120 days or less from Appendix B to make clear that such radionuclides are not subject to decommissioning financial assurance requirements.

If approved by the Commission for publication, a proposed rule would be published in the *Federal Register* for public comment. The NRC staff also plans to hold a public meeting to promote full understanding of this proposed rule and facilitate public comments.

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38. As part of this update, the NRC is updating the basis for the values in Appendix B to 10 CFR Part 30 from International Commission on Radiological Protection (ICRP) Publication 2 to ICRP 26 and ICRP 30 that have served as the basis for 10 CFR Part 20.



## INTERGOVERNMENTAL ORGANISATION ACTIVITY

### Euratom Atomic Energy Community (Euratom)

#### **Euratom Community activities**

#### *Declaration on EU SMR 2030 – The role of Research, Innovation, Education and Training for the safety of Small Modular Reactors (SMRs) in the European Union*

On 4 April 2023, the Declaration on EU SMR 2030<sup>1</sup> was signed by European Union (EU) Commissioner Mariya Gabriel jointly with European stakeholders, namely the European trade association for the nuclear energy industry (nucleareurope), the Sustainable Nuclear Energy Technology Platform, the European Nuclear Society and the European Nuclear Education Network. The declaration emphasised the significance of research, innovation, education, and training for ensuring the safety and development of SMRs in the EU.

SMRs were placed in the context of the EU's efforts to become a climate-neutral continent while maintaining energy security, autonomy and resilience. Collaboration between the nuclear industry and scientific community was welcomed to achieve this goal. The Commission committed to continue supporting research and innovation in nuclear safety through the Euratom Research and Training Programme.

For those member states that choose to include nuclear in their energy mix, the declaration acknowledged the role of SMRs in electricity production, in complementing renewables and in increasing nuclear safety (through SMRs' inherent safety features). It further stressed the wider potential applications beyond electricity production, such as in energy-intensive industries. The declaration underlined the need for nuclear and radiological protection expertise and called for collaboration with other EU programmes related to education and skills. It also outlined research and innovation efforts for the safety of SMRs and advanced modular reactors and called for synergies with other programmes. The declaration further emphasised the potential socio-economic impact through the creation of highly qualified jobs and high-added value companies, including small and medium-size enterprises.

Overall, the signatories committed to continuing to lead research, innovation, education and training for the safety of European SMRs in support of the EU pre-partnership on SMRs.

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1. European Commission (EC) Declaration of 4 April 2023 on EU SMR 2030 – The role of Research, Innovation, Education and Training for the safety of Small Modular Reactors (SMRs) in the European Union, available at: [https://research-and-innovation.ec.europa.eu/system/files/2023-04/ec\\_rtd\\_eu-smr-declaration-2030.pdf](https://research-and-innovation.ec.europa.eu/system/files/2023-04/ec_rtd_eu-smr-declaration-2030.pdf) (accessed 26 Apr. 2024).

### *Applicability of the Complementary Delegated Act to the “EU Taxonomy of environmentally sustainable economic activities”*

As of 1 January 2023, the Commission Delegated Regulation (EU) 2022/1214,<sup>2</sup> adopted on the basis of Regulation (EU) 2020/852,<sup>3</sup> became applicable.<sup>4</sup> By supplementing Commission Delegated Regulation (EU) 2021/2139,<sup>5</sup> the Complementary Delegated Act includes, under strict conditions, certain nuclear energy-related activities in the so-called “EU taxonomy of environmentally sustainable economic activities” established by the Taxonomy Regulation.

The Taxonomy Regulation aims to redirect capital flows across the European Union towards sustainable activities so that the EU can achieve climate neutrality by 2050. According to Article 3 of the Taxonomy Regulation, “an economic activity shall qualify as environmentally sustainable” if it meets the following cumulative criteria:

- it “contributes substantially to one or more of the [six] environmental objectives set out in Article 9” of the Taxonomy Regulation;
- it “does not significantly harm any of those environmental objectives” (so-called “do no significant harm” [DNSH] criteria);
- it “is carried out in compliance with the minimum safeguards laid down in Article 18” of the Regulation;<sup>6</sup> and
- it “complies with technical screening criteria [(TSC)] that have been established by the Commission” through the adoption of delegated acts.

The environmental objectives are set out in Article 9 and further defined in Articles 10-15 of the Taxonomy Regulation. Those objectives as set out in Article 9 are:

- climate change mitigation;
- climate change adaptation;
- the sustainable use and protection of water and marine resources;
- the transition to a circular economy;
- pollution prevention and control; and
- the protection and restoration of biodiversity and ecosystems.

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2. Commission Delegated Regulation (EU) 2022/1214 of 9 March 2022 amending Delegated Regulation (EU) 2021/2139 as regards economic activities in certain energy sectors and Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities, *Official Journal of the European Union (OJ) L 188* (15 July 2022), pp. 1-45 (Complementary Delegated Act).
  3. Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, *OJ L 198* (22 June 2020), pp. 13-43 (Taxonomy Regulation).
  4. The Regulation “shall apply from 1 January 2023” and it “shall be binding in its entirety and directly applicable in all Member States”. Complementary Delegated Act, *supra* note 2, p. 7, Article 3.
  5. Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, *OJ L 442* (9 Dec. 2021), pp. 1-349 (First Delegated Act).
  6. Such minimum safeguards include, in particular, alignment with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights.



The Taxonomy Regulation requires the Commission to adopt delegated acts establishing TSC for determining the conditions under which a given economic activity can be considered environmentally sustainable with respect to the above-mentioned environmental objectives.<sup>7</sup>

In application of this delegation, on 4 June 2021 the Commission adopted the First Delegated Act establishing TSC for determining the conditions under which certain economic activities substantially contribute to the environmental objectives of both climate change mitigation and climate change adaptation, as well as for determining whether those economic activities comply with the DNSH criteria.<sup>8</sup> The First Delegated Act, however, did not lay down any TSC for activities in the field of nuclear energy. The establishment of TSC for those activities was postponed, awaiting an in-depth expert assessment of whether the nuclear life cycle, and notably nuclear waste, could be considered compatible with the DNSH criteria.<sup>9</sup>

Upon completion of the above-cited expert assessment,<sup>10</sup> on 9 March 2022, the European Commission adopted the Complementary Delegated Act, which specifies TSC for certain activities in the nuclear field that can, under strict conditions, make a substantial contribution to climate change mitigation or climate change adaptation, while fulfilling the DNSH criteria. The Complementary Delegated Act covers three types of nuclear energy-related activities:

- pre-commercial stages of advanced technologies to produce energy from nuclear processes with minimal waste from the fuel cycle;<sup>11</sup>
- construction and safe operation of new nuclear power plants, for the generation of electricity or heat, including for hydrogen production, using best-available technologies;<sup>12</sup> and
- electricity generation from nuclear energy in existing installations.<sup>13</sup>

The above-mentioned activities are considered to provide, in compliance with Article 10(2) of the Taxonomy Regulation, a substantial contribution to climate change mitigation by supporting the transition to a climate-neutral economy.<sup>14</sup>

## International Atomic Energy Agency

### Nuclear security

#### *Outreach on the Convention on the Physical Protection of Nuclear Material and its Amendment*

The Agency continued to promote further adherence to and full implementation of the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment through national workshops and awareness missions. Additionally, in the margins of the 67<sup>th</sup> regular session of the International Atomic Energy Agency (IAEA) General Conference,

7. The Commission is expressly required to adopt delegated acts defining TSC for environmental objective. Taxonomy Regulation, *supra* note 3, pp. 30-34, Articles 10(3), 11(3), 12(2), 13(2), 14(2) and 15(2).

8. First Delegated Act, *supra* note 5, p. 1.

9. See recital (3) of Complementary Delegated Act, *supra* note 2, p. 1.

10. See Abousahl, S. et al. (2021), *Technical assessment of nuclear energy with respect to the 'do no significant harm' criteria of Regulation (EU) 2020/852 ('Taxonomy Regulation')*, Publications Office of the European Union, Luxembourg.

11. See Complementary Delegated Act, *supra* note 2, Annex I, pp. 8-11.

12. *Ibid.*, Annex 1, pp. 12-15.

13. *Ibid.*

14. See *ibid.*, recital (6), pp. 2-3.

the Agency organised a side event jointly with the United Nations (UN) Office on Drugs and Crime (UNODC) on the role of the CPPNM and its Amendment as well as the International Convention for the Suppression of Acts of Nuclear Terrorism in strengthening nuclear security worldwide. During the side event, states shared experiences and lessons learnt in joining and implementing these key international legal instruments, and the IAEA and UNODC showcased the support available to states in this regard.

### **Nuclear liability**

The Bureau of the Fourth Meeting of the Contracting Parties and Signatories to the Convention on Supplementary Compensation for Nuclear Damage (CSC) convened several virtual meetings since the Third Meeting of the Contracting Parties and Signatories of the CSC was held in Tokyo from 6-8 June 2023. At these meetings, the Bureau discussed outreach activities for expanding the membership of the CSC and preparations for the Fourth Meeting, which is planned to be held in June 2024 at IAEA Headquarters in Vienna, Austria.

### **Legislative assistance**

The Agency continued to provide legislative assistance to member states to support the establishment of an adequate and comprehensive national nuclear legal framework and to promote adherence to the relevant international legal instruments. The Agency provided such assistance through workshops and awareness-raising activities. Specific bilateral legislative assistance was also provided to several member states through written comments and advice on the preparation of comprehensive national nuclear legislation.

The Agency conducted a Regional Workshop on Nuclear Law for member states in Europe and Central Asia, held in Bar, Montenegro, from 4-8 September 2023. The Agency also held an Interregional Workshop on the International and National Legal Frameworks for Small Modular Reactors (SMRs) at IAEA Headquarters from 28 August to 1 September 2023. The purpose of this workshop was to raise awareness, improve knowledge, and strengthen capacity building on the international and national legal frameworks for SMRs.

The annual session of the IAEA Nuclear Law Institute (NLI) was held in Vienna, Austria from 8-20 October 2023. The NLI was attended by 63 participants from 52 member states. The Agency also sponsored 14 grantees to attend the International School of Nuclear Law (ISNL), which was held in Montpellier, France from 21 August to 1 September 2023.

The first edition of the *World Fusion Outlook* was published with the aim to provide authoritative information and updates on fusion energy and to become a global reference for energy research and development, technology development, and prospective deployment of fusion as a source of unlimited low-carbon energy. This new publication also considered the international legal frameworks for fusion.

### **67<sup>th</sup> regular session of the IAEA General Conference**

The 67<sup>th</sup> regular session of the IAEA General Conference was held in person at the IAEA headquarters in Vienna, Austria from 25-29 September 2023.

Around 2 835 delegates registered to attend the General Conference, coming from 151 of the IAEA's 178 member states and from international organisations, non-governmental organisations and the media. A total of 111 side events took place during the week, highlighting the innovative work underway at the IAEA and in member states using nuclear technology and its applications.

#### *Resolutions of the Conference*

A number of resolutions were adopted by the Conference. As in previous years, resolution GC(67)/RES/7 on Nuclear and Radiation Safety and resolution GC(67)/RES/8 on Nuclear Security include sections addressing the legal aspects of nuclear safety and security. All

resolutions adopted during the 67<sup>th</sup> regular session of the General Conference are available on the IAEA website.<sup>15</sup>

▪ Nuclear and Radiation Safety (GC(67)/RES/7)<sup>16</sup>

Regarding the Convention on Nuclear Safety (CNS), 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”.<sup>17</sup>

Regarding the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention), the Conference likewise urged “all Member States that have not yet done so, particularly those managing radioactive waste or spent fuel, to become Contracting Parties to the Joint Convention”.<sup>18</sup>

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”.<sup>19</sup>

In addition, the Conference requested “the Secretariat to provide full support for the CNS and Joint Convention Review Meetings, and to consider addressing their outcomes in the Agency’s activities, as appropriate and in consultation with Member States”.<sup>20</sup>

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”.<sup>21</sup>

In this context, the Conference requested “the Secretariat, in collaboration with regional and international organizations 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”.<sup>22</sup>

With respect to the Code of Conduct on the Safety and Security of Radioactive Sources, its supplementary Guidance on the Import and Export of Radioactive Sources, and its supplementary Guidance on the Management of Disused Radioactive Sources, the General Conference encouraged “all Member States to make political commitments to the voluntary and non-legally binding Code of Conduct on the Safety and Security of Radioactive Sources, its Guidance on the Import and Export of Radioactive Sources, and its Guidance on the Management of Disused Radioactive Sources, and to implement these, as appropriate, in order to maintain effective safety and security of radioactive sources throughout their life cycle”.<sup>23</sup> The Conference also requested “the Secretariat to continue supporting Member States in this regard”.<sup>24</sup>

15. IAEA (2023), “67<sup>th</sup> IAEA General Conference (2023) Resolutions and Decisions”, IAEA, [www.iaea.org/about/governance/general-conference/gc67/resolutions](http://www.iaea.org/about/governance/general-conference/gc67/resolutions) (accessed. 26 Apr. 2024).

16. IAEA (2023), Nuclear and radiation safety, Resolution adopted on 29 September 2023 during the 13<sup>th</sup> plenary meeting, IAEA Doc. No. GC(67)/RES/7.

17. *Ibid.*, p. 7, para. 16.

18. *Ibid.*, p. 8, para. 17.

19. *Ibid.*, para. 18.

20. *Ibid.*, para. 19.

21. *Ibid.*, para. 20.

22. *Ibid.*, para. 21.

23. *Ibid.*, para. 22.

24. *Ibid.*

Similarly, the Conference encouraged member states “to apply the guidance of the Code of Conduct on the Safety of Research Reactors at all stages in their life, including planning” and “to freely exchange their regulatory and operating information and experience with regard to research reactors”.<sup>25</sup> In this context, the Conference requested the Secretariat “to continue to support Member States, upon request, in [the] application of the guidance of the Code of Conduct on the Safety of Research Reactors”.<sup>26</sup>

With regard to civil liability for nuclear damage, the General Conference encouraged “Member States to give due consideration to the possibility of joining the international nuclear liability instruments, as appropriate, and to work towards establishing a global nuclear liability regime”.<sup>27</sup>

In this context, the Conference requested “the Secretariat, in coordination with the OECD/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”.<sup>28</sup>

In addition, the Conference recognised “the valuable work of INLEX”, took note “of its recommendations and best practices on establishing a global nuclear liability regime, including through the identification of actions to address gaps in and enhance the existing nuclear liability regimes”, encouraged “the continuation of INLEX, especially for its support for the IAEA’s outreach activities to facilitate the achievement of a global nuclear liability regime” and requested “that INLEX, via the Secretariat informs Member States on a regular and transparent basis about the work of INLEX and its recommendations to the Director General”.<sup>29</sup>

- Nuclear Security (GC(67)/RES/8)<sup>30</sup>

In the context of nuclear security, the Conference affirmed “the central role of the Agency in strengthening the nuclear security framework globally and in coordinating international activities in the field of nuclear security, while avoiding duplication and overlap”.<sup>31</sup>

The Conference welcomed “the ongoing preparations for the [the International Conference on Nuclear Security] ICONS 2024”, encouraged “Ministers, policy-makers, senior officials and nuclear security experts from all Member States to participate with a view to achieving substantive outcomes which can further strengthen nuclear security” and further called upon “the Secretariat to continue to organize ICONS every four years”.<sup>32</sup>

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”.<sup>33</sup> It further encouraged “the Agency to continue efforts to promote further adherence to the Amendment with the aim of its universalization”.<sup>34</sup> In this context, the Conference reminded “all Parties to inform the depositary of their laws and regulations which give effect to the Convention without further delay” and requested “the Director General of the IAEA, as the depositary, to continue communicating such information to all Parties”.<sup>35</sup>

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25. *Ibid.*, para. 23.

26. *Ibid.*, para. 25.

27. *Ibid.*, p. 9, para. 34.

28. *Ibid.*, para. 35.

29. *Ibid.*, para. 36.

30. IAEA (2023), Nuclear Security, Resolution adopted on 29 September 2023 during the 13<sup>th</sup> plenary meeting, IAEA Doc. No. GC(67)/RES/8.

31. *Ibid.*, p. 4, para. 1.

32. *Ibid.*, p. 5, para. 8.

33. *Ibid.*, p. 5-6, para. 13.

34. *Ibid.*

35. *Ibid.*

The Conference requested “the Secretariat to take the Outcome Document of the 2022 Conference of the Parties to the Amendment to the CPPNM into consideration in line with the Member States’ respective legal obligations, including convening a follow-on Conference, in line with Article 16.2 of the Convention”.<sup>36</sup>

### *IAEA Treaty Event*

The 13<sup>th</sup> Treaty Event took place on the margins of the 67<sup>th</sup> regular session of the General Conference. It provided member states with a further opportunity to deposit their instruments of ratification, acceptance or approval of, or accession to, the treaties deposited with the Director General, including those related to nuclear safety, security and civil liability for nuclear damage. At the Treaty Event, Belarus ratified the Amendment to the CPPNM (A/CPPNM), Egypt ratified the CNS, and Zimbabwe delivered the following six instruments at once: the instruments of accession to the CNS, the Vienna Convention on Civil Liability for Nuclear Damage, the Joint Protocol relating to the Application of the Vienna Convention and the Paris Convention, as well as the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage, and instruments of acceptance of the A/CPPNM and of the Agreement on the Privileges and Immunities of the IAEA.

### *Side event to mark the 20<sup>th</sup> anniversary of the International Expert Group on Nuclear Liability*

The Agency held a side event to mark the 20<sup>th</sup> anniversary of the establishment of the International Expert Group on Nuclear Liability (INLEX) on the margins of the 67<sup>th</sup> IAEA General Conference, held on 27 September 2023 at IAEA headquarters in Vienna, Austria. The IAEA Director General established INLEX in his announcements to the IAEA Board of Governors and to the 47<sup>th</sup> regular session of the IAEA General Conference in September 2003. INLEX consists of experts from around the world with recognised competence in the field of civil liability for nuclear damage and related issues, including from countries with and without nuclear power reactors. These expert members serve in their individual capacities and do not represent their governments or organisations.

The event provided an opportunity to raise awareness of the importance of addressing civil liability and compensation for nuclear damage. In this context, the event emphasised the importance of the global nuclear liability regime in:

- ensuring the availability of prompt, adequate and non-discriminatory compensation for victims;
- providing legal certainty regarding the liability of the nuclear industry; and
- enhancing international co-operation on nuclear projects.

In addition, the event highlighted the importance of INLEX in enhancing adherence by nuclear and non-nuclear power generating countries to the global nuclear liability regime and in contributing to the development of national legal frameworks on nuclear liability.

## **OECD Nuclear Energy Agency**

### ***Meeting of the NEA Working Party on the Legal Aspects of Nuclear Safety (WPLANS)***

The WPLANS met in person and online on 27 September 2023 to discuss the legal aspects of nuclear safety. The meeting was attended by 35 participants representing 18 NEA member countries, 4 non-NEA member countries, the European Commission (EC) and the International Atomic Energy Agency (IAEA).

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36. *Ibid.*, p. 6, para. 14.

The meeting featured discussions on numerous subjects, including legal issues related to long-term operation/lifetime extension, with presentations provided by Belgium and the United States; the licensing and regulation of small modular and advanced reactors, with presentations provided by Canada, France and Poland; and legal challenges to licensing decisions, with presentations provided by Japan and the United States. Reports on national developments in the legal aspects of nuclear safety were also provided by Brazil and the Slovak Republic. The WPLANS agreed to work towards publication in 2024 of an update to the 2019 report entitled *Legal Frameworks for Long-Term Operation of Nuclear Power Reactors* and also began discussing the most practical and impactful way to approach its next significant project on the legal frameworks for the licensing and regulation of small modular reactors (SMRs).

### **Meeting of the NEA Steering Committee for Nuclear Energy**

The 146<sup>th</sup> meeting of the NEA Steering Committee for Nuclear Energy took place on 25-26 October 2023 in Paris. The biannual meeting convened NEA member countries to discuss numerous important topics like the Agency's engagement with Ukraine and Africa. A cornerstone of the NEA's engagement with Ukraine is the new NEA-Ukraine Visiting Experts Programme, which will bring Ukrainian experts to the NEA for limited-term assignments. During the meeting, Steering Committee delegates also discussed the NEA's engagement with Africa, where many countries are considering nuclear energy in their plans to increase electricity supply while reducing emissions. The Committee discussed the potential future involvement of the NEA in the development of nuclear energy on the continent while ensuring there was no overlap with existing international initiatives.

Some five years after it last debated the issue, the Steering Committee addressed the human capacity needs of the nuclear sector during its policy debate on 26 October 2023. Delegates noted that there is a looming risk of there not being enough qualified people to support current operations, drive further technological developments, and lead decommissioning and waste management solutions. Because of the demographics of the present civil nuclear energy workforce, increasing numbers will have to be recruited to the nuclear industry even if the current plans for expansion were not realised. To propose solutions that meet the demands of member countries, the NEA has developed several global education initiatives, notably the Nuclear Education, Skills and Technology (NEST) Framework, which offers hands-on training opportunities for future nuclear experts, and the Global Forum on Nuclear Education, Science, Technology and Policy, which helps to bridge the gaps between academic institutions and the nuclear energy sector. The NEA invited external speakers from France, Korea the United Kingdom and the United States to discuss the situation in their countries. In addition, the Steering Committee heard about nuclear law education from Mr Paul Bowden, co-programme leader of the NEA's nuclear education programmes.

### **2023 International School of Nuclear Law (ISNL)**

The 22<sup>nd</sup> edition of the ISNL was held from 21 August to 1 September 2023 at the University of Montpellier, in the south of France. The 2023 edition of the programme gathered 60 graduate students and professionals from across the world who came together to enhance their knowledge and understanding of the legal frameworks and major topics related to the peaceful uses of nuclear energy. This year's session was attended by participants from 37 countries, including many from beyond the NEA membership. To date, the ISNL has provided a unique educational opportunity to more than 1 200 graduate students and professionals from more than 100 different countries.

During the two weeks spent in Montpellier, the ISNL delivered a rigorous educational programme consisting of lectures, group assignments and panel discussions touching on all aspects of international nuclear law, including nuclear safety, management of spent fuel and radioactive waste, environmental protection, transport, nuclear security, non-proliferation, safeguards, nuclear liability, and international trade. The programme was delivered by nearly 30 different lecturers who are renowned specialists in nuclear law from international organisations, governments, academia and private industry.

In addition to the social programme, the 2023 ISNL included a trip to the ITER experimental nuclear fusion reactor site, supported by Fusion for Energy, where participants and lecturers had the opportunity to visit the construction site of the world's largest fusion research facility as well as learn about fusion technology concepts and possible legal frameworks for fusion technologies.

While the programme itself has concluded, many participants are continuing their studies by completing a multiple-choice test and writing dissertations on topics relevant to international nuclear law in order to meet the requirements for the University Diploma (*Diplôme d'université* – D.U.) in International Nuclear Law from the University of Montpellier.

### **Third NEA Stakeholder Involvement Workshop on Optimisation in Decision Making**

The NEA held its Third Stakeholder Involvement Workshop on 5-7 September 2023 in Paris, with the theme “Optimisation in Decision Making”. The workshop brought together leaders from regulation, government, industry, academia, international organisations and non-governmental organisations with the key objective of identifying the basis for a framework to help guide decision makers in the nuclear sector to better engage all interested stakeholders, including the public and local communities, with the ultimate goal of reaching a sustainable, transparent and widely accepted decision-making process.

Among the many findings from the workshop was that it should be possible to implement a “framework” nationally and adapt it to cultural contexts by embracing core ethical and procedural values that reinforce trust. The framework should include a flexible set of principles to help optimise societal benefits and the well-being of stakeholders by considering their input in decision making, increasing shared ownership of the process and resolving any tensions that might arise from poorly implemented stakeholder involvement and interactions. Another important conclusion was the need for equity in the balance of power for stakeholders, which should go beyond legal requirements and international and national regulations, serving as a kind of “social licence to operate”.

As part of the NEA's commitment to advancing optimisation in decision making, a high-level NEA group on Stakeholder Engagement, Trust, Transparency, and Social Sciences has been formed, comprised of nine senior level policy officials.

### **Roadmaps to New Nuclear Conference**

French Minister for Energy Transition Ms Agnès Pannier-Runacher and NEA Director-General William D. Magwood, IV welcomed the energy ministers and heads of delegations of 20 countries and over 30 nuclear industry leaders to the conference Roadmaps to New Nuclear in Paris on 28-29 September 2023. Discussions over the two days of the conference explored the steps needed to ensure that nuclear new build can help governments to achieve their net zero targets while also ensuring energy security and fostering economic growth. In the lead-up to COP28, the outcomes of the Roadmaps to New Nuclear conference will inform the development of actionable policy recommendations for policymakers, nuclear utilities and the nuclear industry more broadly.

Two communiqués were issued at the conference. First, a ministerial communiqué presents a call to action and guiding principles in support of roadmaps for nuclear energy, outlining guiding principles for: nuclear financing, policy and regulation, research and development, supply chains, fuel supply, skills, public engagement, energy systems innovation, and international collaborations. Second, associations representing the nuclear industry in OECD countries signed a joint communiqué highlighting the essential role of nuclear energy and calling on deepening the co-operation between governments, international organisations and across the industry.

### **NEA publications of interest**

Since the publication of *Nuclear Law Bulletin* No. 110, the NEA has issued a number of publications of interest.

The NEA continues to assist its member countries to understand and analyse the conditions for successful development and deployment of SMRs across various power and non-power markets. Its latest contribution is the launch of *The NEA Small Modular Reactor Dashboard: Volume II*. The *SMR Dashboard* highlights and follows the progress of various SMR designs toward commercialisation and deployment. As such, it offers decision makers a tool to navigate this complex new wave of SMR technology under development around the world. The new volume, following the release of Volume I in March 2023, assesses 21 new SMR designs and brings the total number of SMR evaluations the Agency has completed to 42. The *NEA SMR Dashboard* is an ongoing project for the NEA, with the second edition to be published in 2024.



## NEWS BRIEFS

### **2024 International Nuclear Law Essentials (INLE)**

The next session of the INLE will take place in Paris, France, from 4-8 March 2024. 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. Renowned specialists in nuclear law from international organisations, governments, academia and private industry will deliver the INLE's intensive programme, which consists of a series of lectures, case studies and panel discussions.



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The following articles are featured in this issue: "Nuclear liability in respect of Ukraine's nuclear installations under Russian military control" by Nathalie L.J.T. Horbach and Omer F. Brown II; "The modern nuclear liability regime's concept of 'environmental damage': How national courts may apply it and what remedies they may provide for such damage" by Sandra Knopp Pisi; and "Nuclear fusion: Legal aspects" by Wolfram Tonhauser and Karoly Tamas Olajos.