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Mitigating the Threat of Attacks on Nuclear Facilities

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The Vienna Center for Disarmament and Non-Proliferation (VCDNP) promotes international peace and security by conducting research, facilitating dialogue, and building capacity on nuclear non-proliferation and disarmament.

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IAEA delegation near the Zaporizhzhia Nuclear Power Plant in Ukraine, September 2024. Credit: Fredrik Dahl/IAEA.

Introduction

Prohibitions of attacks on nuclear facilities date back to Additional Protocols I and II of 1977 to the 1949 Geneva Conventions.¹ Bolstering the Geneva Conventions and their Protocols are a range of norms and documents, other aspects of international humanitarian law (IHL), resolutions of the United Nations General Assembly (UNGA) and the International Atomic Energy Agency (IAEA) policy-making organs, nuclear-weapon-free zone treaties, and other arrangements.

Attacks on nuclear facilities — in the 1980s, when Iran attacked Iraq's Osirak reactor, followed by Israel's destruction of the same reactor, and Iraq's airstrikes on Iran's Bushehr reactors — drew the attention of the international community to the risks posed by such attacks. These facilities were under construction and thus non-operational. In the 1990s, the United States attacked Iraqi nuclear sites, including a non-operational reactor at the Al Tuwaitha nuclear complex. More recently, in 2007, Israel destroyed a building in Syria's desert referred to as the al-Kibar reactor, which had been built in secret and was also not yet operational.²

¹ Different actors define a “nuclear facility” in slightly different ways. When differences in these definitions are important for understanding the application of a prohibition of their attacks on nuclear facilities, the author has made that distinction.

² John Carlson, “Prohibition of military attacks on nuclear facilities”, VCDNP, 12 September 2022, <https://vcdnp.org/prohibition-military-attacks-on-nuclear-facilities/>.

Russia's war against Ukraine and the associated fighting around the Zaporizhzhia nuclear power plant have brought renewed attention to this issue. Incidents of shelling at and around the plant have threatened to disrupt the external power supply to the plant and the flow of cooling water to its reactors.

Drone strikes damaged the containment structure of one of Zaporizhzhia's reactors as recently as April 2024.³ All of the units at the Zaporizhzhia nuclear power plant are currently in either cold or hot shutdown. To date, no release of radioactivity has resulted from these strikes. However, the December 2024 drone attack on an official IAEA vehicle during a rotation of IAEA staff underscores the urgent need to examine existing prohibitions of attacks against nuclear facilities and adherence thereto, as well as to explore ways to strengthen them.⁴

This paper provides an overview of existing prohibitions on attacks against nuclear facilities, as well as an analysis of how these prohibitions could be strengthened. In the current geopolitical climate, achieving consensus on strengthened multilateral legal prohibitions in international negotiating fora is unlikely. However, it is essential to begin considering such measures now so that they might be enacted when tensions subside. In the interim, States could pursue bilateral or regional arrangements and/or take additional steps to strengthen non-binding commitments and norms.

3 Update 220 – IAEA Director General Statement on Situation in Ukraine, 7 April 2024, <https://www.iaea.org/newscenter/pressreleases/update-220-iaea-director-general-statement-on-situation-in-ukraine>.

4 Update 264 – IAEA Director General Statement on Situation in Ukraine, IAEA, 10 December 2024, <https://www.iaea.org/newscenter/pressreleases/update-264-iaea-director-general-statement-on-situation-in-ukraine>.



Negotiations towards the two Additional Protocols to the Geneva Conventions, June 1977. Credit: ICRC.

Existing Prohibitions of Attacks on Nuclear Facilities

Among the existing multilateral prohibitions of attacks on nuclear facilities are the first and second Additional Protocols to the Geneva Conventions. They are supported by resolutions adopted by the IAEA's General Conference (GC) and Board of Governors, and the UNGA that have called for such prohibitions or have strengthened the implementation of existing ones. There are also provisions in a nuclear-weapon-free zone treaty and a bilateral treaty that serve as examples. This section provides an overview of those prohibitions and related instruments.

Additional Protocols I and II to the Geneva Conventions

The Geneva Conventions of 1949 replaced the previous conventions adopted in 1864, 1906, and 1926 on ameliorating the effects of war on soldiers and civilians. The 1949 Conventions consist of four treaties and three additional protocols and form the foundations of IHL.⁵

⁵ According to the International Committee of the Red Cross (ICRC), IHL is defined as a "set of rules that seeks, for humanitarian reasons, to limit the effects of armed conflict. It protects persons who are not, or are no longer, directly or actively participating in hostilities, and imposes limits on the means and methods of warfare. IHL is also known as "the law of war" or "the law of armed conflict".

See ICRC, "What is International Humanitarian Law", March 2022, https://www.icrc.org/sites/default/files/document/file_list/what_is_ihl.pdf.

Customary IHL also offers a wide range of legal guidance, including on the principles of distinction, proportionality, and necessary precautions to take during warfare.

They establish rules that are intended to protect people during war who either do not take part in the fighting or who can no longer fight, and limit the means and methods of warfare.⁶ In 1977, owing to the evolving nature of modern warfare, the first two of the Additional Protocols to those conventions were adopted. Additional Protocol I (AP I) applies to international armed conflicts, while Additional Protocol II (AP II) focuses on non-international armed conflicts.⁷

Both AP I and AP II contain provisions prohibiting attacks on nuclear electrical generating stations. Article 56 of AP I prohibits targeting “works or installations containing dangerous forces”, including “nuclear electrical generating stations”, 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.⁸ That article also prohibits the targeting of military objectives located at or in the vicinity of such works if the attack may cause the release of dangerous forces (e.g. radiation) that could cause severe losses among the civilian population.

However, Article 56 includes an exception to that prohibition if the facility 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”. Article 15 of AP II contains the same provision without that exception.⁹ Even in cases of the loss of this special protection under AP I, the general rules and principles of IHL, such as distinction, proportionality, and necessary precautions, continue to apply.

It is, however, important to note that the prohibitions contained in AP I and AP II reflect a *heightened* prohibition with respect to nuclear electrical generating stations. Article 48 of AP I provides that parties to a conflict “distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.” Article 52.3 of AP I further notes that, if there is doubt whether an object normally dedicated to civilian purposes “is being used to make an effective contribution to military action, it shall be presumed not to be used so.”

Indeed, any attack carried out in such a way that could be expected to cause a release of radiation would violate Article 48 of AP I by threatening exposure to civilians, and Article 35.3 of AP I prohibiting methods or means of warfare, which may be expected to cause widespread, long-term and severe damage to the natural environment. Further, any civilian object is protected, regardless of the risk of the release of radiation.

6 The 1949 Geneva Conventions have 196 parties, including all UN Member States, the UN observers, and the Cook Islands. For the full list, see the International Committee of the Red Cross (ICRC) website: <https://ihl-databases.icrc.org/en/ihl-treaties/geneva-conventions-1949additional-protocols-and-their-commentaries>.

7 Additional Protocol I of the Geneva Conventions has 174 parties and Additional Protocol II has 169. There is a third Additional Protocol, which does not contain provisions relevant for this paper. For the full list, see the ICRC website: <https://ihl-databases.icrc.org/en/ihl-treaties/geneva-conventions-1949additional-protocols-and-their-commentaries>.

8 Portions of the text of Article 56 relevant for nuclear facilities are: “Works or installations containing dangerous forces, namely dams, dykes and nuclear electrical generating stations, 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. Other military objectives located at or in the vicinity of these works or installations shall not be made the object of attack if such attack may cause the release of dangerous forces from the works or installations and consequent severe losses among the civilian population. [...] The special protection against attack [...] shall cease: for a nuclear electrical generating station only if it 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.” Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), Article 56, 8 June 1977. Available at: <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977?activeTab=1949GCs-APs-and-commentaries>.

9 The full text of Article 15 is: “Works or installations containing dangerous forces, namely dams, dykes and nuclear electrical generating stations, 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.” Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II), Article 15, 8 June 1977. Available at: <https://ihl-databases.icrc.org/en/ihl-treaties/apii-1977?activeTab=1949GCs-APs-and-commentaries>.

The following table outlines the status of adherence to the Geneva Conventions and their Protocols by States that either have nuclear facilities on their territory which have been attacked or have been accused of attacking nuclear facilities.

State	Geneva Conventions	Additional Protocol I	Additional Protocol II
Iran	Party since 1957		
Iraq	Party since 1956	Party since 2010	
Israel	Party since 1951		
Russian Federation	Party since 1954	Party since 1989	Party since 1989
Syria	Party since 1953	Party since 1983	
Ukraine	Party since 1954	Party since 1990	Party since 1990
United States	Party since 1955		

The exception in AP I referred to above is narrow: for the prohibition to no longer apply, a nuclear electrical generating station (hereafter “nuclear power plant”) must provide electric power in “regular, significant, and direct support” to military operations, and attacking it must be the only feasible way to terminate that support. The 1987 Commentary on AP I, published by the International Committee of the Red Cross (ICRC), notes that it would be relatively simple to disrupt the electricity supply from a nuclear power plant by simply cutting power lines, rather than attacking the plant itself, so as to avoid the risk of releasing dangerous forces.¹⁰

It is unlikely that an attack on a nuclear power plant would not be illegal, given the prohibitions contained in AP I and AP II, at least with respect to States that are party to those protocols. The release of radioactive particles into the atmosphere would undoubtedly constitute the release of dangerous forces, with severe consequences for civilians and the environment. For States that are party only to the Geneva Conventions and not their Protocols, IHL protecting civilian populations and the environment still applies.

At minimum, customary IHL mandates that parties to an armed conflict take particular care “if works and installations containing dangerous forces, [such as nuclear power plants], and other installations located at or in their vicinity are attacked, in order to avoid the release of dangerous forces and consequent severe losses among the civilian population.”¹¹ In addition, an attack causing radioactive contamination would in all likelihood be inconsistent with the rule of proportionality, the obligations of taking precautions during attacks, and preventing widespread damage to the environment.¹²

However, enforcement of the special prohibitions under APs I and II could be challenging, as discussed in the next section.

¹⁰ ICRC, Geneva Conventions AP I, Commentary of 1987, Article 56, paragraph 2166, <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-56/commentary/1987?activeTab=1949GCs-APs-and-commentaries>.

¹¹ See Customary International Law, Rule 42, Works and Installations Containing Dangerous Forces.

¹² According to the ICRC, Rule 14 of customary IHL prohibits launching “an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated, is prohibited.” Rules 15-21 outline the precautions States must take during attacks to spare civilian populations, individual civilians, and civilian objects. All of these rules would likely be broken by an attack on a nuclear facility. See: <https://ihl-databases.icrc.org/en/customary-ihl/v1>.

Prohibitions Under the Auspices of the International Atomic Energy Agency and its Policy-Making Organs

The IAEA operates under the direction of two policy-making organs: the Board of Governors, today comprised of 35 Member States, and the General Conference, which includes all Member States of the Agency. Each body adopts decisions and resolutions pertaining to the IAEA's work and Member States' participation in it.

To date, there have been five General Conference resolutions related to attacks on nuclear facilities. Four of these five were adopted between 1981 and 1990 and were prompted by the attacks on Iraq's Osirak reactor and the later attack on Iran's Bushehr facility. The fifth resolution, adopted in 2009, was prompted by the destruction of Syria's al-Kibar reactor in 2007.

The resolution adopted in 1981 (GC(XXV)/RES/381) suspended technical assistance by the IAEA to Israel. It also required that an agenda item at the 1982 General Conference be included to consider suspending Israel from the privileges and rights of IAEA membership if it had not by that time complied with United Nations Security Council resolution (UNSCR) 487 (1981).¹³ UNSCR 487, inter alia, called on Israel to place its nuclear facilities under IAEA safeguards.¹⁴ When Israel failed to comply with UNSCR 487, the General Conference considered at its 1982 meeting a resolution to suspend Israel from the rights and privileges of IAEA membership. However, the resolution, which required a two-thirds majority of those present and voting, was not adopted.¹⁵

In 1983, the General Conference adopted two resolutions related to attacks on nuclear facilities: GC(XXVII)/RES/407 and GC(XXVII)/RES/409. In GC(XXVII)/RES/407, the General Conference declared that "all armed attacks against nuclear installations devoted to peaceful purposes should be explicitly prohibited" and urged Member States to take every possible effort to adopt such rules in relevant fora.¹⁶ In GC(XXVII)/RES/409, the General Conference decided to withhold IAEA research contracts to Israel, to discontinue the purchase of equipment and materials from Israel, and to refrain from holding seminars, scientific and technical meetings in Israel if, by the next General Conference, Israel had not withdrawn "its threat to attack and destroy nuclear facilities in Iraq and in other countries".¹⁷

The latter resolution, inter alia, also called for the early consideration of the conclusion of an international agreement to prohibit military attacks on nuclear installations. In addition to assertions that attacks on nuclear facilities were tantamount to attacks on the safeguards system, Member States noted in the resolution that such attacks risked reducing access to nuclear science and technology for peaceful purposes. During deliberations on these resolutions, a number of Member States also argued that such attacks violated the Charter of the United Nations.

In 1984, the IAEA Director General presented a report to the General Conference on "Protection of Nuclear Installations Devoted to Peaceful Purposes" (GC(XXVIII)/721).¹⁸

¹³ IAEA, Military Attack on Iraqi Nuclear Research Centre and its Implications for the Agency (GC(XXV)/RES/381), 19 October 1981, https://www.iaea.org/sites/default/files/gc/gc25res-381_en.pdf.

¹⁴ United Nations Security Council resolution 487, 19 June 1981, <http://unscr.com/files/1981/00487.pdf>.

¹⁵ IAEA General Conference, Record of the Two Hundred and Forty-Fifth Plenary Meeting (GC(XXVI)/OR.245), para. 41, 24 September 1982, https://www.iaea.org/sites/default/files/gc/gc26or-245_en.pdf.

¹⁶ IAEA General Conference, Protection of Nuclear Installations Devoted to Peaceful Purposes Against Armed Attacks (GC(XXVII)/RES/407), 14 October 1983, https://www.iaea.org/sites/default/files/gc/gc27res-407_en.pdf.

¹⁷ IAEA General Conference, Consequences of the Israeli Military Attack on the Iraqi Nuclear Research Reactor and the Standing Threat to Repeat this Attack for: (a) the Development of Nuclear Energy for Peaceful Purposes, and (b) The Role and Activities of the International Atomic Energy Agency (GC(XXVII)/RES/409), 14 October 1983, https://www.iaea.org/sites/default/files/gc/gc27res-409_en.pdf.

¹⁸ Protection of Nuclear Installations Devoted to Peaceful Purposes Against Armed Attacks, Report by the Director General, IAEA, 3 September 1984, https://www.iaea.org/sites/default/files/gc/gc28-721_en.pdf. Other documents from GC(XXVIII) are not available from the IAEA's archives for reasons not clear to Archives officials.

In 1985, having considered that report, the General Conference adopted resolution GC(XXIX)/RES/444, which noted that the Conference considered any armed attack on nuclear facilities devoted to peaceful purposes or any threat thereof would violate the principles of the United Nations Charter, international law, and the IAEA Statute.¹⁹ The resolution also urged “once again” all Member States to make “continuous efforts aimed at the prompt adoption of binding international rules prohibiting armed attacks against all nuclear installations devoted to peaceful purposes”.

The next resolution that specifically addressed attacks against nuclear facilities was in 1990. In resolution GC(XXXIV)/RES/533, the General Conference reiterated the views expressed in GC(XXIX)/RES/444.²⁰

The next time the topic of prohibitions of attacks on nuclear facilities was addressed at an IAEA General Conference was in 2009, following Israel’s destruction of Syria’s al-Kibar reactor in 2007. In decision GC(53)/DEC/13, the General Conference recalled the language in resolutions GC(XXIX)/RES/444 and GC(XXXIV)/RES/533 and noted that a thorough discussion had been made on all aspects of the issue.²¹

The language concerning attacks on nuclear facilities during the 1980s was the strongest, calling for the suspension of technical cooperation by the IAEA with any State that perpetrated an attack on nuclear facilities devoted to peaceful purposes, as well as the suspension of that State’s rights and privileges of IAEA membership. While the General Conference decided to curtail technical cooperation by the IAEA with Israel, attempts to suspend Israel from the rights and privileges of IAEA membership were ultimately unsuccessful.

The General Conference declared in 1983 that “all armed attacks against nuclear installations devoted to peaceful purposes should be explicitly prohibited” and considered in 1985 that any armed attack on and threat against nuclear facilities devoted to peaceful purposes constituted a violation of the principles of the United Nations Charter, international law and the Statute of the Agency. However, these declarations and considerations are not legally binding. General Conference resolutions reflect the political will of Member States. Linking operative paragraphs to UNSC resolutions was an attempt at strengthening language in the resolutions.

In hindsight, the most forceful response attempted by the IAEA’s policy-making organs was the suspension of the rights and privileges of IAEA membership. Although this effort failed in the past, it could be reconsidered in the future. However, prevailing geopolitical conditions would likely hinder such an attempt. This does not suggest that General Conference resolutions are meaningless. Rather, it underscores that General Conference resolutions form part of a broader set of non-binding political measures that increase international pressure to enforce binding prohibitions against attacks on nuclear facilities.

19 IAEA General Conference, Protection of Nuclear Installations Devoted to Peaceful Purposes Against Armed Attacks (GC(XXIX)/RES/444, 1985, https://www.iaea.org/sites/default/files/gc/gc29res-444_en.pdf.

20 IAEA General Conference, Prohibition of All Armed Attacks Against Nuclear Installations Devoted to Peaceful Purposes Whether Under Construction or in Operation (GC(XXXIV)/RES/533), 21 September 1990, https://www.iaea.org/sites/default/files/gc/gc34res-533_en.pdf.

21 IAEA General Conference, Prohibition of armed attack or threat of attack against nuclear installations, during operation or under construction (GC(53)/DEC/13), 18 September 2009, https://www.iaea.org/sites/default/files/gc/gc53dec-13_en.pdf.

International Conventions and Guidance on Nuclear Safety and Nuclear Security

Other relevant measures are also available to States under the auspices of the IAEA and the United Nations, including legally binding conventions, for which the IAEA or the United Nations act as the depository, and guidance documents developed with input from Member States.

Two notable conventions are the Convention on the Physical Protection of Nuclear Material (CPPNM) and its 2005 Amendment, and the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT). The CPPNM focuses on protecting nuclear material during international transport. Its 2005 Amendment expands the scope to include not only nuclear material in domestic use, storage, and transport, but also the protection of nuclear facilities used for peaceful purposes against sabotage, and mitigating or minimising the radiological consequences thereof. ICSANT requires parties to criminalise the planning, threat, or execution of acts of nuclear terrorism. However, both the Amended CPPNM and ICSANT focus on non-State actors, and the Amended CPPNM specifically excludes application to the activities of armed forces during armed conflict, since such activities are governed by other rules of international law.

Following Russia's occupation of the Zaporizhzhia nuclear power plant in February 2022, the IAEA began adapting its existing guidance on nuclear safety and nuclear security to mitigate the risk of a nuclear catastrophe resulting from the ongoing conflict. In March 2022, the IAEA Director General outlined "Seven Indispensable Pillars for Nuclear Safety and Security" during armed conflict. These pillars were based on existing guidance documents developed with input from Member States.²² In May 2023, in an address to the UN Security Council, the Director General outlined five concrete principles based on the Seven Pillars as they related to the Zaporizhzhia nuclear power plant.²³

The IAEA is also developing a new technical guidance document (TECDOC) on "Challenges in the application of the IAEA safety standards and nuclear security guidance during armed conflicts".²⁴ The TECDOC "will analyse the issues and challenges faced at nuclear facilities in terms of practical application of Agency safety standards and nuclear security guidance during armed conflicts, using the knowledge and experience collected in Ukraine since February 2022, and how these issues and challenges might be addressed, if possible, by all interested parties, including the Agency."²⁵ It is expected that this TECDOC will also be based on existing guidance.

While the relevant conventions concluded under IAEA auspices are legally binding, they do not currently obligate State actors to refrain from attacking nuclear facilities. IAEA guidance on safety and security is crafted with active input from Member States, but is merely guidance. Moving into the future, States should consider how these tools could be used or adapted to strengthen prohibitions of attacks on nuclear facilities or, at the least, strengthen norms against such attacks.

22 Joanne Liou, "IAEA Director General Calls for Restraint, Reiterates Need to Ensure Safety of Ukraine's Nuclear Facilities and Their Staff", IAEA, 2 March 2022, <https://www.iaea.org/newscenter/news/iaea-director-general-calls-for-restraint-reiterates-need-to-ensure-safety-of-ukraines-nuclear-facilities-and-their-staff>.

23 Rafael Mariano Grossi, "IAEA Director General Statement to United Nations Security Council", 30 May 2023, <https://www.iaea.org/newscenter/statements/iaea-director-general-statement-to-united-nations-security-council-30-may-2023>.

24 Dominique Delattre, "Maintaining safety and nuclear security during an armed conflict", Commission on Safety Standards 53rd Meeting, 23 to 25 May 2023, https://nucleus.iaea.org/sites/committees/NUSSC%20Documents/ENN2.4_ArmedConflict_Dominique.pdf.

25 IAEA, Nuclear Safety, Security and Safeguards in Ukraine, Report by the Director General, 14 September 2023, <https://www.iaea.org/sites/default/files/gc/gc67-10.pdf>.

Nuclear-Weapon-Free Zones

Article VII of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) foresees that its States Parties could conclude nuclear-weapon-free zones (NWFZs) that would further assure the total absence of nuclear weapons in their respective territories.²⁶ Seven NWFZs exist today, covering Africa, Antarctica, Latin America and the Caribbean, the South Pacific, South-East Asia, Central Asia, and the single-State NWFZ of Mongolia.

The African NWFZ — also referred to as the Treaty of Pelindaba — is the only NWFZ treaty that includes a specific provision prohibiting attacks on nuclear facilities. Pursuant to Article 11 of the Treaty, “each Party undertakes not to take, or assist, or encourage any action aimed at an armed attack by conventional or other means against nuclear installations in the African nuclear-weapon-free zone.”²⁷

All treaty-based NWFZs (Mongolia’s nuclear-weapon-free status is enshrined in a UNGA resolution) include an amendment provision requiring either consensus among States within the respective zone or a two-thirds majority. Amending existing NWFZs to incorporate a provision similar to that in the Treaty of Pelindaba could significantly strengthen the patchwork of prohibitions against attacks on nuclear facilities.

In 2010, NPT States Parties agreed by consensus on a final document including a 64-point Action Plan that, inter alia, encouraged the establishment of additional NWFZs in the future.²⁸ In this vein, scholars and experts have long appreciated the value in pursuing a European NWFZ.²⁹ Whether by amending existing NWFZs to include a prohibition such as that contained in the Treaty of Pelindaba or by working to establish new zones with such a prohibition, NWFZs remain a valuable tool for strengthening the prohibition of attacks on nuclear facilities.

Other Bilateral and Multilateral Prohibitions

The only bilateral treaty on this subject is the 1988 Agreement between India and Pakistan on the Prohibition of Attack Against Nuclear Installations and Facilities (also referred to as the India-Pakistan Non-Attack Agreement).³⁰ The agreement prohibits both parties from “undertaking, encouraging or participating in, directly or indirectly, any action aimed at causing the destruction of, or damage to, any nuclear installation or facility in the other country.” It also requires annual reporting on the coordinates of nuclear facilities (whether peaceful or not) but does not require verification.

The India-Pakistan Non-Attack Agreement was forged as a confidence-building measure between two countries that deeply distrust one another. The India-Pakistan Non-Attack Agreement should serve as a model, even between countries that share positive relations with one another. Like NWFZs, the more such agreements that are in force, the stronger the prohibitions of attacks on nuclear facilities become.

There have been other attempts at strengthening prohibitions of attacks on nuclear facilities, including in the Conference on Disarmament and during the NPT review process.

26 Treaty on the Non-Proliferation of Nuclear Weapons, Article VII, 1 July 1968, <https://treaties.unoda.org/t/npt>.

27 African Nuclear Weapon Free Zone Treaty (Treaty of Pelindaba), Article 11, 28 June 1995, <https://treaties.unoda.org/t/pelindaba>.

28 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons Final Document (NPT/CONF.2010/50 (Vol. I)), page 22, Action 9, <https://documents.un.org/doc/undoc/gen/n10/390/21/pdf/n1039021.pdf>.

29 Harold Müller et al., “A Nuclear Weapon-Free Zone in Europe”, Peace Research Institute Frankfurt, 2015, <https://vcdnp.org/a-nuclear-weapon-free-zone-in-europe/>.

30 Agreement between India and Pakistan on the Prohibition of Attack Against Nuclear Installations and Facilities, 31 December 1988, https://www.nti.org/wp-content/uploads/2021/09/india_pakistan_non_attack_agreement.pdf.

In 1979, the Soviet Union and the United States introduced a joint draft of a Radiological Weapons Convention to the Conference on Disarmament.³¹ States considered a provision that would have prohibited attacks on nuclear facilities, either with respect to facilities devoted to peaceful purposes or as a blanket prohibition. The Conference debated this for several years, but was ultimately unsuccessful in producing a consensus draft. In the 1980s, at the same time as the IAEA was adopting resolutions on the subject, the Conference on Disarmament developed a compilation of draft provisions for a multilateral treaty prohibiting attacks on nuclear facilities; unfortunately, this effort never materialised into a treaty.³²

The last explicit consensus language in NPT Review Conference outcomes that related to prohibitions of attacks on nuclear facilities was in 2010, when States Parties called for adherence to the 2009 IAEA General Conference decision.³³ Subsequent draft language has called attention to the risks posed by attacking nuclear facilities, but did not imply an explicit prohibition.

31 Conference on Disarmament, Agreed Joint USSR-United States Proposal on Major Elements of a Treaty Prohibiting the Development, Production, Stockpiling and Use of Radiological Weapons, CD/31, 9 July 1979, https://documents.unoda.org/wp-content/uploads/2020/11/CD_INF55_ai5.pdf.

32 John Carlson, "Prohibition of military attacks on nuclear facilities", VCDNP, 12 September 2022.

33 Ibid.



First Conference of the Parties to the Amendment to the Convention on the Physical Protection of Nuclear Material, March 2022. Credit: Dean Calma/IAEA.

Strengthening Legally Binding Prohibitions of Attacks on Nuclear Facilities

Enhancing existing multilateral, regional, and bilateral legally binding prohibitions of attacks on nuclear facilities or concluding new ones would be the most ideal way forward but are unlikely to succeed at this time due to prevailing geopolitical tensions and the crisis in multilateralism. However, it is worth considering what, in an ideal world, such strengthened prohibitions could look like, so that there is a basis for future negotiations.

Enhancing Implementation of the Geneva Conventions and Additional Protocols?

The Geneva Conventions and Additional Protocols are the foundation of international law prohibiting attacks on nuclear facilities. In particular, Article 56.6 of AP I provides that parties to an armed conflict should conclude further agreements among themselves to provide additional protection for objects containing dangerous forces. This could take the form of demilitarised zones pursuant to Article 60 of AP I. In cases where the parties to the conflict are unwilling to negotiate such a zone, an intermediary — either another State or an international organisation — could facilitate negotiations. Per Article 56.7 of AP I and Article 16 of the Annex to AP I, States are also encouraged to physically mark works and installations containing dangerous forces with three bright orange circles placed on the same axis to prevent accidental attacks.

In general, more work should be undertaken to raise awareness in the international community on the extensive prohibitions already in place under APs I and II of the Geneva Conventions. This work should also include meetings of States Parties to better understand how international responses to violations of the Geneva Conventions and APs I and II could be coordinated and strengthened.

A more difficult step would be to consider the conclusion of an Additional Protocol IV to the Geneva Conventions to account for the changing nature of warfare, as the 1977 APs did. An AP IV could include an explicit prohibition of attacks on all peaceful nuclear facilities (rather than simply nuclear electricity generating stations), outline criteria for what constitutes a peaceful nuclear facility, and provide further regulation of military behaviour in the vicinity of nuclear facilities.

A peaceful nuclear facility could be described as a civilian object — already under blanket protection — though explicit legal guidance could be beneficial in this respect. States could also consider including language on other aspects of modern warfare, such as cyberattacks, as well as on military occupation of nuclear facilities and the use of nuclear facilities as military bases.

The risk of initiating discussions on an Additional Protocol IV to the Geneva Conventions is that negotiations could become mired by the scale of change to warfare since 1977. Even addressing the issue of cyberattacks on nuclear facilities would likely result in a prolonged and challenging debate. Nevertheless, outlining the priorities and concerns that States consider essential for a new Additional Protocol could help assess the feasibility and desirability of concluding such a protocol when geopolitical tensions have eased. Indeed, States may decide that improving implementation of APs I and II is more desirable than commencing negotiations of an AP IV.

Leveraging the CPPNM Review Conference?

As noted above, both the Amended CPPNM and ICSANT are focused on mitigating the threat posed by non-State actors. Expanding the focus to address threats posed by State actors does not contradict the text of either convention. However, it would likely be impractical. First of all, an amendment to either convention would require a two-thirds majority of States Parties to agree and an amendment would only apply to States that accept it. Second, nuclear security is generally viewed as the domestic responsibility of the State concerned, so expanding the scope of the Amended CPPNM and ICSANT would likely result in pushback from its adherents.

However, work could begin now on defining how parties to these conventions could address threats posed by State attacks on nuclear facilities while remaining within the scope of the conventions themselves.

Article 13 of the CPPNM's 2005 Amendment mandates that the depositary, the IAEA, convene a conference of States Parties five years after its entry into force (in May 2016).³⁴ That conference took place in 2022 and resulted in an outcome document, which, inter alia, requested the IAEA Director General to convene a further conference.³⁵ As of February 2025, no date for that conference has been announced. In the lead-up to that conference, States Parties could already begin work on what the goals of an outcome document could be.

³⁴ Amendment to the Convention on the Physical Protection of Nuclear Material (INFCIRC/274/Rev.1/Mod.1 (Corrected)), IAEA, <https://www.iaea.org/sites/default/files/publications/documents/infircs/1979/infirc274r1m1c.pdf>.

³⁵ 2022 Conference of the Parties to the Amendment to the Convention on the Physical Protection of Nuclear Material, Outcome Document, 28 March – 1 April 2022, https://www.iaea.org/sites/default/files/22/04/english_acppnm_rc_2022_4_outcome_document_approved.pdf.

For example, in the document, States Parties could:

- Pledge not to target nuclear facilities devoted to peaceful purposes or locations where nuclear material is otherwise in domestic peaceful use, storage, or transport; or
- Pledge not to attack critical infrastructure of other States and include specific definitions of facilities to which this pledge would apply.

A New Convention?

Given the challenges noted above in amending the CPPNM or ICSANT, States could consider negotiating a new convention, the depository of which could be the United Nations, the IAEA, a State, or group of States. Such a convention could translate IAEA nuclear security guidance into a legally binding instrument on State conduct in armed conflict with respect to nuclear facilities. This could be based on the IAEA's "Seven Indispensable Pillars for Nuclear Safety and Security" during armed conflict or draw on other guidance provided by the IAEA.

Many IAEA Member States view nuclear security as a sovereign issue and resist any perceived attempt at translating nuclear security measures into legally binding obligations (with the notable exceptions of the CPPNM and ICSANT). Any negotiation of a potential new convention would have to be handled with care, so as to avoid the perception that it would hamper access to peaceful uses of nuclear science and technology.

Alternatively, as noted above, States have debated provisions of a radiological weapons convention that would provide a blanket prohibition on attacks against nuclear facilities. New consideration of what such a convention could look like under today's circumstances could result in a draft that States could use as a starting point when geopolitical tensions have eased.

As an interim step — noting the challenges described above — a non-binding code of conduct could also be considered. Such a code of conduct would be easier to negotiate than a legally binding convention; indeed, the process itself of negotiating a code could help States find common ground on any perceived gaps in existing legal prohibitions. It could also expand beyond "traditional" military attacks to areas such as cyberattacks.

Amending Nuclear-Weapon-Free Zone Treaties?

Among the legally binding options, amending NWFZ treaties might be comparatively easier to achieve. The parties to the NWFZ treaties could consider incorporating a prohibition of attacks against nuclear facilities, similar to that contained in the Treaty of Pelindaba. Alternatively, or in parallel, they could establish new protocols to these treaties with respect to States outside the zone of application pledging not to target nuclear facilities within the zone.

Since no States parties within the zone of application of any of the NWFZs have nuclear weapon facilities, arguments against prohibiting attacks on all nuclear facilities (as opposed to those devoted exclusively to peaceful purposes) become harder to justify. Furthermore, the primary purpose of NWFZs is to establish additional measures that reinforce the global non-proliferation regime. In this respect, leveraging NWFZs to strengthen the patchwork of global prohibitions of attacks on nuclear facilities could be low-hanging fruit.

Finally, while unlikely at this time, States not currently party to NWFZs, such as European and Middle Eastern States, could begin developing a framework for what a NWFZ could look like in their respective regions, including a prohibition on attacks on nuclear facilities.

Bilateral or Regional Treaties?

Legally binding bilateral or regional treaties in the style of the India-Pakistan Non-Attack Agreement could support a global norm against attacks on nuclear facilities in a similar way that NWFZs strengthen non-proliferation norms. Such treaties between States with friendly relations would be relatively simple to conclude and would provide a model for other States to follow.

To motivate States to do so, additional provisions could be included. Such provisions could, for example, require regular data exchange on troop movements, adherence to other international instruments, such as the CPPNM's 2005 Amendment, or measures to address other region-specific security concerns. Concluding such treaties would also serve as confidence-building measures for neighbouring States with nuclear facilities on their territory and serve as a model for broader prohibitions in the future.



Tenth Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons, August 2022. Credit: Cristian de Francia/IAEA.

Strengthening Non-Binding Prohibitions of Attacks on Nuclear Facilities

As noted above, the adoption of legally binding prohibitions, especially multilateral prohibitions, is unlikely at this time, owing to geopolitical tensions and the crisis in multilateralism. While preparations should begin now on imagining what future legally binding prohibitions on attacks against nuclear facilities might look like, States should also begin pursuing non-binding measures to strengthen the norm against attacking nuclear facilities.

Commitments in the NPT Review Process

The 2022 Tenth NPT Review Conference was unable to reach consensus on a final outcome document in large part due to language related to the Zaporizhzhia nuclear power plant.³⁶ Considering the worsening tensions in the NPT context, the ongoing war against Ukraine and other disagreements in the NPT review process, achieving a consensus outcome document at the next Review Conference in 2026 will be challenging.

³⁶ 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Draft Final Document (NPT/CONF.2020/CRP.1/Rev.2), 25 August 2022, https://reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2022/documents/CRP1_Rev2.pdf.

However, there is no formal provision that a consensus final document must be the outcome or the only outcome of an NPT Review Conference. While States Parties may continue to aim for a consensus final document, nothing prevents a Review Conference from adopting a separate decision obligating States Parties to refrain from attacks on nuclear facilities devoted to peaceful purposes. Such a decision would have similar weight as the 13 Practical Steps for nuclear disarmament adopted by the 2000 Review Conference and the 64-point action plan adopted by the 2010 Review Conference.

NPT States Parties could also attempt to adopt a separate decision driving States Parties to commence the negotiation of a legally binding treaty on the prohibition of attacks of nuclear facilities, including through means not clearly envisaged under existing prohibitions (such as cyberattacks) and against facilities not explicitly covered under existing prohibitions.

Stronger Language in IAEA General Conference Resolutions

In addition to directing the Agency's work, the IAEA's policy-making organs have long served as a barometer for the state of global affairs. Since 2009, Member States have consistently agreed on General Conference resolutions that reference prohibitions on attacks against nuclear facilities devoted to peaceful purposes. However, in the 1980s, several resolutions went further, explicitly calling for such prohibitions. Adopting these resolutions by consensus was undoubtedly challenging in the 1980s and may be even more so in the 2020s. Nevertheless, the example set in the 1980s demonstrates that, when Member States are broadly unified in purpose, General Conference resolutions can be a powerful tool for shaping the tone of international negotiations.

One potential barrier here would be the extent to which Member States would find it appropriate for this issue to "live" in the IAEA policy-making organs. In the 1980s, there was some debate as to whether attacks on nuclear facilities violated the Statute (though many Member States argued simply that it violated the principles of the Statute, as the attacks were viewed as a threat to access to peaceful uses of nuclear science and technology).

Nevertheless, General Conference resolutions that express consensus or broad agreement that attacks on nuclear facilities devoted to peaceful purposes violate international law would provide another basis upon which to negotiate a broader legally binding prohibition.

Exercising Soft Power through Political Groupings

Short of steps in the NPT review process and the IAEA policy-making organs, States could take other steps towards strengthening existing prohibitions. For example, the Group of Seven (G7) often focuses its efforts on one broad issue per presidency; one focus for the G7 might be a push to identify elements of the legally binding steps described above.

Alternatively, interested States could form a political grouping as a "Group of Friends", as has been done with the Group of Friends of the Additional Protocol or the Group of Friends of Arealess States – two political groupings established in Vienna. Such groups coordinate policies and efforts in advancing the common goal of the group and often work closely behind the scenes of other negotiations. A Group of Friends-style group could focus, for example, on coordinating activities on increasing ratifications to existing legal prohibitions, raising awareness on the nature of such prohibitions, and formulating common policies on the response to violations.



IAEA delegation visit to the Zaporizhzhia Nuclear Power Plant in Ukraine, June 2023. Credit: Fredrik Dahl/IAEA.

Conclusions

The primary takeaway from the research underpinning this paper is the need for a deeper understanding of how different States and other stakeholders perceive the risks associated with attacking nuclear facilities and what the international community seeks from a prohibition to mitigate those risks.

Some considerations that would likely need to be taken into account might include:

- What behaviour is being addressed (for example, one-off strikes, occupation of facilities, attacks during occupation of facilities) and what consequences of nuclear sites in conflict zones are of the greatest concern?
- How to respond to those different behaviours (measures such as sanctions and demarches, or innovative measures, be they unilateral, by a group of States, or an international body)?
- What can be done to ensure that different regions and political groupings have as cohesive a response as possible to an attack on a nuclear facility and to understand each other's priorities?

Clear definitions and common understandings must be established while addressing these questions. For example, it is essential to clarify that nuclear facilities are civilian objects, and as such, are protected against direct attack and reprisals.

With this in mind, efforts should begin immediately to create a shared understanding among States of what a strengthened prohibition of attacks against nuclear facilities should entail. Dialogue is needed between developed and developing States, as well as between countries in the Global South and the Global North. In order to facilitate buy-in, developing countries and those in the Global South must be assured that any legal strengthening of prohibitions on attacks against nuclear facilities will serve their interests and will not in any way restrict their access to the peaceful uses of nuclear science and technology. In addition, all States must be assured that any strengthened prohibition will not negatively affect their own security interests.

Failing to consider the concerns of all States from the outset risks undermining any effort to strengthen such prohibitions.



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