

Chapter 2: The Legal Framework of Nuclear Weapons

As demonstrated in the preceding chapter, the development of nuclear fusion as a clean and sustainable energy source has implications for nuclear weapons. This chapter provides a comprehensive overview of the existing international and European legal framework of nuclear weapons as it is of relevance for fusion. It starts by examining the political logic of this legal regime (1). The chapter proceeds to analyse the pillars of nuclear weapons law of nuclear non-proliferation (2) and nuclear disarmament (3). The law is presented with a view to the framework's historic background to better understand the feasibility of the approaches presented in the next chapters. The chapter further explores the limitations of law in the broader context of nuclear ambitions and varying interests among actors (4).

1 Political Logic of Nuclear Weapons Law

The regime of nuclear weapons law is of paramount importance for peace and security, as nuclear weapons and the corresponding regime is at the centre of the international order. The invention of no other weapon has transformed the international security architecture as extensively as nuclear weapons did. When nuclear weapons were first developed in the Manhattan Project during World War II, many thought the invention of the atomic bomb might end all wars, as nuclear war could not be won.²³⁷ A nuclear war could lead to the destruction of the world.²³⁸ The use of nuclear weapons in Hiroshima and Nagasaki on 6 and 9 August 1945, and the

237 Winston Churchill shared this thought in his last major speech in the UK Parliament: "It may be that we shall by a process of sublime irony have reached a stage in this story where safety will be the sturdy child of terror, and survival the twin brother of annihilation", Hansard, 5th Series, Volume 537, cc 1893. On this nuclear peace hypothesis, see *Robert Rauchhaus*, Evaluating the Nuclear Peace Hypothesis: A Quantitative Approach, *The Journal of Conflict Resolution* 53 (2009), 258–277.

238 *Leo Sartori*, Effects of Nuclear Weapons, *Physics Today* 36 (1983), 32–41; *R. P. Turco/O. B. Toon/T. P. Ackerman et al.*, Nuclear Winter: Global Consequences of Multiple Nuclear Explosions, *Science* 222 (1983), 1283–1292; *A. Robock/L. Oman/G. L. Stenchikov et al.*, Climatic Consequences of Regional Nuclear Conflicts, *Atmospheric Chemistry and Physics* 7 (2007), 2003–2012.

thousands of nuclear weapons tests that have followed, have demonstrated the destructive potential of this weapon. Nuclear weapons have also led to major shifts in the way in which superpowers deal with their rivals.²³⁹ This section will examine the political logic of nuclear weapons that frame the international nuclear legal regime. First, it will analyse the use of nuclear weapons for deterrence and coercion (1.1). Second, it will focus on the conflict between security and the economy (1.2).

1.1 Nuclear Weapons as a Tool for Deterrence and Coercion

The political power of a nuclear weapon stems from the fact that its possession is synonymous with having great power. From a nuclear-weapon State perspective, the fear of nuclear retaliation not only keeps it safe from both conventional and nuclear armed attacks (so-called nuclear deterrence²⁴⁰), but also leverages the State's position in negotiations and world politics (so-called nuclear coercion or nuclear blackmail²⁴¹). Thus, the possession

239 *Robert Jervis*, *The Political Effects of Nuclear Weapons: A Comment*, *International Security* 13 (1988), 80–90; *Richard K. Betts*, *Nuclear Peace and Conventional War*, *Journal of Strategic Studies* 11 (1988), 79–95; *Harald Müller*, *Looking at Nuclear Rivalry: The Role of Nuclear Deterrence*, *Strategic Analysis* 38 (2014), 464–475.

240 On the theory of nuclear deterrence in political science, see *Robert Powell*, *Nuclear Deterrence Theory: The Search for Credibility*, Cambridge: Cambridge University Press 1990. On its legality under international law, see the contributions by Nigel D. White, Monique Cormier and Jonathan L. Black-Branch in Jonathan L. Black-Branch/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law*, vol V – Legal Challenges for Nuclear Security and Deterrence, Asser Press 2020; *Stuart Casey-Maslen*, *The Status of Nuclear Deterrence Under International Law in Light of the Treaty on the Prohibition of Nuclear Weapons*, in: Terry D. Gill/Robin Geiß/Heike Krieger/Christophe Paulussen (eds.), *Yearbook of International Humanitarian Law*, Volume 21 (2018), The Hague: T.M.C. Asser Press 2020, 23–57; *Daniel J. Arbess/Simeon A. Sahaydachny*, *Nuclear Deterrence and International Law: Some Steps toward Observance*, *Alternatives* 12 (1987), 83–111.

241 On this concept, see *Todd S. Sechser/Matthew Fuhrmann*, *Nuclear Weapons and Coercive Diplomacy*, Cambridge: Cambridge University Press 2017; *Jeff McMahan*, *Nuclear Blackmail*, in: Nigel Blake/Kay Pole (eds.), *Dangers of Deterrence*, Oxford, New York: Routledge 1983, 84–111.

of nuclear weapons has been²⁴² and still is²⁴³ very attractive for many countries. Conversely, States already in possession of nuclear weapons have an interest in maintaining their privileged position and to prevent other States from acquiring nuclear weapons. Keeping the nuclear advantage is a core interest of nuclear weapon States which they maintain by exercising hegemony in shaping the legal framework.²⁴⁴

States pursue nuclear capabilities either by acquiring them (horizontal proliferation) or by expanding existing arsenals (vertical proliferation), using a variety of pathways. While some States openly develop nuclear weapons, others follow more opaque strategies. For example, some pursue covert development, as is widely attributed to Israel, which has never officially confirmed its nuclear arsenal. Others engage in nuclear hedging, exemplified by Iran.

Hedging refers to the deliberate development of the technological and industrial capacity to produce nuclear weapons – such as enrichment facilities or other technical expertise – without committing to actually building a bomb.²⁴⁵ It reflects a strategic posture of ambiguity, maintaining a position of "maybe" that can quickly shift to a "yes" depending on political circumstances.²⁴⁶

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- 242 Historic examples are South Africa and Sweden. South Africa built three nuclear warheads but destroyed them subsequently. On the South African nuclear programme, see *Waldo Stumpf*, *South Africa's Nuclear Weapons Program: From Deterrence to Dismantlement*, *Arms Control Today* 25 (1995), 3–8. Sweden followed an ambitious nuclear programme after World War II until its accession to the NPT in 1968, *Thomas B. Johansson*, *Sweden's Abortive Nuclear Weapons Project*, *Bulletin of the Atomic Scientists* 42 (1986), 31–34. Even Germany had ambitions to develop a federal-German nuclear weapon in the late 1950s and early 1960s. On German Chancellor Adenauer's vision of nuclear weapons, see *Dennis Romberg*, *Atomgeschäfte – Die Nuklearpolitik der Bundesrepublik Deutschland 1970–1979*, Paderborn: Ferdinand Schöningh 2020, at 55.
- 243 Iran's nuclear programme is a prominent example. On the state of the programme, see *Paul K. Kerr*, *Iran and Nuclear Weapons Production*, Washington DC: Congressional Research Service 2024.
- 244 *Dimitris Bourantonis*, *The Negotiation of the Non-Proliferation Treaty, 1965–1968: A Note*, *The International History Review* 19 (1997), 347–357; *Nick Ritchie*, *A Hegemonic Nuclear Order: Understanding the Ban Treaty and the Power Politics of Nuclear Weapons*, *Contemporary Security Policy* 40 (2019), 409–434. See also *Rebecca Davis Gibbons*, *American Hegemony and the Politics of the Nuclear Non-proliferation Regime*, Washington DC: Georgetown University 2016.
- 245 *Vipin Narang*, *Strategies of Nuclear Proliferation – How States Pursue the Bomb*, *International Security* 41 (2016), 110–150.
- 246 *Ibid.*, at 117 ff.

Nuclear weapons are closely related to the identity of a State.²⁴⁷ Nuclear weapons are often a sign of national pride, as seen in the French *dissuasion nucléaire* under de Gaulle or in North Korea under the Juche ideology.²⁴⁸ It gives a State the perception of super power status and provides it with a feeling of control in international relations as they are able to act autonomously without the support of other States.²⁴⁹ Further reasons for why States pursue or do not pursue nuclear weapons lay within domestic policies and the strength of international norms.²⁵⁰

Nuclear deterrence is based on a paradox:²⁵¹ The possession of the deadliest weapon ever created by mankind, capable of erasing the entire world several times over, makes the world a safer place by preventing wars. For instance, many attribute the fact that the Cold War never escalated to a direct military conflict between the United States and the Soviet Union to the deterring effects of nuclear weapons.²⁵² Nuclear weapons are designed not to be used in combat, but to prevent the combat from happening altogether. Some even go as far as arguing that there would not be any bilateral conflict if all nations were nuclear armed.²⁵³ For (neo-)realist scholars, as this stream of political science is called, nuclear deterrence avoids war as the consequences of the use of nuclear weapons are catastrophically.²⁵⁴ However, history has shown that nuclear deterrence does not avoid military confrontation with a nuclear power. Not only were there proxy wars between the United States and the Soviet Union during the Cold War, military conflicts of the 2020s disprove nuclear deterrence.

247 Jacques E. C. Hymans, *The Psychology of Nuclear Proliferation: Identity, Emotions and Foreign Policy*, Cambridge: Cambridge University Press 2006; Scott D. Sagan, *Why Do States Build Nuclear Weapons?: Three Models in Search of a Bomb*, *International Security* 21 (1996), 54–86.

248 See below, Sections 4.2.1.4 and 4.2.2.

249 Hymans (n 247), at 32 ff.

250 Sagan (n 247).

251 Scott D. Sagan, *The Perils of Proliferation: Organization Theory, Deterrence Theory, and the Spread of Nuclear Weapons*, *International Security* 18 (1994), 66–107, at 66.

252 Ibid.

253 Bruce Bueno de Mesquita/William H. Riker, *An Assessment of the Merits of Selective Nuclear Proliferation*, *Journal of Conflict Resolution* 26 (1982), 283–306, at 283.

254 Kenneth N. Waltz, *The Spread of Nuclear Weapons: More May Be Better: Introduction*, *The Adelphi Papers* 21 (1981), 1–32; Kenneth N. Waltz, *Nuclear Myths and Political Realities*, *The American Political Science Review* 84 (1990), 731–745; Krieger Zanyvl/Ariel Ilan Roth, *Nuclear Weapons in Neo-Realist Theory*, *International Studies Review* 9 (2007), 369–384.

Russia is unable to conquer Ukraine despite Russia's giant nuclear weapons arsenal and even suffered occupation and attacks within its own borders. Russia's nuclear weapons did not deter Ukraine to defend itself, even on Russian territory. Similarly, the nuclear armed States of Pakistan and India have had a minor military conflict in 2025. In addition, Iran has attacked the nuclear armed State of Israel with ballistic missiles in 2024 and 2025. None of these involvements of nuclear weapon States has led to the use of a nuclear weapon. As a consequence, some characterise nuclear deterrence as a myth.²⁵⁵ For constructivists, the meaning of nuclear weapons is not given by its abstract capability to destroy the opponent, but is constructed within a social context. For them, a changing social context also changes the importance of nuclear weapons.²⁵⁶ Critical towards nuclear weapons is also a third school of international relations, liberalists, which believe in mitigating the proliferation of nuclear weapons through international cooperation, especially treaties and international organisations.²⁵⁷

Nuclear coercion is based on a similar premise as nuclear deterrence. The destructive consequences of the use of a nuclear weapon guide the behaviour of another State. While nuclear deterrence focuses more on defensive action of a nuclear weapon State, nuclear coercion is based on the premise of a nuclear first-use. To prevent such nuclear first-use, States often cope to the demands of a nuclear weapon State. For example, the end of the Korean War has been partially attributed to nuclear coercion.²⁵⁸

255 *Ward Wilson*, *The Myth of Nuclear Deterrence*, *The Nonproliferation Review* 15 (2008), 421–439. Critical: *Derrin Culp*, Part I: A Critical Examination of “The Myth of Nuclear Deterrence”, *The Nonproliferation Review* 19 (2012), 51–68. Critical towards the role of deterrence is *Vipin Narang*, *What Does It Take to Deter? Regional Power Nuclear Postures and International Conflict*, *Journal of Conflict Resolution* 57 (2013), 478–508.

256 See for example *Nina Tannenwald*, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945*, Cambridge: Cambridge University Press 2007; *T.V. Paul*, *The Tradition of Non-Use of Nuclear Weapons*, Stanford: Stanford University Press 2009.

257 *Elizabeth N. Saunders*, *The Domestic Politics of Nuclear Choices—A Review Essay*, *International Security* 44 (2019), 146–184; *Robert E. Kelly*, *Liberal Norms or Coercive Counterproliferation: The American Response to Potential South Korean Nuclearization*, *Pacific Focus* 40 (2025), 69–99; Harald Müller/Carmen Wunderlich (eds.), *Norm Dynamics in Multilateral Arms Control: Interests, Conflicts, and Justice*, Athens: University of Georgia Press 2013.

258 *Rosemary J. Foot*, *Nuclear Coercion and the Ending of the Korean Conflict*, *International Security* 13 (1988), 92–112; *Edward Friedman*, *Nuclear Blackmail and the End of the Korean War*, *Modern China* 1 (1975), 75–91.

Paradoxically, the division of Korea eventually led to North Korea's nuclear programme and the use of nuclear coercion by that State.²⁵⁹ There are also examples where nuclear coercion was proven wrong. Nuclear coercion was a tool by Russia in the years leading up to the full-scale invasion starting in 2022.²⁶⁰ The relevance of nuclear weapons as a tool of coercion has thus been challenged.²⁶¹

The legality of both doctrines revolves around the question of the legality of the threat and use of nuclear weapons which has been the subject of an advisory opinion rendered by the International Court of Justice (ICJ) in 1996.²⁶² If the use of a nuclear weapons is illegal, then a signalled intention to use such a weapon is also illegal.²⁶³ In the advisory opinion, the Court stated that the threat or use of nuclear weapons is not *per se* illegal under international law: From a *jus contra bellum* perspective, its legality is questionable vis-à-vis the necessity and proportionality requirements of Article 51 of the UN Charter.²⁶⁴ From a *jus in bello* perspective, the possibility to distinct between military and civilian targets is doubtful, which is the core principle of international humanitarian law.²⁶⁵ Nevertheless, the Court could not come to a definitive conclusion whether the “fundamental right of every State to survival” might – in extreme circumstances – warrant the use of nuclear weapons.²⁶⁶ In addition, the Court explicitly did not denounce the policy of nuclear deterrence.²⁶⁷

The ICJ's advisory opinion has been heavily criticised, both from within and outside the Court. From within, five judges added a declaration, three a separate opinion and six judges a dissenting opinion. Especially the finding that the Court could not definitively conclude whether the threat or use of nuclear weapons in extreme cases where the State's survival is at stake,

259 More on this below, Section 4.2.2.

260 Anna Clara Arndt/Liviu Horovitz/Michal Onderco, Russia's Failed Nuclear Coercion Against Ukraine, *The Washington Quarterly* 46 (2023), 167–184; *Foot* (n 258), *Friedman* (n 258).

261 *Sechser/Fuhrmann* (n 241). The reduced role of nuclear superiority is analysed by David C. Logan, *The Nuclear Balance Is What States Make of It*, *International Security* 46 (2022), 172–215.

262 *International Court of Justice*, *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion of 8 July 1996, ICJ Reports 1996, p. 226.

263 *Ibid.*, para. 47.

264 *Ibid.*, paras 37 ff.

265 *Ibid.*, paras 90 ff.

266 *Ibid.*, para. 96 f.

267 *Ibid.*, para. 67.

was split by a 7–7 decision with the President’s casting vote deciding. From outside, the advisory opinion has resulted in a wealth of scholarly contributions.²⁶⁸ Many authors join the dissenting judges in their opinion that the effects of the use of nuclear weapons cannot be justified under any circumstances and are always in violation of international law,²⁶⁹ thus also leading to the illegality of the doctrines of nuclear deterrence and nuclear coercion.

Despite the critiques, nuclear deterrence and nuclear coercion are still guiding the interests of nuclear weapon States.²⁷⁰

1.2 Conflict between Security and Economy

The international rules regulating nuclear weapons are a matter giving rise to a conflict between political and economic interests. There is a global interest that no further country acquires nuclear weapons. Nuclear weapon States want to maintain their elevated status and non-nuclear weapon States do not want to see an increased threat of nuclear war rising from an increased number of nuclear weapon States. However, as long as countries exploit the atomic nucleus for energy purposes, due to the dual-use characteristics of nuclear energy, there is always an underlying risk that countries use the technology for nuclear weapons. Consequently, any measure aiming to prevent the proliferation of nuclear weapons might impede the use of nuclear material for peaceful applications. It is important to acknowledge the substantial economic benefits offered by nuclear energy to numerous

268 A search of “ICJ Advisory Opinion Nuclear Weapons” on Google Scholar leads to about 37,600 results. See for example Laurence Boisson de Chazournes/Philippe Sands (eds.), *International Law, the International Court of Justice and Nuclear Weapons*, Cambridge: Cambridge University Press 1999; *Mariano J. Aznar-Gomez, The 1996 Nuclear Weapons Advisory Opinion and Non Liqueur in International Law*, *International and Comparative Law Quarterly* 48 (1999), 3–19; Special Issue, *International Review of the Red Cross*, No 316.

269 From the ICJ: Dissenting opinions of Vice-President Schwebel, Judge Shahabuddeen, Judge Weeramantry and Judge Koroma. From the literature, see for example *Eric David, The Opinion of the International Court of Justice on the Legality of the Use of Nuclear Weapons*, *International Review of the Red Cross* 316 (1997), 21–34; *Michael Greenwood, Jus ad bellum and jus in bello in the Nuclear Weapons Advisory Opinion*, in: Laurence Boisson de Chazournes/Philippe Sands (eds.), *International Law, the International Court of Justice and Nuclear Weapons*, Cambridge: Cambridge University Press 1999, 247–265.

270 On the various interests, see below Section 4.2.

countries by providing them with a stable supply of cheap energy. The oil crisis of the 1970s as well as the recent energy crisis in Europe following the targeted sanctions against Russia underscore the economic and political significance of affordable energy. Peaks in energy costs can have far-reaching political and societal ramifications.²⁷¹ The political impacts of the *Fridays for Future*²⁷² or *Gilets Jaunes*²⁷³ movement are examples of this political dimension of the transition towards greenhouse gas-free sources of energy. In addition, the heightened awareness of the climate crisis has led to a growing emphasis on nuclear energy, which plays an essential role for many countries in transitioning their energy production to greenhouse gas-free sources of energy, as for instance recognised by many States during COP28.²⁷⁴ The heightened attention towards nuclear energy is evident in both industrialised nations such as the United States, the United Kingdom or Poland, as well as countries in the Global South, including African nations.²⁷⁵ Energy is a matter of paramount importance to the sovereignty of a State.²⁷⁶ Any external interference, thus, is typically met with a degree of scepticism, being accepted only for reasons of equal importance, such as national security in the context of the proliferation of nuclear weapons.

In principle, the most effective strategy for ensuring the highest level of non-proliferation would be to impose a complete prohibition on nuclear

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- 271 *Kenneth E. Boulding*, The Social System and the Energy Crisis, *Science* 184 (1974), 255–257; *Daniel Faber*, Trump’s Election Victory, the Climate Crisis, and the Working Class: What Does this Mean for the Future?, *Capitalism Nature Socialism* 35 (2024), 1–18; *Jonathan Federle/Cathrin Mohr/Moritz Schularick*, Inflation Surprises and Election Outcomes, Kiel Working Paper 2278 (2024), 1–31.
- 272 *Marc Fabel/Matthias Flückinger/Markus Ludwig et al.*, The Power of Youth: Political Impacts of the “Fridays for Future” Movement, CESifo Working Paper 9742 (2022), 1–47.
- 273 *Pierre C. Boyer/Thomas Delemotte/Germain Gauthier et al.*, Les déterminants de la mobilisation des Gilets jaunes, *Revue économique* 71 (2020), 109–138.
- 274 See for example the Declaration Recognizing the Key Role of Nuclear Energy In Keeping Within Reach the Goal of Limiting Temperature Rise to 1.5 Degree Celsius, signed during COP28 in Dubai by 26 States. It is available at <https://www.energy.gov/articles/cop28-countries-launch-declaration-triple-nuclear-energy-capacity-2050-recognizing-key>, last accessed 25 February 2025.
- 275 *Joseph Maina*, Africa Explores Nuclear Energy as Climate-Friendly Way to Ease Power Shortfalls (2022); *Laura Gil*, Is Africa Ready for Nuclear Energy? (2018), International Atomic Energy Agency.
- 276 *Jorge E. Viñuales*, *Energy in International Law*, Cambridge: Cambridge University Press 2022, 45 ff.; *Magnus Abraham-Dukuma*, Sovereignty, Trade, and Legislation: The Evolution of Energy Law in a Changing Climate, *Energy Research & Social Science* 59 (2020), 101305; Principle 2 of the Rio Declaration on Environment and Development, A/CONF.151/26.

energy, potentially leading to significant impacts on domestic development. Conversely, the least effective strategy would be to implement no international control whatsoever, and giving nuclear energy no restraints in its development and deployment. Consequently, the non-proliferation regime aims to find a middle ground that offers the greatest benefits for both international security and domestic development.

Another dimension pertains to the financial implications of ensuring that non-nuclear weapon States remain nuclear weapons-free. The system of verification, termed *safeguards*, incurs various costs, both domestically and internationally. At the domestic level, safeguards impose costs on operators and exporters. Operating all verification systems and providing access to international inspectors lead to limitations in the operation of a power plant, thus leading to costs for operators.²⁷⁷ Exporters must follow strict export control laws, leading to additional costs and potentially facing a prohibition to export nuclear material to a specific country. Granting international inspectors access to information and facilities increases the risk of industrial espionage.²⁷⁸ More safeguards lead to more interference and more work for nuclear operators, increasing the cost and impacts of safeguards on their nuclear industries.²⁷⁹

At the international level, the implementation of a safeguards system leads to costs for the inspecting organisation, most notably the International Atomic Energy Agency (IAEA). In accordance with numerous international organisations,²⁸⁰ the IAEA's budget has been subject of a zero growth policy for many years.²⁸¹ Any increase of the Agency's budget is limited to a price adjustment following inflation. The IAEA has an operational regular budget of \$ 390.2 million, with 39 % allocated to nuclear verification, by

277 David Fischer, Innovations in IAEA Safeguards of Meet the Challenges of the 1990s, in: David Fischer/Ben Sanders/Lawrence Scheinman/George Bunn (eds.), *A New Nuclear Triade: The Non-Proliferation of Nuclear Weapons, International Verification and the International Atomic Energy Agency*, Southampton: The Mountbatten Centre for International Studies, University of Southampton 1992, 27–43, at 28.

278 Ibid.

279 Ibid. Especially Germany was quite hesitant to accept strengthened safeguards and took a leading role of a critical block in the negotiations, *Oliver Meyer, A Civilian Power Caught Between the Lines: Germany and Nuclear Non-Proliferation*, Trier: 1998.

280 Examples are the International Organization for Migration or the UNFCCC Secretariat.

281 *Trevor Findlay, Unleashing the Nuclear Watchdog – Strengthening and Reform of the IAEA* (2012), Centre for International Governance Innovation.

far the largest item of the budget.²⁸² This underscores that any modification or evolution of the safeguards system gives rise to questions regarding costs. Do countries accept potential economic losses for their operators and exporters? Do countries accept to increase the budget of the IAEA? Most often the answer is no.

2 The Law of Nuclear Non-Proliferation

The law of nuclear non-proliferation contains of various legal sources on the international and European level. The regime tries to comprehensively prevent the further spread of nuclear weapons and consists of four elements:²⁸³ Commitments by non-nuclear-weapon States not to develop and build nuclear weapons, deterring measures to prevent the dissemination of means to build nuclear weapons, verification of compliance, and enforcement.

International law provides only limited means of enforcement. As the failure to comply with the regime of nuclear weapons has far-reaching consequences to the international security architecture, nuclear weapons law includes methods of ensuring compliance which are more impactful than most other regimes. The field of nuclear non-proliferation law has developed two methods to verify compliance: safeguards and export controls. Safeguards focus on the verification of the amount, use and location of nuclear material within a country, while export controls impose restrictions on access to material and technologies necessary for nuclear weapons production.

Safeguards are typically categorised by their focus: Material-based safeguards focus on material, its location, use and deposition. Facility-based safeguards focus on facilities, how they are designed and operated as well as how they handle material. For the development of nuclear weapons, both facilities and materials are important. Without material, there is no bomb, but without facilities there is no possibility to enrich or produce the material required for the bomb.

282 International Atomic Energy Agency, *The Agency's Programme and Budget 2022–2023*, GC(65)/2, at 11.

283 Ben Sanders, IAEA Safeguards: A Short Historical Background, in: David Fischer/Ben Sanders/Lawrence Scheinman/George Bunn (eds.), *A New Nuclear Triad: The Non-Proliferation of Nuclear Weapons, International Verification and the International Atomic Energy Agency*, Southampton: Mountbatten Centre for International Studies, University of Southampton 1992, 1–13.

In the decade following the invention of the atomic bomb, there were only limited international instruments to ensure nuclear non-proliferation (2.1). It was not until 1957 with the establishment of the International Atomic Energy Agency (IAEA) that an international organisation was created with a significant level of authority (2.2). This institution is charged with ensuring compliance with the Nuclear Non-Proliferation Treaty (2.3) and safeguards agreements (2.4). In Europe, safeguards are further implemented by Euratom institutions and regulations (2.5). Beyond the realm of safeguards, export controls play a significant role in ensuring nuclear non-proliferation (2.6).

2.1 Non-Proliferation Predating the IAEA

The non-proliferation regime is a highly political regime that consists of a web of legal sources. While it emerged as a fragmented system in 1945 and remained so for decades, a standard level of safeguards converged into an almost universal system by the end of the 20th century. Historically, the genesis of the regime can be traced back to the United States' desire to maintain its monopoly of nuclear weapons following the Trinity Test in 1945, while also benefiting from exporting civilian nuclear technology.²⁸⁴ Consequently, the first non-proliferation measures were codified in US domestic law and bilateral treaties between the United States and an importing State. Prior to the establishment of the IAEA and Euratom in 1957, specialists of the US Atomic Energy Commission (AEC) verified the use of exported nuclear goods.²⁸⁵ During this time, the United States proposed in the so-called Baruch Plan the creation of an International Atomic Development Authority which would have had a global monopoly on the mining of nuclear material and on the operation of nuclear power plants, while also establishing and operating a safeguards mechanism.²⁸⁶ Also, the United

284 *Grégoire Mallard*, *Fallout: Nuclear Diplomacy in an Age of Global Fracture*, Chicago: The University of Chicago Press 2014, 120 f.

285 The plan was based on the earlier Acheson-Lilienthal report which was mainly drafted by Dean Acheson (then Undersecretary of State), David E. Lilienthal (then director of the Tennessee Valley Authority) and J. Robert Oppenheimer (Leader of the Manhattan Project). The Baruch Plan was presented by Bernard Baruch, representative of the United States to the UN Atomic Energy Commission, to this commission on 14 June 1946.

286 *Elisabeth Röhrlich*, *Inspectors for Peace*, Baltimore: John Hopkins University Press 2022, at 24.

States pledged to decommission their nuclear weapons in the process. This plan was quickly rejected by the Soviet Union due to a lack of trust – since the United States had tested nuclear weapons secretly in 1945, there was a perceived possibility of it doing so again – and the fear of the United States prolonging its nuclear monopoly.²⁸⁷ The first international safeguards system was established in a cooperation treaty between the United States and Euratom.²⁸⁸

2.2 The IAEA Statute

The International Atomic Energy Agency (IAEA) is widely regarded as the world's nuclear watchdog.²⁸⁹ While the IAEA's powers are limited in relation to other areas of nuclear law such as nuclear safety and security,²⁹⁰ it is in the domain of non-proliferation that the watchdog has teeth²⁹¹ and where it has significant authority.

2.2.1 The IAEA's Authority as Nuclear Watchdog

Limiting the proliferation of nuclear weapons stands at the very heart of the International Atomic Energy Agency. The IAEA was founded in 1957

287 Mallard (n 284), at 67–72.

288 Articles XI and XII of the Agreement For Cooperation Between The Government Of The United States Of America And The European Atomic Energy Community (Euratom) Concerning Peaceful Uses Of Atomic Energy of 8 November 1958.

289 See for example Findlay (n 281); Tobias Weise, *The Involuntary Watchdog: Legitimizing the International Atomic Energy Agency*, in: Klaus Dingwerth/Antonia Witt/Ina Lehmann/Ellen Reichel/Tobias Weise (eds.), *International Organizations under Pressure – Legitimizing Global Governance in Challenging Times*, Oxford: Oxford University Press 2019, 130–160; Mohamed ElBaradei, *Nuclear Power – an Evolving Scenario*, IAEA Bulletin 46 (2004), 4–8.

290 Nuclear safety describes the area of nuclear law which aims at preventing accident, mitigating accident consequences and protecting workers, the public and the environment from undue radiation risks. Nuclear security aims at preventing, detecting and responding to criminal or intentional unauthorised acts involving or directed at radioactive material or nuclear facilities. On this, see *International Atomic Energy Agency*, IAEA Nuclear Safety and Security Glossary, Vienna: IAEA 2022, at 139 f.

291 Wolfram Tonhauser, *The International Atomic Energy Agency as the “Watchdog” over the Safe and Peaceful Use of Nuclear Energy?*, in: Kerstin Odendahl (ed.), *Internationales und europäisches Atomrecht*, Berlin: Duncker & Humblot 2013, 167–184.

following US President Eisenhower's proposal of an international organisation at the UN General Assembly in his famous *Atoms for Peace* speech.²⁹² He envisaged an international organisation that possesses and distributes nuclear material supplied by both the United States and the Soviet Union. His idea was to limit the Soviet Union's capacity to build a nuclear weapon by ensuring that the Soviet Union would supply so much uranium to this international pool that their remaining resources would not suffice to build a weapon.²⁹³ While Eisenhower underestimated the available resources of uranium, the very foundation of the IAEA was shaped by the global interest to limit the proliferation of nuclear weapons.

The IAEA is headquartered at the Vienna International Center, sharing its offices with the United Nations Office in Vienna. It is not a UN specialised agency, but the two organisations are linked by a Relationship Agreement.²⁹⁴ 178 States have ratified its Statute. It has a typical structure of an international organisation with an assembly of all Member States, a General Conference, a Board of Governors as an executive organ, and a bureaucratic body of international public servants led by a Director General. The General Conference and the Board of Governors make up the policy-making bodies of the IAEA. The General Conference convenes once per year and each country has one single vote. This body decides with a simple majority of votes except for financial questions, amendments of the Statute and the suspension of voting rights in which cases a two-thirds majority is required.²⁹⁵ In practise, the General Conferences adopts decision by consensus.²⁹⁶ The Board of Governors currently consists of 35 Member States, including the "most advanced countries in the technology of atomic energy" and additional representatives from specific regions of the world.²⁹⁷

292 The transcript of the speech is available at <https://www.iaea.org/about/history/atoms-for-peace-speech>, last accessed 25 February 2025.

293 *Röhrlich* (n 286), at 41.

294 Agreement Governing the Relationship Between the United Nations and the International Atomic Energy Agency, published as INFCIRC/11.

295 This is set out in Article V of the IAEA Statute.

296 *Laura Rockwood*, *The International Atomic Energy Agency (IAEA)*, in: Eric Myer/Thilo Maruhn (eds.), *Research Handbook on International Arms Control Law*, Cheltenham: Elgar 2022, 503–529, at 509.

297 This is set out in Article VI.A.1 of the IAEA Statute. The Board of Governor currently is composed of Algeria, Argentina, Armenia, Australia, Bangladesh, Belgium, Brazil, Burkina Faso, Canada, China, Colombia, Ecuador, Egypt, France, Georgia, Germany, Ghana, India, Indonesia, Italy, Japan, the Republic of Korea, Luxembourg, Morocco, the Netherlands, Pakistan, Paraguay, Russia, South Africa, Spain, Thailand, Ukraine, the United Kingdom, the United States and Venezuela.

As with the General Conference, each Member State has one vote and the Board usually decides with a simple majority except for budgetary and financial questions where a two-thirds majority is necessary.²⁹⁸ It is important to note that no country has a veto right in any policy-making body, neither directly like in the UN Security Council,²⁹⁹ nor indirectly like in the Bretton Woods system³⁰⁰. The Director General, currently the Argentinian diplomat *Rafael Mariano Grossi*, is appointed by the Board of Governors with the approval of the General Conference and is the chief of the administrative officers of the IAEA.³⁰¹

The IAEA's extensive authority in the field of nuclear non-proliferation has led to its depiction as *nuclear watchdog*. The next section analyses these powers.

2.2.2 The IAEA's Powers in Nuclear Non-Proliferation

While most of the safeguarding powers are derived from bilateral (or trilateral³⁰²) agreements, the Statute of the IAEA itself contains the foundation of the IAEA's powers, including the safeguards system. Outlined as a function of the Agency in Article III.A.5 and specified in Article XII, safeguards are a significant field of operation of the IAEA. Article III.A.5 grants the IAEA the authority "to establish and administer safeguards." These safeguards are designed to ensure that "special fissionable and other materials, services, equipment, and information [...] are not used in such a way as to further any military purpose." Furthermore, the Statute authorises the Agency "to apply safeguards, at the request of the Parties, to any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy." The application of this provision to fusion is a key question that will be addressed in the subsequent chapter.

Article XII of the IAEA Statute envisages a safeguards system that includes equipment and facilities (facility-based approach) next to a pure material-based approach started by US domestic law. This system is further specified in various decisions by the IAEA's Board of Governors.³⁰³ In

298 This is set out in Article VI of the IAEA Statute.

299 Article 27 para. 3 of the UN Charter.

300 Article XII of the IMF Agreement, Article VI of the World Bank Agreement.

301 This is set out in Article VII of the IAEA Statute.

302 In some cases, Euratom is also a Party to the agreement.

303 Especially INFCIRC/26 and INFCIRC/66. On this, see below Section 2.4.1.

accordance with Article XII, the IAEA has specific rights and responsibilities when requested to apply safeguards by the Parties. They include the examination of facility and equipment designs, the verification of the use of source and special fissionable material, requesting data, sending inspectors into countries and to suspend or terminate assistance in the case of non-compliance.

In the event that a State is found to be in non-compliance, the inspectors report to the Director General, who, in turn, reports to the Board of Governors. The Board of Governors reports such a case of non-compliance to all Members of the IAEA, the UN Security Council and the UN General Assembly. Furthermore, it possesses the authority to suspend assistance or even membership rights of the respective country, as outlined in Article XII.C.

The IAEA's main role in safeguards is to implement safeguards, according to Article III.A.5 of the IAEA Statute, when requested by a treaty, such as the Non-Proliferation Treaty.

2.3 The Non-Proliferation Treaty

The most important legal instrument within nuclear weapons law and one of the most adhered to international treaties is the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

2.3.1 The Cornerstone of Nuclear Non-Proliferation

The NPT is widely regarded as the cornerstone of the nuclear non-proliferation regime.³⁰⁴ There is no other treaty regarding nuclear weapons that has as many Member States as the NPT and no other treaty has shaped nuclear non-proliferation as profoundly as the NPT did. Most discussions

304 See e.g. *U.S. Department of State, The Nuclear Non-Proliferation Review Conference, 2022*; *Leonard S. Spector, Meeting the New Challenges to the NPT, Disarmament Topical Papers 8 (1991), 177–194*; *Thomas Graham Jr./Damien J. LaVera, Cornerstone of Security – Arms Control Treaties in the Nuclear Era, Seattle, London: Univeristy of Washington Press 2002, at 98 ff.* Recently, *Joelien Pretorius and Tom Sauer* challenged the NPT's role as cornerstone, *Joelien Pretorius/Tom Sauer, Ditch the NPT, Survival 63 (2021), 103–124*; *Joelien Pretorius/Tom Sauer, When is it Legitimate to Abandon the NPT? Withdrawal as a Political Tool to Move Nuclear Disarmament Forward, Contemporary Security Policy 43 (2022), 161–185.*

concerning nuclear non-proliferation regard the implementation of the NPT.

The treaty was negotiated in the context of the rapid proliferation of nuclear weapons, beginning with the United States' first testing of nuclear weapons in 1945, followed by the Soviet Union's first test in August 1949, the United Kingdom's first test in October 1952, France's first test in February 1960 and China's first test in October 1964. The 1960s were characterised by the widespread fear of further proliferation of nuclear weapons. At that time, several other countries aspired for nuclear weapons, such as, among others, Sweden,³⁰⁵ Brazil³⁰⁶ and Germany³⁰⁷. South Africa even built a handful of nuclear explosive devices.³⁰⁸

To interrupt this momentum of nuclear weapon proliferation, following a proposal by Ireland,³⁰⁹ the Eighteen Nations Committee on Disarmament (ENDC)³¹⁰ undertook negotiations on the NPT between 1965 and 1968. The ENDC followed the Ten Nations Committee on Disarmament, a forum which was founded by the Big Four powers (United States, United Kingdom, France, Soviet Union) in 1960 with the objective of addressing the issue of nuclear disarmament and consisted of five NATO and five Warsaw Pact States.³¹¹ The ENDC added eight non-aligned States to the conversation on disarmament. The negotiations conducted by the conference were based on two identical drafts submitted by the United States

305 *Thomas Jonter/Emma Rosengren*, From Nuclear Weapons Acquisition to Nuclear Disarmament – The Swedish Case, in: Ilkka Taipale (ed.), *Nuclear Exits – Countries Foregoing the Nuclear Option*, London: Routledge 2016, 46–63.

306 *Matias Spektor*, The Evolution of Brazil's Nuclear Intentions, *The Nonproliferation Review* 23 (2016), 635–652.

307 *Romberg* (n 242), at 55.

308 *Stumpf* (n 242).

309 The so-called Irish Resolution included a first proposal for the prevention of the wider distribution of nuclear weapons. It is available at https://archives.nato.int/uploads/r/nato-archives-online/7/2/6/7266018483f149bf8190c1673dbbdf09e298829348947eb7f77fc10af7043e1a/1_-_POL_VII_Nuclear_Weapons_Irish_Resolution_To_UN_1961_ENG.pdf, last accessed 25 February 2025.

310 The Committee was established by UN General Assembly Resolution A/RES/16/1722 and was composed of Brazil, Bulgaria, Burma, Canada, Czechoslovakia, Ethiopia, France, India, Italy, Mexico, Nigeria, Poland, Romania, Sweden, Union of Soviet Socialist Republics, United Arab Republic, United Kingdom of Great Britain and Northern Ireland and United States of America.

311 It was composed by Canada, France, United Kingdom, Italy, United States (NATO) and Bulgaria, Czechoslovakia, Poland, Romania, Soviet Union (Warsaw Pact).

and the Soviet Union.³¹² Both the forum and the draft show the hegemonic influence of NWS on the NPT. The finalised treaty was referred to the UN General Assembly for adoption, which took place on 12 June 1968 with 95 votes in favour, 21 abstentions³¹³ and four no³¹⁴ votes.³¹⁵

As demonstrated by the result of the vote, approximately 20 % of the Members of the UN General Assembly did not vote in favour of the NPT. In its early days, many States highly criticised the treaty. A central point of critique was the enshrinement of super-power status by the permanent Members of the UN Security Council, while all other States had to renounce nuclear weapons. Some State officials even denounced the discriminatory structure as the establishment of a “super-cartel of the world powers”³¹⁶ or nuclear apartheid.³¹⁷ Even States that the treaty recognises as NWS were hesitant to join treaty, such as China and France. France hesitated to join the treaty for economic (being able to export nuclear goods freely) and political (escaping the hegemony of the United States and USSR) reasons.³¹⁸ China, in support of the Global South, condemned the nuclear monopoly of five NWS and the interference with national nuclear programmes.³¹⁹

Nevertheless, over the subsequent decades, more and more States joined the NPT. Resistance against the treaty fell as the Cold War came to a close. A significant milestone in terms of adherence was reached in 1992 when France and China ratified the treaty. Today, the treaty has 190 Parties. The

312 *United Nations*, Yearbook of the United Nations 1968, New York: United Nations 1968, at 4.

313 Algeria, Argentina, Brazil, Burma, Burundi, Central African Republic, Republic of Congo, France, Gabon, Guinea, India, Malawi, Mali, Mauritania, Niger, Portugal, Rwanda, Saudi Arabia, Sierra Leone, Spain and Uganda.

314 Albania, Cuba, Tanzania and Zambia.

315 A/RES/2373 (XXII).

316 Federal Republic of Germany’s Finance Minister Franz Josef Strauß in a letter to Federal Republic of Germany’s Chancellor Kurt Georg Kiesinger, 15 February 1967, Archive for Christian-Democratic Policy 01–226–285.

317 India uses this framing, see for instance the comments of government officials *Krishnan Raghunath*, *From Nuclear Apartheid to Nuclear Deal: The First Steps*, *Indian Foreign Affairs Journal* 5 (2010), 85–122; *Jaswant Singh*, *Against Nuclear Apartheid Essay*, *Foreign Affairs* 77 (1998), 41–52.

318 *Georges-Henri Soutou*, *La France et la non-prolifération nucléaire*, *Revue historique des armées* 262 (2011), 35–45; *Bertrand Goldschmidt*, *La France et la non-prolifération*, *Relations internationales* (1992), 41–50.

319 *Zachary S. Davis*, *China’s Nonproliferation and Export Control Policies: Boom or Bust for the NPT Regime?*, *Asian Survey* 35 (1995), 587–603, at 588 f.

only countries outside the treaty are the nuclear weapons possessing States of Pakistan, India, North Korea³²⁰ and Israel, as well as the young and troubled nation of South Sudan.

2.3.2 Legal Framework of the NPT

A fundamental principle of the treaty is the delineation of the world into two distinct categories of States: Nuclear-Weapon States (NWS), the *Haves*, and Non-Nuclear-Weapon States (NNWS), the *Have-nots*. Article IX para. 3 defines NWS as those countries that have successfully conducted a nuclear weapons test prior to 1 January 1967. This criterion is met by the United States, the Soviet Union, the United Kingdom, France and China. NWS are allowed to possess nuclear weapons, Article I, while NNWS are forbidden to possess, manufacture or control nuclear weapons or other nuclear explosive devices³²¹, Article II. NWS are further not allowed to assist, encourage or induce nuclear weapons programmes in NNWS, Article I. Non-proliferation is verified by a safeguards system and the implementation of export controls, Article III. The majority of States have thus agreed to never obtaining nuclear weapons while accepting that the P5 keep the weapon that has proven to be the most devastating military instrument humankind has ever created. The acceptance of such a discriminatory system required concessions from NWS. Firstly, Articles IV and V stipulate provisions for technical assistance. While NNWS renounce the possession of nuclear weapons, they receive assistance in using the atomic nucleus for peaceful purposes. This assistance includes support in building nuclear power plants as well as the use of radiological technologies in medicine or agriculture.³²² Secondly, Article VI includes a provision on the cessation of the nuclear arms race and sets a pathway to nuclear disarmament, even including the prospect of a treaty on general and complete disarmament.

320 There is some ambiguity in North Korea's standing within the NPT, *Masahiko Asada*, *International Law of Nuclear Non-Proliferation and Disarmament* (Volume 424), The Hague: Brill | Nijhoff 2022, 73–75.

321 Historically, there was a differentiation between nuclear explosive devices used as a weapon and those used for civilian purposes, such as excavating.

322 In 2023, the IAEA spent approximately 130 Million euros in its technical cooperation programme, *International Atomic Energy Agency*, Technical Cooperation Report for 2023, GC(67)/RES/9, Vienna: IAEA 2024.

The objective of the treaty can be outlined as follows: Freezing the status quo of nuclear powers at the moment of negotiation without impeding the deployment of commercial nuclear activities and by promising disarmament. Given that the primary nuclear exporters in the late 1960s were the United States and the Soviet Union,³²³ maintaining the status quo and fostering nuclear export follows the clear interest of the hegemonic powers of the Cold War. The treaty provisions of Article VI on nuclear disarmament as well as the prospects of complete and general disarmament was a concession for non-nuclear weapon States to accept the treaty. This hegemonic imbalance in the treaty's power dynamics is further underscored by the language of the provisions. While the articles on freezing the status quo contain legal obligations indicated by clear legal indicators such as “undertakes”, “not to transfer”, “not [...] to assist, encourage or induce”, “not to receive”, “not to manufacture or otherwise acquire”, “not to seek”, “accept” and “not to provide”, the language regarding disarmament is significantly weaker. In this case, the obligation is limited to undertakings “to pursue negotiations in good faith.”

Every five years, all State Parties of the NPT meet and review the progress of implementing the treaty's provisions in so-called Review Conferences (or RevCons for short), Article VIII.III of the NPT. In the three years leading to a RevCon, State Parties meet in Preparatory Commission (or PrepCom for short) to prepare the upcoming RevCon.

Originally, the nuclear status quo was intended to be provisional: Article X para. 2 of the NPT stipulates a limited duration of 25 years. Despite the end of the Cold War, hegemonic powers succeeded in indefinitely extending the NPT at its Review and Extension Conference of 1995.

These three aspects of the NPT – non-proliferation, technical assistance and nuclear disarmament – are referred to as the three pillars of the NPT.³²⁴ The entire construct of agreeing to a discriminatory treaty for technical

323 On their nuclear export policies, see *Gloria Duffy*, Soviet Nuclear Export, *International Security* 3 (1978), 83–111; *Michael A. Bauser*, United States Nuclear Export Policy: Developing the Peaceful Atom As a Commodity in International Trade Selected Developments in International Trade and Investment Controls, *Harvard International Law Journal* 18 (1977), 227–272.

324 *Daniel H. Joyner*, *Interpreting the Nuclear Non-Proliferation Treaty*, Oxford: Oxford University Press 2011, at 26; *Ingrid Kirsten/Mara Zarka*, Balancing the Three Pillars of the NPT: How Can Promoting Peaceful Uses Help?, *Non-Proliferation and Disarmament Papers* 79 (2022), 1–18; *Dean Rust*, How We've Come to View the NPT: Three Pillars, in: Henry Sokolski (ed.), *Nuclear Rules, Not Just Rights: The NPT Reexamined*, Arlington: Nonproliferation Policy Education Center 2017, 37–101.

assistance and the perspective of nuclear disarmament is termed as the *grand bargain*.³²⁵

For this analysis, the NPT safeguards provisions are important. The NPT itself does not contain any detailed provisions on how the safeguards system looks like. Article III.1 requires all States to accept safeguards which are set forth and negotiated in an agreement with the IAEA. These agreements must be in accordance with the IAEA's Statute and the IAEA's safeguards system. The scope of safeguards is limited to "the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons." In terms of procedure, they "shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility." The NPT further stipulates "that safeguards required by this Article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere."

Safeguards obligations are further defined in agreements between the State Parties and the IAEA.

2.4 Safeguards Agreements

Safeguards are the core of the verification regime in nuclear non-proliferation law. The underlying objective of safeguards is twofold: confidence-building and deterrence.³²⁶ On the one hand, safeguards lead to trust among States by demonstrating good behaviour. On the other hand, States are deterred to start a nuclear weapons programme given the high risk of discovery.

Today's conception of safeguards is to focus on nuclear material in civilian facilities with a relatively recent shift to also look comprehensively at nuclear activities in a non-nuclear weapon State as a whole. The objective of safeguards is to monitor the amount, use and location of nuclear material

325 Leonard Weiss, Nuclear-Weapon States and the Grand Bargain, *Arms Control Today* 33 (2003), 21–25; Phil Twyford, What Next for the Nuclear "Grand Bargain?", *New Zealand International Review* 47 (2022), 19–23; Christian Mölling, The Grand Bargain in the NPT: Challenges for the EU Beyond 2010, in: Jean Pascal Zanders (ed.), *Nuclear Weapons After the 2010 NPT Review Conference*, Paris: European Union Institute for Security Studies (EUISS) 2010, 49–70.

326 Sanders (n 283).

in order to ensure that such material is only used for peaceful purposes. Nuclear material within a country is monitored and accounted for by the IAEA from its entry until its deposition or exit. These powers of the IAEA are set out in safeguards agreements which have evolved since the IAEA's foundation in 1957.

2.4.1 Structure of Safeguards Agreements

Safeguards agreements are agreements concluded between the IAEA and a State. While each NNWS concludes a safeguards agreement individually, their content is the same for all. In order to ensure that all agreements are identical in content, the development and conclusion of safeguards agreement follows a specific procedure. The Board of Government decides on the content and structure of the agreement. While the Board's decisions on early stages of the safeguards system contained the outline of the content and structures with the precise content to be specified in negotiations with the IAEA Director General, the most recent iteration of safeguards – the Additional Protocol – was adopted by the Board as a template where only the name of the State is added.

During the negotiations of a safeguards agreement, the Board of Government considers the input of committees and the IAEA Secretariat.³²⁷ The adoption of such a template agreement is published in the IAEA's information circular (INFCIRC) series and made available to all Member States. The safeguards system predating the NPT is published in INFCIRC/26 and was expanded by a decision of the Board published in INFCIRC/66, the NPT-mandated comprehensive safeguards agreement is published as INFCIRC/153(Corrected) and the model Additional Protocol is published as INFCIRC/540(Corrected). Following the adoption of a template agreement, the Board of Governors instructs the Director General to conclude and subsequently implement safeguards agreement individually with each non-nuclear weapon State Party of the IAEA.

As the content and structure of the safeguards agreements with each NNWS only translates the decision of the Board of Governors, it is customary to refer to the INFCIRC document containing the decision rather than quoting each individual safeguards agreement. Legally, however, it is important to note that obligations of States and the authority of the IAEA

327 *International Atomic Energy Agency, IAEA* (ed.), *The Evolution of IAEA Safeguards*, Vienna: IAEA 1998.

only come from the individual safeguards agreement concluded by the State, not from the Board of Governors' decision.

2.4.2 Safeguards Predating the NPT

The first safeguards system administered by the IAEA was established in 1961, four years after the foundation of the Agency and seven years before the adoption of the NPT. This system was established by the IAEA's Board of Governors in a decision which is published in INFCIRC/26,³²⁸ and focused on States receiving technical assistance from the IAEA. The entire safeguards system was based on two provisions within the IAEA's Statute, Articles III.A.5 and XII. It was subsequently expanded in 1965 by the Board of Governors in INFCIRC/66. This safeguards regime is item-specific in contrast to the later developed comprehensive safeguards agreements. This means that agreements concluded following INFCIRC/66 are limited to those facilities specifically listed in the agreement. Item-specific safeguards agreements are still guiding the IAEA's verification activity in States that are Members of the IAEA but not Parties to the NPT. This applies to India, Pakistan and Israel, but they do not update their agreements to include new nuclear facilities, especially those for military use. The limited effects of these agreements are obvious given the fact that these three countries all possess nuclear weapons.

Item-specific safeguards apply to both nuclear material³²⁹ and nuclear facilities³³⁰, as well as non-nuclear material and equipment (defined as items,³³¹ hence the name). The IAEA's powers include a design review of principal nuclear facilities,³³² review of reports³³³ and inspections.³³⁴

328 On pre-NPT safeguards, see *John Carlson/Vladimir Kuchinov/Thomas Shea, The IAEA Safeguards System Prior to the NPT from 1959 to 1972 (The IAEA's Safeguards System as the Non-Proliferation Treaty's Verification Mechanism, 2020), Nuclear Threat Initiative.*

329 Paras 32 ff. of INFCIRC/26; paras 19 ff. of INFCIRC/66.

330 Paras 36 ff. of INFCIRC/26, paras 30 ff. of INFCIRC/66.

331 Para. 31 of INFCIRC/26.

332 Paras 30 ff. of INFCIRC/66.

333 Paras 39 ff. of INFCIRC/66.

334 Paras 45 ff. of INFCIRC/66.

2.4.3 Comprehensive Safeguards Agreements and the Additional Protocol

The adoption of the NPT and especially its Article III led to a significant extension of the safeguarding responsibility of the IAEA upon entering into force in 1970. The IAEA is since is mandated to apply safeguards to all NNWS that had signed the NPT, not only to those States that received technical assistance. Additionally, the safeguards now applied to all source and special fissionable material in all peaceful activities, not only to a limited list of facilities as before.³³⁵ The implementation of the newly extended safeguards mandate was entrusted to the Safeguards Committee, open to all IAEA Member States and included leading experts in the field. However, it were the United States and the Soviet Union, as well as the advanced nuclear States of the Federal Republic of Germany and Japan, that dominated the negotiations.³³⁶

In 1972, the IAEA's Board of Governors adopted the "Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons" or INF-CIRC/153(Corrected), in order to operationalise Article III.1 of the NPT. Based on this document, the IAEA concludes individual Comprehensive Safeguards Agreements (CSA) with each NNWS Party to the NPT. This agreement stipulates the rights and privileges of the IAEA to verify that no nuclear material is diverted from civilian to military purposes. State Parties with no or limited nuclear material have the option to adopt the Small Quantities Protocol which simplifies the safeguards regime by suspending the application of a significant part of the CSA's provisions.³³⁷

In 116 paragraphs, the CSA sets out a comprehensive and detailed system. The agreement contains both competences and limits of the IAEA. The CSA requires a State to maintain an accounting and reporting mechanism for nuclear material subject to safeguards (paras 7, 31–32, 51–58, 62–67) and to provide the IAEA with information on nuclear material and facilities, including their designs (paras 8, 42–50). Furthermore, States accept IAEA inspectors entering their territories and facilities (paras 9, 70–89). These inspections include both routine and ad-hoc inspections. The agreement

335 Elisabeth Röhrlich, *Negotiating Verification: International Diplomacy and the Evolution of Nuclear Safeguards, 1945–1972*, *Diplomacy & Statecraft* 29 (2018), 29–50, at 40.

336 Ibid.

337 The implementation of safeguards under the Small Quantities Protocol is explained in detail in *International Atomic Energy Agency, Safeguards Implementation Guide for States with Small Quantities Protocols*, Vienna: IAEA 2013.

defines the objective of safeguards as the “timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons” (para. 28). In addition, the agreement contains a long list of definitions (paras 98–116). The implementation of safeguards must be designed in a manner to avoid “hampering the economic and technological development”, “undue interference in the State’s peaceful nuclear activities”, and to protect commercial and industrial secrets and to ensure optimum cost-effectiveness (paras 4–6). The question whether these provisions apply to fusionable material and fusion facilities will be addressed in the next chapter.

Despite the comprehensive nature of the agreement, subsequent events have demonstrated the limited authority of the IAEA in key domains. The discovery of clandestine nuclear activities by Iraq in 1991 led to the adoption of the “Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards”³³⁸ in 1997.³³⁹ The IAEA has since implemented Additional Protocols (AP) with 141 States,³⁴⁰ thereby extending the IAEA’s competences significantly. The AP obliges the State Party to inform the IAEA about *all nuclear activities*³⁴¹ and extends the IAEA’s rights to access all relevant locations throughout the nuclear fuel cycle,³⁴² including extensive competences of environmental sampling.³⁴³ The Additional Protocol fundamentally changed the approach to safeguards. While the IAEA Statute, the NPT and the CSA all focus on nuclear material mainly in nuclear facilities – specific material at specific locations –, the AP explicitly extends the safeguards to a broader list of facilities and – due to the explicit mentioning of environmental sampling – even outside declared locations. While under the CSA the IAEA also had the right to implement safeguards with a view of detecting undeclared facilities,³⁴⁴ such requests by the IAEA were quite

338 INFCIRC/540(Corrected).

339 *Laura Rockwood*, The IAEA’s Strengthened Safeguards System, *Journal of Conflict and Security Law* 7 (2002), 123–136; *Richard Hooper*, The System of Strengthened Safeguards, *IAEA Bulletin* 39/4 (1997), 26–30.

340 <https://www.iaea.org/sites/default/files/20/01/sg-ap-status.pdf>, last accessed 25 February 2025.

341 Article 2 of INFCIRC/540 (Corrected).

342 Article 5 of INFCIRC/540 (Corrected).

343 Article 6 of INFCIRC/540 (Corrected).

344 See paras 19, 76, 78–82 of INFCIRC/153 and the interpretation presented by *Laura Rockwood*, IAEA Safeguards: Correctness and Completeness of States’ Safeguards Declarations, in: *International Atomic Energy Agency* (ed.), *Nuclear Law: The*

rare.³⁴⁵ The AP further provides the IAEA with the right to complementary access.³⁴⁶ While the CSA provides the IAEA with the right to *special inspections*³⁴⁷, the notion itself implied circumstances of extraordinary concern, thus leading to the introduction of *complementary access* in the AP.³⁴⁸ Safeguards under the CSA focus primarily on a facility-by-facility basis to verify declared nuclear material at declared nuclear facilities,³⁴⁹ while the Additional Protocol aims to verify nuclear activities by a State as a whole. Chapter 3 will address the question of whether the IAEA's extended authority under the AP also extends to fusion.

2.4.4 Voluntary Offer Agreements

The NPT requires safeguards exclusively for NNWS. However, due to criticism from NNWS and concerns regarding the commercial disadvantage of operators who have to accept safeguards, the NWS accepted safeguards for their civilian infrastructure during the 1970s and 1980s.³⁵⁰ The five NWS under the NPT have concluded Voluntary Offer Agreements (VOA) with the IAEA.³⁵¹ These cover source and special fissionable material in specifically selected civilian nuclear facilities from which the IAEA can select those in which it verifies that the nuclear material in these facilities remains in peaceful activities. The NWS itself decides which facilities it opens for IAEA safeguards and it retains the right to remove any facility

Global Debate, The Hague: T.M.C. Asser Press 2022, 205–222. This is also reflected in decisions by the IAEA's Board of Governors, GOV/OR.776 paras 48, 83 f. and GOV/2636.

345 George Bunn, Nuclear Safeguards – How Far Can Inspectors Go?, IAEA Bulletin 48–2 (2007), 49–55.

346 Articles 4–6 of INFCIRC/540(Corrected).

347 Para. 73 of INFCIRC/153(Corrected).

348 Theodore Hirsch, The IAEA Additional Protocol: What It Is and Why It Matters, The Nonproliferation Review II (2004), 140–166, at 117.

349 Rockwood (n 344).

350 Adolf von Baekmann, IAEA Safeguards in Nuclear-Weapon States, IAEA Bulletin 30–1 (1988), 22–25 (22).

351 United States: INFCIRC/288 of 18 November 1977; United Kingdom: originally a tri-partite agreement between the United Kingdom, Euratom and the IAEA, INFCIRC/263 of 6 September 1976, which was replaced by INFCIRC/951 of 12 January 2021 due to Brexit with no change to the content; France: INFCIRC/290; Russia: INFCIRC/327 of 21 February 1985; China: INFCIRC/369 of 20 September 1988.

from its list.³⁵² The specific extent of the applied safeguards differs from NWS to NWS.³⁵³ Following the adoption of the Additional Protocol to the CSA for NNWS, all NWS have adopted additional protocols to their VOA, extending the authority of the IAEA and approaching the level of safeguards in NNWS.³⁵⁴ It is important to note that the additional protocol is unique for each NWS and differs from those for NNWS.³⁵⁵ None of the VOA's extended safeguards are as far-reaching as those for NNWS. For example, no NWS accepts environmental sampling. While the Additional Protocol to the CSA intended to increase the IAEA's capacity to detect undisclosed nuclear activities and other violations of the NPT, this is not the objective in NWS. In these countries, the VOAs' additional protocols serve to assist to the IAEA in developing more effective procedures, tools and techniques for safeguarding activities in NNWS.³⁵⁶ They also aim to encourage the acceptance of NNWS to accept the exercise of authority by the IAEA.³⁵⁷

2.5 Euratom Safeguards

Historically, European States pursued a path independent from the IAEA. In the same year as the IAEA was founded, the Euratom Treaty was signed by France, Federal Republic of Germany, Italy, Belgium, the Netherlands and Luxembourg.³⁵⁸ Today, all 27 EU Member States are Members of Euratom. In addition, Switzerland and the United Kingdom are associated

352 This is set out in Article 1 b) of each agreement. The United States limits the removal to associations with “activities of direct national security significance”, the United Kingdom “for national security reasons”, while France, Russia and China have not included limitations.

353 *von Baekmann* (n 350), at 23.

354 United States: INFCIRC/288/Add.1 of 9 March 2009; United Kingdom: INFCIRC/263/Add.1 of 24 February 2005 and replaced by INFCIRC/951/Add.1 of 12 January 2021; France: INFCIRC/290/Add.1 of 24 February 2005; Russia: INFCIRC/327/Add.1 of 8 January 2008; China: INFCIRC/369/Add.1 of 22 April 2002.

355 The differences are highlighted in *James Martin Center for Nonproliferation Studies*, Additional Protocol (Inventory of International Nonproliferation Organizations and Regimes, 2015).

356 Letter from Ambassador Kenneth Brill to the IAEA Director General, 30 April 2002, United States Senate Treaty Document 107–7, at 6.

357 *Frank S. Houck*, The Voluntary Safeguards Offer of the United States – A Review of its History and Implementation, IAEA Bulletin 27 (1985), 13–18.

358 The Euratom Treaty is one of the two Treaties of Rome, signed on 25 March 1957.

Members.³⁵⁹ Euratom is governed by the same institutions as the European Union.³⁶⁰ The Commission is the institution which assumes the safeguarding powers within Euratom.

This section first gives an overview of the historic development of the question of nuclear weapons under Euratom (2.5.1), before focussing on the safeguards regime under the Euratom Treaty (2.5.2).

2.5.1 The European Route

Euratom has played an essential role in the development of today's non-proliferation regime for several reasons. A core objective of the organisation is securing and providing Europe with nuclear material (Article 2(d) Euratom Treaty), thereby fostering the civilian development of nuclear energy. Apart from this civilian dimension, there are also indications that Euratom was intended to serve another purpose: A common Western European nuclear deterrence in Europe driven by France, Federal Republic of Germany and Italy.³⁶¹ It is important to note that in the mid and late 1950s only the United States, the Soviet Union and the United Kingdom possessed nuclear weapons with numerous countries around the world having nuclear ambitions. Nuclear weapons played a pivotal role in Western Europe, as *Bernard Baruch* – Presidential Advisor and US Representative to the United Nations Atomic Energy Commission and author of the aforementioned Baruch plan – stated: “The only thing that stands in the way of the over-running of Europe today is the atom bomb.”³⁶² At the same time, the rearmament of the Federal Republic of Germany, particularly with regard to nuclear weapons, was a highly debated topic in the 1950s. Ultimately, mainly pushed by *Charles de Gaulle*, France decided to unilaterally develop nuclear weapons and to abandon any European military nuclear cooper-

359 The United Kingdom is associated by the UK-EU Trade and Cooperation Agreement, Switzerland has a Cooperation Agreement in place since 1978. Association with Euratom is possible following Article 206 of the Euratom Treaty.

360 The institutions merged with the Treaty establishing a single Council and a single Commission of the European Communities, signed on 8 April 1965 in Brussels.

361 *Mallard* (n 284), at 117 ff. with further references. France, Federal Republic of Germany and Italy entered into a secret Tripartite Agreement in military nuclear cooperation discussing a potential use of Euratom for common nuclear weapons purposes.

362 Baruch 1948 (October 5), Letter to John Foster Dulles, cited after *ibid*, at 68.

ation.³⁶³ In 1960, France conducted its first nuclear weapons test in the Algerian desert. This led to an unanticipated scenario: Euratom provides its Member States with nuclear material, yet one of its Member States had become an NWS.

This situation has led to a distinctive characteristic of the Euratom safeguards regime: Rather than verifying that certain material is not diverted from peaceful to military purposes, the regime's objective is to verify that "ores, source materials and special fissile materials are not diverted from their intended uses", Article 77(a). Moreover, the scope of Euratom's safeguarding powers extend to verify that Member States are in accordance with safeguarding obligations assumed by Euratom under an agreement with an international organisation, Article 77(b).

The establishment of this specific safeguards regime gave rise to a considerable disagreement between Euratom Member States and the IAEA in the late 1960s and early 1970s. At the time the NPT was concluded, Euratom had already ten years of experience in administering safeguards. Consequently, the six Member States were reluctant to accept IAEA safeguards out of fear of giving up a functional safeguards system³⁶⁴ and the potential for industrial espionage by non-European inspectors.³⁶⁵ Another dispute emerged from a conflict between the NPT and existing treaties, with both the Euratom Treaty and the US-Euratom agreement being incompatible with the NPT safeguards system. The most significant conflict stemmed from the fact that within Euratom, a supranational organisation is responsible for all nuclear material.³⁶⁶ Acting in compliance with the NPT would necessitate the exercise of sovereignty in an area where sovereignty has already been delegated to a supranational organisation. However, Euratom was unable to join the NPT as intergovernmental organisation to an interstate treaty. Especially the Federal Republic of Germany was opposed to establishing official relations between Euratom and the IAEA as it feared that too many powers by the IAEA could undermine the legitimacy of Euratom controls.³⁶⁷ Thirdly, the discriminatory treatment between

363 Ibid, at 175.

364 H. W. Schleicher, Nuclear Safeguards in the European Community – A Regional Approach, IAEA Bulletin 22 (1980), 45–50.

365 Fischer (n 277), at 28.

366 Article 52 Euratom Treaty.

367 Memorandum of F. Cancellario D'Alena, from the Foreign Relations Department of Euratom. EC, BAC 086/1982–29, cited after Mallard (n 284).

Euratom Members – France as NWS and all other Euratom Member States as NNWS – was deemed unacceptable.³⁶⁸

In order to resolve the dispute, the IAEA and Euratom reached an agreement in 1973.³⁶⁹ This agreement provides for a cooperative application of safeguards by both the IAEA and Euratom. For example, Euratom carries out preliminary checks and analysis.³⁷⁰ The design of facilities is examined jointly and inspections of IAEA and Euratom are closely coordinated.³⁷¹ This agreement pathed the way to the accession of all Euratom NNWS to the NPT in 1975, and subsequently France's accession in 1992.

2.5.2 Safeguards in Europe

The Euratom Treaty includes an entire chapter (Chapter 7) on safeguards, with Article 77 introducing two avenues to apply safeguards, different to the safeguards regime introduced by the IAEA Statute and later the NPT. Firstly, as Euratom verifies that “ores, source material and special fissile materials are not diverted from their intended uses as declared by the users”, Article 77(a), there is a slightly different wording than the application of IAEA safeguards to source and special fissionable material. Another difference to IAEA safeguards is the application regardless of status as NWS or NNWS. Given the fact that the Euratom Treaty also applies to France and applied to the United Kingdom for decades as NWS, Euratom only focuses on verifying the declared use of that material, while the IAEA also verifies the absence of undeclared material.

The second pillar is the application of international safeguards agreements, Article 77(b). As mentioned above, Euratom and IAEA safeguards were in competition in the 1950s and 1960s, resulting today in a cooperative approach by both international organisations, which is based on an agreement pursuant Article 77(b).

368 Notes à la Commission de Cancelario d'Alena sur les répercussions du contrôle dans le Traité, Notes de la Commission sur le projet de l'URSS d'article n.3 du Traité et sur l'aide-mémoire américain à ce sujet, cited after *Mallard* (n 284).

369 Agreement between Euratom and the IAEA in Implementation of the Treaty on the Non-Proliferation of Nuclear Weapons of 1973.

370 *David Fischer*, IAEA/Euratom Agreement – An Explanation, IAEA Bulletin 15 (1973), 11–16.

371 *Ibid.*

Article 78 imposes an obligation to declare basic technical characteristics for facilities that work with source and special fissile materials to the Commission to facilitate its safeguarding operations.

Safeguards procedures under the Euratom Treaty encompass the verification of records (Articles 79, 82) and the right to access all places and data (Article 81). In the event of non-compliance, the Commission is authorised to issue sanctions, starting with a warning, the withdrawal of financial or technical assistance and extends as far as placing the undertaking under administration of the Commission or withdrawal of the material (Article 83). All sanctions are subject to review by the Court of Justice of the European Union. Safeguards under the Euratom Treaty, however, are limited by the dual nature of its Member States as the treaty applies to both NWS and NNWS: Safeguards may not extend to materials intended to meet defence requirements, Article 84.³⁷²

The detailed application of these safeguards is further delineated in Commission Regulation (Euratom) 302/2005 and in Commission Recommendation of 11 February 2009 on the implementation of a nuclear material accountancy and control system by operators of nuclear installations.

In accordance with Article 77(b) of the Euratom Treaty, Euratom has also adopted an Additional Protocol and verifies the Member States' compliance jointly with the IAEA.³⁷³

2.6 Export Controls

Complimentary to safeguards, export controls play an essential role in preventing the proliferation of nuclear weapons by regulating the conditions of the supply of both nuclear material and dual-use technology to a State. Supplier States only provide another State with such a material or technology if certain conditions are met. Unlike mandatory safeguards, the requirements of export controls also apply to all NPT Member States, both NWS and NNWS, via Article III.2 of the NPT.

372 The competences of the European Commission with regards to safeguards have been characterized as “extraordinary rights”, *Wolfgang Kilb*, *The Nuclear Safeguards Regime of EURATOM: A Regional Cornerstone of the Verification of Non-Proliferation Obligations in the European Union*, in: Jonathan L. Black-Branch/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law: Volume II – Verification and Compliance*, The Hague: T.M.C. Asser Press 2016, 151–165, at 154.

373 Additional Protocol 1999/188/Euratom.

This treaty provision prohibits to provide source or special fissionable material or equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to an NNWS for peaceful purposes, unless the source or special fissionable material is subject to safeguards. This treaty provision left open the question of when equipment or material is especially designed or prepared, as neither the NPT nor any other treaty includes a definition.

The NPT contains two mechanisms to ensure compliance: Safeguards and export controls. While Article III.1 of the NPT mandates the IAEA to apply safeguards and requires NNWS to conclude safeguards agreements with the IAEA, Article III.2 of the NPT leaves the implementation of export controls up to the Member States. The IAEA harmonises the application of safeguards to all NNWS, but there is no mandate within the NPT for an international organisation to harmonise export controls.

In order to establish a common understanding of definitions and procedures to specify the NPT's obligation with regard to export controls, nuclear exporting States have set up two informal groups: The Zangger Committee and the Nuclear Suppliers Group (NSG).

There are many similarities between the Zangger Committee and the NSG. Both are informal intergovernmental discussion groups that produce legally unbinding documents which serve as a basis for the harmonisation of the understanding and procedure of nuclear export controls.³⁷⁴ Also, there is a significant overlap of their Members. All 39 Member States of the Zangger Committee are also Members of the NSG, while the NSG has nine more Member States.³⁷⁵ Furthermore, both groups observe the work of and coordinate with the respective other group.³⁷⁶ Additionally, both groups work on an informal basis and rely on consensus-based rule-making.

2.6.1 Zangger Committee

The Zangger Committee was established in 1971 with the aim of harmonising the interpretation of Article III.2 of the NPT. It functions as an inter-

374 *Fritz W. Schmidt*, *The Zangger Committee: Its History and Future Role*, *The Nonproliferation Review* 2 (1994), 38–44, at 38 f.; *Fritz W. Schmidt*, *NPT Export Controls and the Zangger Committee*, *The Nonproliferation Review* 7 (2000), 136–145, at 138.

375 Brazil, Cyprus, Estonia, Iceland, Latvia, Lithuania, Malta, Mexico, Serbia.

376 *Schmidt*, *The Zangger Committee* (n 374), at 42 ff.

governmental forum to discuss export controls and to coordinate them. It is not a formal body of the NPT, nor an international organisation, but an informal intergovernmental forum for discussion.

Originally, 15 nuclear exporting States held informal meetings chaired by the Swiss diplomat *Claude Zangger*, hence the name. The primary objective of this committee is to find a common interpretation of Article III.2 of the NPT and to develop procedures for nuclear exports among participating governments.³⁷⁷ The committee, now comprising 39 Member States, maintains a Trigger list which stipulates the criteria that must be met for a State to export nuclear material.³⁷⁸ The consensual understanding of nuclear exporting States is that they may only export material listed on the Trigger List, if it is guaranteed that: Nuclear material must not be diverted to nuclear weapons, material and equipment has to be placed under IAEA safeguards, and re-exporting to a third State is only allowed under the same conditions as the first export.³⁷⁹

Decisions by the Zangger Committee, including the Trigger List, are legally non-binding and are limited to serve as a basis for harmonised unilateral policy declarations.³⁸⁰ Formally, they are adopted by an exchange of notes among the members of the Zangger Committee, unilaterally declaring that these understandings would be implemented through domestic export control and by sending letters to the Director General of the IAEA informing the Agency that the State intends to act in conformity with the understandings reached in the Zangger Committee.³⁸¹ The Trigger List as well as any subsequent updates are published by the IAEA in its Information Circular (INFCIRC) series as INFCIRC/209.

While decisions by the Zangger Committee itself are legally non-binding, they have legal implications. Subsequent agreements regarding the interpretation of a treaty or the application of its provisions and subsequent practise in the application of the treaty have to be taken into account according to the general rule of interpretation, enshrined in Article 31 para. 3 of the Vienna Convention on the Law of Treaties (VCLT). As the decisions taken by the Zangger Committee are non-binding, they do not constitute an

377 Ibid.

378 The most current version is from 2020, published as INFCIRC/209/Rev.5.

379 INFCIRC/209/Rev.5, para. 3.

380 *Schmidt*, The Zangger Committee (n 374), at 38.

381 NPT/CONF.2010/WP.I, para. 10.

agreement in the sense of Article 31 para. 3(a) VCLT.³⁸² They can, however, constitute subsequent practise establishing the agreement of the Parties regarding the interpretation of Article III.2 of the NPT, according to Article 31 para. 3(b) VCLT. As the majority of nuclear exporting State Parties to the NPT agree on the interpretation of Article III.2 of the NPT and act accordingly, the decisions by the Zangger Committee have to be taken into account in interpreting Article III.2 of the NPT. In addition, several documents of the NPT Review Conferences referred to the Zangger Committee's activity, some even underlying the contribution the Committee has in strengthening the implementation of Article III.2 of the NPT.³⁸³ Thus, the Trigger List and other decisions by the Zangger Committee have legal implications as they have to be taken into account in the interpretation of the NPT's export control obligations.

2.6.2 Nuclear Suppliers Group

The Indian nuclear test of 1974 showcased that there were gaps within the Zangger Committee regime. As response, nuclear exporting States, including France which has not been a Party to the NPT until 1992, met in London³⁸⁴ in 1974 to address the deficiencies. The NSG has a membership that extends beyond that of the Zangger Committee, and includes nine further States, totalling 48 Member States with relevant nuclear infrastructure. As the Zangger Committee, the NSG is an informal intergovernmental forum which takes no legally binding decisions. NSG Member States inform the IAEA Director General about their intent to apply the NSG Guidelines in their domestic legal order when considering the export of nuclear material, equipment or technology. The NSG Guidelines are also published by the

382 *Matthias Herdegen*, Interpretation in International Law, in: Anne Peters/Rüdiger Wolfrum (eds.), *Max Planck Encyclopedia of Public International Law*, Heidelberg, Oxford: Oxford University Press 2020, at para. 35.

383 An overview is given in Annex I of NPT/CONF.2010/WP.1, para. 10.

384 As a consequence, the NSG is sometimes referred to as "London Club", see e.g. *Louis Reitmann*, Reforming the 'London Club': How transparency and outreach can benefit the Nuclear Suppliers Group (2023), European Leadership Network; *Sarah Bidgood*, The Establishment of the London Club and Nuclear-Export Controls, Adelphi series 56 (2016), 135–162.

IAEA as INFCIRC/254. As with the Zangger Committee, the NSG Guidelines have to be translated into domestic law.³⁸⁵

The NSG bases its work on the Zangger Lists, but expands them in two key ways. First, it extends the list content-wise, by including important areas such as heavy water production items, which is not required by the NPT. Secondly, it introduces a procedural requirement for the recipient to assure the implementation of IAEA safeguards.³⁸⁶

The NSG Guidelines *de facto* specify and, in certain instances even exceed the export control regime required by Article III.2 of the NPT. Within the NSG, national governments establish rules and procedure for the export of nuclear material. These guidelines are divided into two parts. The first part – the so-called Trigger List³⁸⁷ – includes materials whose main purpose is to be used in nuclear technology. The second part – the so-called Dual Use List³⁸⁸ – contains materials, equipment and software that could contribute significantly to the development and/or construction of nuclear explosive devices, but which also have peaceful applications.

The NSG Guidelines require States to apply export controls if they intend to export material, equipment or software listed in either one of the lists. The specific export control procedure depends on the specific list. In the event that a given material, equipment or component is included on the Trigger List, the export State should require the recipient State to provide formal assurances that certain stipulated conditions are met: the material will not be used for “nuclear explosive activities”, the material should be placed under physical protection, and the material will only be transferred to NNWS under the condition that the material is subject to IAEA safeguards.³⁸⁹ Material listed on the Trigger List includes enriched uranium, natural uranium exceeding a certain threshold, and specific nuclear reactor components. For dual use items, the procedure is more lenient. If a recipient State wishes to receive an item on the Dual-Use List, the export may only be made to a NNWS if a CSA is in place with the IAEA, if there is no unacceptable risk of diversion to nuclear-weapons purposes, and if there is no unacceptable risk of diversion to acts of nuclear terrorism. Items

385 In the European Union Regulation (EU) 2021/821 of the European Parliament and of the Council of 20 May 2021 following Article 207 para. 1 TFEU incorporates the Guidelines of the Nuclear Suppliers Group.

386 On the history of the NSG, see *Tadeusz Strulak*, *The Nuclear Suppliers Group, The Nonproliferation Review* 1 (1993), 2–10.

387 INFCIRC/254, Part 1.

388 INFCIRC/254, Part 2.

389 INFCIRC/254, Part 1, para. 4.

on the Dual Use list include inter alia specific lasers, certain software, and equipment related to heavy water production.

As the NSG Guidelines do not constitute an agreement in the sense of Article 31 para. 3(a) VCLT, similar to the Zangger List, they are not subsequent agreements on the interpretation of the NPT provision. While the Zangger List has to be taken into account in interpreting Article III. 2 of the NPT as subsequent practise in the application of the NPT, the situation for the NSG Guidelines is different. First, the NSG extends export controls beyond to what is required by Article III.2 of the NPT. This indicates that the practise of applying export controls on certain goods is not *in application of the treaty*, as required by Article 31 para. 3(b) VCLT. Second, the NSG Guidelines show no indication that they are intended to be used in the application of the NPT. Where the NPT is mentioned, the reference is limited to encourage technology transfer following Article IV of the NPT³⁹⁰ or to define categories of procedural requirements for importing States.³⁹¹

The NSG Guidelines, in addition, do not constitute customary international law. This would require both a general practise (*consuetudo*) and the acceptance as law (*opinion iuris*).³⁹² There are doubts with regard to both elements that the NSG Guidelines constitute customary international law. First, the existence of a general and consistent practise is doubtful. On the one hand, the membership of the NSG is limited to only 48 States and excludes the majority of States.³⁹³ While it is not necessary that each and every State follows a certain practise, it has to be *sufficiently widespread and representative*.³⁹⁴ With regard to the NSG, this depends especially on whether or not all major nuclear exporting States follow the practise of implementing the NSG Guidelines. The NSG Member States include all nuclear exporting States that are Party to the NPT, however non-NPT States such as India and Pakistan export nuclear goods without following the NSG Guidelines. In addition, even those States that are part of the NSG do not always implement the guidelines, as there are plenty of exam-

390 INFCIRC/254, Part 1, paras 7 and 12.

391 INFCIRC/254, Part 2, para. 4.

392 Article 38 (1)(b) ICJ Statute, *Permanent Court of International Justice*, Lotus Case, PCJ (1927) Series A No. 10, at 28; *International Court of Justice*, North Sea Continental Shelf (Federal Republic of Germany v. The Netherlands), Judgment, ICJ Reports 1969, p. 3, at para. 77.

393 *Andrea Viski*, The Status of Nuclear Export Control Regimes in International Law, *Tilburg Law Review* 15 (2010), 183–204, at 201.

394 *International Law Commission*, Draft Conclusions on Identification of Customary International Law, New York: United Nations 2018, Conclusion 8.

ples where States do not follow the procedures, such as the United States exporting nuclear goods to India as a non-State Party to the NPT. A varying practise usually indicates the absence of a custom.³⁹⁵ Thus, the existence of practise as first constitutive element of customary law is doubtful.³⁹⁶

Second, States have to undertake the practise with a sense of legal right or obligation.³⁹⁷ On the one hand, NSG Member States inform the IAEA about their intent to implement the NSG Guidelines in their domestic legislations via a note verbal, indicating a sense of legal obligation. On the other hand, States are persistent in highlighting that the NSG is only an informal forum for discussing export controls and that the Guidelines are non-binding. Thus, there is no clear evidence for an *opinion juris* as second constitutive element. As a consequence, the NSG Guidelines do not reflect international customary law.

Thus, NSG Guidelines are legally non-binding, intended to harmonise national export control procedures without a legal obligation.

While the NSG has been regarded as a successful forum for promoting nuclear non-proliferation,³⁹⁸ the group has been subject to controversies and cannot escape current geopolitical tensions. While the Cold War had no effect on the work of the NSG, as both the United States and the Soviet Union cooperated productively,³⁹⁹ the topic of India has left its mark on the group. While being the reason for the formation in 1974, the United States has been advocating for years for exporting its nuclear goods to India despite the State's non-adherence to the NPT and refusal of comprehensive safeguards as it possesses nuclear weapons.⁴⁰⁰ There are further allegations that Russia and China have not respected NSG Guidelines in bilateral nuclear cooperation relationships as well.⁴⁰¹ A further controversy within the

395 Ibid, Conclusion 7.

396 Similar, *Viski* (n 393).

397 *International Law Commission* (n 394), Conclusion 9.

398 *Mark Hibbs*, The Nuclear Suppliers Group and Geostrategic Politics, *Strategic Trade Review* 3 (2017), 5–24; *Fred McGoldrick*, The Road Ahead for Export Controls: Challenges for the Nuclear Suppliers Group, *Arms Control Today* 41 (2011), 30–36.

399 *Hibbs* (n 398).

400 *Leonard Weiss*, U.S.-India Nuclear Cooperation, *The Nonproliferation Review* 14 (2007), 429–457; *Mario E. Carranza*, From Non-Proliferation to Post-Proliferation: Explaining the US–India Nuclear Deal, *Contemporary Security Policy* 28 (2007), 464–493; *Oliver Meier*, The US–India Nuclear Deal: The End of Universal Non-Proliferation Efforts?, *Internationale Politik und Gesellschaft* (2006), 28–43.

401 *McGoldrick* (n 398); *Sibylle Bauer*, Developments in the Nuclear Suppliers Group, in: Bates Gill/Ian Anthony/D.A. Cruickshank (eds.), *SIPRI Yearbook 2011*, Stockholm: SIPRI 2011, 376–386, at 384 f.; *Hibbs* (n 398).

NSG is whether to extend its export requirements from the implementation of a CSA to also require the implementation of the Additional Protocol.⁴⁰²

Chapter 3 will address the question of whether the export control regime finds an answer to fusion's proliferation potential.

2.7 The Limited Success Story of the Non-Proliferation Regime

This section analyses the limited success story of the NPT regime. While there are a lot of achievements attributable to the regime (2.7.1), there are also significant shortcomings (2.7.2), highlighting the highly political nature of the regime. This analysis allows to understand the feasibility of approaches developed in the next chapters in order to apply the regime to fusion.

2.7.1 Achievements

The NPT is by many regarded as the cornerstone of nuclear non-proliferation as there are significant achievements attributable to the regime. They include the establishment of an international norm and the prevention of nuclear proliferation. These achievements will be analysed in the following section.

2.7.1.1 Setting an International Norm

One of the NPT's achievements is the establishment of an international norm on nuclear non-proliferation. This is, firstly, evidenced by the significant number of States that have joined the treaty. The NPT has 190 State Parties, a number surpassed by only a few other treaties.⁴⁰³ Some characterise the treaty as “the most inclusive security treaty in the world.”⁴⁰⁴ Despite being negotiated during the Cold War, States from both East and

402 *Hibbs* (n 398), at 22; *McGoldrick* (n 398).

403 There are only 26 treaties with a higher number of State Parties. Examples are the UN Charter, the UN Framework Convention on Climate Change, the Convention on the Rights of the Child or the Chemical Weapons Convention.

404 *Maria Rost Rublee/Carmen Wunderlich*, *The Vitality of the NPT After 50*, *Contemporary Security Policy* 43 (2022), 5–23.

West as well as non-aligned States quickly joined the treaty. In its fifty-five years of existence, the NPT has established a near universal international norm against nuclear proliferation.⁴⁰⁵

This success is further underscored by the fact that the NPT has enabled the IAEA's characterisation as nuclear watchdog. As Article III.1 of the NPT requires NNWS to conclude Comprehensive Safeguards Agreements with the IAEA, all 185 non-nuclear weapon State Parties to the NPT have concluded these agreements, giving the IAEA extensive verification and monitoring rights. The regime has set up a detailed framework with a unique level of authority of an international organisation.⁴⁰⁶

The international norm is not only set for the present, but also for the future. While the treaty was created with a limited duration of 25 years, it has been indefinitely extended by the 1995 Review and Extension Conference. Consequently, the prohibition on the proliferation of nuclear weapons, in conjunction with the accompanying safeguards system, is set to remain indefinitely. The perpetual character of the norm is further supported by the requirements to withdraw from the regime. According to Article X.1 of the NPT, a withdrawal is only possible if a State "decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country." Despite numerous wars and tensions in the last decades, also including the involvement of NWS and even threats to use nuclear weapons against NNWS,⁴⁰⁷ there has only been one withdrawal, by North Korea, in 2003.⁴⁰⁸

Furthermore, States tried to act within the broader NPT framework even in times of crisis. For example, the NPT framework was operationalised to stop the Iranian nuclear weapons programme with the Joint Comprehensive Plan of Action (JCPoA) in 2015. The JCPoA was intended to guide a path for Iran to full compliance with the NPT, while at the same time

405 *Nobuyasu Abe*, The NPT at Fifty: Successes and Failures, *Journal for Peace and Nuclear Disarmament* 3 (2020), 224–233, at 4. *Spurgeon M. Keeny Jr.*, The NPT: A Global Success Story, *Arms Control Today* 25 (1995), 3–7 speaks of a "norm of international behavior".

406 On this, see above Section 2.2.1.

407 A recent example are Russia's threats to use nuclear weapons in Ukraine. On this, see *Tom Sauer*, How Useful Are Nuclear Weapons in Practice? Case-Study: The War in Ukraine, *Journal for Peace and Nuclear Disarmament* 7 (2024), 194–210.

408 On North Korea's withdrawal, see *Assia Dosseva*, North Korea and the Non-Proliferation Treaty Recent Developments, *Yale Journal of International Law* 31 (2006), 265–286; *Masahiko Asada*, Arms Control Law in Crisis? A Study of the North Korean Nuclear Issue, *Journal of Conflict and Security Law* 9 (2004), 331–355.

lifting sanctions against the Islamic Republic. The JCPOA included clear references to the NPT as the cornerstone of the nuclear non-proliferation regime,⁴⁰⁹ and the IAEA was mandated to monitor and verify compliance.⁴¹⁰ The protocol contains clear references to Iran's Comprehensive Safeguards Agreements as well as the Additional Protocol.⁴¹¹ Despite the risk of a breach of the NPT, States tried to find an answer within the regime to ensure further compliance with the treaty. While the JCPOA failed in the end, this is not due to shortcomings of the NPT and its regime, but due to a political decision of the first Trump administration.⁴¹² Enforcing compliance with the NPT through sanctions is a strong lever in international politics. A similar strategy has been followed with regard to North Korea following its withdrawal from the NPT in 2003 during the so-called six-party talks.⁴¹³ Similarly to the JCPOA, the objective of these talks was to encourage North Korea to rejoin the NPT regime in exchange for the lifting of sanctions. However, these talks ultimately failed due to North Korea withdrawing from the talks and resuming its nuclear weapons programme.

These examples illustrate the NPT's role in establishing an international norm against nuclear proliferation, something that no other international instrument has achieved.

2.7.1.2 Stopping Nuclear Weapons Programmes

In addition, the NPT has led to the cessation of several nuclear weapons programmes. Sweden has pursued nuclear weapons, but dismantled its programme after acceding to the NPT.⁴¹⁴ Similar developments were observed in South Korea,⁴¹⁵ Argentina and Brazil.⁴¹⁶ It also kept threshold States,

409 Preamble and General Provisions para. vii.

410 Preamble and General Provisions para. x.

411 E.g. paras 1 and 13.

412 *Mark Fitzpatrick*, *Assessing the JCPOA*, Adelphi series 57 (2017), 19–60, at 51 ff.

413 Five rounds of talks took place from 2003 to 2007. The six parties were China, Japan, North Korea, South Korea, Russia and the United States. A comprehensive overview of the talks is given by *Leszek Buszynski*, *Negotiating with North Korea – The Six Party Talks and the Nuclear Issue*, London: Routledge 2013.

414 *Jonter/Rosengren* (n 305).

415 *Abe* (n 405), at 3.

416 *Julio C. Carasales*, *The Argentine-Brazilian Nuclear Rapprochement*, *The Nonproliferation Review* 2 (1995), 39–48; *José Goldemberg/Carlos Feu Alvim/Olga Y. Mafra*,

i.e. States that have the technological capacity to develop nuclear weapons relatively quickly, such as Germany and Japan, despite early critics,⁴¹⁷ from acquiring nuclear weapons. The decades before the adoption of the NPT were characterised by a rapid proliferation of nuclear weapons. This development has been slowed down by the adoption of the NPT. The success becomes even more apparent when compared with the proliferation of nuclear energy. Since the adoption of the NPT, the number of fission power reactors has more than quadrupled.⁴¹⁸ Also, the number of States with nuclear reactors increased significantly. In 1968, the year of the adoption of the NPT, there were eleven countries with nuclear reactors.⁴¹⁹ Today, there are 30 countries operating nuclear power plants and 20 additional countries with past or future programmes.⁴²⁰ At the same time, the number of States possessing nuclear weapons has less than doubled.

Moreover, the NPT framework enabled two States possessing nuclear weapons to abandon them while joining the treaty. South Africa developed nuclear weapons during the time of the apartheid regime but dismantled them prior to acceding to the NPT in 1991.⁴²¹ Ukraine decided to give up the nuclear weapons stored in its territory after the end of the Soviet Union and joined the NPT as a non-nuclear weapon State.⁴²²

2.7.2 Shortcomings

The NPT is not only a success story, but also suffers from significant shortcomings. These shortcomings include the lack of universality of the NPT, its retroactive rather than proactive nature of dealing with the proliferation of nuclear weapons and the lack of consensus on fundamental questions of

The Denuclearization of Brazil and Argentina, *Journal for Peace and Nuclear Disarmament* 1 (2018), 383–403.

417 *Romberg* (n 242), at 55; *George H. Quester*, Japan and the Nuclear Non-Proliferation Treaty, *Asian Survey* 10 (1970), 765–778.

418 *Mark Ho/Edward Obbard/Patrick A. Burr et al.*, A Review on the Development of Nuclear Power Reactors, *Energy Procedia* 160 (2019), 459–466.

419 These countries are United States (1942), Canada (1945), Soviet Union (1946), France (1948), United Kingdom (1956), India (1956), West-Germany (1957), East-Germany (1957), China (late 1950s), Japan (1963), Italy (1964) and Spain (1968).

420 *International Atomic Energy Agency*, *Nuclear Power Reactors in the World*, Vienna: IAEA 2024.

421 *Stumpf* (n 242).

422 *Mariana Budjeryn*, The Power of the NPT: International Norms and Ukraine's Nuclear Disarmament, *The Nonproliferation Review* 22 (2015), 203–237.

the treaty regime. These shortcomings have led to some authors questioning the future of the regime altogether.⁴²³

2.7.2.1 Lack of Universality

The most evident shortcoming of the treaty is its lack of universality. Since 1968 – the year in which the NPT was adopted – nuclear weapons have been proliferated. The treaty is not universal. Israel, India, Pakistan and North Korea all possess nuclear weapons and have either never signed or have left the treaty. South Africa also possessed nuclear weapons in the 1970s. The treaty has thus failed to achieve what it was created for: maintain the nuclear status quo of the 1960s.⁴²⁴ Iran is on the brink of developing its first nuclear weapon.⁴²⁵ Once Iran succeeds in acquiring a nuclear weapon, other countries in the Middle East might follow, especially Saudi Arabia, despite the treaty's obligations.⁴²⁶ With each new NWS outside the NPT, support for NPT among NNWS diminishes.⁴²⁷ For instance, in recent years, Türkiye's President Erdogan has openly criticised the NPT's asymmetry in the UN General Assembly.⁴²⁸ Ukraine has put the option of a re-nuclearisation on the table.⁴²⁹ Even voices in the European Union called for a breach of the NPT.⁴³⁰ In the current geopolitical climate, the future of the entire treaty regime is uncertain.

423 *Pretorius/Sauer; Pretorius/Sauer; Richard Leaver*, *The Failing NPT: The Case for Institutional Reform*, *Australian Journal of International Affairs* 59 (2005), 417–424; *Michael Wesley*, *It's Time to Scrap the NPT*, *Australian Journal of International Affairs* 59 (2005), 283–299.

424 *Pretorius/Sauer*, *Ditch the NPT* (n 423), at 105.

425 *Jennifer Hansler/Kylie Atwood*, *Blinken Says Iran's Nuclear Weapon Breakout Time is Probably Down to 1–2 Weeks* (*CNN*, 2024), <https://www.cnn.com/2024/07/19/politics/blinken-nuclear-weapon-breakout-time/index.html>, last accessed 17 July 2025.

426 *On Saudi Arabia's nuclear ambitions Norman Cigar*, *Saudi Arabia and Nuclear Weapons – How Do Countries Think About The Bomb?*, London: Routledge 2016.

427 *Pretorius/Sauer*, *Ditch the NPT* (n 423), at 117.

428 <https://www.reuters.com/article/us-turkey-nuclear-erdogan-idUSKCN1VP2QN>, last accessed 25 February 2025.

429 *Alexander K. Bollfrass*, *Are Nuclear Weapons an Option for Ukraine?* (2025), IISS.

430 *Philipp Sauter*, *European Nuclear Weapons – Europe's Nuclear Ambitions and the Constraints of International Law* (2024), in: *Verfassungsblog*, <https://verfassungsblog.de/nuclear-weapons/>, last accessed 25 February 2025.

2.7.2.2 Reactivity Instead of Proactivity

The second crucial shortcoming is the reactivity of the non-proliferation regime, which is only strengthened after countries have either succeeded in building a nuclear weapon or have had advanced programmes which remained undiscovered for a long time. This is primarily due to shortcomings within the verification regime.

The reactive character of the non-proliferation regime is evident throughout history. The issue of nuclear weapons was first raised on the international stage during the First UN General Assembly, several months *after* the first use of nuclear weapons. As the 1950s and 1960s have demonstrated, the mandate of the IAEA without comprehensive safeguarding powers proved inadequate in preventing the proliferation of nuclear weapons. By the mid-1960s, prior to the adoption of the NPT, all five permanent Members of the UN Security Council had conducted nuclear weapons tests.⁴³¹ In the 1970s, India, South Africa and Israel followed. Especially the Indian test shocked both the world and the IAEA given that IAEA inspectors were present in India on the day of the test unaware of the State's capacity to construct a nuclear explosive device.⁴³² This incident highlighted the inadequacy of the then existing legal safeguards framework with limited competences,⁴³³ and how it was insufficient in addressing the potential of diverting nuclear material from peaceful to military⁴³⁴ purposes. One fact especially caught the attention of many States: India was able to build their nuclear explosive device *Smiling Buddha* with Western nuclear technology.⁴³⁵ To prevent any further circumvention of nuclear material, States with a nuclear infrastructure founded the NSG, *after* the previous export control regime of the Zangger Committee proved insufficient.

When the biggest step in strengthening safeguards happened in the early 1970s with the adoption of the CSA, there were already several States

431 The first tests from each country were: United States 1945, Soviet Union 1949, United Kingdom 1952, France 1960, China 1964.

432 *Röhrlich* (n 286), at 1 ff.

433 This regime is set out in INFCIRC/26 and INFCIRC/66.

434 It must be noted that India declared to have tested a so-called Peaceful Nuclear Device. However, it is impossible to distinguish peaceful nuclear devices from unpeaceful nuclear devices. On peaceful nuclear explosions, *Frederick Reines*, *The Peaceful Nuclear Explosion*, *Bulletin of the Atomic Scientists* 15 (1959), 118–122.

435 *Röhrlich* (n 286), at 136; *Susanna Schrafstetter*, *Preventing the 'Smiling Buddha': British-Indian Nuclear Relations and the Commonwealth Nuclear Force, 1964–68*, *Journal of Strategic Studies* 25 (2002), 87–108, at 90.

that had either nuclear weapons or advanced development programmes. The next step of strengthening the system, the adoption of the Additional Protocol in 1997, was also a response to failures of the system. The 93+2 programme, which led to the adoption of the protocol, was a reaction to the detection of Iraq's clandestine nuclear programme – not by the IAEA, but by UN inspectors.⁴³⁶ The non-proliferation system has always been strengthened only after its shortcomings were presented by breaches of the regime.

2.7.2.3 Lack of Consensus on Fundamental Questions

The third shortcoming of the NPT regime is the lack of consensus on a manifold of fundamental questions related to the operation of the regime. As the treaty has tried to maintain the status quo of the late 1960s, progress on numerous aspects has been either slow or completely halted. These fundamental questions encompass the implementation of Article VI, the legality of nuclear sharing and specific forms of nuclear cooperation, the implementation of the 1995 extension deal, and the review of the treaty itself.

2.7.2.3.1 Implementation of Article VI

The first point of contention relates to the implementation of the disarmament provision in Article VI, which stipulates that “[e]ach of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.”

Despite this obligation, nuclear weapon States are not only opposed to nuclear disarmament, but are also actively perpetuating the nuclear arms race. Although the NPT entered into force in 1970, the number of nuclear weapons has increased significantly during the Cold War. While this number decreased in the decade following the fall of the Iron Curtain, the reduction has halted in the last decade. The number of nuclear warheads

436 It must be reiterated that the IAEA is *not* a UN specialised agency.

has remained within the range of 13,000 to 15,000 for years.⁴³⁷ In recent years, there has been the first increase of the number of nuclear weapons in decades,⁴³⁸ primarily attributable to China's intentions to massively build up its nuclear arsenal.⁴³⁹ The *Stockholm International Peace Research Institute* (SIPRI) anticipates that China will be soon on level with the United States or Russia with respect to intercontinental ballistic missiles (ICBMs).⁴⁴⁰ Similarly, the United Kingdom is on its path to increase its number of nuclear weapons from 225 to 260 warheads.⁴⁴¹ Even those countries that do not increase their number of nuclear warheads are allocating substantial resources towards the modernisation of nuclear weapons.

While many NNWS from the Global South view the Treaty on the Prohibition of Nuclear Weapons (TPNW) as a fulfilment of Article VI's obligation, NWS are rejecting this treaty in a rare case of unanimity, deeming it "simultaneously irrelevant and dangerous"⁴⁴², further emphasising a lack of will to implement *all* NPT obligations, including Article VI.

2.7.2.3.2 Legality of Nuclear Sharing

A further point on which consensus is missing pertains to nuclear sharing agreements. Under NATO agreements, the United States deploys nuclear weapons in allied States. Currently, US nuclear weapons are deployed in Belgium, Germany, Italy, the Netherlands, and Turkey.⁴⁴³ Poland has also

437 Robert S. Norris/Hans M. Kristensen, *Global Nuclear Weapons Inventories, 1945–2010*, *Bulletin of the Atomic Scientists* 66 (2010), 77–83.

438 Hans M. Kristensen/Matt Korda, *World Nuclear Forces*, in: *Stockholm International Peace Research Institute* (ed.), *SIPRI Yearbook 2023: Armaments, Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute 2023, 247–336.

439 *Ibid.*, at 284 ff.

440 *Ibid.*

441 *UK Government*, *Global Britain in a Competitive Age – The Integrated Review of Security, Defence, Development and Foreign Policy* (2021).

442 Statement by France on behalf of the P5, IAEA General Conference, 23 September 2020.

443 Hans M. Kristensen/Matt Korda/Eliana Johns et al., *Nuclear Weapons Sharing, 2023*, *Bulletin of the Atomic Scientists* 79 (2023), 393–406; Alexander Mattelaer, *Nuclear Sharing and NATO as a Nuclear Alliance*, in: Stephan Frühling/Andrew O'Neil (eds.), *Alliances, Nuclear Weapons and Escalation*, Canberra: ANU Press 2021, 123–131, at 124 f.

expressed interest in hosting US nuclear weapons.⁴⁴⁴ Recently, Russia and Belarus entered into a similar agreement with the stationing of Russian nuclear weapons in Belarus.⁴⁴⁵ Moreover, South Korea has recently signalled its interest in hosting US nuclear weapons in the country in the wake of heightened tensions with its nuclear weapons possessing neighbour North Korea.⁴⁴⁶

NATO countries⁴⁴⁷ and some scholars⁴⁴⁸ argue that nuclear sharing is legal under the NPT, as these agreements predate the NPT. The United States is further of the opinion that the NPT would no longer be applicable in case of a nuclear war in order to justify the transfer of control of a nuclear weapon in the case of war, despite Article I NPT.⁴⁴⁹ However, other States and some scholars⁴⁵⁰ contest this interpretation and the legality of nuclear sharing under the NPT. Mexico questioned the legality of nuclear sharing agreements during a session of the 1995 RevCon.⁴⁵¹ During both

444 *Julian Borger*, Poland Suggests Hosting US Nuclear Weapons Amid Growing Fears of Putin's Threats in: *The Guardian*, <https://www.theguardian.com/world/2022/oct/05/poland-us-nuclear-wars-russia-putin-ukraine>, last accessed 17 July 2025.

445 *Kristensen/Korda/Johns et al.* (n 443).

446 *Jean Mackenzie/Barbara Plett Usher*, US and South Korea Agree Key Nuclear Weapons Deal in: *BBC News*, (25 February 2025) <https://www.bbc.com/news/world-us-canada-65404805>, last accessed 17 July 2025. On the historic dimension, see *Hans M. Kristensen/Robert S. Norris*, A History of US Nuclear Weapons in South Korea, *Bulletin of the Atomic Scientists* 73 (2017), 349–357.

447 *U.S. Government*, Questions on the Draft Non-Proliferation Treaty Asked by US Allies Together with Answers Given by the United States, 1968; *Mohamed Ibrahim Shaker*, *The Nuclear Non-Proliferation Treaty – Origin and Implementation 1959–1979*, Dobbs Ferry: Oceana Publication 1980, at 222 ff.; *NATO*, Factsheet: NATO's Nuclear Sharing Arrangements, 2022; *Wissenschaftlicher Dienst des Deutschen Bundestages*, Kurzinformation: Rechtsfragen zur atomaren Bewaffnung Deutschlands (2020).

448 *Mika Hayashi*, NATO's Nuclear Sharing Arrangements Revisited in Light of the NPT and the TPNW, *Journal of Conflict and Security Law* 26 (2021), 471–491; *Shaker* (n 447), at 235 ff.; *Kate Deere*, The Obligations of Nuclear-Weapon States Not to Transfer Nuclear Weapons and Devices (Article I NPT), in: *Jonathan L. Black-Branch/Dieter Fleck* (eds.), *Nuclear Non-Proliferation in International Law – Volume I*, The Hague: T.M.C. Asser Press 2014, 23–45, at 27.

449 The United States shared this point of view during the NPT negotiations in *U.S. Government* (n 447). The excerpt is printed in *Shaker* (n 447), at 234. See also *Hayashi* (n 448), at 482 ff. with further references.

450 *Bernd Hahnfeld*, Nukleare Teilhabe ist völkerrechtswidrig – Ein Widerspruch zur anderslautenden Behauptung der Bundesregierung, *Wissenschaft und Frieden (W+F)* 46 (2020), 46–48.

451 NPT/CONF.1995/32 (Part III), at 244.

the 2015 Review Conference and the 2019 Preparatory Commission,⁴⁵² Russia stated that nuclear sharing agreements contradicted the NPT.⁴⁵³ China also regularly calls for ending nuclear sharing agreements.⁴⁵⁴ The failure to reach a consensus on this important question further weakens the NPT regime.

2.7.2.3.3 Legality of Nuclear Cooperation

Another lack of consensus is evident in the context of civilian nuclear cooperation, particularly with regard to the US-India Civil Nuclear Cooperation. Since 2005, India has received support from the United States for a civilian nuclear energy programme. While this cooperation led to India placing its civilian nuclear infrastructure under IAEA safeguards, these safeguards are not comprehensive and do not apply to *any principal nuclear facility* in the sense of Article III.1 NPT. The safeguards applied to Indian nuclear facilities are not based on INFCIRC/153, the full-scope safeguards, but rather on pre-NPT safeguards based on INFCIRC/66, so-called item-specific safeguards, where the State decides which facilities to declare to the IAEA. However, as a State Party to the NPT, the United States is not permitted to provide States with this type of infrastructure, as long as the recipient country does not consent to comprehensive safeguards, Article III.2 of the NPT. Additionally, the nuclear deal provides India with uranium, which in turn frees up India's own uranium resources for its nuclear weapons programme.⁴⁵⁵ This can be interpreted as assisting any NWS outside the NPT to manufacture or otherwise acquire nuclear weapons, which would constitute a violation of Article I of the NPT.⁴⁵⁶ This cooperation between the United States and India does not only violate the spirit of the NPT,⁴⁵⁷ but also its letter.⁴⁵⁸ The United States justifies this nuclear cooperation by

452 Two Preparatory Conferences are held in the two years prior to a Review Conference.

453 NPT/CONF.2020/PC.III/WP.6, at para. 15; Statement by Russia, NPT Review Conference (27 April 2015), at 10, available at https://www.un.org/en/conf/npt/2015/statements/pdf/RU_en.pdf, last accessed 25 February 2025.

454 NPT/CONF.2020/PC.III/WP.40, para. 3; NPT/CONF.2010/PC.I/WP.46, Recommendations 6–9.

455 Carranza (n 400), at 474.

456 Similarly, *ibid.*

457 Meier (n 400).

458 The legality is also questioned by Weiss (n 400).

arguing that this deal strengthens the global non-proliferation regime by placing all of India's civilian nuclear facilities under IAEA safeguards.⁴⁵⁹

2.7.2.3.4 Implementation of 1995 Extension Deal

Another lack of consensus is shown with regard to the implementation of the 1995 Extension Deal. Originally, the NPT was intended to last for 25 years. When the 25-year period elapsed in 1995, States discussed the future of the treaty. While many NNWS from the South were in favour of only a limited extension,⁴⁶⁰ especially due to the shortcomings with respect to Article VI, States from the Global North succeeded in convincing the international community to unanimously extend the NPT indefinitely.⁴⁶¹ This was achieved by promising three aspects which, thirty years later, are still not fulfilled.

The first promise was to establish a nuclear-weapons-free zone in the Middle East.⁴⁶² Still today, the Middle East continues to be a major concern with regard to nuclear security with Israel as a NWS outside the NPT, Iran being close to having nuclear weapons, and Saudi-Arabia potentially ready to develop nuclear weapons once Iran acquires them. However, thirty years later, there is no substantial progress in this regard. Several conferences have taken place, yet no consensus has been reached.⁴⁶³ The current rise of tensions in the Middle East following the Hamas attacks on Israel on 7

459 Ibid.

460 *George Bunn/John B. Rhinelanders*, *Extending the NPT: What are the Options?*, *Arms Control Today* 25 (1995), 8–10; *Harald Müller*, *The NPT Review Conferences*, in: Emily B. Landau/Azriel Bermant (eds.), *The Nuclear Nonproliferation Regime at a Crossroads*, Tel Aviv: Institute for National Security Studies 2014, 17–26, at 20.

461 NPT/CONF.1995/32 (Part I), Annex, Decision 3.

462 Ibid, Decision 2, para. 5. On a nuclear weapons-free zone in the Middle East, see *Konstantinos D. Magliveras*, *The Conference on the Establishment of a Middle East Zone Free of Nuclear Weapons and Other Weapons of Mass Destruction: Too Little, Too Late?*, in: Jonathan L. Black-Branch/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law – Volume VI: Nuclear Disarmament and Security at Risk – Legal Challenges in a Shifting Nuclear World*, The Hague: T.M.C. Asser Press 2021, 113–133 (optimistic view); *Claudia Baumgart/Harald Müller*, *A Nuclear Weapons-Free Zone in the Middle East: A Pie in the Sky?*, *The Washington Quarterly* 28 (2004), 45–58 (pessimistic view).

463 The Conference on the Establishment of a Middle East Zone Free of Nuclear Weapons and Other Weapons of Mass Destruction have been held annually (except in 2020) since 2019, following A/RES/73/546.

October 2023 and Israel's military response to Iran's nuclear programme casts a shadow over the prospects of any imminent progress.

Second, the NWS promised to bring into force the Comprehensive Test Ban Treaty (CTBT).⁴⁶⁴ More than 2000 nuclear weapons tests have been conducted since the Trinity Test in 1945, with the vast majority of tests between the 1950s and 1980s. In earlier times, most tests were conducted above ground, with a shift to underground testing occurring from the 1960s on. Above-ground nuclear testing led to consequences for the atmosphere. Not only does a nuclear explosion lead to nuclear fallout, radioactive dust produced by the weapon gets spread over hundreds, if not thousands, of kilometres. Above-ground test also caused an increase in radioisotopes in the atmosphere.⁴⁶⁵ The ecological and health concerns caused by the then around 500 overground tests⁴⁶⁶ led to the adoption of the Partial Nuclear Test Ban Treaty in 1963 (PTBT). This treaty, which is signed by the United States, the United Kingdom, the Soviet Union, India, Pakistan, and Israel, but not by China and France, prohibits nuclear testing in the atmosphere, in outer space, or under water. Under this treaty, only underground testing is allowed. Such underground tests were continued during the decades following the adoption of the PTBT.

In order to ban all testing, the Global South pushed for the adoption of the CTBT. With formal negotiations beginning in 1993 and a push from both the 1995 RevCon and civil society, the CTBT was adopted in 1996. The CTBT extends the provisions of the PTBT to prohibit *any nuclear weapon test explosion [...] at any place* (Article I.1). Unlike the PTBT, the CTBT also includes a verification mechanism. To this end, a new international organisation, the Comprehensive Nuclear-Test-Ban Treaty Organiza-

464 Decision 2, para. 4a, NPT/CONF.1995/32 (Part I), Annex. On the failure of the CTBT, see *Daryl Kimball*, *What Went Wrong: Repairing the Damage to the CTBT*, *Arms Control Today* 29 (1999), 3–9; *Keith Hansen*, *CTBT: Forecasting the Future*, *Bulletin of the Atomic Scientists* 61 (2005), 50–57; *Christophe Daniello*, *Quel avenir pour le Traité d'interdiction complète des essais nucléaires?*, *DSI (Défense et Sécurité Internationale)* (2014), 52–55.

465 This anthropogenic increase of radionuclides has even been considered for the characterisation of a new geological era, the Anthropocene: *Alexandra Witze*, *This Quiet Lake Could Mark the Start of a New Anthropocene Epoch* in: *Nature*, <https://www.nature.com/articles/d41586-023-02234-z>, last accessed 17 July 2025; *Paul Voosen*, *Pond Mud Proposed as Anthropocene's 'Golden Spike'*, *Defining Human-Altered Geological Age* in: *Science*, <https://www.science.org/content/article/pond-mud-proposed-anthropocene-s-golden-spike-defining-human-altered-geological-age>, last accessed 17 July 2025.

466 *Daryl Kimball*, *The Nuclear Testing Tally* (2022), Arms Control Association.

tion (CTBTO), was established. This organisation, which shares the very same building with the IAEA, has a wide range of authority to verify the comprehensive nuclear test ban. Hundreds of monitoring stations in tens of laboratories across 90 countries are established and would allow for detecting clandestine tests through a range of technologies.⁴⁶⁷ However, the treaty never entered into force. Entry into force requires the ratification of the treaty by countries listed in Annex 2 to the treaty, Article XIV.⁴⁶⁸ These countries include, among others, all States possessing nuclear weapons. However, neither the United States, nor China, nor Pakistan, nor India, nor Israel, nor North Korea have ratified the treaty. Despite regular calls by the UN Security Council⁴⁶⁹ and different countries,⁴⁷⁰ the entry into force of the CTBT seems out of reach. Russia's recent move to de-ratify the treaty further diminishes the likelihood of the CTBT's entry into force.⁴⁷¹

Third, a treaty focusing on fissile material was promised.⁴⁷² The idea behind a fissile material treaty is simple: If no new fissile material is produced, no new nuclear weapons (apart from recycling material in existing weapons) can be built. Called for by the UN General Assembly in 1993⁴⁷³ and mandated by the Conference of Disarmament in 1995,⁴⁷⁴ negotiations on the treaty were quickly halted, primarily due to a lack of consensus on the mandate. While some countries advocate for negotiations leading

467 On the role of the CTBTO in verification, see *Sabine Bauer/Cormac O'Reilly*, *The Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO): Current and Future Role in the Verification Regime of the Nuclear-Test-Ban Treaty*, in: Jonathan L. Black-Branck/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law: Volume II – Verification and Compliance*, The Hague: T.M.C. Asser Press 2016, 131–150.

468 On the various problems regarding the entry into force, see *Jenifer Mackby*, *The NPT-CTBT Connection*, in: Jonathan L. Black-Branck/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law – Volume V: Legal Challenges for Nuclear Security and Deterrence*, The Hague: T.M.C. Asser Press 2020, 31–52, at 46–51.

469 UN Security Council Resolution 2310 (2016).

470 E.g. Germany, Statement of the Federal Republic of Germany on Nuclear Weapon at the UN General Assembly, 77th Session, First Committee, 17th October 2022.

471 *David A. Koplou*, *Russia, the CTBT, and International Law*, *Arms Control Today* 53 (2023), 17–17; *Pavel Podvig*, *Preserving the Nuclear Test Ban After Russia Revoked its CTBT Ratification*, *Bulletin of the Atomic Scientists* 80 (2024), 75–80.

472 NPT/CONF.1995/32 (Part I), Annex, Decision 2, para. 4b.

473 Resolution A/RES/48/75.

474 The so-called Shannon Mandate established an ad hoc committee to negotiate the FCMT. On the work of that committee, see *Paul Meyer*, *Is There Any Fizz Left in the Fissban? Prospects for a Fissile Material Cutoff Treaty*, *Arms Control Today* 37 (2007), 18–22.

to complete nuclear disarmament,⁴⁷⁵ other countries favour parallel discussions on preventing an arms race in outer space.⁴⁷⁶ Additionally, there is no agreement on the extent of covering fissile material. One stream is a Fissile Material Cut-Off Treaty focusing on the prohibition of producing new material, while another stream is to have a more comprehensive Fissile Material Treaty to cover also existing stockpiles of fissile material.⁴⁷⁷ As with the CTBT, the prospects of such a Fissile Material (Cut-Off) Treaty are relatively slim.

Consequently, the very basis of the continued existence of the regime is predicated on unfulfilled promises, which adds to the list of shortcomings of the treaty regime.

2.7.2.3.5 Review of the NPT

Another example of the lack of consensus to fundamental questions of the regime are evidenced by the NPT Review Conferences. Intended to review the operation of the NPT with a view to assuring that the purposes and provisions are being realised,⁴⁷⁸ the Review Conferences have largely failed to meet this objective. The last two Review Conferences held in 2015 and 2022 have failed, as both RevCons have not produced an outcome document. The 2015 RevCon was unsuccessful due to the language used with regard to a nuclear-weapons-free zone in the Middle East, which led to vetoes by the United States, the United Kingdom, and Canada.⁴⁷⁹ The 2022 RevCon has failed due to a veto by Russia following the mentioning of the Zaporizhzhia Nuclear Power Plant in the war in Ukraine.⁴⁸⁰ The failure to reach consensus on the operation of the NPT over the course of ten years highlights the inherent deficiencies of the treaty.

475 *Annette Schaper*, Der Fissile Material (Cutoff) Treaty – ein Vertrag, der niemals kommt?, Sicherheit und Frieden (S+F) / Security and Peace 36 (2018), 86–91.

476 *Meyer* (n 474).

477 *Ibid*; *Rebecca Johnson*, Little Orphan Fissban, Bulletin of the Atomic Scientists 53 (1997), 4–4.

478 Article VIII.3 of the NPT.

479 *Oliver Meier*, The 2015 NPT Review Conference Failure – Implications for the Nuclear Order (2015), Stiftung Wissenschaft und Politik.

480 <https://press.un.org/en/2022/dc3850.doc.htm>, last accessed 25 February 2025.

2.7.3 Summary

The NPT has been successful in achieving a number of objectives and continues to be a significant international treaty. However, the treaty also exhibits notable deficiencies and shortcomings, which have the effect of diminishing the effectiveness of the regime, and at times even impeding the achievement of minimal progress. As long as there is no tangible progress in addressing the shortcomings, any change to the NPT regime is hard to imagine. The prospect of developing new safeguards appears highly improbable given the prevailing sentiment of dissatisfaction among many NNWS with the existing regime. This dissatisfaction is further compounded by the reluctance of NNWS to address the majority of the identified shortcomings, thereby creating an impasse within the NPT regime.

3 *The Law of Nuclear Disarmament*

The second pillar of nuclear weapons law deals with the subject of nuclear disarmament. As with nuclear non-proliferation, fusion will play a role within this part of nuclear weapons law for mainly two reasons. First, fusion technology creates new pathways for the production of nuclear weapons, standing in contrast to the aims of the regime on nuclear disarmament. Second, the treaties on nuclear disarmament contain safeguards provisions separate from the NPT, where the same questions on the applicability of safeguards on fusion arise.

This section first presents nuclear disarmament in the context of the United Nations (3.1). It proceeds to analyse the role of nuclear disarmament within the NPT regime (3.2). It continues to explore the legal basis and functioning of the Treaty on the Prohibition of Nuclear Weapons (3.3), and concludes by investigating the scope and extent of Nuclear-Weapon-Free-Zones (3.4)

3.1 Nuclear Disarmament and the United Nations

The issue of nuclear disarmament has always been an issue at the forefront of activities by the United Nations. The inaugural meeting of the United Nations General Assembly was convened less than six months after the use of the atomic bomb in Hiroshima and Nagasaki. During this inaugural

session, the very first resolution of the UN General Assembly raised the topic of nuclear disarmament.⁴⁸¹ Since that time, the abolition of nuclear weapons has been a recurring theme in UN activities, with persistent calls for the prohibition of such weapons.

The UN General Assembly has been at the forefront of UN activities to call for nuclear disarmament, having first called for a treaty to ban nuclear weapons in 1961 with its Resolution 1649 (XVI) and adopted each year resolutions requesting States to conclude such a treaty.⁴⁸² Furthermore, the UN General Assembly requested the ICJ to deliver an advisory opinion on the legality of the threat and use of nuclear weapons.⁴⁸³

While the UN General Assembly is dominated by countries from the Global South, the UN⁴⁸⁴ forum designed to address the issue of disarmament, the Conference on Disarmament (CD), has not yet achieved any progress in nuclear disarmament. The CD is a multilateral disarmament negotiation forum, set up by 65 countries, representing all regions of world. The CD takes its decisions by consensus,⁴⁸⁵ each country has effectively a veto right, leading to NWS and their allies impeding any progress towards nuclear disarmament. Despite its role as the successor institution to the ENDC, which negotiated the NPT, as well as the institution's success in abolishing other types of weapons of mass destruction, the CD has not made any progress in the realm nuclear disarmament since 1968.

3.2 Disarmament within the NPT

As part of the grand bargain, disarmament and especially nuclear disarmament was incorporated into the NPT. To recall, Article VI of the NPT includes an obligation to all State Parties to

481 UN General Assembly Resolution 1(I).

482 ICJ, *Nuclear Weapons Advisory Opinion* (n 262), at para. 73.

483 UN General Assembly Resolution 49/75 K.

484 It must be noted that the CD is not a UN organisation or body, yet it is headquartered in the Palais des Nations in Geneva and the Director-General of the United Nations Office at Geneva serves as Secretary-General of the CD. It also submits reports to the UN General Assembly and works on issues recommended by UN General Assembly Resolutions.

485 Rule 18 of the Rules of Procedure of the Conference on Disarmament, CD/8/Rev.5; *Gro Nystuen/Kjølvs Egeland/Torbjørn Graff Hugo*, *The TPNW: Setting The Record Straight*, Norwegian Academy of International Law 2018, at 9.

pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.

Despite the vagueness of the language used, the ICJ has recognised that Article VI contains an *obligation* to negotiate in good faith on nuclear disarmament.⁴⁸⁶

As there are still more than 12,000 nuclear weapons in the world⁴⁸⁷ and substantial investments in the modernisation of nuclear arsenals are underway⁴⁸⁸, this provision is yet to be implemented.

The inclusion of the nuclear disarmament provision has been a tool to convince NNWS to accept the discriminatory nature of the treaty.⁴⁸⁹ Combined with the limited duration of the treaty of 25 years, this provision would have ensured the temporary nature of the separation into NWS and NNWS. However, the NPT has been extended indefinitely and NWS consistently refuse to implement nuclear disarmament, while NNWS are left with little leverage.

The failure to implement Article VI of the NPT has resulted in a number of States advocating for nuclear disarmament outside the NPT, which culminated in the adoption of the Treaty on the Prohibition of Nuclear Weapons. The dynamics between Article VI of the NPT and the adoption of the Treaty on the Prohibition of Nuclear Weapons will be of relevance when approaches to newly developed fusion regulation will be discussed in Chapters 4 and 5.

486 ICJ, *Nuclear Weapons Advisory Opinion* (n 262), at para. 99.

487 *Kristensen/Korda* (n 438).

488 *Congressional Budget Office*, *Approaches for Managing the Costs of U.S. Nuclear Forces, 2017 to 2046*, 2017; *Claire Mills/Esme Kirk-Wade*, *The Cost of the UK's Strategic Nuclear Deterrent*, London: House of Commons Research Briefing 2023; *Julian Cooper*, *How Much Does Russia Spend on Nuclear Weapons?* in: SIPRI, <https://www.sipri.org/commentary/topical-backgroundunder/2018/how-much-does-russia-spend-nuclear-weapons>, last accessed 17 July 2025.

489 *Paul M. Kiernan*, *Disarmament under the NPT: Article VI in the 21st Century*, *Michigan State University College of Law International Law Review* 20 (2011), 381–400, at 384.

3.3 Treaty on the Prohibition of Nuclear Weapons

Following the frustration of the majority of States in the world towards the lack of implementing Article VI of the NPT, and in view of the devastating humanitarian consequences of nuclear warfare, the UN General Assembly adopted the Treaty on the Prohibition of Nuclear Weapons (TPNW) in 2017.⁴⁹⁰

The first attempt to prohibit nuclear weapons in a global treaty was undertaken shortly after the ICJ rendered its Advisory Opinion on the Threat and Use of Nuclear Weapons. In 1997, experts drafted a Model Nuclear Weapons Convention which was submitted by Costa Rica to the United Nations.⁴⁹¹ This draft has been updated in 2007, and Costa Rica submitted it as a working paper to the Preparatory Commission of the 2010 NPT Review Conference.⁴⁹² While this treaty has not been adopted, it provided a foundation for the development that has followed.

At the 2010 NPT Review Conference, the International Committee of the Red Cross⁴⁹³ made a further attempt which led to a focus on “the catastrophic humanitarian consequences of any use of nuclear weapons.”⁴⁹⁴ In the following preparatory sessions for the 2015 NPT Review Conference, a coalition of States regularly reiterated the humanitarian dimension of nuclear weapons, which resulted in joint statements by the vast majority of countries within the NPT forum⁴⁹⁵ and the UN.⁴⁹⁶ This humanitarian

490 On the relation between Article VI of the NPT and the TPNW, see *Stefan Kadelbach*, Possible Means to Overcome Tendencies of the Nuclear Weapons Ban Treaty to Erode the NPT, in: Jonathan L. Black-Branch/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law – Volume V: Legal Challenges for Nuclear Security and Deterrence*, The Hague: T.M.C. Asser Press 2020, 305–322, at 312 ff.

491 UN Document A/C.1/52/7.

492 NPT/CONF.2010/PC.I/WP.17.

493 *Jakob Kellenberger*, Bringing the Era of Nuclear Weapons to an End – Statement by Jakob Kellenberger, President of the ICRC, to the Geneva Diplomatic Corps, Geneva, 20 April 2010 (2010), International Committee of the Red Cross. On the ICRC’s influence, see also *Elizabeth Minor*, Changing the Discourse on Nuclear Weapons: The Humanitarian Initiative, *International Review of the Red Cross* 97 (2015), 711–730.

494 NPT/CONF.2010/50 (Vol. I), at 19.

495 The Joint Statement on the Humanitarian Consequences of Nuclear Weapons during the 2015 NPT RevCon was endorsed by 159 States.

496 Joint Statements were presented at the UNGA First Committee’s 67th, 68th and 69th sessions and were endorsed by 35 (in 2012), 125 (in 2013) and 155 (in 2014) States, *Minor* (n 493).

initiative then evolved into proper diplomatic conferences in Oslo/Norway (2013), Nayarit/Mexico (2014) and Vienna/Austria (2014). These sessions of conferences culminated in the formulation of the Humanitarian Pledge, which called upon all NPT State Parties “to renew their commitment to [...] Article VI” of the NPT and to “fill the legal gap for the prohibition and elimination of nuclear weapons.”⁴⁹⁷

The Humanitarian Pledge eventually resulted in the First Committee of the UN General Assembly to adopt a resolution mandating negotiations for a nuclear ban treaty.⁴⁹⁸ Taking place in two sessions in 2017, the conference adopted the TPNW on 7 July 2017 with 122 countries in favour, one abstention (Singapore) and one vote against (Netherlands). It entered into force in 2021 and is the only treaty that prohibits nuclear weapons on a global scale. 94 States signed the treaty and 73 States deposited their ratification instruments.⁴⁹⁹ These State Parties to the TPNW are mostly from Africa, South America, Asia and the Pacific region, but also include European countries such as Ireland, Austria and Malta. The TPNW incorporates a comprehensive prohibition of any involvement of a country regarding nuclear weapons, Article 1. Compliance with the TPNW is, inter alia,⁵⁰⁰ ensured by a safeguards system, Article 3 and Article 4 para. 3.⁵⁰¹

Safeguards requirements within the TPNW depend on whether the State is a former NWS or a NNWS. For NNWS, Article 3, the system is based on IAEA safeguards introduced within the NPT framework. These State Parties are required to at least maintain the level of safeguards in effect at the time of accession to the treaty with the possibility of exceeding this level in the future, Article 3 para. 1. All States must have at least a CSA in place, Article 3 para. 2. The Additional Protocol to the CSA is not a requirement within the TPNW,⁵⁰² but States that already have an AP in place must keep

497 A/C.1/71/L.24, para. 3. The pledge was endorsed by 107 States.

498 A/C.1/71/L.41.

499 <https://treaties.unoda.org/t/tpnw/participants>, last accessed 25 February 2025.

500 Former NWS State Parties are also required to submit reports on their progress to the elimination of nuclear weapons, Article 4 para. 5, and to accept safeguards, Article 4 para. 3.

501 Article 4 para. 1 also includes safeguards requirements for a State that has eliminated its nuclear weapons programme between 7 July 2017 and the entry into force of the treaty. The treaty entered into force on 22 January 2021. Since no State had eliminated its nuclear weapons in this period, this provision is of no interest.

502 The exclusion of the AP as safeguards standard has been criticized: *Stuart Casey-Maslen*, *The Treaty on the Prohibition of Nuclear Weapons: a Commentary*, Oxford: Oxford University Press 2019, Article 3, at paras 3.14 ff. with further references;

it according to its para. 1, while those countries without an AP in place are under no obligation to adopt one.

Former NWS Parties, Article 4 para. 3, once they accede to the treaty, are required to conclude a safeguards agreement with the IAEA “sufficient to provide credible assurance of the non-diversion of declared nuclear material from peaceful nuclear activities and of the absence of undeclared nuclear material or activities.” Such a safeguards agreement might exceed the level of Article 3.⁵⁰³ The prospects of NWS acceding to treaty are slim as, in rare unanimity, NWS regularly reject the TPNW in joint declarations, deeming it “simultaneously irrelevant and dangerous.”⁵⁰⁴ Similarly, NATO States reject the treaty as well.⁵⁰⁵ The majority of State Parties to the TPNW contains of States that already been members of regional nuclear-weapon-free zones.

3.4 NWFZ Treaties

The establishment of regional nuclear-weapon-free zones (NWFZ) has contributed significantly to nuclear non-proliferation and disarmament. In these zones, the development, manufacturing, control, possession, testing, stationing, and transport of nuclear weapons is prohibited.⁵⁰⁶ The importance of NWFZ is further emphasised in Article VII of the NPT, which reserves the right of any group of States to enter into such treaties.

The first NWFZ Treaty for Latin America and the Caribbean (Treaty of Tlatelolco) even preceded the NPT. The Member States of these treaties were also the ones who strongly pushed for the adoption of the TPNW.

Newell Highsmith/Mallory Stewart, *The Nuclear Ban Treaty: A Legal Analysis*, *Survival* 60 (2018), 129–152, at 135 f.

503 *Casey-Maslen* (n 502), at para. 4.20. Critical with regard to the *travaux préparatoire*, *Adina Carla Loghin*, Which International Authority Should Be Designated for Verifying the Irreversible Elimination of Nuclear Weapons under Article 4 of Nuclear Ban Treaty (TPNW) *Scientific*, *Amsterdam Law Forum* 11 (2019), 73–96, at 88 f.

504 Statement by France on behalf of the P5, IAEA General Conference, 23 September 2020.

505 Germany does “not deem the TPNW to be an appropriate framework to make tangible progress on nuclear disarmament and [it] will not accede to it”, Statement of the Federal Republic of Germany on Nuclear Weapons at the UN General Assembly, 77th Session, First Committee, October 17th, 2022.

506 UN Report of the Disarmament Commission, A/54/42, at para. 33; Art.1 Treaty of Tlatelolco; Art. 3 Treaty of Rarotonga; Art. 3 Treaty of Bangkok; Art. 3 Treaty of Pelindaba; Art. 3 Central-Asian Treaty.

Today, the five regional nuclear-weapon-free zone treaties⁵⁰⁷ cover more than 50 % of the world's land area and 60 % of all countries on Earth. The regions include Latin America and the Caribbean, the South Pacific (Treaty of Rarotonga), South-East Asia (Treaty of Bangkok), Central Asia (Treaty of Semipalatinsk), and the entire continent of Africa (Treaty of Pelindaba). Moreover, there have been active endeavours to establish a NWFZ in the Middle East for decades.⁵⁰⁸ The existing NWFZs include States that have, at one point in history, actively pursued nuclear weapons. Most prominently, South Africa even possessed three nuclear warheads in the 1970s, but later disassembled them.⁵⁰⁹ In addition, Brazil and Argentina embarked on a nuclear competition in the 1970s and 1980s.⁵¹⁰ The Central-Asian NWFZ includes former Soviet republics where nuclear weapons were deployed. Furthermore, numerous countries hosted nuclear weapons tests during colonial periods such as Algeria or the Marshall Islands. Moreover, many countries in these zones have nuclear infrastructure, such as Australia in the South Pacific, or intend to build nuclear power plants, such as Thailand in South East Asia or several African States. Consequently, each NWFZ Treaty incorporates its own individual safeguards provisions.

All of these treaties refer to IAEA safeguards to ensure compliance with the obligations set out in the respective treaty.⁵¹¹ The different levels of safeguards required differ. While all the treaties require a CSA in place with the IAEA, only the Central Asian Treaty requires the conclusion of an

507 They are: The Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean of 14 February 1967 (Treaty of Tlatelolco), The South Pacific Nuclear-Free Zone of 6 August 1985 (Treaty of Rarotonga), The Southeast Asian Nuclear-Weapon-Free-Zone Treaty of 15 December 1995 (Treaty of Bangkok), The African Nuclear-Weapon-Free-Zone Treaty of 12 April 1996 (Treaty of Pelindaba), The Treaty on a Nuclear-Weapon-Free Zone in Central Asia of 8 September 2006. On the relevance of NWFZ Treaties, see: Ramesh Thakur (ed.), *Nuclear Weapon-Free Zones*, Springer 1998.

508 The prospect of a NWFZ in the Middle East was part of the extension deal in 1995, Decision 2, para. 5, NPT/CONF.1995/32 (Part I), Annex. On a nuclear weapons free zone in the Middle East, see *Magliveras* (n 462) (optimistic view); *Baumgart/Müller* (n 462) (pessimistic view).

509 *Stumpf* (n 242).

510 *Spektor* (n 306); *John R. Redick*, *Nuclear Illusions: Argentina and Brazil*, Washington DC: The Henry L. Stimson Center 1995.

511 Art. 13 Treaty of Tlatelolco, Art. 5 Treaty of Bangkok, Art. 9 Treaty of Pelindaba, Art. 8 Central-Asian Treaty, Art. 8 para. 2 Treaty of Rarotonga.

Additional Protocol.⁵¹² These treaties do not limit themselves to IAEA safeguards to verify compliance, but rather introduce additional instruments and even institutions. These include Councils, Commissions or Committees possessing the authority to demand further information or to conduct special inspections⁵¹³ More specifically, reporting and review mechanisms are in place.⁵¹⁴ These mechanisms are coupled with specific powers of regional control bodies that are set up under the respective NWFZ Treaty.⁵¹⁵ The role of fusion under these instruments will be discussed in the next chapter.

4 The Limits of International Law in Preventing Nuclear Proliferation

International legal frameworks, including the NPT and IAEA safeguards, play a critical role in regulating nuclear technology. However, their capacity to prevent proliferation is inherently limited – particularly when a State is politically determined to develop nuclear weapons.

4.1 Limitations of Safeguards

Especially with regard to safeguards, there are significant limitations to what law can achieve. The case of Iran illustrates these limitations. Despite being a party to the NPT and subject to IAEA safeguards, Iran advanced its nuclear program significantly. It was not legal instruments, but diplomatic negotiations culminating in the legally non-binding Joint Comprehensive Plan of Action (JCPoA), that temporarily curtailed its progress. Iran coming close to the nuclear bomb is not necessarily due to a lack of legal

512 Ibid. On the IAEA safeguards in NWFZ Treaties, see *Inout Suseanu*, IAEA Safeguards Under Nuclear-Weapon-Free Zone Treaties, IAEA Bulletin 62 (2021), 8–9.

513 Articles 15 and 16 Treaty of Tlatelolco, Annex 4 to the Treaty of Rarotonga, Annex to the Treaty of Bangkok, Annex IV to the Treaty of Pelindaba.

514 Art. 14 to 16 Treaty of Tlatelolco, Art. 8 to 10 Treaty of Rarotonga, Art. 10 to 13 Treaty of Bangkok, Art. 12 and 13 Treaty of Pelindaba, Art. 10 Central-Asian Treaty.

515 Art. 7 Treaty of Tlatelolco establishes the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean, Annex 3 to the Treaty of Rarotonga establishes a Consultative Committee, Art. 8 Treaty of Bangkok establishes the Commission for the Southeast Asian Nuclear Weapon-Free Zone, Art. 12 Treaty of Pelindaba establishes the African Commission on Nuclear Energy. The Central-Asian Treaty did not establish a special body.

rules but due to the political will of an individual country. International law can make it more difficult to develop nuclear weapons, especially in a clandestine manner, but it cannot stop a committed State.⁵¹⁶ This has been even acknowledged by the former IAEA Director General Hans Blix during the process of strengthening nuclear safeguards in the 1990s, which ended in the adoption of the Additional Protocol, where he stated:

“No safeguards system, no matter how extensive the measures, can provide absolute assurance that there has been no diversion of nuclear material or that there are no undeclared nuclear activities in a State.”⁵¹⁷

Similar to Hans Blix, the drafters of the Comprehensive Safeguards Agreement regarded safeguards alone as not being sufficient to prevent nuclear weapons proliferation, instead describing them as confidence-building measures with a deterring effect.⁵¹⁸ International law can decrease the risk of nuclear proliferation significantly, but cannot eliminate it.

A key challenge for safeguards is the dual-use nature of nuclear technology – where the same facilities and materials can be used for both civilian and military purposes. However, this duality is not a fixed characteristic of the technology itself, but rather an assumption underpinning the safeguards regime.⁵¹⁹ In practice, the line between peaceful and military use remains blurred, particularly in threshold states with latent weapons capability. Rather than assuming a clear separation between peaceful and military uses, it may be more accurate to describe nuclear technology as inherently ambivalent.⁵²⁰ Such ambivalence surrounding nuclear technology,

516 On the limitations of the safeguards regime towards non-cooperative States, see *Gerald Kirchner/Stefan Oeter*, Technical Limits of Verification and Their Implications for Treaty Design, in: Jonathan L. Black-Branch/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law: Volume II – Verification and Compliance*, The Hague: T.M.C. Asser Press 2016, 167–186.

517 *Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System – Report by the Director General to the General Conference*, GC(39)/17, para. 15.

518 *Röhrlich* (n 286), at 42; *Werner Ungerer/Ryukichi Imai/I. D. Morokhov et al.*, Safeguards: Five Views, IAEA Bulletin 13–3 (1971), 2–13, at 6.

519 *Matthias Englert/Anne Harrington*, Next Generation Nuclear Technologies: New Challenges to the Legal Framework of the IAEA from Intense Neutron Sources, in: Jonathan L. Black-Branch/Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law: Volume II – Verification and Compliance*, The Hague: T.M.C. Asser Press 2016, 187–212, at 205.

520 *Wolfgang Liebert/Rainer Rilling/Jürgen Scheffran*, Die Janusköpfigkeit von Forschung und Technik. Zum Problem der zivil-militärischen Ambivalenz, Mar-

specifically with regard to latent nuclear capabilities and the possibility of its discovery, remains with fusion. While safeguards intend to reduce such ambivalence, there is only limited success as safeguards replace ambivalence with a perceived certainty of objectivity by science and verification techniques.⁵²¹

Ultimately, the development of nuclear weapons is shaped by a complex web of factors – including technical expertise, geopolitical tensions, espionage networks, and resource availability.⁵²² Legal instruments like safeguards obligations and export control regimes are essential, but they function within this broader landscape and cannot, in isolation, prevent the use of fusion for nuclear proliferation. This broader landscape is shaped by political interests which are highly heterogenous.

4.2 Heterogenous Set of Interests

This section presents an overview of the heterogenous set of interests in the realm of nuclear weapons law among the various actors in international law, covering key States, groups of States as well as the IAEA and the EU. These interests stretch from full support to all aspects of nuclear weapons law, to clear opposition.

4.2.1 Nuclear Weapon States Recognised by the NPT

The NPT recognises five nuclear weapon states (NWS): The United States, Russia, the United Kingdom, France and China. While these States rarely share a common interest, it is exceptionally with nuclear non-proliferation and nuclear disarmament where they do.

As they possess an elevated position under the NPT, they have a key interest in maintaining this position. They want to remain the gate keepers to nuclear deterrence and nuclear coercion. These States want to be able

burg: BdWi-Verlag 1994; *Itty Abraham*, 'Who's next?' Nuclear Ambivalence and the Contradictions of Non-Proliferation Policy, *Economic and Political Weekly* 45 (2010), 48–56.

521 *Englert/Harrington* (n 519), at 209.

522 *Sophie Grape/Erik Branger/Vitaly Fedchenko et al.*, Development of Uranium and Plutonium Based Nuclear Weapons – What Impacts the Choice of Fissile Material Route?, *Journal of Strategic Trade Control* 3 (2025), 1–27.

to use these political advantages of the weapon without seeing another State gaining a similar level of power. As a consequence, they are strictly in favour of maintaining the status quo. They support the non-proliferation regime and push for its implementation.⁵²³ These States are against existing initiatives on nuclear disarmament,⁵²⁴ but offer negative security assurances to nuclear weapon free zones.⁵²⁵

However, their interests differ in details, especially on how they use nuclear coercion, on how large their nuclear stockpiles are and how strict their disapproval of nuclear disarmament is.

4.2.1.1 United States

The United States invented nuclear weapons in 1945 during the Manhattan Project at the height of World War II. Today, the United States possesses 5044 nuclear weapons.⁵²⁶

Historically, the United States aimed at limiting the capacity of other States to develop nuclear weapons as they were the only State possessing nuclear weapons between 1945 and 1949. As mentioned above, a key motivator of the United States to suggest the foundation of the International Atomic Energy Agency (IAEA) was to limit other States' capacities to develop nuclear weapons.⁵²⁷

The United States is also one of the architects of the NPT. The NPT not only allows the United States to maintain its elevated position; it also enables the United States to export its nuclear technology all around the world. Its exports of nuclear reactors alone amount to roughly half a billion USD per year.⁵²⁸

523 NPT/CONF.2015/PC.I/12.

524 Statement by France on behalf of the P5 (n 442).

525 Additional Protocols to all NWFZ Treaties except the Treaty of Bangkok are signed by all NWS under the NPT and ratified by all except the US.

526 *Hans M. Kristensen/Matt Korda*, World Nuclear Forces, in: Stockholm International Peace Research Institute (ed.), SIPRI Yearbook 2024: Armaments, Disarmament and International Security, Stockholm: Stockholm International Peace Research Institute 2024, 271–376, at 272.

527 *Röhrlich* (n 286), at 41.

528 *Observatory of Economic Complexity (OEC)*, Nuclear Reactors in the US (2025), <https://oec.world/en/profile/bilateral-product/nuclear-reactors/reporter/usa>, last accessed 17 July 2025.

The United States usually sees itself as a defender of the non-proliferation system. Bilateral safeguards agreements between the United States and importing States of nuclear technology before the inception of the IAEA were the model of the first IAEA safeguards regime. The United States also constantly advocates for a functioning safeguards system. However, the export of US nuclear technology also facilitated India's development of nuclear weapons and the United States continues to export nuclear technology to India.⁵²⁹ In addition, the United States has used its interest to prevent the proliferation of nuclear weapons as justification for military action, such as the Iraq War⁵³⁰ or its attacks on Iranian personnel and nuclear infrastructure in 2020 and 2025.⁵³¹

Nuclear deterrence is crucial to nuclear interests of the United States. The United States perceives its possession of nuclear weapons as insurance for deterring any attack, historically mainly from the Soviet Union or later Russia, but nowadays also from China.⁵³² The United States and Russia keep their stockpiles at levels sufficient to ensure mutually assured destruction. This follows the neo-realist logic that – as their arsenals are capable to fully destroy the other State –, any conventional or nuclear attack is deterred. The United States extends its nuclear deterrence also to its NATO partners, via Article 5 of the North Atlantic Treaty and nuclear sharing agreements. US nuclear weapons are currently deployed to Belgium, Germany, Italy, the Netherlands and Turkey.⁵³³ In case of a nuclear war, the weapons would be mounted onto the allied country's fighter jets.

Together with the Soviet Union and later Russia, these two States have always maintained the vast majority of nuclear weapons in the world of more than 90 %.⁵³⁴ Especially during the Cold War but also in the first decade of the 2000s, the United States had an interest in maintaining an equal level of nuclear weapons with the Soviet Union and later Russia. The United States also supported the reduction of both arsenals in several

529 See above n 400.

530 Colin Powell, Remarks to the United Nations Security Council, 2 February 2003.

531 *William Tobey*, Overview: Nuclear Scientists as Assassination Targets in: Bulletin of the Atomic Scientist, <https://thebulletin.org/premium/2020-11/overview-nuclear-scientists-as-assassination-targets/>, last accessed 17 July 2025; Donald J. Trump, Address to Nation, 22 June 2025.

532 *U.S. Department of Defense*, Nuclear Posture Review, Washington DC: U.S. Government 2022, at III.

533 See above n 443.

534 *Norris/Kristensen* (n 437).

nuclear arms control treaties, such as the SALT Agreements, the Intermediate-Range Nuclear Forces Treaty or the New-START Treaty.

4.2.1.2 Russia

The Soviet Union conducted its first nuclear test in 1949. Today, Russia, as the legal successor of the Soviet Union, possesses 5580 nuclear weapons.⁵³⁵

Russia is a proponent of the NPT as well and supports the non-proliferation regime. The Soviet Union was a key architect of the NPT as well, presenting identical drafts to the conference in 1968.⁵³⁶ To ensure non-proliferation, Russia tried to act as negotiator with North Korea and Iran in their nuclear activities.

During times of the Warsaw Pact, the Soviet Union also extended its nuclear deterrence to allied States. After the dissolution of the Soviet Union, Russia succeeded as NWS and secured its nuclear weapons and materials from former Soviet Union States, such as Ukraine (which used to have the third largest nuclear arsenal), Kazakhstan and Belarus.⁵³⁷ Following its full-scale invasion of Ukraine, Russia has also engaged in a nuclear sharing agreement with Belarus.⁵³⁸ This conflict also led to the suspension of the last nuclear arms control treaty in force.⁵³⁹ Since the 1980s, the Soviet Union and later Russia has had the largest nuclear arsenal in the world.⁵⁴⁰

4.2.1.3 United Kingdom

The United Kingdom tested its first nuclear weapon in 1952 and possesses today 225 nuclear weapons.⁵⁴¹

The United Kingdom follow a different approach to nuclear weapons compared to the United States or Russia. The United Kingdom possesses

535 *Kristensen/Korda* (n 526), at 272.

536 *United Nations* (n 312), at 4.

537 *Vijai Kumar*, Problems of Succession to the Soviet Nuclear Arsenal and International Law, *International Studies* 31 (1994), 305–320.

538 See above n 445.

539 *Philipp Sauter*, Russia's Withdrawal from New START – The End of a Cold War Relic, but Not the Beginning of a New Nuclear Arms Race (2023), in: *Völkerrechtsblog*, <https://voelkerrechtsblog.org/russias-withdrawal-from-new-start/>.

540 *Norris/Kristensen* (n 437).

541 *Kristensen/Korda* (n 526), at 272.

less than 5 % of the nuclear weapons of either the United States or Russia, following a policy of minimum credible deterrent. While nuclear coercion is also used by the United States or Russia, the United Kingdom's policy is limited to nuclear deterrence. The United Kingdom is also engaged in discussions on nuclear disarmament,⁵⁴² but does not support the TPNW.⁵⁴³ Given its limited nuclear arsenal, the United Kingdom was never part of any arms control regime.

The United Kingdom's nuclear programme is also closely aligned with the United States, as its Trident missiles carrying the nuclear warhead are manufactured and maintained by the United States.⁵⁴⁴ In addition, the United Kingdom was a partner in the Manhattan Project.

4.2.1.4 France

France tested its first nuclear weapon in 1960 and today possess 290 nuclear weapons.⁵⁴⁵ Historically, nuclear weapons were essential for France's self-understanding of its position in the post-war world order, initially under the presidency of Charles de Gaulle.⁵⁴⁶

Central to France's nuclear weapons policy is its *dissuasion nucléaire* and its independence from other States. It is based on strict sufficiency of having just enough nuclear weapons to deter any aggression against France's vital interests. France controls its nuclear forces entirely nationally with no foreign involvement like the United Kingdom, despite its comparable size of arsenals.

Historically, France used to be critical towards the international non-proliferation regime. Despite being recognised as NWS by the NPT, it only acceded to the treaty in 1992 for political and economic reasons.⁵⁴⁷ France has been bound by the Euratom safeguards regime since the community's foundation in 1957. Today, France unequivocally supports the nuclear non-

542 For example, the UK Foreign, Commonwealth & Development Office has hosted three conferences on the topic of irreversibility on nuclear disarmament through 2022 to 2024.

543 Statement by France on behalf of the P5 (n 442).

544 *Hans M. Kristensen/Matt Korda*, United Kingdom Nuclear Weapons, 2021, *Bulletin of the Atomic Scientists* 77 (2021), 153–158.

545 *Kristensen/Korda* (n 526), at 272.

546 *Bruno Tertrais/Ministère de la Défense*, *La France et la dissuasion nucléaire : Concept, moyens, avenir*, Paris: La documentation Française 2017, at 79 ff.

547 See above 2.3.1.

proliferation regime set up by the NPT, but it is against the TPNW. In addition, France might extend its nuclear deterrence to European States in the future.⁵⁴⁸

4.2.1.5 China

China tested its first nuclear weapon in 1964 and today possesses 500 nuclear weapons.⁵⁴⁹ With this arsenal size, it sits between the smaller arsenals of the United Kingdom and France on the one hand, and the large arsenals of the United States and Russia on the other hand. It follows a path of nuclear armament, intending to increase its nuclear arsenal, but (potentially) not seeking parity with the United States or Russia.⁵⁵⁰

Similar to France, it only joined the NPT in 1992 despite its recognition as NWS after opposing the treaty for decades for political reasons.⁵⁵¹ It supports the non-proliferation regime. They limit their arsenals to deter nuclear attacks, counter nuclear coercion and maintain strategic stability.⁵⁵² It does not support the TPNW.⁵⁵³ China is further a strong criticizer of US nuclear sharing.⁵⁵⁴ It further opposes being included in US-Russia arms control talks as long as these States do not significantly reduce their arsenals.⁵⁵⁵

4.2.1.6 Summary

NWS recognised under the NPT share a dislike towards the TPNW, while France, the United Kingdom and China are more open towards nuclear disarmament compared to the United States and Russia. It also those two States that use nuclear weapons not only for deterrence, but also as leverage

548 *Philipp Sauter*, *European Nuclear Weapons - Europe's Nuclear Ambitions and the Constraints of International Law* (2024), in: *Verfassungsblog*, <https://verfassungsblog.de/nuclear-weapons/>, last accessed 25 February 2025.

549 *Kristensen/Korda* (n 526), at 272.

550 *Hans M. Kristensen/Matt Korda/Eliana Johns et al.*, *Chinese Nuclear Weapons*, 2025, *Bulletin of the Atomic Scientists* 81 (2025), 135–160.

551 See above 2.3.1.

552 *Kristensen/Korda/Johns et al.* (n 550).

553 Statement by France on behalf of the P5 (n 442).

554 See above n 454.

555 *David Santoro*, *Getting Past No: Developing a Nuclear Arms Control Relationship with China*, *Journal for Peace and Nuclear Disarmament* 6 (2023), 68–86.

in international relations. Regarding non-proliferation, all States share an interest in an effective regime in order to maintain the order established by the NPT.

4.2.2 Nuclear Weapon States Outside the NPT

The interests from NWS outside the NPT differ significantly from those within. These States are India, Pakistan, Israel and North Korea.

India's (first test in 1974 and 172 nuclear weapons⁵⁵⁶) and Pakistan's (first test in 1998 and 170 nuclear weapons⁵⁵⁷) possession of nuclear weapons is mainly motivated by regional conflicts. Both countries have been in an ongoing conflict among each other for decades, which from time to time turns military, especially in the Kashmir region.⁵⁵⁸ In addition, India has had wars against the nuclear-armed China,⁵⁵⁹ further motivating India to possess nuclear weapons. Their stockpiles are limited to a credible minimum deterrence against their rivals to maintain strategic balance. As they are outside the NPT, they do not support the international safeguards regime. Yet, as they have safeguards agreements in place with the IAEA predating the NPT, they have opened up parts of their civilian nuclear infrastructure for IAEA safeguards. They also, in principle, support nuclear disarmament.⁵⁶⁰

Israel has never officially admitted to possess nuclear weapons, while it is one of the worst kept secrets that they do. Experts estimate Israel's arsenal to consist of 90 nuclear weapons.⁵⁶¹ Given the geopolitical situation in which Israel finds itself, nuclear weapons and its deterring factor are seen

556 *Kristensen/Korda* (n 526), at 272.

557 *Ibid.*

558 *Rajesh M. Basrur*, Nuclear Weapons and India–Pakistan Relations, *Strategic Analysis* 33 (2009), 336–344.

559 *Kumar Sundaram/M. V. Ramana*, India and the Policy of No First Use of Nuclear Weapons, *Journal for Peace and Nuclear Disarmament* 1 (2018), 152–168; *Hans M. Kristensen/Matt Korda/Eliana Johns et al.*, Indian Nuclear Weapons, 2024, *Bulletin of the Atomic Scientists* 80 (2024), 326–342.

560 *Rajesh Basrur*, India and Nuclear Disarmament, *Security Challenges* 6 (2010), 69–81; *Mohd Amin Mir/Thseen Nazir*, South Asian Perspectives on the Nuclear Weapons Ban: Challenges and Prospects for Disarmament, *Peace Review* 36 (2024), 256–266.

561 *Kristensen/Korda* (n 526), at 272.

as critical for the survival of the State.⁵⁶² In addition, Israel is against the further spread of nuclear weapons in the Middle East. Israel's opposition against nuclear weapons in the region is also enforced by military action against nuclear programmes, as seen in 1981 in Iraq, 2007 in Syria or 2025 in Iran.⁵⁶³

North Korea possesses nuclear weapons both for survival but also for nuclear coercion. North Korea first tested nuclear weapons in 2006 and is estimated to possess around 50 nuclear weapons.⁵⁶⁴ Nuclear weapons serve as an important tool to protect the Kim regime.⁵⁶⁵ North Korea further uses its nuclear arsenal as leverage in diplomacy to gain concessions against its isolation and to force negotiations with other States such as the United States or South Korea,⁵⁶⁶ as witnessed by the Six Party Talks.⁵⁶⁷

4.2.3 Non-Nuclear NATO States

Another important group of States are non-nuclear NATO States, meaning all NATO States except the United States, the United Kingdom and France. While these 29 States are still quite heterogenous, they share a quandary: They might be the target for Russian nuclear weapons, yet they do not possess any themselves. Instead, they rely on the nuclear umbrella extended by the United States. Thus, they rely on US nuclear weapons for deterrence.

562 On Israel's nuclear weapons programme in a wider context, see *Shlomo Aronson*, *The Politics and Strategy of Nuclear Weapons in the Middle East – Opacity, Theory, and Reality, 1960–1991 -- An Israeli Perspective*, Seattle: SUNY Press 2012. For a particularly trenchant statement, see *Louis René Beres*, *Where the Shadow Really Falls: Why Israel Must Have Nuclear Weapons*, *The Brown Journal of World Affairs* 4 (1997), 127–138.

563 *Istvan Pogany*, *The Destruction of Osirak: A Legal Perspective*, *The World Today* 37 (1981), 413–418; *Ori Wertman/Christian Kaunert*, *Operation “Outside the Box”: The Securitization of the Syrian Nuclear Reactor*, in: *Israel: National Security and Securitization: The Role of the United States in Defining What Counts*, Cham: Springer International Publishing 2023, 123–148; *Michael N. Schmitt*, *Israel's Operation Rising Lion and the Right of Self-Defense* in: *Lieber Institute Articles of War*, <https://lieber.westpoint.edu/israels-operation-rising-lion-right-of-self-defense/>, last accessed 17 July 2025.

564 *Kristensen/Korda* (n 526), at 272.

565 *Benjamin Habib*, *North Korea's Nuclear Weapons Programme and the Maintenance of the Songun System*, *The Pacific Review* 24 (2011), 43–64.

566 *Jonathan D. Pollack*, *North Korea's Nuclear Weapons Development – Implications for Future Policy*, *Proliferation Papers* 33 (2010), 7–44.

567 See above n 413.

Yet, as they are NATO Member States, they have to support the nuclear dimension of the alliance, despite strong resentments against nuclear weapons in some Member States.⁵⁶⁸ As members of the alliance, they are against nuclear disarmament under the current security environment.⁵⁶⁹

There are, however several examples of NATO Member States having a critical stance towards this doctrine. Sweden used to be a strong opponent of nuclear weapons.⁵⁷⁰ The Dutch Government refused to participate at the negotiations of the TPNW, but was forced to by a parliamentary vote.⁵⁷¹ Germany participates as an observer to meetings of State Parties of the TPNW, but refuses to join the treaty.⁵⁷²

Regarding non-proliferation, they share the goal of universalising the Additional Protocol,⁵⁷³ pushing for a maximum level of safeguards in the world. Most European NATO States are also part of Euratom, where they adhere to the Euratom safeguards regime. Their stance on non-proliferation is even more important as many NATO members can be considered as threshold States. States such as Germany or Canada have the technological capacity to build nuclear weapons, but they decide actively to use nuclear technology for peaceful uses only. Most States are not able to build nuclear weapons and do not want to build nuclear weapons, while many NATO States would be able, but do not want to build nuclear weapons.

Among non-nuclear NATO States, Germany occupies a specific role. It is an outspoken defender of the nuclear non-proliferation regime, even more than others, as seen in the nuclear talks with Iran in 2014 and 2015. Alongside the permanent members of the UN Security Council (which are also the only States that the NPT recognises as NWS), Germany was the only

568 On the role of Sweden and Finland, see *William Alberque/Benjamin Schreer*, What Kind of NATO Allies Will Finland and Sweden Be?, *Survival* 64 (2022), 123–136.

569 On the role of NATO being a nuclear alliance, see *Kjølvs Egeland*, Spreading the Burden: How NATO Became a ‘Nuclear’ Alliance, *Diplomacy & Statecraft* 31 (2020), 143–167.

570 Sweden which funds several institutions such as the Alva Myrdal Center for Nuclear Disarmament at the University of Uppsala, named after the Swedish Nobel Peace Prize Laureate for her support of disarmament, or the Stockholm International Peace Research Institute.

571 *Ekaterina Shirobokova*, The Netherlands and the prohibition of nuclear weapons, *The Nonproliferation Review* 25 (2018), 37–49.

572 *Katja Astner/Moritz Kütt*, The Treaty on the Prohibition of Nuclear Weapons – Changing Disarmament Discourses in Germany?, in: Ulrich Kühn (ed.), *Germany and Nuclear Weapons in the 21st Century – Atomic Zeitenwende?*, Oxford: Routledge 2024, 203–229.

573 All NATO States have concluded an Additional Protocol.

non-nuclear weapon State participant to those talks with Iran, underlying Germany's specific interest to defend the non-proliferation regime.⁵⁷⁴

4.2.4 Non-NATO States from the Global North

Another important group of States are non-NATO States from the Global North, mainly Ireland, Austria and Malta. Historically, also Sweden had been an example before its accession to NATO in 2024.

These States unequivocally support both nuclear non-proliferation and nuclear disarmament. For example, the negotiations which led to the NPT were initiated by the so-called Irish Resolution in 1958 where Ireland called for an end of the nuclear arms race at the United Nations.⁵⁷⁵ Austria not only hosts the headquarters of the IAEA, but it was at the forefront of negotiating the TPNW.⁵⁷⁶ All three States are Member States of the TPNW.

4.2.5 States from the Global South

The Global South is a heterogenous group of States. While there is some diversity in their stance on nuclear non-proliferation, the Global South is united in its opinion on nuclear disarmament.

Regarding nuclear disarmament, they are at the forefront of not only talking about it, but at taking action. With the important exception of NWS outside the NPT and some States in the Middle East, all States which are deemed to belong to the so-called Global South are members of NWFZs. The Treaty of Tlatelolco which established the NWFZ in Latin America and Caribbean even predated the NPT. It was especially the States from this region that also pushed for the adoption of a binding instrument leading towards nuclear disarmament, first with proposals of a model nuclear weapons conventions within the NPT framework, later with the adoption

574 On Germany's role in the JCPoA negotiations and implementation, see *Cornelius Adebahr*, *Germany's Role in the Success and Failure of the Iran Nuclear Deal*, in: Ulrich Kühn (ed.), *Germany and Nuclear Weapons in the 21st Century*, London: Routledge 2024, 281–301.

575 See above n 309.

576 *Nick Ritchie/Alexander Kmentt*, *Universalising the TPNW: Challenges and Opportunities*, *Journal for Peace and Nuclear Disarmament* 4 (2021), 70–93.

of the TPNW. Out of the treaty's 73 parties, all but six parties⁵⁷⁷ belong to the Global South.

With regard to nuclear non-proliferation, there is a mixed picture. The majority of States pushes for a high level of safeguards in order to ensure that the objectives of the NPT and other nuclear weapons law instruments are met.⁵⁷⁸ A key motivator for them is that as long as States are assured that their neighbours are not pursuing nuclear weapons, there is no need for themselves to pursuing them. However, there is also a group which is quite sceptical towards new instruments of nuclear non-proliferation, including Argentina, Brazil, Egypt, Iran, Syria and Venezuela. They regard the three pillars of the NPT – non-proliferation, technical assistance and disarmament – as equals and are disappointed that NWS refuse to consider nuclear disarmament. As long as NWS do not engage in nuclear disarmament, they see additional safeguards as a sign of mistrust, as they keep their end of bargain, unlike NWS according to their perception.⁵⁷⁹ As the NPT had a limited duration of 25 years and was set to expire in 1995, States from the Global South tried to use a potential expiration as leverage to force NWS and other States from the Global North to concessions, which ended up in the 1995 Extension Deal, which – as analysed above – still lacks implementation and further increases the frustration of these States. These are the reasons why some States from the Global North did not conclude an Additional Protocol with the IAEA and why the safeguards standard of the Additional Protocol was not included in the TPNW.⁵⁸⁰

4.2.6 Other States with Particular Interests

There are two States in particular which are difficult to group into another category: Japan and Iran.

577 Austria, Holy See, Ireland, Malta, New Zealand and San Marino are State Parties to the TPNW, but belong to the Global North.

578 More than 100 States from the Global South have concluded an Additional Protocol with the IAEA.

579 See for example Brazil's opposition to the Additional Protocol, *Marcos Valle Machado da Silva*, Brazil and the Refusal to the Additional Protocol: Is It Time to Review this Position?, *Carta Internacional* 16 (2021), 1–26.

580 *Casey-Maslen* (n 502), Article 3, at paras 3.14 ff.

As Japan has witnessed the devastating effects of nuclear weapons and has lost approximately 200,000 people to nuclear weapons,⁵⁸¹ Japan is one of the most outspoken States against nuclear weapons. Despite its status as a threshold State, Japan stands unequivocally to its three non-nuclear principles: Japan shall not possess nuclear weapons, shall not produce nuclear weapons and shall not permit the introduction of nuclear weapons into its territory.⁵⁸² It also a fierce advocate of nuclear disarmament.⁵⁸³ Nonetheless, it is part of the United States' extended nuclear umbrella and has not signed the TPNW.

Another State with particular interests is Iran. Despite being a Member State of the NPT, it (most likely) actively pursues a nuclear weapons programme.⁵⁸⁴ Unlike North Korea, it has not yet decided to withdraw from the treaty, yet it does not act in conformity with its obligations under its Comprehensive Safeguards Agreement it has concluded with the IAEA.⁵⁸⁵ It pursues nuclear weapons for mainly two reasons. First, its archenemy Israel possesses nuclear weapons. Iranian nuclear weapons would lead to a strategic level playing field. Iran would also be able to deter both conventional and nuclear attacks as well as to use nuclear coercion towards other States in the region. Second, Iran has used its nuclear programme as diplomatic leverage, leading to the JCPoA, which would have resulted in the lifting of a majority of Western sanctions against the Mullah regime. Following the United States' withdrawal from the JCPoA, Iran has resumed its nuclear programme, which was struck militarily by Israel and the United States in 2025.

581 *Masao Tomonaga*, *The Atomic Bombings of Hiroshima and Nagasaki: A Summary of the Human Consequences, 1945–2018, and Lessons for Homo sapiens to End the Nuclear Weapon Age*, *Journal for Peace and Nuclear Disarmament* 2 (2019), 491–517.

582 Statement by Prime Minister Eisako Sato, 11 December 1967.

583 *Yukiya Amano*, *A Japanese View on Nuclear Disarmament*, *The Nonproliferation Review* 9 (2002), 132–145; *Jonathon Baron/Rebecca Davis Gibbons/Stephen Herzog*, *Japanese Public Opinion, Political Persuasion, and the Treaty on the Prohibition of Nuclear Weapons*, *Journal for Peace and Nuclear Disarmament* 3 (2020), 299–309.

584 Iran has enriched uranium to 60 %, which is significantly above levels for commercial application, GOV/INF/2023/1. On the timeline of the programme, see *Matt Field*, *A Simple Timeline of Iran's Nuclear Program in:* *Bulletin of the Atomic Scientists*, <https://thebulletin.org/2025/06/a-simple-timeline-of-irans-nuclear-program/>, last accessed 17 July 2025.

585 IAEA Board of Governors, GOV/2025/38.

4.2.7 European Union and Euratom

The European Union and Euratom have a special role corresponding to specific interests in the regime of nuclear weapons law.

On the one hand, there is Euratom, the European community charged with supplying its Member States with nuclear material and to administer safeguards. Historically, Euratom's role to administer safeguards was the cause for hesitation of European States towards the IAEA's safeguards regime, which was only solved after a compromise delimiting the authorities of both institutions. Regarding non-proliferation, Euratom supports the Additional Protocol and its heightened standard of safeguard. Euratom also continues to improve the effectiveness and efficiency of Euratom safeguards.⁵⁸⁶ Given the limited scope of the Euratom Treaty, Euratom does not take a stance on expanding nuclear non-proliferation outside Europe.

Such matters of foreign policy are, however, supported by the European Union under the EU's Common Foreign and Security Policy. The EU takes part at NPT Review Conferences, financially supported the setup of the CTBTO, is a large donor to the IAEA and promotes the universalisation of the Additional Protocol.⁵⁸⁷ Regarding nuclear disarmament, the EU finds itself in a difficult situation. EU Member States include France as an NWS, NATO States and non-NATO States, which do not share a common stance on the topic. While the EU funds the EU Non-Proliferation and Disarmament Consortium, a network of European think tanks and research centres,⁵⁸⁸ the EU does not engage in negotiations on nuclear disarmament.

4.2.8 IAEA

The IAEA as nuclear watchdog also has a specific interest in the regime of nuclear weapons. As safeguards are at the centre of its activities, the IAEA has an interest in a strong nuclear non-proliferation regime. As the IAEA has the mandate to administer safeguards, it has an interest in having the

586 Council Decision (Euratom) 2025/492 of 18 February 2025 approving a Commission Regulation on the application Euratom safeguards.

587 *Peter Van Ham*, The European Union's WMD Strategy and the CFSP: A Critical Analysis, EU Non-Proliferation Consortium Non-Proliferation Papers 2 (2011), 1–16, at 8.

588 Council Decision (CFSP) 2022/597 of 11 April 2022 promoting the European network of independent non-proliferation and disarmament think tanks.

means of effectively implementing its mandate. The non-detection of Iraq's nuclear weapons programme by the IAEA caused heavy critiques of the organisation and finally led to the adoption of the Additional Protocol.⁵⁸⁹ The IAEA's interest to effectively administer safeguards is also complementary to the IAEA's role of promoting nuclear energy and other nuclear technologies. Only if it is effectively guaranteed that the IAEA prevents the proliferation of nuclear weapons rather than supporting nuclear weapons programmes, the IAEA can justify its existence.

In addition, it is the IAEA's interest to remain the hub for dealing with nuclear non-proliferation. Regarding other aspects of nuclear weapons law, the IAEA has remained silent. The IAEA did not oppose the creation of the CTBTO to verify the arms control instrument CTBT, neither did it actively advocate for or lobby against a potential future delegation as competent international authority under the disarmament instrument TPNW. It sees itself as politically neutral, relying on the consensus of its Member States. It also acknowledges the limitations of its Statute which is limited to non-proliferation and does not extend to nuclear disarmament or arms control.

4.2.9 Summary

The interests can be summarised as follows: NWS recognised under the NPT unanimously defend the nuclear order established by the NPT. They support a strong non-proliferation regime while they regard nuclear disarmament as crucial. NATO States typically share this interest, while they are more open towards pathways to nuclear disarmament. NWS outside the NPT possess nuclear weapons mostly as a result of regional tensions as a deterrence against attacks. States from the Global South generally push towards nuclear disarmament, but they do not have a common stance towards a strong regime on nuclear non-proliferation. Some support it, some see a movement towards nuclear disarmament by NWS as prerequisite for it. The European Union promotes a strong non-proliferation regime. The IAEA as nuclear watchdog has a heightened interest of a strong regime as well.

589 See above n 339.

5 Summary

The international regulation of nuclear weapons is characterised by a delicate balance of security, economic, and environmental interests. The ongoing challenges in enforcing non-proliferation while allowing peaceful uses of nuclear technology have led to a complex regime of nuclear weapons law. This regime consists of a wide web of legal sources, covering the areas of nuclear non-proliferation and nuclear disarmament.

The development of the nuclear non-proliferation regime can be traced back to a series of incidents involving States developing nuclear weapons clandestinely, kick-started by the Manhattan Project during World War II. The safeguards system mandated by the NPT and implemented by the IAEA has been identified as the cornerstone of this regime. In executing its mandate, the IAEA exercises a high level of authority on NNWS. The scope of the regime is further set out in different safeguards agreements. The basis for NNWS is the CSA, based on INFCIRC/153(Corrected). Many States have also concluded an Additional Protocol, based on INF-CIRC/540(Corrected), further extending the IAEA's safeguards authority. NWS recognised by the NPT have concluded Voluntary Offer Agreements with a limited scope of application. In a similar manner, NWS outside the NPT (India, Pakistan, Israel) have item-specific safeguard agreements with the IAEA, with military facilities excluded, thus limiting the IAEA's authority in safeguards. Moreover, the Euratom Treaty includes a regional European safeguards regime, which deals with the specificity of addressing both NNWS and NWS with one regime. The safeguards regime is further complemented by export control regimes, which are further specified in the intergovernmental fora of the Zangger Committee and the NSG.

In the context of nuclear disarmament, there is an absence of a treaty that can be regarded as a cornerstone. Despite being mandated by Article VI of the NPT, NWS continue to refuse to negotiate or join nuclear disarmament treaties. Despite being at the centre of the international agenda since the inception of the United Nations, there is only limited progress. Nevertheless, there are treaties addressing the prohibition of nuclear weapons: The TPNW on the international level, and NWFZ Treaties on the regional level. These treaties include their individual safeguard regimes for verification, based on the IAEA framework.

International law, while important, has inherent limitations in preventing nuclear proliferation, as determined States can circumvent legal frameworks to develop weapons, highlighting the insufficiency of legal measures

alone. The dual-use nature of nuclear technology and the influence of multiple factors beyond legal safeguards further complicate efforts to curb proliferation effectively. This is especially due to a variation of interests among States, State groups and international organisations. Regardless of the law's limitations, the legal framework of nuclear weapons is the foundation of any action against nuclear proliferation.

The next chapter will investigate how this framework is applicable to fusion.

