

Dirty Warfare? The Application of International Law to Attacks on Nuclear Power Plants in the Conduct of Hostilities

by Julia Vassileva

ABSTRACT

Russia's war of aggression in Ukraine poses multiple threats to international security, with nuclear safety and nuclear weapons returning to the forefront of global politics. Alongside verbal threats of using tactical nuclear weapons, Russia's invasion plans have included attacks on nuclear power plants (NPPs), such as the shelling of the Zaporizhzhia complex in Ukraine. These actions raise critical questions about the application of international law to military operations involving NPPs and liability for resulting nuclear damage. This paper examines the scope of international law in such scenarios and concludes with implications from the perspective of strategic studies and NATO nuclear policy.

Russia | Ukraine | International law | Nuclear power plants | Zaporizhzhia

keywords

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Introduction

Russia's full-scale invasion and war of aggression against Ukraine poses multiple threats to international security. The ample challenges also play out in the nuclear dimension, with (amongst others) nuclear safety and nuclear weapons returning to "centre stage in international politics".¹ Next to verbal menaces from the Russian side to use tactical nuclear weapons, part of the Russian invasion plans in Ukraine also included attacking nuclear power plants (hereinafter abbreviated as NPPs); for example, Russia's shelling of the Zaporizhzhia reactor complex. Such actions have raised questions about new means of warfare and effective ways to respond to them, including legal aspects relating to military operations involving NPPs and liability for the resulting nuclear damage.²

What is the scope of application of international law to attacks on NPPs that are used as "dirty bombs"?³ The purpose of the paper is to hone a better understanding of international law and the scenario of military attacks on NPPs. After an

¹ See for example Pierre de Dreuzy and Andrea Gilli, "Introduction", in Andrea Gilli and Pierre de Dreuzy, "Nuclear Strategy in the 21st Century: Continuity or Change?", in *NDC Research Papers*, No. 27 (December 2022), p. 1, <https://www.ndc.nato.int/news/news.php?icode=1782>.

² Kudakwashe Z. Mapako, "Recourse to Use of Force or Threat Thereof, Justification of an Illegal War: A Tale of the Ukraine-Russia War", in *SSRN*, 9 June 2022, <https://doi.org/10.2139/ssrn.4132649>.

³ See for example Christina Pazzanese: "Beyond fears of unintended leaks in possible future attacks on Ukraine's three remaining nuclear plants, menacing statements by Russian President Vladimir Putin and Sergey Lavrov, minister of foreign affairs, have spurred worries that Russia may seek to turn captured reactors into 'dirty bombs.'" Christina Pazzanese, "Russian Attack, Takeover of Ukraine Plant Ramps Up Nuclear Threat", in *The Harvard Gazette*, 7 March 2022, <https://news.harvard.edu/?p=339612>.

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· Revised version of a paper presented at the 5th edition of the Early-Career Nuclear Strategists Workshop, held at the NATO Defense College in Rome on 21-23 June 2023.

explanation of the comparability/distinctness of NPPs and nuclear weapons, the paper employs a legal analysis to examine how international law applies to attacks on NPPs. It concludes with a synthesis of the implications from the perspective of strategic studies and NATO nuclear policy.

1. Different concept, similar effect: Nuclear power plants and nuclear weapons

There is considerable degree of uncertainty as to the extent an attack on an NPP could lead to a catastrophe that is comparable to the use of a nuclear weapon.⁴ Nuclear weapons certainly have much greater destructive potential, but there are various dangers connected to attacks on NPPs, among them horrific humanitarian and environmental consequences.⁵ Next to radiation emissions being unpredictable, the danger comes from nations often clustering several reactors and thus problems being compounded “if the contents of more than one were discharged as is conceivable in military scenarios”.⁶ A further dangerous aspect is the release of the inventories of spent fuel located at reactor sites.⁷

Crucially, various scholars argue that Russia might in fact be using NPPs as a tactic of warfare, that “for Russia, nuclear plants are nuclear bombs”⁸ and a “pre-positioned nuclear weapon” that endanger not only Ukraine but also various European (including NATO) states.⁹ In the Cold War period, Russian experts would consider nuclear power plants “a nuclear bomb on enemy territory”¹⁰ and a possibility for a “passive form” of employing weapons of mass destruction (WMD).¹¹ Verbal threats in this direction have been made by Russian military and government officials, for example Admiral Vladimir Valuev in 2001, who noted that it was not necessary to use nuclear weapons to inflict heavy losses; it would be sufficient simply to destroy

⁴ See for example Gary Ackerman and William C. Potter, “Catastrophic Nuclear Terrorism: A Preventable Peril”, in Nick Bostrom and Milan M. Ćirković (eds), *Global Catastrophic Risks*, Oxford, Oxford University Press, 2008, p. 402-449, DOI 10.1093/oso/9780198570509.003.0026.

⁵ Maxim Starchak, “For Russia, Nuclear Plants Are Nuclear Bombs”, in *CEPA Insights & Analysis*, 9 September 2022, <https://cepa.org/?p=7127>.

⁶ Bennet Ramberg, “Military Sabotage of Nuclear Facilities: The Implications”, in *Annual Review of Energy*, Vol. 10 (1985), p. 495-514 at p. 498, DOI 10.1146/annurev.eg.10.110185.002431; Bennet Ramberg, “Nuclear Plants – Military Hostages?”, in *Bulletin of the Atomic Scientists*, Vol. 42, No. 3 (1986), p. 17-21 at p. 17, DOI 10.1080/00963402.1986.11459336.

⁷ Ibid.

⁸ Maxim Starchak, “For Russia, Nuclear Plants Are Nuclear Bombs”, cit.

⁹ Mary Glantz, “Russia’s New Nuclear Threat: Power Plants as Weapons”, in *USIP Analyses*, 24 August 2022, <https://www.usip.org/node/148061>.

¹⁰ Maxim Starchak, “For Russia, Nuclear Plants Are Nuclear Bombs”, cit.; Vladimir E. Novikov, “The Threat of Nuclear Terrorism: American Experience” (in Russian), in Национальная Оборона (National Defence), 30 October 2013, <https://riss.ru/news/smi/ugroza-yadernogo-terrorizma-amerikanskiy-opyt>.

¹¹ Maxim Starchak, “For Russia, Nuclear Plants Are Nuclear Bombs”, cit.

just a few of the existing nuclear power plants.¹² Similarly, former President Dmitry Medvedev (2008-2012) commented on the shelling of the Zaporizhzhia plant “that the EU should not forget that they also have nuclear power plants that can suffer ‘accidents’.”¹³

It is evident that such attacks form part of “Russia’s wider intimidation strategy” and indicate President Vladimir Putin being well aware of European fears for their safety in connection to the Ukrainian NPPs.¹⁴ Given the dangers and the potential for strategic (ab)use of NPPs by Russia in Ukraine now and elsewhere in the future, experts have proposed approaches that would “punish Russia [...] and send the message to all states that such attacks will not be forgotten but will incur significant and long-term costs”.¹⁵ To this end, the following section asks how international law plays role in this process of raising costs and regulating the subject matter. It thus builds on the understanding that a commitment to the rules-based international order requires the enforcement of existing norms of international law and developing new ones if and when confronted with new threats to international peace and security.

2. The application of international law to attacks on nuclear power plants

International law on nuclear weapons is arguably well established.¹⁶ Over time it has developed customary and treaty norms and rules that raise the costs and set standards for their use. The legal regime on attacks on NPPs exists but is not as clear.¹⁷ While at present, “there are no existing treaties that deal specifically with nuclear power plants and the fuel storage and other facilities associated with them”,¹⁸ the law of armed conflict or international humanitarian law (IHL), the jus

¹² Ibid.; “Kaliningrad Region. Vice Admiral Vladimir Valuev: ‘The Baltic Fleet Has Non-Nuclear Weapons’” (in Russian), in *Regions.ru*, 13 February 2001, <http://web.archive.org/web/20221130132152/http://regions.ru/news/422400>.

¹³ Maxim Starchak, “For Russia, Nuclear Plants Are Nuclear Bombs”, cit.; “‘Accidents Can Happen at European Nuclear Plants Too,’ Russian Ex-President Says”, in *Reuters*, 12 August 2022, <https://www.reuters.com/world/europe/accidents-can-happen-european-nuclear-plants-too-russian-ex-president-says-2022-08-12/>; “Medvedev Accused Ukraine and the West of Trying to ‘Arrange a New Chernobyl’ at the Zaporozhye Nuclear Power Plant” (in Russian), in *TASS*, 12 August 2022, <https://tass.ru/politika/15456931>.

¹⁴ Stuart Coles et al., “Seven Ways Russia’s War on Ukraine Has Changed the World”, in *Chatham House Articles*, 20 February 2023, <https://www.chathamhouse.org/node/31218>.

¹⁵ James M. Acton, “The Ukraine War’s Linger Nuclear Power Danger”, in *Carnegie Commentaries*, 21 February 2023, <https://carnegieendowment.org/publications/89080>.

¹⁶ A comprehensive overview, used for the present analysis, in Gro Nystuen, Stuart Casey-Maslen and Annie Golden Bersagel (eds), *Nuclear Weapons under International Law*, Cambridge, Cambridge University Press, 2014.

¹⁷ George M. Moore, “How International Law Applies to Attacks on Nuclear and Associated Facilities in Ukraine”, in *Bulletin of the Atomic Scientists*, 6 March 2022, <https://thebulletin.org/?p=95026>.

¹⁸ Ibid.

in bello, is relevant in this field.

All relevant rules of IHL, including military necessity, distinction between civilians and combatants, proportionality to achieve a proportionate military objective, and minimising collateral damage (including to the environment) apply to the case of attacks on NPPs.¹⁹ Furthermore, Article 56 of the 1977 Additional Protocol I to the Geneva Conventions (GC) specifically forbids “attacks against works and installations containing dangerous forces and against military objectives located in their vicinity”, explicitly mentioning “nuclear electrical generating stations”.²⁰ However, paragraph 1 of this provision prohibits attacks only to the extent that they “may cause the release of dangerous forces from the works or installations and consequent severe losses among the civilian population”. Put differently, if it is not expected to cause “severe losses among the civilian population”, then it might be permitted under certain circumstances.²¹ Moreover, the wording “nuclear electrical generating stations” includes nuclear power reactors, but not nuclear research reactors, enrichment facilities, fuel fabrication facilities, reprocessing facilities and spent fuel storage facilities.²²

Paragraph 2 in fact permits an attack if the NPP “provides electric power in regular, significant and direct support of military operations and if such attack is the only feasible way to terminate such support”.²³ In times of war, NPPs may constitute so called “dual-use objects, [meaning they can] serve civilian and military purposes at the same time”;²⁴ it may be “hard to separate the two” uses, as this also depends on interpretation.²⁵

Moreover, paragraph 5 clarifies that “the Parties to the conflict shall endeavour to avoid locating any military objectives in the vicinity” of NPPs.²⁶ But the Additional Protocol also states: “Nevertheless, installations erected for the sole purpose of

¹⁹ See for example Mona Ali Khalil speaking at the session on “Attacks on Civilian Infrastructure” organised by the Stockholm International Peace Research Institute (SIPRI) on 10 November 2022 at the 2022 Stockholm Security Conference *Battlefields of the Future: Trends of Conflict and Warfare in the 21st Century—Effects and Impact of the War in Ukraine*, <https://youtu.be/GE1YduUbCKc>.

²⁰ IHL Databases: *Practice relating to Norma 42. Works and Installations Containing Dangerous Forces*, <https://ihl-databases.icrc.org/en/customary-ihl/v2/rule42>.

²¹ *Ibid.*; John Carlson, “Prohibition of Military Attacks on Nuclear Facilities”, in *VCDNP Commentaries*, 12 September 2022, <https://vcdnp.org/?p=11110>.

²² Mohamed ElBaradei, Edwin Nwogugu and John Rames, “International Law and Nuclear Energy: Overview of the Legal Framework”, in *IAEA Bulletin*, Vol. 37, No. 3 (1995), p. 16-25 at p. 20-21, <https://www.iaea.org/publications/magazines/bulletin/37-3/international-law-and-nuclear-energy-overview-legal-framework>.

²³ IHL Databases: *Practice relating to Norma 42*, *cit.*

²⁴ Anne Dienelt, “How Are Nuclear Power Plants Protected by Law During War?”, in *Völkerrechtsblog*, 7 March 2022, <https://voelkerrechtsblog.org/?p=16725>.

²⁵ Christoph Hasselbach, “Ukraine: Are Attacks on Nuclear Plants Illegal?”, in *Deutsche Welle*, 19 August 2022, <https://www.dw.com/en/a-62859174>.

²⁶ IHL Databases: *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 8 June 1977, <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-56>.

defending the protected works or installations from attack are permissible and shall not themselves be made the object of attack”, again giving ways to circumvent the provision.²⁷

GC Additional Protocol II relates briefly to attacks on nuclear and associated facilities, notably in Article 15 on “Protection of works and installations containing dangerous forces” which “shall not be made the object of attack, even where these objects are military objectives, if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population”,²⁸ a provision that is, once more, subject to interpretation.

There also exists *customary international law* on attacks on nuclear electrical generating stations. For example, Rule 42 of Customary International Humanitarian Law²⁹ states that: “Particular care must be taken if works and installations containing dangerous forces [...] are attacked”.³⁰ This rule has been included in the military guidelines of states including Russia,³¹ albeit evidently being disregarded in practice.

In sum, there is no absolute immunity of NPPs during the conduct of hostilities.³² Existing provisions are not airtight and attacks may be permitted under narrowly defined circumstances.³³ However, the provisions are subject to interpretation and therefore remain highly subjective.³⁴

When it comes to *further legal regimes* applicable to attacks on NPPs, the law is even less clear. This is the matter for example with international criminal law and criminal liability for such attacks. Here, the US Embassy in Kyiv has stated that “[i]t is a war crime to attack a nuclear power plant”;³⁵ the International Committee of the Red Cross (ICRC) also notes that launching an attack against nuclear power

²⁷ Ibid.; Christoph Hasselbach, “Ukraine: Are Attacks on Nuclear Plants Illegal?”, cit.

²⁸ George M. Moore, “How International Law Applies to Attacks on Nuclear and Associated Facilities in Ukraine”, cit.

²⁹ Jean-Marie Henckaerts and Louise Doswald-Beck (eds), *Customary International Humanitarian Law. Vol. I: Rules*, Cambridge, Cambridge University Press, 2005, p. 139-142, <https://www.icrc.org/en/doc/resources/documents/publication/pcustom.htm>; Ali Alkış, “Nuclear Security During Armed Conflict”, in *Stimson Center Policy Memos*, 19 October 2022, <https://www.stimson.org/?p=64605>.

³⁰ Jean-Marie Henckaerts and Louise Doswald-Beck (eds), *Customary International Humanitarian Law. Vol. I: Rules*, cit., p. 139.

³¹ George M. Moore, “How International Law Applies to Attacks on Nuclear and Associated Facilities in Ukraine”, cit.

³² International Committee of the Red Cross (ICRC), *How Humanitarian Law Applies to Armed Conflict and Nuclear Power Plants*, 2 September 2022, <https://www.icrc.org/en/document/how-ihl-applies-to-conflict-nuclear-power-plants>.

³³ Anne Dienelt, “How Are Nuclear Power Plants Protected by Law During War?”, cit.

³⁴ Christoph Hasselbach, “Ukraine: Are Attacks on Nuclear Plants Illegal?”, cit.

³⁵ “U.S. Embassy in Ukraine Calls Nuclear Power Plant Attack ‘War Crime’”, in *Reuters*, 5 March 2022, <https://www.reuters.com/world/us-embassy-ukraine-calls-nuclear-power-plant-attack-war-crime-2022-03-04>.

plants may constitute a *war crime*.³⁶ Attacks may be disproportionate and illegal as breaching GC Additional Protocol I³⁷ and the International Criminal Court (ICC) Statute.³⁸ An indication that international law is developing on the matter of criminal liability is the fact that the International Law Commission (ILC) has included it in its 1996 Draft Code of Crimes against the Peace and Security of Mankind, according to which an attack on NPPs connected to harm to civilians constitutes a war crime.³⁹

As the consequences of nuclear leakage would be disastrous, there are *human rights* (*right to life and right to health, and right to legal remedy*) and *environmental law* considerations linked to the issue, similar to the case of nuclear weapons.⁴⁰

Additional legal instruments include the 2005 amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) of 1987, which prohibits sabotage to any nuclear facility.⁴¹ Attacks on NPPs could also fall under the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT). However, in both cases application is limited exclusively to non-state actors.⁴²

Some experts propose agreements on a demilitarised or nuclear safety and security protection zone around NPPs. Scholars argue that this might be difficult to implement because, in the case of shelling, the sides could just withdraw from an agreement⁴³ but that treating NPPs as demilitarised zones would be a reasonable option.⁴⁴

The International Atomic Energy Agency (IAEA) has long recognised the need to prohibit armed attacks on NPPs and adopted a resolution regarding the Protection of Nuclear Installations against Armed Attacks, arguing that an international

³⁶ ICRC, *How Humanitarian Law Applies to Armed Conflict and Nuclear Power Plants*, cit.

³⁷ Anne Dienelt, "How Are Nuclear Power Plants Protected by Law During War?", cit.

³⁸ Tom Dannenbaum, "Ukraine Symposium – The Escalating Military Use of the Zaporizhzhia Nuclear Plant", in *Articles of War*, 22 August 2022, <https://lieber.westpoint.edu/?p=16672>.

³⁹ International Law Commission (ILC), "Draft Code of Crimes against the Peace and Security of Mankind", in *Yearbook of the International Law Commission 1996*, Vol. II, Part 2, New York/Geneva, United Nations, 1998, p. 53, https://legal.un.org/ilc/publications/yearbooks/english/ilc_1996_v2_p2.pdf.

⁴⁰ Gro Nystuen, "Conclusions on the Status of Nuclear Weapons under International Law", in Gro Nystuen, Stuart Casey-Maslen and Annie Golden Bersagel (eds), *Nuclear Weapons under International Law*, Cambridge, Cambridge University Press, 2014, p. 483-486 at p. 485-486.

⁴¹ Kudakwashe Z. Mapako, "The Nexus of Nuclear Security and Pertinent Armed Conflicts: A Reflection of International Law Applicability in the Ukraine-Russia Conflict", in *Opinio Juris*, 1 December 2022, <http://opiniojuris.org/?p=44884>; Ludovica Castelli and Olamide Samuel, "Justifying Attacks on Nuclear Facilities", in *The Nonproliferation Review*, 7 February 2024, <https://doi.org/10.1080/10736700.2024.2301883>.

⁴² SIPRI, *Attacks on Civilian Infrastructure: How to Ensure the Safety and Security of Nuclear Power Plants in an Armed Conflict*, 10 November 2022, <https://www.sipri.org/node/6030>.

⁴³ Maxim Starchak, "For Russia, Nuclear Plants Are Nuclear Bombs", cit.

⁴⁴ Mary Glantz, "Russia's New Nuclear Threat: Power Plants as Weapons", cit.

agreement should be reached on this issue.⁴⁵ In the context of the war in Ukraine, the IAEA's Board of Governors condemned the Russian aggression,⁴⁶ stating that attacks on NPPs violate the "seven indispensable pillars for ensuring nuclear safety and security during an armed conflict".⁴⁷ Yet the IAEA remains without authority to adopt legally binding resolutions.⁴⁸

A final question to examine is liability for nuclear damage resulting from attacks on NPPs. The 1963 Vienna Convention on Civil Liability for Nuclear Damage establishes a civil liability regime under domestic law, with "absolute" liability of the operator, except in the case of "a nuclear incident directly due to an act of armed conflict".⁴⁹ Here, the Hague Regulations place responsibility on Russia as the occupying power, which must "restore, and ensure, as far as possible, public order and safety", prevent transboundary harm,⁵⁰ e.g. to the environment (confirmed also in ILC 2019 Draft Principles on the Protection of the Environment in Relation to Armed Conflicts), with an "obligation of diligent conduct".⁵¹

3. Implications: Strategic studies

From the viewpoint of strategic studies, based on game theory and the work in particular of Thomas Schelling, who extensively explored the logic of nuclear deterrence, (any) conflict can be considered as an outcome of a strategic showdown between rational decision-makers weighing up the costs and benefits of their choices.⁵² This pertains to making nuclear use credible: even though the theory

⁴⁵ George M. Moore, "How International Law Applies to Attacks on Nuclear and Associated Facilities in Ukraine", cit.

⁴⁶ Francois Murphy, "IAEA Board 'Deplores' Russian Invasion of Ukraine, Only Two Votes Against", in *Reuters*, 3 March 2022, <https://www.reuters.com/world/europe/iaea-board-deplores-russian-invasion-ukraine-only-two-votes-against-2022-03-03>.

⁴⁷ International Atomic Energy Agency (IAEA), *Nuclear Safety, Security and Safeguards in Ukraine. 2nd Summary Report by the Director General*, 28 April-5 September 2022, 6 September 2022, p. 7, https://www.iaea.org/sites/default/files/22/09/ukraine-2ndsummaryreport_sept2022.pdf.

⁴⁸ Ali Alkış, "Nuclear Security During Armed Conflict", cit.

⁴⁹ Tibisay Morgandi and Batuhan Betin, "Legal Implications of the Military Operations at the Chernobyl and Zaporizhzhya Nuclear Power Plants", in *EJIL Talk!*, 15 April 2022, <https://www.ejiltalk.org/?p=20905>.

⁵⁰ Ibid.; Eyal Benvenisti, *The International Law of Occupation*, 2nd ed., Oxford, Oxford University Press, 2012.

⁵¹ Tibisay Morgandi and Batuhan Betin, "Legal Implications of the Military Operations at the Chernobyl and Zaporizhzhya Nuclear Power Plants", cit.; Marco Longobardo, "The Relevance of the Concept of Due Diligence for International Humanitarian Law", in *Wisconsin International Law Journal*, Vol. 37, No. 1 (2020), p. 44-87 at p. 44, https://wilj.law.wisc.edu/wp-content/uploads/sites/1270/2020/07/37.1_44-87_Longobardo.pdf.

⁵² "If a would-be attacker expects to gain more from aggression than any cost his adversary can impose on him, then he is likely to go through with the aggressive act." Economist, "The Disturbing New Relevance of Theories of Nuclear Deterrence", in *The Economist*, 18 March 2022, <https://www.economist.com/finance-and-economics/2022/03/18/the-disturbing-new-relevance-of-theories-of-nuclear-deterrence>.

does not mention attacks on NPPs specifically, a parallel can be drawn with regards to the opportunity to make nuclear threats credible.⁵³ In connection with the legal analysis of the previous sections, it can thus be asked what implications attacks on NPPs and the formalisation of stricter legal norms might have.

One way of making a threat credible is the chance that “something could (genuinely) go wrong”, meaning that events may be set in motion that become no longer controllable.⁵⁴ Like a roulette, a conscious Russian attack on an NPP is followed by the probability of a large-scale catastrophe, in a potentially coercive way. An aggressor country threatening to attack another country with several NPPs means a higher probability of a catastrophe and release of radioactivity. Attacks on NPPs may thus be used to raise the risk of catastrophe in a more credible way. This also gives a new dimension to the notion that all the years of existence of nuclear weapons have not led to nuclear war⁵⁵ – use of nuclear weapons is not the only nuclear threat during wartime (see section 1 for the Russian strategic considerations).

When it comes to prevention and protection of NPPs against attacks, two avenues appear possible. First, the physical protection of constructing NPPs in anticipation of such threats, thus re-defining the internal and external threats an NPP should be able to withstand, similar to earthquakes, airplane crashes or fire. However, there are significant limits to the possibility of such protection. In particular, nowadays the threats may reach beyond kinetic attacks and encompass also the significant threat of cyber-attacks.⁵⁶

Therefore, legal rules to govern such attacks can be seen as an additional tool of protection. Hence, making Russia pay a high price for what it has already done in the form of accountability and liability; and raising the costs of attacking NPPs by establishing stricter norms and clearer prohibitions (e.g. universal acceptance of an absolute prohibition on attacks against NPPs). Certainly, it is not guaranteed that norms will restrain a determined aggressor state. But put very simply, having a norm would be better than not having one at all, and international law can help to define and establish such norms. Ensuring accountability for violations of international law and other forms of liability for damages may reduce or even deter the threat in the future. In that sense, law itself becomes a strategy and a starting point for strategic interests, responding to the needs of states, new realities and the

⁵³ For more on credibility of threats see Thomas C. Schelling, “Establishing Credibility: Strategic Considerations”, in *The American Economic Review*, Vol. 72, No. 2 (May 1982), p. 77-80.

⁵⁴ Avinash K. Dixit and Barry J. Nalebuff, “Making Strategies Credible”, in Richard J. Zeckhauser (ed.), *Strategy and Choice*, MIT Press, 2016, p. 161-184 at p. 163.

⁵⁵ Thomas C. Schelling, “What Went Wrong with Arms Control?”, in *Foreign Affairs*, Vol. 64, No. 2 (Winter 1985/86), p. 219-233 at p. 219.

⁵⁶ A further area of international law and law of armed conflict that is under intense discussion. For newest developments see for example Tatiana Jančárková et al. (eds), *15th International Conference on Cyber Conflict: Meeting Reality*, Tallinn, NATO Cooperative Cyber Defence Centre of Excellence, 2023, https://www.ccdcoe.org/uploads/doc/CyCon_2023_book_print.pdf.

evolving character of war.

Conclusion

The ongoing conflict in Ukraine has highlighted the importance of existing international rules governing nuclear safety, despite challenges in implementation and legal loopholes. In the midst of this conflict and growing global nuclear proliferation concerns, acknowledging and strengthening the existing rules of IHL with regards to attacks on NPPs has acquired new importance. It is worth contemplating the enhancement of international frameworks for nuclear security during times of armed conflict through additional treaties and legal instruments. The current context highlights the importance of addressing attacks on NPPs specifically, given their vulnerability to military strikes and the catastrophic consequences such attacks could entail.⁵⁷

Scholars have rightly noted that the effectiveness of IHL is debated.⁵⁸ They have also emphasised the interconnectedness of the nuclear security regime and IHL, highlighting the necessity for robust regulations to prevent exploitation and violations of international law during conflicts. Intertwinement of the nuclear security regime and IHL is thus advisable, given that international law is subject to interpretation, thus creating loopholes which can be “used as pretext for war crimes and further violation of international law”.⁵⁹ While there is widespread recognition of the need to prohibit armed attacks on all nuclear facilities, including NPPs, and the urgency to establish clear international agreements to that effect, the process of solidifying definitive rules in this area is ongoing and evolving.⁶⁰

From a strategic studies perspective, conflict can be seen as a strategic showdown where decision-makers weigh the costs and benefits of their choices, drawing on game theory principles. While the theory of nuclear deterrence does not explicitly mention attacks on nuclear power plants, parallels can be drawn regarding the credibility of nuclear threats and the potential for escalation. Attacks on NPPs may raise the risk of catastrophe in a more credible way, adding a new dimension to nuclear threats during wartime. In terms of prevention and protection against such attacks, two approaches are possible: physical protection measures for NPPs and the establishment of legal rules to govern such attacks. While physical protection measures have limitations, legal norms can serve as an additional tool of protection by holding aggressor states accountable and establishing stricter prohibitions on attacks against NPPs. Although norms may not always restrain determined aggressor states, having them in place is preferable to their absence.

⁵⁷ Ali Alkış, “Nuclear Security During Armed Conflict”, cit.

⁵⁸ Kudakwashe Z. Mapako, “The Nexus of Nuclear Security and Pertinent Armed Conflicts”, cit.

⁵⁹ Ibid.

⁶⁰ Mohamed ElBaradei, Edwin Nwogugu and John Rames, “International Law and Nuclear Energy”, cit., p. 21.

International law can help define and establish such norms, thereby addressing evolving security challenges and serving as a strategy to respond to the needs of states.

In the 2010 Strategic Concept, NATO allies emphasised the importance of deterrence, based on a balance of nuclear and conventional capabilities, as a core element of NATO's strategy.⁶¹ The 2022 Strategic Concept, influenced by the war in Ukraine, highlights the renewed relevance of the nuclear issue.⁶² The Concept also emphasises NATO's commitment to international law⁶³ and the rules-based international order.⁶⁴ Ultimately, it was Secretary General Jens Stoltenberg that reminded that "arms control agreements are not made between friends, they are made between adversaries", and that "some of the most successful arms control agreements were reached in periods of heightened tensions".⁶⁵ The international community will hopefully seize this opportunity for developing further international law on attacks on NPPs, clarifying international norms and standards of behaviour, and holding Russia accountable for posing a severe nuclear threat to Ukraine and Europe.

Updated 11 April 2024

⁶¹ Bruno Tertrais, "Principles of Nuclear Deterrence and Strategy", in *NDC Research Papers*, No. 19 (May 2021), <https://www.ndc.nato.int/download/downloads.php?icode=693>.

⁶² Thierry Tardy (ed.), "NATO's New Strategic Concept", in *NDC Research Papers*, No. 25 (September 2022), <https://www.ndc.nato.int/news/news.php?icode=1737>.

⁶³ "Our vision is clear: we want to live in a world where sovereignty, territorial integrity, human rights and international law are respected and where each country can choose its own path, free from aggression, coercion or subversion. We work with all who share these goals. We stand together, as Allies, to defend our freedom and contribute to a more peaceful world." See NATO, *2022 Strategic Concept*, Adopted by Heads of State and Government at the NATO Summit in Madrid, 29 June 2022, p. 2, <https://www.nato.int/strategic-concept>.

⁶⁴ "We will continue to work towards just, inclusive and lasting peace and remain a bulwark of the rules-based international order." *Ibid.*, p. 1.

⁶⁵ NATO, *Remarks by NATO Secretary General Jens Stoltenberg at the 18th Annual NATO Conference on Arms Control, Disarmament and Weapons of Mass Destruction Non-Proliferation*, 18 April 2023, https://www.nato.int/cps/en/natohq/opinions_213952.htm.

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