

The role of non-nuclear weapons states in a disarmament regime driven by the vision of a world free of nuclear weapons

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Summary

The aim with this report is to identify ways for Norway and other non-nuclear weapons states (NNWS) to contribute in the process towards a world free of nuclear weapons. In particular, the report investigates how Norway and other NNWS can achieve a meaningful role in the process of verifying the dismantling of nuclear weapons. Up to now, the nuclear weapons states (NWS) have primarily handled the verification of nuclear dismantlement themselves. This is insufficient because it does not provide enough international transparency and confidence to ensure that the dismantlement has indeed taken place. Involvement from NNWS in the verification process would create increased legitimacy to the dismantling process, as a broader range of actors are then overseeing that the NWS comply with their commitments.

However, the Treaty on the Non-Proliferation of Nuclear Weapons (NTP) sets strict limitations on the exchange of information regarding nuclear weapons between NWS and NNWS. Because of this, involvement from NNWS in the verification process also represents special complications related to the risk of proliferation of nuclear weapons technology to new actors. These challenges are unique to nuclear weapons and differ from those arising during verification of disarmament of other weapon types.

The report shows that Norway and other NNWS can have meaningful roles in a nuclear disarmament regime, as long as proliferative and other sensitive information is properly protected. Norway, in particular, has experience in developing systems that make verification by NNWS possible in a non-proliferative way. Norway is also competent to carry out international on-site inspections to ensure that nuclear weapons have been dismantled in conformity with international agreements. Besides, Norway can continue to contribute in the process of preparing and finding international support for arms control agreements and subsequent verification regimes. Norway's membership in the North Atlantic Treaty Organization (NATO) creates additional opportunities for Norway to influence and assist NATO and the international community in the process towards a world free of nuclear weapons.

Norwegian summary

Hensikten med denne rapporten er å finne mulige roller for ikke-kjernevåpenstater generelt og Norge spesielt i prosessen fram mot en kjernevåpenfri verden. Rapporten undersøker hvordan Norge og andre ikke-kjernevåpenstater kan oppnå en rolle i et framtidig nedrustningsregime som skal overvåke kjernefysisk nedrustning, drevet av visjonen om en kjernevåpenfri verden. Foreløpig har kjernevåpenstatene i stor grad håndtert verifikasjon av kjernefysisk nedrustning på egenhånd. Dette gir imidlertid ikke tilstrekkelig gjennomsiktighet rundt kjernevåpennedrustningen til å kunne garantere at kjernevåpnene i realiteten er eliminert. Inkludering av ikke-kjernevåpenstater i et verifikasjonsregime gir større grad av legitimitet til nedrustningsprosessen ved at flere uavhengige aktører overvåker at kjernevåpenstatene etterlever sine nedrustningsforpliktelser.

Avtalen om ikke-spredning av kjernevåpen (NPT) innebærer imidlertid strenge restriksjoner for utveksling av informasjon mellom kjernevåpenstater og ikke-kjernevåpenstater. Dersom ikke-kjernevåpenstater inkluderes i verifikasjonsprosessen knyttet til kjernevåpennedrustning, vil det kunne oppstå nye utfordringer relatert til risikoen for spredning av kjernevåpenteknologi til nye aktører, utover det man har ved verifikasjon av nedrustning av andre våpentyper.

Denne rapporten viser at Norge og andre ikke-kjernevåpenstater kan ha meningsfulle roller i et framtidig verifikasjonsregime, gitt at det etableres metoder for å hindre spredning av sensitiv informasjon om kjernevåpenteknologi. Norge er spesielt kvalifisert til å utvikle systemer som muliggjør ikke-kjernevåpenstaters deltagelse i overvåkning av kjernefysisk nedrustning. Norge kan også delta i internasjonale inspeksjoner som overvåker at kjernevåpennedrustning skjer i tråd med relevante nedrustningsavtaler. Samtidig kan Norge fortsette å være en viktig pådriver i utviklingen av internasjonale nedrustningsavtaler og påfølgende verifikasjonsregimer, samt bidra til å sikre høy oppslutning omkring slike avtaler. Norges medlemskap i NATO skaper ytterligere muligheter for Norge til å påvirke og bistå NATO og verdenssamfunnet generelt i prosessen fram mot en kjernevåpenfri verden.

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Preface

This report is the result of a study financed by a grant from the Department of Security Policy of the Norwegian Ministry of Defence, and it constitutes FFI's formal reporting to the ministry under this grant.

1 Introduction

There are more than 23,000 nuclear weapons in existence in the world today, in which approximately a half of them are operational or active (Norris and Kristensen 2009).¹ All these nuclear weapons are located in 13 or 14 different countries.² The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) aims to prevent the spread of nuclear weapons to new countries and to progress towards complete disarmament of existing nuclear capabilities, while promoting cooperation on the peaceful use of nuclear energy. As of November 2010, a total of 190 states are members of the NPT, which entered into force in March 1970.

The NPT classifies the states parties into two groups, Nuclear Weapons States (NWS) and Non-Nuclear Weapons States (NNWS). The NWS are those states which had “manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January, 1967” (See the full treaty text in Appendix A). These states are allowed to keep a nuclear arsenal, but are obliged to work towards complete disarmament. Thus, according to the NPT, the United States, Russia, the United Kingdom, France and China are the only ‘legitimate’ NWS in the world today. These five countries are also permanent members of the United Nations Security Council (UNSC). Russia has the most nuclear weapons among the NWS, with approximately 13,000 nuclear warheads in total (Norris and Kristensen 2009). The United States possesses about 9,400 nuclear warheads; however, the United States has a comparatively larger arsenal of strategic nuclear weapons than Russia. The three remaining NWS possess a much smaller number of nuclear weapons. France has approximately 300 nuclear warheads; China approximately 240, while Britain possesses about 180 nuclear warheads.

The NNWS are obligated through the NPT not to develop or possess nuclear weapons or nuclear weapons technology, and they are required to develop and adhere to a Safeguards agreement with the International Atomic Energy Agency (IAEA). The IAEA is an international agency entrusted with the responsibility of verifying compliance of the NPT. The IAEA is allowed to conduct on-site inspections on all declared nuclear facilities in those NNWS who are party to the treaty.

The NPT only distinguishes between NWS and NNWS. However, the division between these two categories is not as clear as it was when the treaty was developed. India, Pakistan and North Korea, and sometimes Israel, are generally referred to as *de facto* NWS. Israel, India and Pakistan never joined the NPT, while North Korea, after first signing the treaty in December 1985, declared its withdrawal from the NPT in 2003, before conducting its first nuclear test in 2006. Also India and Pakistan have carried out test explosions and thereby demonstrated their possession of nuclear weapons, while Israel has neither confirmed nor denied that it possesses

¹ The estimates were developed by Norris and Kristensen in the end of 2009.

² Nuclear weapons are located in the United States, Russia, France, China and Britain (the five ‘legitimate’ NWS), India, Pakistan, North-Korea and sometimes Israel (the three or four *de facto* NWS), as well as Belgium, the Netherlands, Germany, Italy and Turkey (the five European members of NATO hosting U.S. non-strategic nuclear weapons).

nuclear weapons. Various reports nevertheless indicate that Israel is a *de facto* NWS, with approximately 80-100 nuclear warheads (Norris and Kristensen 2009).

The verification issues discussed in this report mainly apply to the states that are parties to the NPT. Nevertheless, even though the *de facto* NWS must be treated separately, these states cannot be ignored in the overall debate on nuclear disarmament, bearing in mind that these countries are vital participants in order to achieve a world free of nuclear weapons.

To reach the ultimate goal of total nuclear disarmament, verifiable arms reduction treaties must be developed and implemented. Only through transparency and verification can the international community be ensured that the NWS are actually reducing their armaments, and that they are in compliance with their contractual obligations in the treaties. Today, there are greater expectations of openness and transparency regarding nuclear disarmament than before, and nuclear dismantlement is anticipated to take place under international inspections and supervision. Involvement from an NNWS or an international organization in the verification process could create increased confidence and legitimacy to a disarmament process, but it also represents an increased risk of proliferation of nuclear weapons to new actors. International verification can also be seen as a threat to the national security of the states being inspected. The balance between necessary confidentiality and sufficient transparency must be secured by careful weighing, and transparency issues are generally given a lower priority than non-proliferation aspects.

Many tools can be used to create sufficient confidence that NWS comply with their obligations in arms reduction treaties. One solution, which is being explored through a joint initiative between Norway and the United Kingdom, is to allow NNWS direct participation in the verification process of actual dismantlement of nuclear weapons. In this way, NNWS will be able to oversee that NWS are taking the proper steps regarding nuclear dismantlement. However, NNWS participation requires extensive use of *managed access*³ procedures and credible *information barrier* systems,⁴ so that the NNWS do not receive proliferative knowledge about nuclear weapons technology.

This report discusses how NNWS in general and Norway in particular can become credible contributors in nuclear disarmament processes. To identify challenges in a possible future disarmament process, it is useful to take a step back and study previous arms reduction agreements and treaties. Chapter 2 contains a review of the agreements most relevant to future work on nuclear arms reduction. We will see how verification systems have become steadily more important in these treaties. In Chapter 3, we look more closely at the special challenges regarding verification of disarmament of nuclear weapons with regard to national security and non-proliferation issues, especially when involving NNWS. Chapter 4 investigates possible solutions

³ *Managed access* implies that inspectors are given access to a sensitive facility under strict control by the host country. For more information, see Section 4.2.

⁴ In this context, an *information barrier* is a system that would give a nuclear disarmament inspector enough information to be confident that a certain object meets certain criteria without revealing any information that could be proliferative. For more information, see Section 4.3.

to the practical challenges encountered when developing systems for verification of disarmament, including lessons learned from the United Kingdom-Norway Initiative. In Chapter 5, Norway's role in previous international arms reduction processes is discussed, leading to an outline of a possible role for Norway as an NNWS in a future nuclear disarmament regime with systems for verification.

1.1 Towards a world free of nuclear weapons

At a summit in Reykjavik in 1986, where former President Ronald Reagan of the United States and former Soviet President Mikhail Gorbachev participated, President Reagan declared a goal of abolishing all nuclear weapons. Reagan also called the nuclear weapons “totally irrational, totally inhumane, good for nothing but killing.”⁵ In January 2007, George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn published an article in the *Wall Street Journal* declaring their support for the elimination of nuclear weapons (Shultz et al 2007). The ‘four elders’ cited Ronald Reagan for his efforts towards this goal, and they listed several concrete steps which they hoped would lay the groundwork in the striving towards a world free of nuclear weapons. When President Barack Obama and President Dmitry Medvedev signed the new Strategic Arms Reduction Treaty (START) in April 2010, this unquestionably represented a significant step towards the ultimate goal of a world free of nuclear weapons. It also represented an important move towards meeting the requirements of NPT’s Article VI on disarmament, an article which has received much less attention from the NWS than those addressing non-proliferation.

Up to now, we have seen a stepwise reduction in nuclear weapons. The United States and Russia have implemented significant cutbacks in the number of strategic nuclear weapons, but there has not been a similar reduction of non-strategic (tactical) weapons and weapons in reserve. If the ultimate goal of total disarmament stipulated in the NPT is ever to be reached, the United States and Russia must take the initiative to move further towards zero by reducing their nuclear weapons and implementing strict verification regimes. These two countries must be on the forefront of disarmament because they possess the world’s largest stocks of nuclear weapons. When the nuclear arsenals of the United States and Russia are approaching the levels of the three remaining NWS, the United Kingdom, France and China, these states must also join the nuclear arms reduction process and implement significant nuclear cutbacks. To achieve the goal of a nuclear weapons free world, the de facto NWS must in a similar way join in the collective strive towards zero. In the end, all states must contribute in the process of creating a world free of nuclear weapons. Even though the United States and Russia must take the first crucial and large steps towards zero, the other NWS should also consider contributing at an early stage. This will put disarmament on the international agenda, and a world free of nuclear weapons will be easier to achieve.

1.2 Obligations due to the Non-Proliferation Treaty

The NPT was signed in July 1968, entered into force in March 1970, and was extended indefinitely in May 1995. The NPT rests on three pillars: non-proliferation, disarmament and the

⁵ Quote from Ronald Reagan, as cited in Shultz et al 2007.

right to peaceful use of nuclear energy. The ultimate goal of the NPT is to eliminate all nuclear weapons. The NWS are, under Article I, obligated not to transfer, assist or encourage any NNWS to acquire or manufacture a nuclear weapon. Under Article VI, the NWS pledge to negotiate complete nuclear disarmament. The NNWS are, under Article II, obligated not to receive, acquire or have control over nuclear weapons. However, under Article IV, all member states have an inalienable right to the use of nuclear energy for peaceful purposes.

The International Atomic Energy Agency (IAEA) is entrusted with the authority to verify compliance with the NPT. The Agency has developed bilateral Safeguards agreements with the NNWS, allowing the IAEA to carry out on-site inspections of nuclear facilities, materials and activities. The IAEA is currently urging all NNWS to also implement the ‘Additional Protocol’ to the Safeguards agreements, which will extend the authority of the IAEA by allowing the Agency access also to undeclared facilities.⁶ This is very important because without the Additional Protocol, the IAEA cannot discover possible undeclared facilities that may be part of a hidden nuclear weapons programme.

1.3 The concept of verification

A verification system is essential in all disarmament agreements in order to ensure that the parties comply with their contractual obligations. According to a UN Panel of Government Experts (2008), verification is “a tool to strengthen international security. It involves the collection, collation and analysis of information in order to make a judgment as to whether a party is complying with its obligations.” In disarmament agreements where there exists a high degree of confidence between the parties, a strict verification system is less important. If there are uncertainties regarding non-compliance, however, a verification regime will be necessary in order to create sufficient confidence that member states are fulfilling their obligations.

A great range of tools can be used in order to create sufficient confidence in the authenticity of the dismantling process. Monitoring systems and on-site inspections can provide relevant information about the disarmament of nuclear weapons in a given state, which subsequently may be used to evaluate whether that state is in compliance or not with a treaty. A monitoring system can be developed as a small-scale monitoring system, a global monitoring system or a satellite-based system (Dahlman 2010). The most comprehensive monitoring system ever established is the global verification system of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), where monitoring stations are set up in different areas of the world, including in Norway.⁷ On-site inspections are also important tools to ensure that nuclear disarmament is taking place, and such inspections have been included in many arms reduction regimes. The verification system of the

⁶ See for example Heireng and Moezzi (2010:12).

⁷ The CTBT is an international treaty which prohibits all member states from carrying out nuclear test explosions. By November 2010, the CTBT was still awaiting ratification by some of the 44 states required to ratify it before it can enter into force. Norway, which is one of the 44 states, ratified the treaty in July 1999. Norway has developed four seismic installations located in different parts of Norway, aimed at detecting and localizing nuclear explosions. For more information about Norway’s monitoring stations and its contribution to the CTBT verification regime, see Section 3.5.2.

new START agreement between the United States and Russia, for instance, will use on-site inspections as a method to verify the disarmament of strategic nuclear weapons. In the Chemical Weapons Convention (CWC), inspections also constitute an important part of the verification system (see Section 2). The IAEA is allowed to carry out comprehensive notified and un-notified on-site inspections in NNWS, in order to verify their compliance with the NPT.

What is perceived as adequate verification by one party is not necessarily seen as sufficient by another. To which extent a given verification regime must go depends on the parties involved and the existing confidence between these parties. Verification can take place under bilateral or multilateral arrangements, but can also happen under national control. Some verification systems are comprehensive and legally binding, while others are vague and informal. In many cases, previous agreements and verification methods have established the foundation of new agreements and regimes. Many aspects of verification are analysed in the book by Hinderstein (2010).

1.3.1 Verification through national technical means

The first disarmament agreements between the United States and the Soviet Union during the Cold War included no independent verification systems, but relied on *national technical means* (NTM) for verification. The term implies that the involved states unilaterally use intelligence information to verify the disarmament of nuclear weapons at the jurisdiction of the other side. In order to obtain enough information about the process, compliance then somehow had to be observable. Satellite-based observation systems can for instance be used as a NTM of verification. When intelligence is collected via satellite or aerial photography, it is often called imagery intelligence (IMINT). When communication or other electronic signals are detected via satellites or other means, this is referred to as signal intelligence (SIGINT).

1.3.2 Bilateral verification

With the collapse of the Soviet Union, it became politically possible for the United States and Russia to agree on more comprehensive verification procedures. The verification systems included in the 1991 *Strategic Arms Reduction Treaty* (START I), for instance, went beyond previous satellite-based observation systems, to allowing the United States and the Soviet Union to conduct bilateral on-site inspections at each other's nuclear installations.

During this same period of time, Argentina and Brazil also established arrangements for bilateral verification through the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). The ABACC was created in 1991 and became responsible for verifying that nuclear materials in Brazil and Argentina are being used exclusively for peaceful purposes (The ABACC 2010a). ABACC has established its own team of highly qualified inspectors from Brazil and Argentina, a team that has carried out many inspections at nuclear facilities in both countries, in collaboration with the IAEA. The Brazilian ABACC inspectors are responsible for verifying nuclear facilities in Argentina, while the Argentinean inspectors verify nuclear facilities in Brazil (The ABACC 2010a).

An advantage of bilateral verification to international verification is a reduced risk of sensitive information falling into the wrong hands. International verification generally involves more actors, increased transparency and additional access to a state territory, something many states may see as a threat to their national security and sovereignty.

1.3.3 International verification

International verification is desirable because it enhances transparency and creates legitimacy. In the aftermath of the Cold War era, the number of international verification systems has increased; however, we have not yet seen an international verification system to ensure credible disarmament of nuclear weapons. Article VI in the NPT clearly states that nuclear disarmament shall take place “under strict and effective international control.” This language leaves room for interpretation when it comes to defining the international body carrying out this control. No international organization is ideal in verifying dismantlement of nuclear weapons (Shea 2010), but some organizations possess a good deal of nuclear knowledge and expertise, as well as the necessary legitimacy to be in control of such a verification process.

The IAEA has for instance acquired a great deal of nuclear know-how through many years of collaboration and supervision within the nuclear field. According to Thomas E. Shea (2010), the IAEA could potentially become the main organization in a global verification regime of nuclear dismantlement. The IAEA has previously played an important role in several verification agreements, including the so-called “Trilateral Initiative,” which ran from 1996 to 2002 and involved Russia, the United States and the IAEA. Even though the Trilateral Initiative never was fully completed, it did resolve some important questions. The IAEA did not, for instance, gain access to weapons design information (Cliff, Elbahtimy and Persbo 2010:14). At the General Conference in Vienna in September 2010, the United States and Russia once again invited the IAEA to verify nuclear disarmament. This time, the IAEA was invited to verify the disposition of declared excess stocks of weapons grade plutonium. During the Cold War, the United States and Russia produced large amounts of plutonium for their nuclear weapons. Through the new initiative, the United States and Russia committed to eliminate 34 metric tons of plutonium each (Cliff 2010), which is enough for thousands of nuclear weapons. The elimination is expected to be carried out under the supervision of the IAEA. This initiative clearly illustrates that involvement of an international organization in the verification process is as relevant today as it was in the 1990s.

An alternative to including the IAEA in the verification process is to develop an entirely new organization with the necessary responsibilities. This has been done before in several verification regimes. Among others, the signatory states of the Chemical Weapons Convention (CWC) in 1997 decided to form an organization known as the Organization for the Prohibition of Chemical Weapons (OPCW). The OPCW was entrusted with the responsibility to verify the implementation of the CWC. In a similar way, the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) was established in 1996 in order to establish a verification regime to ensure compliance of the CTBT when it enters into force. Inclusion of international organizations in the verification of nuclear disarmament will be investigated further in Section 2.

1.4 The role of NNWS in the verification of nuclear disarmament

For a verification process to be acceptable, a reasonable number of states must recognize the actual process and methods of verification. However, up to this point, the NWS have preferred to handle the dismantlement verification between themselves without the involvement of a third party. From the perspective of the NNWS, this is unsatisfactory. It is difficult to convince everybody that an NWS has reduced its nuclear arsenal without any NNWS or an international organization actually observing the disarmament process to some sufficient degree. Verification only by NWS is also unsatisfactory in relation to the actual wording of the NPT. Article VI does not only create an opportunity for the NNWS to contribute in the important process of verifying nuclear disarmament, but it does also in fact oblige the NNWS to participate in the process of achieving complete disarmament. Article VI in the NPT states in full that (see Appendix A):

Each 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.

NPT, Article VI

If NNWS were allowed to partake in the verification process of dismantling nuclear weapons, who would be best suited among the NNWS to do this? First, the participating NNWS must clearly be members to the NPT with a good standing in the non-proliferation regime. The participation of the NNWS must not violate the NPT or cause unacceptable security concerns within the NWS. Second, different NNWS possess different levels of nuclear knowledge, and in a verification regime the NNWS could play different roles depending on their previous experiences and nuclear know-how. For example, South Africa developed nuclear weapons independently during the 1970s and 1980s, but subsequently decided to voluntarily give those up (Enger 2008). South Africa must therefore have significant knowledge about nuclear fuel cycle technology, as well as the design and the manufacture of nuclear weapons. Ukraine, Belarus and Kazakhstan inherited strategic nuclear weapons from the former Soviet Union. These former Soviet republics accepted to get rid of their nuclear weapons by transporting them to Russia. All these four countries have more knowledge about sensitive nuclear technology than most other NNWS, including Norway. The role of the NNWS in verifying warhead dismantlement may vary correspondingly. A verification regime must not only oversee the dismantlement of nuclear warheads, but must also monitor nuclear material that has not been eliminated, and maybe also nuclear facilities and infrastructure as well as delivery systems. NNWS should therefore take upon themselves different tasks depending on their previous experience and nuclear know-how.

Under Article I of the NPT, the NWS undertake not to transfer, assist or encourage any NNWS to acquire or manufacture a nuclear weapon. In a similar way, under Article II, the NNWS pledge not to receive, acquire or control nuclear weapons. It is therefore essential that the NNWS can verify warhead dismantlement without receiving proliferative nuclear weapons information. The key question becomes how to balance the NNWS's legitimate need for sufficient information to verify that the disarmament process is genuine, with the NWS's, and indeed the entire

international community's, legitimate need to keep detailed knowledge about the design of nuclear weapons secret.

In an attempt to clarify this problem and find a way to work around it, Norway has worked closely with the United Kingdom on verification issues.⁸ For example, the two parties have investigated how Norway, as an NNWS, can confirm the presence or absence of a warhead, while at the same time not obtaining sensitive information about the warhead. A similar verification system was examined through the Trilateral Initiative between the United States, Russia and the IAEA from 1996 to 2002. During this six-year effort, the parties developed a verification system with an information barrier that should keep inspectors from the IAEA from getting access to sensitive information about nuclear warheads. The experiences from the Trilateral Initiative and the "United Kingdom-Norway Initiative" will be of great value in the development of a future verification regime with an information barrier system and managed access procedures. The experiences so far confirm that cooperation between an NWS and an NNWS in the process of eliminating nuclear weapons is both feasible and fruitful.

Norway's Minister of Foreign Affairs, Jonas Gahr Støre, (Støre 2010a) has stated that "We cannot leave it to the nuclear weapon states alone to decide when it is time for them to do away with these weapons." As an NNWS, Norway has shared interests as well as shared obligations with all other states in ensuring that the NWS reduce their armaments in accordance with Article VI of the NPT. Norway is in a position in which it could become an active participant in potential nuclear verification regimes, and thereby represent many other NNWS in their common strive for transparent verification. Chapter 5 of this report will discuss how Norway potentially can verify nuclear disarmament, and why Norway should attempt to achieve such a constructive role in the verification process.

2 Verification regimes in a changing world

To identify possible future verification regimes for nuclear weapons in which NNWS have a meaningful role, it is necessary to study previous verification practice. For that reason, some historical reflections on relevant arms control agreements and subsequent verification regimes are made below.⁹ We will see how stringent verification systems have become gradually more significant, while the earlier treaties had hardly any independent verification systems at all. This overall trend is very clear and provides us with important information about how a future nuclear disarmament verification regime may be structured.

2.1 Relevant arms control agreements and verification regimes

In this section, the relevant arms control agreements and their corresponding verification systems are presented chronologically.

⁸ The so-called 'United Kingdom-Norway Initiative' is presented in Section 4.5.

⁹ More information about arms control agreements in Heidi Kristine Toft 2003.

2.1.1 The Limited Test Ban Treaty

Already during the administration of President Dwight D. Eisenhower, from 1953 to 1961, efforts were made towards transparent, verifiable nuclear disarmament. When the United States, the United Kingdom and the Soviet Union agreed to suspend their nuclear test program in November 1958, a moratorium which lasted almost three years,¹⁰ the parties strived to create a verification system to ensure compliance of the moratorium. However, the parties had divergent views on the necessity of a stringent verification system. The western countries wanted a rigorous verification regime to ensure that the test ban agreement would not be vulnerable to clandestine violation. The Soviet leaders, on the other hand, stated that an atomic or hydrogen bomb could not be “produced without being recorded in other countries” (ACDA 1982:36). A new independent, stringent verification system was therefore not needed. The Soviet Union and the United States could not agree on several important questions regarding verification, particularly on the number and location of the seismological stations needed in the verification system and on the sovereignty of the verification system itself (Powaski 1998:124). Consequently, the moratorium took place without any verification measures. The United States, the United Kingdom and the Soviet Union continued the negotiations at the Paris summit in May 1960, but the meeting was interrupted after an American U-2 spy plane was shot down over the Soviet Union. It was not until after the Cuban Missile Crisis that the parties finally agreed on a treaty.¹¹ *The Limited Test Ban Treaty* (LTBT) prohibited all test detonations of nuclear weapons in the atmosphere, in outer space and under water (LTBT Treaty Text 1963). It did not, however, ban nuclear weapons tests underground. The treaty was signed by the United States, the Soviet Union and the United Kingdom in Moscow in August 1963. Despite these parties approving a limited test ban treaty, U.S. President John F. Kennedy and First Secretary of the Communist Party of the Soviet Union (CPSU) Nikita Khrushchev, could not agree on the number of annual on-site inspections and the number and location of control posts (LTBT Treaty Text 1963). The agreement therefore entered into force without any verification mechanisms.

2.1.2 The Treaty on the Non-Proliferation of Nuclear Weapons

In March 1970, the most important arms reduction treaty negotiated during the administration of President Lyndon B. Johnson entered into force, namely the *NPT* (see Appendix A). As previously explained, the IAEA was entrusted with the responsibility of verifying compliance of the NPT, and all NNWS were obligated to accept a comprehensive Safeguards agreement with the IAEA to enable the IAEA to assure that no nuclear material had been diverted to develop nuclear weapons. Even so, the IAEA verification regime has been criticized for not being thorough enough. The criticism gained weight after it was discovered that Iraq in the 1980s managed to develop a clandestine nuclear weapons program, and lately after revelations that Iran has managed to develop nuclear facilities in secret. Consequently, the IAEA now encourages all

¹⁰ The first nuclear test after the moratorium entered into force was conducted by France, which carried out its very first nuclear test in February 1960. The following three nuclear weapons tests were also conducted by the French government.

¹¹ The confrontation between the United States and the Soviet Union during the Cuban Missile Crisis in October 1962 was the closest the world had ever been to a nuclear war. The crisis created a political climate for arms reduction.

member states to implement the Additional Protocol, a Safeguards agreement designed to give the IAEA extended means of verification, by allowing its inspectors access to any undeclared facility suspected of harbouring nuclear activities. Without the Additional Protocol, the IAEA can only verify declared activities; with the Additional Protocol it can in principle verify that no prohibited activities take place. Implementation of the Additional Protocol will therefore strengthen the verification system considerably. The verification regime of the NPT is generally seen as being very comprehensive and quite successful.

2.1.3 The Strategic Arms Limitations Talks

President Johnson also attempted to involve the United States in *Strategic Arms Limitations Talks* (SALT) with the Soviet Union, but did not succeed.¹² The breakthrough in the SALT negotiations occurred in 1972, when President Richard Nixon and General Secretary of the CPSU Leonid Brezhnev signed the Anti-Ballistic Missile Treaty (*The ABM Treaty*), which limited the deployment of anti-ballistic missile systems in both countries, and the *Interim Agreement*, which reduced land-based and submarine-based nuclear weapons (SALT I Treaty Text 1972). The parties agreed to monitor each other based on each country's own NTM, namely intelligence satellites, to ensure compliance. The ABM agreement was actually the first agreement using the term 'National Technical Means.' Article V of the SALT I agreement, stipulated that both parties were obligated not to interfere with the other party's NTM. In addition, they were not allowed to apply deliberate concealment measures that could impede the monitoring. The SALT I agreement turned out to be a symbol of successful *détente*, as it reduced the tension between the two countries considerably.

After the successful SALT I agreement, Nixon and Brezhnev also signed a declaration of principles for a second SALT agreement. However, the actual *SALT II Treaty* was not completed until June 1979 under President Jimmy Carter and General Secretary Brezhnev. Through the SALT II Treaty, the United States and the Soviet Union agreed to limit the number of strategic nuclear delivery vehicles (SNDV), including heavy bombers, intercontinental ballistic missiles (ICBM) and submarine-launched ballistic missiles (SLBM). The SALT II agreement also limited the use of multiple independently targetable re-entry vehicles (MIRV) on missiles (SALT II Treaty Text 1979). Even though the negotiations were considered successful, there was a lack of stringent verification mechanisms. Similar to the SALT I agreement, the verification system was based on NTM, and the parties were compelled not to interfere with each other's NTM. In addition, under Article XVI, the parties pledged to notify each other if they planned to conduct an ICBM launch. Beyond these measures, there were no ways of ensuring compliance. Despite President Carter's efforts in developing the SALT II Treaty, he never managed to achieve a ratification of the agreement in the United States.

¹² Events such as the ongoing war in Vietnam and the Soviet overthrow of the government in Czechoslovakia in 1968 hardened the climate and made it impossible for the two parties to begin the talks (Powaski 1998:165).

2.1.4 The Biological and Toxin Weapons Convention

In April 1972, the *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, better known as the Biological and Toxin Weapons Convention (BTWC), opened for signature. The BTWC, which entered into force in March 1975, did not only prohibit the use of biological weapons, but did also outlaw the development, production and stockpiling of such weapons.¹³ In similarity with most other arms control treaties at that time, the BTWC had no formal verification procedures to ensure compliance. The States Parties could, according to Article VI, lodge a complaint to the UNSC if they suspected other member states of being in non-compliance with the BTWC (BTWC Treaty Text 1975). The member states were also, according to Article V, obligated to cooperate and consult one another, bilaterally or multilaterally, to solve problems. Beyond these measures, however, there were few verification procedures. Nonetheless, some additional understandings complementing the Articles in the BTWC were reached at the BTWC Review Conferences. At the sixth BTWC Review Conference in November 2006, for instance, it was decided to establish an Implementation Support Unit (ISU), with the aim of supporting states in implementing the Convention. Negotiations regarding development and implementation of possible verification measures are still ongoing.

2.1.5 The Threshold Test Ban Treaty

The Threshold Test Ban Treaty (TTBT) was signed by the United States and the Soviet Union in July 1974, but did not enter into force until December 1990. The Treaty prohibited underground nuclear weapons tests exceeding 150 kilotons (TTBT Treaty Text 1974). Through the agreement, the United States and the Soviet Union also undertook an obligation to continue negotiations towards a comprehensive test ban treaty. The verification system of the TTBT included on-site inspections and seismic monitoring with respect to all tests having a planned yield exceeding 35 kilotons, as well as a hydrodynamic yield measurement method regarding all tests having a planned yield of more than 50 kilotons (TTBT Treaty Text 1974). Even though the treaty entered into force at a much later date, both parties observed the yield limit of 150 kilotons already from 1976.

2.1.6 The Treaty on Underground Nuclear Explosions for Peaceful Purposes

In April 1976, the United States and the Soviet Union signed the bilateral *Treaty on Underground Nuclear Explosions for Peaceful Purposes* (PNET). Article III in the Treaty prohibited individual nuclear explosions with a yield exceeding 150 kilotons, as well as any group explosions with an aggregate yield exceeding 1,500 kilotons (PNET Treaty Text 2001). In addition, the parties were obliged not to carry out any group explosions with an aggregate yield exceeding 150 kilotons if the individual explosions within the group explosion could not be measured independently. According to Article IV, verification of PNET was, like the SALT agreements, based on the use

¹³ In fact, already in June 1925, the use of biological weapons in warfare was prohibited for those states signing and ratifying the 1925 Geneva Protocol. This Protocol, which entered into force in February 1928, also prohibited the use of chemical weapons in warfare (Geneva Protocol Treaty Text 1925).

of NTM, and no parties were allowed to interfere with those means. Both parties were obliged to give information about and access to sites of explosions (PNET Treaty Text 2001).

2.1.7 The Intermediate-Range Nuclear Forces Treaty

In December 1987, however, President Ronald Reagan and General Secretary of the CPSU, Mikhail Gorbachev, signed a treaty on the elimination of their intermediate-range and short-range missiles, commonly referred to as the *INF Treaty* (short for Intermediate-Range Nuclear Forces Treaty), which included more comprehensive verification measures. The INF Treaty eliminated an entire category of delivery vehicles, including nuclear and conventional ground-launched ballistic missiles (GLBM) and ground-launched cruise missiles (GLCM) with ranges of 500 to 5,500 kilometres (INF Treaty Text 1998). Through Article IV and V, the parties were pledged to eliminate all its intermediate-range and short-range missiles, including launchers and related structure and equipment. The INF Treaty consisted of three comprehensive documents. The *Protocol on Elimination*, which explained the procedures of the elimination process of the missile systems, the *Memorandum of Understanding*, which was a document containing exchanged data on intermediate-range and short-range missiles and launchers of such missiles, and the *Protocol on Inspections*, which described the inspections that would ensure verification of compliance. The INF Treaty ensured détente between the two superpowers, and included some very stringent verification arrangements. In addition to verification by NTM, Article XI specified that both parties were allowed to carry out on-site inspections on the territory of the other party (INF Treaty Text 1998). Furthermore, Article XIII declared that the United States and the Soviet Union should develop a Special Verification Commission with the responsibility of resolving outstanding questions related to compliance with the agreement (INF Treaty Text 1998). The parties were requested to use the Nuclear Risk Reduction Centers, a channel of communication established to reduce the risk of nuclear war, to exchange data relevant to the articles in the treaty.

2.1.8 The Strategic Arms Reduction Treaty I

Further nuclear disarmament was achieved when Mikhail Gorbachev and President George H. W. Bush signed the first *Strategic Arms Reduction Treaty* (START I) in 1991. Belarus, Kazakhstan and Ukraine signed a protocol to the START Treaty in May 1992, as these countries then had inherited strategic nuclear weapons from the former Soviet Union. Through the START I agreement, the United States and the Soviet Union reduced and limited the number of ICBMs, launchers and warheads, as well as SLBMs, launchers and warheads (START I Treaty Text 1991). The reductions were scheduled to be completed by the end of 2001. Under Article XI of the treaty, the United States and the Soviet Union received the right to conduct on-site inspections at each other's facilities as well as implementing various monitoring activities. Exchange of periodic data and missile test telemetry tapes were also part of the verification system. In addition, the verification system relied on NTM.

2.1.9 The Strategic Arms Reduction Treaty II and the Treaty on Strategic Offensive Reductions

The second strategic arms reduction treaty, *START II*, was signed by President Boris Yeltsin of the Russian Federation and President George H. W. Bush in January 1993. The treaty

complemented the earlier START I by further limiting the number of warheads on strategic offensive forces (START II Treaty Text 1993). To ensure compliance, the treaty would be verified by on-site inspections. Any questions related to compliance should be solved within the Bilateral Implementation Commission (BIC), a commission established exclusively to solve issues related to compliance. START II never entered into force. In June 2002, the United States also announced its withdrawal from the ABM treaty which had previously been implemented. In its place, *the Treaty on Strategic Offensive Reductions* (SORT) was signed in 2002 by presidents George W. Bush and Vladimir Putin, a treaty which reduced the number of strategic weapons in the United States and Russia (SORT Treaty Text 2002). SORT had, in contrast to the START and ABM treaties, no verification provisions. The SORT agreement is often referred to as *the Moscow Treaty*.

2.1.10 The Trilateral Initiative

Between 1996 and 2002, the United States, Russia and the IAEA designed a system for verification of nuclear dismantlement. This collaborative effort, which is generally referred to as *the Trilateral Initiative*, sought to develop a system in which the IAEA could verify nuclear dismantlement without actually obtaining proliferative or other sensitive nuclear information. The United States and Russia are, under Article I of the NPT, obliged not to transfer, assist or encourage any parties to acquire or manufacture nuclear weapons. A verification system which included the IAEA therefore had to be developed with managed access procedures and information barriers to retain sensitive information. The IAEA received a monitoring role in the initiative without gaining access to design information (Cliff 2010:14). Although the Initiative never was entirely completed, many lessons were learned from the development of a verification system with an information barrier.

2.1.11 The Chemical Weapons Convention

When the *Convention of the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction* (CWC) opened for signature in January 1993, it aimed to eliminate an entire category of non-conventional weapons (CWC Treaty Text 1993). The treaty entered into force in April 1997, and as of November 2010 the CWC was ratified by 188 states.¹⁴ The verification system of the CWC is based on both national and international monitoring of compliance, and the system has been successfully implemented. On the national level, the member states have pledged to implement the treaty, and to provide mandatory declarations about its implementation. On the international level, an independent verification organization, the Organization for the Prohibition of Chemical Weapons (OPCW), is established to verify compliance of the treaty. The OPCW has the mandate to carry out systematic, routine on-site inspections, as well as on-site challenge inspections in the member states, aiming to confirm the accuracy of the relevant declarations, destruction of stockpiles or claims of non-compliance. The mandate includes permission to carry out inspections of certain civilian industrial facilities. The verification system of the CWC is highly comprehensive.

¹⁴ Syria, North-Korea, Angola, Egypt and Somalia have not yet signed the CWC, while Israel and Burma have signed but not ratified the convention.

2.1.12 The Comprehensive Nuclear-Test-Ban Treaty

With regards to nuclear weapons, the international treaty with the most comprehensive monitoring system today is *the Comprehensive Nuclear-Test-Ban Treaty (CTBT)*, a treaty which prohibits all member states from carrying out nuclear test explosions (CTBT Treaty Text 1996). Even though the CTBT opened for signature in September 1996, the treaty has not yet entered into force. Article XVI in the treaty stipulates that the CTBT will not enter into force until a specific list of 44 states have ratified the treaty.¹⁵ As of October 2010, the treaty lacked ratification from China, North-Korea, Egypt, India, Indonesia, Iran, Israel, Pakistan and the United States before it could enter into force (CTBTO 2010). The CTBT has a much more comprehensive technical system for verifying compliance compared to all former verification regimes. The verification system consists of seismic monitoring, infrasound monitoring, radionuclide monitoring and hydroacoustic monitoring from 321 different monitoring stations around the globe, cf. Figure 2.1 (NORSAR 2008:7).

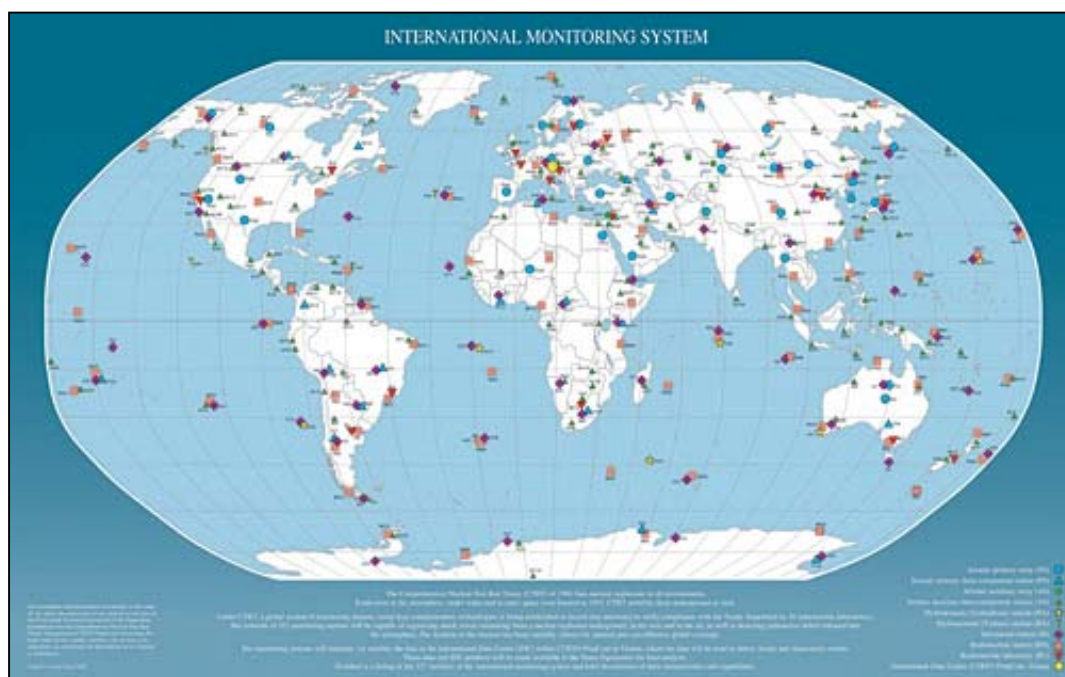


Figure 2.1 Global distribution of the CTBT monitoring stations. Source: www.ctbto.org

The aim of the monitoring system, commonly referred to as the CTBT International Monitoring System (IMS), is to detect and localize nuclear explosions. The use of challenge on-site inspections is permitted if a state is accused of being in non-compliance of the treaty. The system was successfully tested when it detected the nuclear explosions in North-Korea in 2006 and 2009. In 1996, the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) was established to build the verification regime and to ensure compliance by the member states.

¹⁵ These were the states in possession of nuclear power reactors or nuclear research reactors at the time.

2.1.13 The New START Treaty

In April 2010, President Barack Obama of the United States and President Dmitry Medvedev of the Russian Federation signed *the New START* accord, which involves a number of strict verification measures. This successor to the 1991 Strategic Arms Reduction Treaty calls for a new reduction in strategic nuclear weapons. The United States and Russia are barred, according to Article II, from exceeding 1550 deployed warheads, 700 deployed delivery systems, and 800 deployed or non-deployed launchers (New START Treaty Text 2010). Under Article XI, the parties obtain the right to conduct inspection activities at various bases, including ICBM bases, submarine bases and air bases, and on specific facilities to ensure compliance. In addition, Article X of the treaty stipulates that NTM shall be used. The parties are prohibited from interfering with the NTM and banned from using concealment measures that may impede the verification. Some of the types of strategic nuclear weapons covered by the new START agreement are easier to verify than others. Among the strategic weapons addressed, removal of deployed ICBMs is relatively easy to verify because they are land-based, mainly in silos, and visible. Other strategic nuclear weapons are more difficult to detect; SLBMs are for instance in general hidden at sea. The New START Treaty was ratified by the American Senate in December 2010.

2.1.14 The Fissile Material Cut-off Treaty

For many years, efforts have been invested towards developing a *Fissile Material Cut-off Treaty* (FMCT) that aims to ban the production of fissile materials for use in nuclear weapons or other nuclear explosive devices (FMCT Draft Treaty Text 2009). Fissile materials are in this context limited to plutonium or highly enriched uranium, key ingredients in nuclear weapons. The parties ratifying the treaty will be allowed to produce fissile material, but only under international safeguards, under which constraints on the quality of the fissile materials will be implemented. The FMCT negotiations have not yet been completed, and there are uncertainties regarding the development of a verification system to ensuring compliance with the treaty. However, in December 1993, the United Nations General Assembly passed a resolution requesting the IAEA to assist in the examination of verification arrangements (UN Res/48/75L 1993).

2.2 Overall trends and patterns

The earliest examples of arms control agreements between the United States and the Soviet Union during the Cold War were, as we have seen, agreements primarily verified through NTM, with no independent systems. The LTBT and the SALT treaties are great examples of this overall tendency. Lack of trust between the parties made it difficult to agree on more comprehensive systems of verification, making NTM the only way of verification. The NPT, the TTBT and the PNET involved some verification methods surpassing the NTM mechanisms in stringency; however, these extended verification arrangements were not at the level of today's strong verification regimes, in which access is given more deeply and more frequently.

The trend then moved towards more stringent verification systems to ensure compliance, as seen from CTBT, CWC, START and the Trilateral Initiative, all developed in the aftermath of the

Cold War. Some of these latest agreements also established international organizations with the aim of developing verification systems and overseeing the actual disarmament. Examples are the OPCW, responsible of verifying compliance of State Parties to the CWC, the CTBTO, responsible of developing the verification system of the CTBT, and the IAEA, an important contributor to the Trilateral Initiative. There were some set-backs however, with, for instance, lack of verification arrangements to ensure compliance of SORT. The overall tendency throughout the last two decades still appears to be more usage of on-site inspections and monitoring activities to ensure compliance, whereas NTM of verification and other comparatively obligation-free measurements have been deemed less important. When NTM are used, these means in most cases complement other monitoring tools.

In what way can these experiences hold lessons for prospective successful implementation of effective verification of nuclear disarmament? When developing a verification regime for the disarmament of nuclear weapons, under which the NNWS have an active role in the verification process, the trend tells us that this could be done through the induction of stringent verification systems based on on-site inspections and external monitoring activities, as well as NTM. In addition, an international organization could be established with the responsibility of developing and implementing the verification regime. The IAEA has not yet fully asserted its role in the verification of nuclear weapons disarmament, and a revision of its mandate may be necessary for the IAEA to be able to hold such a position in a verification regime. In any case, managed access procedures and information barrier systems must be developed in an early phase in order for NNWS to participate in the process.

3 What is desirable and possible to inspect?

This chapter contains a discussion of the conflicts between what on the one hand one would like to inspect in order to verify nuclear disarmament and what on the other hand it is possible to inspect. Without a good balance between these concerns it will be impossible to reach the necessary level of confidence about the process that is being verified. Verification is ultimately all about confidence building.

3.1 What is desirable to inspect?

Any international verification regime will have to be based on a treaty of some kind (bilateral or multilateral), and the treaty will in turn define the *Treaty Accountable Item* which will be the topic of verification. In some treaties, the Treaty Accountable Item could be missiles or other means of delivery, for example. In case of nuclear weapons dismantlement, the Treaty Accountable Item would have to be the warhead itself or some smaller part of it, but always a part which contains the fissile materials. The inspectors must therefore be able to convince themselves that all fissile materials in the weapon are removed or either destroyed or placed in monitored storage or a secure repository.

The inspectors therefore need to

- Verify that the weapon contains the appropriate fissile materials to begin with.
- Verify that no fissile materials are diverted during the dismantlement process.
- Verify that all fissile materials are destroyed or placed in appropriate storage.

Ideally, to accomplish these tasks, the inspectors will need full access to the fissile materials in the weapons during the entire dismantlement process, but as we will see in the sections below, this is impossible. Compromises will have to be found in such way that allows the inspectors to maintain their confidence in the dismantlement process.

3.2 Transparency in nuclear disarmament

Verification of disarmament of any kind is difficult. The inspectors must be able to assure themselves, and the international community relying on their efforts, that the dismantlement process they have been sent out to observe is real, and that the armaments are being adequately destroyed and disposed of. In some cases, the inspectors must also verify that there are no hidden stockpiles and that the entire arsenal has been destroyed. To verify all of these matters, the inspections include not only observation of the destruction process, but also access to documentation regarding the arsenal, the history of the weapons and often interviews with key personnel. The inspectors might also need access to former manufacturing plants, storage areas and ideally also the military bases where the weapons were kept.

In a disarmament inspection, the state being inspected has the upper hand. This state is more in control of the situation than the inspectors, and it would generally always have a number of opportunities of misleading the inspectors by using hidden rooms in dismantlement facilities, false documentation, and so on. The aim of a disarmament verification regime must be to make the disarmament process as transparent as possible to the inspectors.

A future international treaty on the disarmament of nuclear weapons, with a verification regime, is often envisioned as something similar to the CWC. There are, however, several essential differences between these two fields.

Chemical weapons have been outlawed completely in the signatory states of the CWC. The states are only allowed to synthesize, keep or use small quantities of the chemical substances covered by the convention for research and protective purposes, and all such quantities must be declared to the OPCW (cf. Section 2.1.11). The facilities where such compounds (above certain threshold quantities) are manufactured or stored are subject to regular international inspections. However, information about the chemical composition of these substances is not restricted by the treaty, and such information may be shared among the parties as long as it is used only for peaceful purposes, for example development of protective measures or detection systems.

The situation regarding nuclear weapons is very different. The member states are obliged by the NPT to work towards complete disarmament, but the NPT does not outlaw nuclear weapons; the designated NWS are allowed to keep and even expand their arsenals. However, they are not

allowed to share proliferative information with NNWS or aid them in developing their own nuclear weapons. These heavy restrictions on the flow of information regarding nuclear weapons technology also restrict what a verification regime can practically control, particularly if NNWS are involved in the inspection process.

3.3 The challenge of sensitive nuclear information

Still today, more than 60 years after the first nuclear weapons were manufactured and used, all issues regarding nuclear weapons are surrounded by extreme security and secrecy. The severe secrecy is rooted in two different concerns: National security and the NPT.

National security concerns normally surround any type of military installation or procedure. However, the NWS tend to put their nuclear weapons in a special security category, covered by extra layers of security.

In the cold war era, the NWS used their nuclear arsenal as the centrepiece of their military capacity. Nuclear weapons have exceptionally strong military potential, and for the states that possessed them, any other military capacity could be viewed as merely supportive. Today, in a changed political climate, nuclear weapons have been pushed more into the background, but the NWS still rely on them as their last option, to be used in extreme situations when all other options have been exhausted. However, this view of nuclear weapons as a last option only has not lead to less secrecy, as it logically follows that these weapons must be kept absolutely safe at all times, potentially to the very end of a future war. Their locations and the exact numbers of weapons will therefore be guarded more closely than most other military secrets. Other capacities would after all be revealed through direct actions at earlier points in an escalating war before the option of using nuclear weapons would be even considered.

Nuclear weapons have a singularly extreme capacity for destruction. The holders of these weapons are naturally themselves acutely aware of this and will therefore strive to protect any information that might help their enemies to develop nuclear weapons or improve an existing arsenal. The NPT has made non-proliferation international law.

The NWS tend to view any information regarding the technical properties of their nuclear weapons as extremely secret. This includes both the isotope composition, the amount of fissile material used in each warhead and the configuration of the material. Information about such sensitive issues may be revealed through radiation from the weapons themselves. In addition, the isotopic composition could be determined from careful analysis of minimal samples of contamination from the fissile material in facilities where the weapons have been assembled or dismantled. This makes the NWS wary of letting outside personnel anywhere near the real weapons or even the facilities where the dismantlement takes place. Verification of destruction or down-blending of the fissile materials from the weapons is equally difficult to achieve, as it could be possible to estimate the original composition and amount of nuclear material used in each warhead from the amount and composition of the end products.

In addition to this, there may be other components, nuclear or non-nuclear, in the weapon systems that the NWS consider essential to the design of their weapon. The mere existence of such essential components would be kept as secret as anything else in the nuclear weapons field.

All states obviously have national security reasons for hiding certain information. When an NWS is increasingly drawn into a process of verification and transparency, the monitoring party will bit by bit receive details about capabilities which in total could be sensitive or proliferative. Strong opposition from NWS to permit direct involvement by NNWS in the nuclear dismantling process could easily be the result of such security considerations.

Some of the non-proliferation issues would be easier to deal with in verification regimes involving only NWS, especially if they regard each other as being on roughly the same technological level. Most of the issues regarding national security would however still apply.

It is obvious that this policy of complete secrecy makes nuclear disarmament inspections very hard, seemingly almost impossible, to carry out. In a successful future nuclear disarmament verification regime, some concessions will have to be made.

3.4 The balance between transparency and national security

Non-proliferation, the way it is defined in the NPT, is not negotiable. National security related security measures, however, may be taken up for consideration anew. In order to handle these questions, a clear line should be drawn to distinguish between sensitive and non-sensitive information and technology related to the NPT. Similarly, a consensus should be reached on how much information is needed to achieve an acceptable level of verification in a given disarmament regime. In this way, the NWS will be able to preserve their national secrets, while at the same time the NNWS can have a role in the dismantling process. Where exactly this line should be drawn is not generally obvious (Høibråten and Kippe 2010).

The world has changed since 1945. Today, many NNWS have considerable knowledge of fissile materials and nuclear technology from the civilian nuclear sector. Information in this sector is generally handled openly. Modern modelling software can in hours handle calculations that sixty years ago would have been impossible to complete. Perhaps it is time for the NWS to reconsider which concepts in the nuclear field must still be considered secret, and which they may now assume that nuclear experts in NNWS are already in possession of?

3.5 Concerns and formalities

In the process of developing a nuclear disarmament verification regime, the involved parties must ensure that all verification procedures are developed in accordance with existing international agreements, particularly the NPT. A verification regime should preferably be developed and implemented at times when the international context is favourable, as this will increase the likelihood of success.

3.5.1 Verification regimes consistent with international agreements

When establishing a new disarmament verification regime under which NNWS are given active roles in the dismantling processes, it is vital that the regime is in compliance with other existing international agreements. Of particular significance is Article I and Article II of the NPT, stipulating that the NWS are prohibited from assisting or encouraging any NNWS to acquire or manufacture a nuclear weapon, and that the NNWS are prohibited from receiving, acquiring or manufacturing a nuclear weapon (cf. Appendix A). In order for a verification regime to be consistent with these articles, the regime must be developed such that the NNWS only have managed access to facilities, materials and technology being inspected, and such that sensitive information is protected with reliable information barrier systems where necessary. The IAEA or another international body can potentially oversee the monitoring activities as they are being carried out, in order to ensure that all activities are performed in accordance with existing arms control treaties. New disarmament treaties will presumably be developed over time, and the verification regime must thus be kept in accordance with these treaties too.

3.5.2 The political environment

There is a contemporary trend towards increased focus on nuclear disarmament. Through the new START agreement, President Barack Obama and President Dmitry Medvedev have accepted a reduction in strategic nuclear weapons and allowed comprehensive on-site inspections related to the total number of warheads on deployed missiles. A new level of transparency is reached between the former enemies of the Cold War, as Washington and Moscow are contributing to paving the way toward a world free of nuclear weapons. Simultaneously, the number of nuclear weapons free zones is expanding worldwide (Holøien 2006:9). According to Norway's Minister of Foreign Affairs, Jonas Gahr Støre, the possibility of eliminating all nuclear weapons is higher today than during the previous 65 years.¹⁶

Smaller states are also increasingly drawn into initiatives designed to ensure nuclear disarmament and non-proliferation. For instance, under the verification system of the CTBT, smaller states are allowed to detect and verify nuclear explosions, and thereby oversee if powerful states are complying with international agreements. NORSAR, for instance, is a Norwegian national resource centre entrusted with the responsibility of verifying compliance with the CTBT. NORSAR has developed advanced seismic installations in Finnmark (northeast of Norway), Hedmark (southeast of Norway), Spitsbergen (an island north of Norway) and Jan Mayen (an island northwest of Norway), where the institute carries out seismic monitoring (NORSAR 2008:11). When North Korea tested its first nuclear weapon in 2006, the Norwegian seismic station in Finnmark detected the explosion right away and made comprehensive measurements. When North Korea carried out its second nuclear test in 2009, the seismic stations in Finnmark and Hedmark both recorded the seismic signature of the explosion.

¹⁶ This statement was given by Mr. Støre at a conference on "Nuclear disarmament strategies, non-proliferation and export control" in Oslo, 12 October 2010.

Now may be an appropriate time for NNWS to look for ways to contribute to the process of verifying nuclear disarmament. The window of opportunity may not be open indefinitely, as future administrations in Washington and Moscow may not hold the same agendas as their predecessors. The NNWS should take advantage of today's favourable political environment and use the opportunity to become more actively engaged in nuclear disarmament.

4 Implementation of a mutually acceptable verification practice

As we have seen, proper verification of nuclear disarmament represents several unsolved challenges. In the NWS, nuclear weapons are surrounded by national security measures as well as the non-proliferation measures stipulated by the NPT. This means that inspections to verify nuclear disarmament must be performed with a minimum of access to the weapons that are to be dismantled, and with a minimum of information regarding their properties. This is particularly so if NNWS are to be involved in the dismantlement process.

4.1 The initialisation problem

Imagine that you are an inspector from an NNWS sent out to observe the dismantlement of a nuclear weapon in an NWS, and to, if possible, verify that this process takes place according to the NWS's disarmament declaration. Presumably, no physical access will be given to the warhead itself. You will be given no technical drawings, no exact weights or other verifiable measurements of the physical properties of the weapon. Any documentation regarding the weapon, its history and former use will most likely be heavily censored for national security reasons, and such information is also easily falsified. You will not be informed of the exact amount of fissile materials present, or the isotopic composition of this material. In such a situation, not only will it be extremely difficult to be confident that you have actually followed the same object through the whole dismantlement process; you will not even know if the object you have followed was the real weapon it was claimed to be to begin with.

One way of countering this intrinsic problem, the so-called *initialisation problem*, could be to redefine the purpose of the inspection. As long as the NWS has removed from its nuclear material stock an amount of weapons grade fissile material sufficient to make one weapon, the NWS's potential to build nuclear weapons has definitely decreased by one.

This view makes the inspectors' job a little easier. Seen this way, the main objective would be to make sure that the object selected for dismantlement contains fissile materials of sufficient quantity and quality to constitute a real weapon, not that it is in the shape of a functioning weapon. The inspection must verify that this material is in fact taken out of circulation in the NWS's weapons complex by destruction or by being placed in monitored storage. *Information barrier systems* (see Section 4.2) can be used to give the inspectors assurance of this while keeping all other information regarding the construction of the weapon secret.

4.2 Managed access

Managed access means that inspectors are given access to a facility under strict control by the host country. If performed successfully, managed access is a tool that allows weapons inspectors to verify a dismantlement process in a sensitive area, without breaching the NPT or putting the host country's national security under any unacceptable risk. To develop a system of managed access that both parties are satisfied with will require thorough consideration from all involved parties and probably long negotiations.

For disarmament verification inspectors, the important issue would be to follow the fissile materials from the weapon through the dismantlement process. They do not need direct access to the materials themselves, as long as they are able to verify to an adequate degree of certainty that no part of the fissile material is diverted at any point in the process. Proper chain-of-custody procedures, which would let the inspectors track and seal all different containers used would be essential to achieve this.

4.3 Information barrier systems

Radiation spectra from nuclear weapons could potentially reveal a lot of information about the fissile material itself, its isotopic composition, shape and weight, and also information on other parts of the weapon that contribute to the radiation shielding. Each different isotope gives off a characteristic gamma radiation spectrum, and other materials used in the weapon, such as casing, conventional explosives etc., will have characteristic shielding properties. The fissile materials used in weapons also give off neutron radiation, which by interaction with the materials surrounding it results in further radiation effects. An observer that gets access to complete radiation spectra may use all this intrinsic information to estimate essential properties of the weapon.

An *information barrier system* is a system designed to verify certain weapons parameters without revealing any proliferative information to the inspectors. It may for instance be made to verify that a certain minimum amount of weapons grade fissile material (uranium or plutonium) is present, while at the same time keep all specific information regarding the properties of a weapon secure.

Information barrier systems have been developed and tried out by the United States and Russia in connection with the START treaties and the tri-lateral initiative (D. Langner et al. 2001), but have not been used in real verification inspections. To avoid any possible leakage of sensitive information, the systems developed have been complicated and large, but not very practical and not very transparent. The information barrier system developed in the UK-Norway initiative, which is shown in Figure 4.1, is based on a somewhat different philosophy. The system, consisting of a software and electronic component package analysing the data from a gamma radiation detector, is kept as simple and transparent as possible. It is jointly developed and contains only commercially available, standard components. In this way, both parties can have confidence in the system. They can replace parts, even on site, and trust that the information

barrier does what it is supposed to do. Each instrument is cheap enough to be scrapped after use, thus preventing any danger that additional information is later retrieved from the instrument. More information about the information barrier system and the software used can be found in H. E. Torkildsen 2009. It is crucially important that the system, including the software, is understood and trusted by all involved parties.



Figure 4.1 The information barrier system developed in the UK-Norway Initiative. The control unit gives a green light if fissile material is present and a red light if such material is not present. The pictures were taken at the Institute for Energy Technology in Norway during an exercise in June 2009.

4.4 Designated facilities

In the UK-Norway dismantlement inspection exercise in 2009 (which is further described in Section 4.5), the inspectors were allowed to screen empty rooms and containers using standard radiation detectors. This was considered necessary to make sure that all fissile materials were removed from the facilities and that the information barrier system therefore was detecting fissile materials inside the supposed weapon and not a different source hidden somewhere in the room. In a real nuclear dismantlement facility, there might be contamination present from earlier construction or dismantlement activities; and such screening could then cause non-proliferation or security challenges for the host.

One possible solution to this problem would be to construct a designated facility for the monitored dismantlement process. This would remove any danger of the inspectors identifying contamination from previous activities in the building. As an added benefit, the inspecting part could be allowed to follow the construction of the building, and thereby verify that there would not be any hidden rooms, doors etc. which could be used by the host to intercept parts of the fissile material.

4.5 The United Kingdom-Norway Initiative

In 2006 Norway (an NNWS) and the United Kingdom (an NWS) began a technical level collaboration to investigate how NNWS can participate in the nuclear disarmament process. Both parties were highly aware of the constraints imposed by the NPT in this field, and it took some time to establish the right level of information exchange. In 2007, the work started to plan an

exercise in which the fictitious NWS “Torland” was going to dismantle one of its fictitious “nuclear warheads” (containing the radioactive isotope cobalt 60 instead of real fissile materials) in a process verified by the fictitious NNWS “Luvania.” The dismantlement of one warhead from a sizeable arsenal was chosen because it is the most straightforward situation to verify. Verifying the absolute number of warheads in an NWS, for example, is a much more complex task.

As an extra layer of protection against real (unintended) proliferation of sensitive information, it was decided that Norway should play the NWS and the United Kingdom should play the NNWS. This move had the added benefit of forcing the participants to better understand the way of thinking of “the other side.” Active participants in the United Kingdom were the Atomic Weapons Establishment (AWE) and the Ministry of Defence, and in Norway the Institute for Energy Technology (IFE), NOR SAR, the Norwegian Defence Research Establishment (FFI) and the Norwegian Radiation Protection Authority (NRPA). The efforts of the Norwegian participants were financed by the Norwegian Ministry of Foreign affairs throughout this collaboration. In addition the London-based Non-Governmental Organisation VERTIC participated in the exercise as an independent observer and rapporteur.

The verification process would necessarily involve managed access to sensitive nuclear weapons facilities. Existing facilities at IFE and FFI were used as Torland’s nuclear weapons laboratory. The hosts had to establish a plausible dismantlement process and then decide how to introduce this to the inspectors and how much information to reveal to them.

The need for an information barrier system was identified early on. There had to be a way for the inspectors to verify the presence or absence of nuclear materials without being in conflict with the NPT. One lesson from the earlier Trilateral Initiative (Section 2.1.10) was that an information barrier system must be simple enough and transparent enough that both parties can have full confidence in it. With these concerns in mind, a robust, portable and modular information barrier system was jointly developed by the two countries.

The actual exercise in which Luvania verified the dismantlement of one of Torland’s nuclear weapons was held at IFE and FFI in Norway in December 2008 and June 2009. The first part of the exercise was a so-called “Familiarization Visit.” A team of inspectors came in to visit the facilities where the dismantlement would later take place. The purpose of the familiarization visit was to give the inspectors an opportunity to familiarize themselves with the dismantlement process and the facilities in which it would be taking place, as well as to negotiate procedures etc. for the later inspection of the actual dismantlement process (the “Monitoring Visit”). By studying the rooms and buildings involved in the process, they could identify those parts of the process where they might lose track of the fissile material and suggest possible measures to ensure verification of a continuous chain of custody of this material. The picture in Figure 4.2 was taken during the Familiarization Visit.



Figure 4.2 From the Familiarization Visit in December 2008. The picture was taken at the Norwegian repository for low and medium activity radioactive waste, which is operated by the Institute for Energy Technology.

In the subsequent Monitoring Visit in June 2009, the dismantlement was played out in full. The inspectors were allowed to follow the mock weapon from a storage area and through the whole dismantlement process until the radioactive source used as a substitute for the fissile material was put in monitored storage at a nuclear waste storage facility. During the Monitoring Visit, the first prototype information barrier system was used to identify the radiation spectrum from the cobalt isotope that was used in the “nuclear weapon.” In addition, the inspectors were allowed to screen empty rooms and containers using standard radiation detectors supplied by the host. The exercise identified possibilities and challenges associated with the proposed verification regime. Furthermore, it provided the Norwegian side with valuable insights into the challenges surrounding nuclear inspections and verification of nuclear disarmament in general. The British side gained insight into nuclear disarmament challenges from an NNWS’s point of view.

In spite of many practical problems, the exercise was quite successful. It showed that an NWS and an NNWS can collaborate on the verification of nuclear weapon dismantlement and successfully manage the risk of proliferation. It also demonstrated that it should be possible to maintain a chain of custody to a high degree of confidence in such a situation. The main outstanding question was the “initialisation problem” (cf. Section 4.1).

Results and experiences from the dismantlement exercise were reported by Norway and the United Kingdom to the 2010 NPT Review Conference (Norway and the United Kingdom 2010).

5 Norway's role in the verification of nuclear disarmament

The former chapters have demonstrated that there are many possible roles for NNWS in a future nuclear disarmament verification regime. This chapter investigates how Norway, in particular, may contribute to the development and implementation of suitable verification procedures in the process towards a nuclear weapons free world. The Norwegian government has been in the forefront in promoting nuclear disarmament and non-proliferation, and has participated in many disarmament initiatives aimed at reducing the role of nuclear weapons in the world. These experiences may increase Norway's opportunities of active participation in a regime responsible for verifying nuclear disarmament.

5.1 Norway as a non-nuclear weapons state

Norway does not only hold a good standing within the non-proliferation regime, but is also greatly involved in issues related to disarmament. A large amount of funding and effort has been devoted to various projects related to disarmament, with special focus recently on landmines and cluster bombs, as well as disarmament in Kosovo. The Norwegian government promotes an image of Norway as a human rights advocate, in addition to Norway having a significant role in issues of global concerns, including peace negotiations in the Middle East and Sri Lanka.

If Norway were to increase its role in the verification of nuclear disarmament, in collaboration with the NWS and possibly international organizations, such involvement will be in line with Norway's previous political position. It will sustain and strengthen Norway's reputation as a serious actor in the disarmament field.

In 2005, Norway formed an informal coalition of states calling for nuclear disarmament referred to as the Seven-Nation Initiative (7NI). The 7NI included Australia, Chile, Indonesia, Romania, United Kingdom, South Africa and Norway. In addition to these countries, the initiative gained broad support from more than 100 countries. According to the Norwegian government, the joint initiative reflected a focus area of the Norwegian government in which the centre of attention was angled towards the importance of nuclear disarmament and non-proliferation (Ministry of Foreign Affairs 2007a). Through the 7NI, which was primarily established to promote consensus after the unsuccessful NPT Review Conference in 2005, the Norwegian government has cooperated with various national and international research communities in order to create a climate for arms reductions and non-proliferation of nuclear weapons. The Norwegian Ministry of Foreign Affairs provided grants for many research projects, including projects on opportunities for new nuclear weapon free zone treaties, minimization of highly enriched uranium in the civilian sector, and on ways to strengthen UNSC Resolution 1540.¹⁷ One of the most important ambitions within the 7NI has been to reduce the number of nuclear warheads in the world (Ministry of Foreign Affairs 2007c). The United Kingdom-Norway Initiative on the verification of nuclear warhead dismantlement (see Section 4.5) was actually developed as part of the 7NI, and became a significant success. The 7NI was created in response to the international standstill in 2005 and

¹⁷ UNSC Resolution 1540 prohibits the transfer of weapons of mass destruction technology to non-governmental actors.

was never a very formal coalition. In 2010, it is no longer referred to as a collaboration for current issues as the international situation has changed to the better.

In an article in *The Nonproliferation Review*, Marianne Hanson (2010) has analyzed in detail what she describes as “advocacy states.” These states stand out as being particularly active in supporting the elimination of nuclear weapons. Norway receives a great deal of attention in her article, as a result of Norway’s striving toward nuclear disarmament within the 7NI. In particular, the United Kingdom-Norway Initiative is highlighted. If Norway continues in the same direction, the work on disarmament and non-proliferation will progress, and the engagement will produce results.

5.2 Norway’s previous experiences in international disarmament

Norway has made a strong case for disarmament in the past. Of particular importance is Norway’s role in disarmament for humanitarian reasons, especially on the Convention on Cluster Munitions (CCM) and the convention on the prohibition of the use, stockpiling, production and transfer of Anti-Personnel Mines, typically referred to as the Ottawa Convention. Norway also contributed noticeably to the development of the Chemical Weapons Convention (CWC).

When the comprehensive treaty to ban Anti-Personnel Landmines opened for signature in December 1997, Norway was one of the first countries to sign the treaty. Today, 156 countries have ratified the treaty, and the treaty has in reality become an international norm where most countries follow the regulations despite absent ratification. When the Convention was negotiated, many non-governmental organizations (NGOs) contributed to the process of developing the treaty. On the Norwegian side, in particular the Norwegian Red Cross and the Norwegian People’s Aid (Ministry of Foreign Affairs 2007b) gave valuable contributions. The Norwegian People’s Aid works with mine clearance in general, while the Norwegian Red Cross has experience helping people who are injured by land mines. The Norwegian government has the last few years been one of the largest financial contributors to mine clearance tasks in the world (Ministry of Foreign Affairs 2007b).

Norway also played an important role as an initiator when the Convention on Cluster Munitions was negotiated (Ministry of Foreign Affairs 2010d). Norway hosted a conference in February 2008 to determine which steps needed to be taken towards establishing an international convention banning cluster munitions. Representatives from different states, NGOs and the United Nations participated. The conference was perceived as highly successful, mainly because an action plan was agreed on, and 46 countries joined the Oslo declaration (Ministry of Foreign Affairs 2010d). The signing of the CCM took place in Oslo in December 2008, and the treaty entered into force in August 2010. The CCM prohibits the use, stockpiling, production and transfer of Cluster Munitions.

The international process towards prohibiting both cluster munitions and anti-personnel mines was initiated by Norway (Ministry of Foreign Affairs 2007c). It has been a stated goal of the Norwegian government to be on the forefront in supporting and actively fighting for these

conventions, as Norway in a similar way has eagerly wanted to start negotiations on the ban on the production of fissile material for weapons purposes (FMCT). The Norwegian government also continues to support the CWC, which prohibits the production and use of chemical weapons, and in connection with this, Norway has financially supported the dismantlement of Russian chemical weapons (Ministry of Foreign Affairs 2008a). The Norwegian government has also been very supportive when it comes to the Comprehensive Test Ban Treaty (CTBT), which has not yet entered into force, and it has urged all remaining states to ratify the treaty. Norway has expressed a willingness to contribute financially in order to construct a global CTBT verification regime (Ministry of Foreign Affairs 2009a).

5.3 In what way can Norway contribute to verifying nuclear disarmament?

As previously discussed, Norway has a great deal of experience with international disarmament for humanitarian reasons, especially from its activities and achievements related to the convention on cluster munitions and the ban on anti-personnel land mines. These experiences do not immediately make Norway an expert in issues related to the verification of nuclear disarmament. However, Norway probably has an advantage compared to most other NNWS because of its efforts to promote disarmament in general. Norway's Minister of Foreign Affairs Jonas Gahr Støre (2010a) recently wrote: "Experience from humanitarian disarmament should guide us on how to pursue and negotiate disarmament issues in general." This agenda of the Norwegian government illustrates that Norway can use its experiences from the field of humanitarian disarmament to produce progress in other areas related to disarmament.

Disarmament of nuclear weapons is very different from disarmament of conventional arms such as anti-personnel land mines and cluster munitions. Nuclear weapons are weapons of *strategic* significance, implying that disarmament of such weapons will disturb the balance of power between the most powerful states in the world. The disarmament of anti-personnel land mines and cluster munitions does not influence the power balance noteworthy. Furthermore, nuclear weapons are in a separate category of weapons when it comes to their capacity for destruction, and disarmament of nuclear weapons must therefore be treated as qualitatively different from the disarmament of conventional weapons. In spite of the extensive work on disarmament in general, Norway lacks direct experience in disarmament of nuclear weapons.

However, when it comes to the development of international agreements in general, there are similarities between nuclear weapons disarmament and previous work done on prohibition and disarmament of conventional weapons. There is no reason why Norway should not be able to contribute in the process of preparing and finding international support also for nuclear agreements.

Norwegian experts have gained valuable experience in verifying warhead dismantlement through their collaboration with the United Kingdom. In this process, the Norwegian participants gained insight into the situation for both NWS and NNWS, and both countries gained a lot of experience in designing and evaluating an actual verification process that would observe their non-proliferation obligations as well as national security concerns. These skills will be of great value

when a future verification regime for nuclear disarmament is being developed. In previous international inspections, Norwegian experts have conducted on-site inspections of Iraq's biological, chemical and nuclear capabilities under the direction of the UN and the IAEA, and have in this way increased their knowledge and competence in verification in the nuclear field. All these experiences will be very valuable when a nuclear disarmament verification regime is being developed.

Verification of nuclear dismantlement is a complicated process. However, as demonstrated by the United Kingdom-Norway Initiative, Norway will be able to contribute even without detailed knowledge of the technical properties of nuclear arms. Norway can have a role in developing information barrier systems, as it possesses knowledge about the interaction and challenges arising between NWS and NNWS when such a verification system is being developed. Norway has especially learned how inspectors can access sensitive facilities without gaining proliferative information. Norway can also carry out follow-on international inspections to ensure compliance after disarmament has taken place, as Norway has gained knowledge and understanding of these processes from previous experiences in Iraq.

The Norwegian government should express its willingness to contribute in a nuclear verification process. It should emphasise Norway's previous experiences with similar matters, while simultaneously explain what Norway needs to learn and improve to be part of such a verification process.

5.4 Norway's role as a NATO member state

Norway is currently working for nuclear disarmament within the framework of the North Atlantic Treaty Organization (NATO). Is this framework creating opportunities or constraints for Norway? This section will discuss how Norway may contribute in the process towards total nuclear disarmament while observing the values and interests of NATO. To facilitate this discussion, it is necessary to first examine the role of nuclear weapons in NATO's security policy.

5.4.1 NATO's nuclear policy

NATO's Strategic Concept is an official document outlining the purpose, nature and security tasks of the Alliance. The Strategic Concept is the second most important policy document in NATO, following the North Atlantic Treaty.¹⁸ Previous to November 2010, NATO followed a Strategic Concept approved in April 1999. The 1999 strategic Concept necessarily represented the security environment at that time, placing high emphasis on nuclear defence. In November 2010, however, NATO approved a new Strategic Concept at the Lisbon summit, defining the core mission of the Alliance for the next decade. The significant changes in the international security landscape since the end of the Cold War had raised expectations of a distinctly new strategy in NATO. However, lack of consensus among NATO member states made it difficult to agree on new initiatives and major shifts in policy regarding the role of nuclear weapons.

¹⁸ NATO was established as a military alliance with the signing of the North Atlantic Treaty in Washington D.C. in April 1949

According to the 1999 Strategic Concept, Article 46, nuclear forces played an essential role in preserving peace and preventing war (NATO 1999). NATO's nuclear forces in Europe provided a significant link between the European and the North American members (Art. 63), and were seen as vital to the security of Europe (Art. 42). The 1999 Strategic Concept furthermore underlined that nuclear weapons were necessary to ensure credible deterrence (Art.46). Despite great expectations of a reduced role for nuclear weapons in NATO's new Strategic Concept, nuclear forces continue to have a significant role also in the new Strategic Concept (NATO 2010). According to the 2010 Strategic Concept, the Alliance will maintain a mix of nuclear and conventional capabilities (Art. 19), and the nuclear guarantee provided by the United States, and complemented by France and the United Kingdom (Art.18), continues to be as relevant as in the 1999 Strategic Concept. The 2010 Strategic Concept also underlines that NATO will retain nuclear weapons as long as there are nuclear weapons anywhere in the world.

However, some of the aspects of the new Concept are positive with regards to nuclear disarmament. NATO is now committed to a goal of creating an environment for a world without nuclear weapons in accordance with the goal of the NPT (Art. 26). There has also been a change in the role of American non-strategic nuclear forces based in Europe and committed to NATO. In the 2010 Strategic Concept, the non-strategic nuclear forces are no longer seen as vital for the transatlantic link between Europe and North America (NATO 2010). Another positive change in the new Concept is NATO's increased focus on the importance of engaging Russia as a partner. Article 34 and Article 33 underline, respectively, that "the security of NATO and Russia is intertwined" and that "We want to see a true strategic partnership between NATO and Russia" (NATO 2010). Increased involvement from Russia may possibly lead to further reductions in nuclear weapons in the long-term. Despite such positive measures in the new Strategic Concept, nuclear forces continue to have a significant role in NATO's security policy, however.

5.4.2 Norway in a verification regime within the framework of NATO

The Strategic Concept approved in Lisbon in 2010 underlines the traditional policy of NATO, namely to ensure the collective defence of NATO's member states. Since the central point in the Concept is to defend the member nations, the framework may, under some circumstances, create constraints for Norway's strive to contribute to the process towards total nuclear disarmament. Nevertheless, Norway's long-standing membership in NATO concurrently brings opportunities for Norway, as the Norwegian government can influence NATO's strategic and non-strategic thinking, as well as NATO member states' attitudes towards further limitations on nuclear weapons. The following sub-sections examine the constraints and opportunities for Norway within the framework of NATO, in order to gain an understanding of how Norway can participate and contribute in the process towards total nuclear disarmament while observing the values and interests of NATO. It is also demonstrated how Norway is currently working for nuclear disarmament within the NATO framework.

5.4.2.1 Constraints

NATO is primarily a political and military alliance committed to collective defence. NATO is obliged to protect and defend its member states, deploy military forces when and where required,

and prevent and manage crises. The military aspects of NATO play a major role, and even though NATO is obligated to help achieve the goal of a world without nuclear weapons, as underlined by Article 26 in the new Strategic Concept (NATO 2010), nuclear disarmament and non-proliferation issues are of secondary importance in NATO. As a NATO member state, Norway must comply and act in accordance with the organisation's framework. The military aspects therefore place some constraints on Norway's involvement in efforts of nuclear disarmament.

As a member state of NATO, Norway has close ties to the United States, and is under NATO's 'nuclear umbrella'. As a consequence of this, non-member states might express doubt about Norway's ability to remain impartial in the role of verifying nuclear disarmament, especially if Norway was to verify nuclear disarmament in the United States, France or the United Kingdom, three NWS with close ties to Norway. How can Russia and China, for instance, be certain that the disarmament is actually taking place when the verification is completed by a close ally?

It is difficult to find a country genuinely free from political bias. Despite Norway being a NATO member state, Norway has a reputation of being relatively neutral in many matters of international affairs. Norway has been actively engaged in peacekeeping in the Middle East and in Sri Lanka, dealing with all sides as a neutral party. When Norway was a neutral facilitator in the negotiations between Israel and the Palestinians in the early 1990s, it managed to maintain a positive relationship with Israel while simultaneously not ignoring the Palestinians (Bien 2000:129). Norway also has generally good relations with the government in Moscow, especially after the signing of the successful Barents Sea Agreement on maritime delimitation and cooperation in September 2010. The Norwegian government has emphasized that the High North Area is Norway's most important strategic priority (Ministry of Foreign Affairs 2008b), whereas close cooperation with Russia becomes very significant. Increased cross-border cooperation between Norway and Russia in the High North may suggest that Russia sees Norway primarily as an independent neighbouring state rather than as a NATO member state. This obviously increases Norway's likelihood of being considered a neutral actor by Russia, and thereby Norway's possibility of being a credible contributor in nuclear disarmament processes. China, however, might have more difficulty distinguishing Norway from other NATO members, given China's distant geographic location and Norway's relatively small size. In any case, NATO's embrace of a large number of non-member states through various partnership programs may help to expand the number of states positive to any NATO member's active role in international disarmament verification.

5.4.2.2 Opportunities

Being a member state of NATO concurrently brings an opportunity for Norway to influence NATO's paramount values and strategic objectives. Norway has lately been involved in several intergovernmental initiatives to promote disarmament and advocate changes in NATO's official nuclear arms policy. In February 2010, for instance, the foreign ministers of Norway, Belgium, the Netherlands, Luxemburg and Germany sent a joint letter to the Secretary General of NATO demanding further achievements in the area of nuclear disarmament (Ministry of Foreign Affairs 2010a). The foreign ministers called on NATO to reduce the role of nuclear forces, and to seek a

world free of nuclear weapons. They also proposed a discussion on NATO's overall nuclear policy, which they suggested could take place in Tallinn in April 2010. According to the Norwegian government, the statement was an effort to influence the direction of NATO's new strategic concept. Norway and Poland have also issued a joint statement to NATO, calling for negotiations on the non-strategic nuclear weapons in Europe committed to NATO. In April 2010, the foreign ministers in Oslo and Warsaw, Jonas Gahr Støre and Radoslaw Sikorski, suggested a step-by-step approach, recommending the non-strategic nuclear weapons to be included in a broader nuclear disarmament process (Ministry of Foreign Affairs 2010b). This joint Norwegian-Polish initiative has received a great deal of attention both within and outside NATO (NTI 2010). As advocacy states, Norway and Poland ought to consider inviting new NATO-members as parties to the initiative, so as to achieve additional support for a possible reduction in American non-strategic B-61 nuclear weapons in Europe. Even if this did not result in any large changes in NATO's nuclear policy, it will demonstrate the influential power Norway has on other European states and on NATO's overall nuclear strategy.

Norway's status as a NATO member state provides an opportunity to work more closely with the NWS in NATO. National security measures are an important obstacle on the way to develop disarmament verification systems, but when working with an NNWS that after all is a member of the same military alliance, the NWS will not need to implement the strongest possible security measures, but must, however, adhere to the non-proliferative aspects of the NPT.

In order to reach the ultimate goal of a world without nuclear weapons, the United States and Russia must make the first significant cutbacks in their number of nuclear warheads; however, inclusion of the French and British governments at an early stage will be essential to reach this goal. Norway may urge these two states towards reducing their nuclear arsenals, and thereby improving the conditions for achieving a world without nuclear weapons. France has generally been more sceptical to a reduction in the role of nuclear weapons in NATO compared to the United Kingdom; however, Norway has the opportunity to influence both the French and the British position. The possibility of success will increase if Norway involves other NATO member states in promoting reductions in nuclear warheads. Previous initiatives have given Norway many cooperation partners that might be available for support in future activities.

Norway's view on NATO's nuclear policy has been expressed very clearly through its many efforts of promoting arms reductions. However, nothing indicates that these initiatives have violated the interests or values of NATO. On the contrary, NATO has on the whole been quite positive to Norway's proposals.¹⁹ Article 4 in the 2010 Strategic Concept states that NATO will contribute to arms control, non-proliferation and disarmament in order to enhance international security. This framework in itself creates an opportunity for Norway to promote nuclear disarmament without being in non-compliance with its commitments to NATO.

¹⁹ See for example NATO's positive reactions on the Norwegian-Polish Initiative (Ministry of Foreign Affairs 2010c).

In sum, it appears that the NATO framework actually creates more opportunities than constraints for Norway in its strive to contribute to the process towards total nuclear disarmament. Being a member of NATO has given Norway multiple channels to influence future disarmament efforts, and has provided Norway with a unique starting point for achieving an active role in verifying nuclear weapons disarmament. Norway has fully utilized its potential for influencing NATO's nuclear posture, as well as that of individual member states, towards a world free of nuclear weapons, while observing its commitments to the legal and political framework of the alliance.

6 Conclusions

The world has witnessed a shift in world affairs towards more focus on nuclear disarmament and non-proliferation. With the signing and ratification of the New START agreement, the prospects of reaching the ultimate goal of a world free of nuclear weapons appear to be better today than ever since 1945. Simultaneously, there has been a trend towards more usage of stringent verification systems to ensure compliance of arms control treaties.

Despite this, the NWS have primarily preferred to handle the verification of nuclear dismantlement between themselves without any involvement from NNWS or international organizations. For a verification process to be generally acceptable, however, a reasonable number of states must oversee the process and methods of verification. As long as the challenges related to proliferation risks are taken into consideration, there is a place for NNWS in the process of verifying warhead dismantlement. This is also mandated by Article VI of the NPT which states that "Each of the Parties to the Treaty undertakes to pursue negotiations ... on a treaty on general and complete disarmament under strict and effective international control." Note that the constraints of the NPT regarding proliferative information in many ways overlap the national security concerns of the NWS.

A verification regime must oversee the dismantlement of nuclear warheads, monitor nuclear material that has not yet been eliminated, as well as monitor activities at selected nuclear facilities and infrastructure. The NNWS possess different levels of nuclear knowledge, and should take upon themselves different tasks in the verification regime depending on their previous experience and nuclear know-how. Some NNWS can contribute in the development of information barrier systems, while others can perform on-site inspections and monitoring activities. The NNWS could potentially share the verification responsibility with an international organization in order to add more legitimacy to the verification process. An entirely new organization with the necessary responsibilities may have to be established, unless the IAEA could be made the main organization in a global verification regime of nuclear dismantlement. If so, the IAEA mandate may have to be revised.

Norway has been an advocacy state in many disarmament efforts, and has experience in encouraging states to join various disarmament initiatives and treaties. Great examples are Norway's vital role in the development of the Convention on Cluster Munitions and the Convention on Anti-Personnel Landmines. These experiences can be applied to the nuclear field,

making Norway an important contributor in preparing future international nuclear arms reduction treaties. Norwegian experts have also been involved in numerous on-site inspections of Iraq's biological, chemical and nuclear capabilities, making Norway competent to also carry out follow-on international inspections in an NWS after disarmament has taken place, and the weapons have been destructed.

Disarmament of nuclear weapons is a complicated and time-consuming process. The verification exercise conducted under the United Kingdom-Norway Initiative demonstrated that NNWS also can have a role in a verification regime during the dismantlement process itself. Through this initiative, Norway has gained experience on the challenges, and possible solutions, regarding the protection of proliferative and national security related information in connection with international inspections at sensitive nuclear facilities. Norway can therefore have a role in developing systems that enable secure and non-proliferative verification by NNWS actors. Especially, the joint development of an information barrier system related to this exercise has shown that Norway can participate in developing such systems for verification of nuclear disarmament.

Being a member state of NATO brings additional opportunities for Norway to advocate nuclear disarmament efforts, as well as to contribute to constructive solutions. Norway has the opportunity to influence NATO's overall nuclear policy, and thereby move NATO and its three NWS further in the direction of a world free of nuclear weapons.

This report demonstrates that NNWS are not prevented from having meaningful roles in a future nuclear disarmament verification regime. The risk of nuclear proliferation must be addressed and can be successfully managed. An inclusion of NNWS is in fact necessary in order to create sufficient confidence in the dismantlement process. Norway is definitely competent to contribute to such verification regimes, and has multiple channels of influencing disarmament efforts and thereby reducing the role of nuclear weapons in international relations.

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List of abbreviations

7NI – Seven-Nation Initiative
ABACC – Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials
ABM – Anti-Ballistic Missile Treaty
AP – Additional Protocol of the Safeguards agreement
AWE – Atomic Weapons Establishment
BIC – Bilateral Implementation Commission
CCM – Convention on Cluster Munitions
CPSU – Communist Party of the Soviet Union
CTBT – Comprehensive Nuclear-Test-Ban Treaty
CTBTO – Preparatory Commission for the Comprehensive Nuclear-Test-Ban Organization
CWC – Chemical Weapons Convention
FFI – Norwegian Defence Research Establishment
FMCT – Fissile Material Cut-off Treaty
GLBM – Ground-Launched Ballistic Missiles
GLCM – Ground-Launched Cruise Missiles
IAEA – International Atomic Energy Agency
ICBM – Intercontinental ballistic missiles
IFE – Institute of Energy Technology
IMINT – Imagery Intelligence
IMS – International Monitoring System
INF – Intermediate-Range and Shorter-Range Missiles
LTBT – Limited Test Ban Treaty
MIRV – Multiple independently targetable reentry vehicles
NATO – North Atlantic Treaty Organization
NGO – Non-Governmental Organization
NNWS – Non-Nuclear Weapons State
NPT – Nuclear Non-Proliferation Treaty
NTM – National Technical Means
NWS – Nuclear Weapons State
OPCW – Organization for Prohibition of Chemical Weapons
PNET – Treaty on Underground Nuclear Explosions for Peaceful Purposes
SALT – Strategic Arms Limitation Talks
SIGINT – Signal Intelligence
SLBM – Submarine-launched ballistic missiles
SNDV – Strategic nuclear delivery vehicles
SORT – Treaty on Strategic Offensive Reductions
START – Strategic Arms Reduction Treaty
TTBT – Threshold Test Ban Treaty
UNSC – United Nations Security Council

Appendix A The Treaty on the Non-Proliferation of Nuclear Weapons

The States concluding this Treaty, hereinafter referred to as the Parties to the Treaty,

Considering the devastation that would be visited upon all mankind by a nuclear war and the consequent need to make every effort to avert the danger of such a war and to take measures to safeguard the security of peoples,

Believing that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war,

In conformity with resolutions of the United Nations General Assembly calling for the conclusion of an agreement on the prevention of wider dissemination of nuclear weapons,

Undertaking to co-operate in facilitating the application of International Atomic Energy Agency safeguards on peaceful nuclear activities,

Expressing their support for research, development and other efforts to further the application, within the framework of the International Atomic Energy Agency safeguards system, of the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points,

Affirming the principle that the benefits of peaceful applications of nuclear technology, including any technological by-products which may be derived by nuclear-weapon States from the development of nuclear explosive devices, should be available for peaceful purposes to all Parties to the Treaty, whether nuclear-weapon or non-nuclear-weapon States,

Convinced that, in furtherance of this principle, all Parties to the Treaty are entitled to participate in the fullest possible exchange of scientific information for, and to contribute alone or in co-operation with other States to, the further development of the applications of atomic energy for peaceful purposes,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament,

Urging the co-operation of all States in the attainment of this objective,

Recalling the determination expressed by the Parties to the 1963 Treaty banning nuclear weapons tests in the atmosphere, in outer space and under water in its Preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end,

Desiring to further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all their existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery pursuant to a Treaty on general and complete disarmament under strict and effective international control,

Recalling that, in accordance with the Charter of the United Nations, States must refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations, and that the establishment and maintenance of international peace and security are to be promoted with the least diversion for armaments of the world's human and economic resources,

Have agreed as follows:

Article I

Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any non-nuclear weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices.

Article II

Each non-nuclear-weapon State Party to the Treaty undertakes not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices.

Article III

1. Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for 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 or other nuclear explosive devices. Procedures for the safeguards required by this article 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 safeguards required by this article shall be applied to 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.

2. Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this article.

3. The safeguards required by this article shall be implemented in a manner designed to comply with article IV of this Treaty, and to avoid hampering the economic or technological development of the Parties or international cooperation in the field of peaceful nuclear activities, including the international exchange of nuclear material and equipment for the processing, use or production of nuclear material for peaceful purposes in accordance with the provisions of this article and the principle of safeguarding set forth in the Preamble of the Treaty.

4. Non-nuclear-weapon States Party to the Treaty shall conclude agreements with the International Atomic Energy Agency to meet the requirements of this article either individually or together with other States in accordance with the Statute of the International Atomic Energy Agency. Negotiation of such agreements shall commence within 180 days from the original entry into force of this Treaty. For States depositing their instruments of ratification or accession after the 180-day period, negotiation of such agreements shall commence not later than the date of such deposit. Such agreements shall enter into force not later than eighteen months after the date of initiation of negotiations.

Article IV

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

Article V

Each party to the Treaty undertakes to take appropriate measures to ensure that, in accordance with this Treaty, under appropriate international observation and through appropriate international

procedures, potential benefits from any peaceful applications of nuclear explosions will be made available to non-nuclear-weapon States Party to the Treaty on a non-discriminatory basis and that the charge to such Parties for the explosive devices used will be as low as possible and exclude any charge for research and development. Non-nuclear-weapon States Party to the Treaty shall be able to obtain such benefits, pursuant to a special international agreement or agreements, through an appropriate international body with adequate representation of non-nuclear-weapon States. Negotiations on this subject shall commence as soon as possible after the Treaty enters into force. Non-nuclear-weapon States Party to the Treaty so desiring may also obtain such benefits pursuant to bilateral agreements.

Article VI

Each 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.

Article VII

Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories.

Article VIII

1. Any Party to the Treaty may propose amendments to this Treaty. The text of any proposed amendment shall be submitted to the Depositary Governments which shall circulate it to all Parties to the Treaty. Thereupon, if requested to do so by one-third or more of the Parties to the Treaty, the Depositary Governments shall convene a conference, to which they shall invite all the Parties to the Treaty, to consider such an amendment.

2. Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to the Treaty, including the votes of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. The amendment shall enter into force for each Party that deposits its instrument of ratification of the amendment upon the deposit of such instruments of ratification by a majority of all the Parties, including the instruments of ratification of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. Thereafter, it shall enter into force for any other Party upon the deposit of its instrument of ratification of the amendment.

3. Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be held in Geneva, Switzerland, in order to review the operation of this Treaty with a view to

assuring that the purposes of the Preamble and the provisions of the Treaty are being realized. At intervals of five years thereafter, a majority of the Parties to the Treaty may obtain, by submitting a proposal to this effect to the Depositary Governments, the convening of further conferences with the same objective of reviewing the operation of the Treaty.

Article IX

1. This Treaty shall be open to all States for signature. Any State which does not sign the Treaty before its entry into force in accordance with paragraph 3 of this article may accede to it at any time.

2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the United States of America, the United Kingdom of Great Britain and Northern Ireland and the Union of Soviet Socialist Republics, which are hereby designated the Depositary Governments.

3. This Treaty shall enter into force after its ratification by the States, the Governments of which are designated Depositaries of the Treaty, and forty other States signatory to this Treaty and the deposit of their instruments of ratification. For the purposes of this Treaty, a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to January 1, 1967.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or of accession, the date of the entry into force of this Treaty, and the date of receipt of any requests for convening a conference or other notices.

6. This Treaty shall be registered by the Depositary Governments pursuant to article 102 of the Charter of the United Nations.

Article X

1. Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

2. Twenty-five years after the entry into force of the Treaty, a conference shall be convened to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. This decision shall be taken by a majority of the Parties to the Treaty.

Article XI

This Treaty, the English, Russian, French, Spanish and Chinese texts of which are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Treaty.

DONE in triplicate, at the cities of Washington, London and Moscow, this first day of July one thousand nine hundred sixty-eight.

Note:

On 11 May 1995, in accordance with article X, paragraph 2, the Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons decided that the Treaty should continue in force indefinitely.