Development of the International Atomic Energy Agency safeguards system and its application to Iran: from the IAEA Statute to the Joint Comprehensive Plan of Action

Artem Lazarev

TESI DOCTORAL UPF / 2017

DIRECTOR DE LA TESI

Dr. Santiago Ripol Carulla

DEPARTAMENT DE DRET

Universitat Pompeu Fabra Barcelona

Acknowledgments

I am very grateful to my academic supervisor, Dr Santiago Ripol Carulla, for thoughtful advice and significant research assistance provided throughout my work on this study.

I would also like to thank my family for the considerable and invaluable support. In particular, I am thankful to Andey Lazarev for introducing me to the topic of nuclear safeguards, and to my wife Anna whose encouragement was worth more than I can express on paper.

Abstract

The International Atomic Energy Agency has established and implements a set of technical measures – the safeguards – is to ensure that nuclear material, equipment, facilities, and technology are not used for a military purpose. The safeguards system is based on international agreements concluded between the Agency and a great majority of states. The IAEA safeguards system has experienced a significant evolution throughout the time, responding to variety of challenges. The changes included adoption of new legal instruments and new measures within the existing legal framework. The showcase of the safeguards evolution is Iran. Initially, the country placed its nuclear programme under the US safeguards. Then it concluded a Comprehensive Safeguards Agreement with the Agency, which, however, failed to help the Agency discover Iran's undeclared nuclear material and activities, triggering the "Iran's case". Iran also signed an Additional Protocol and started to implement it voluntarily pending ratification. Ultimately, the country agreed to implement new monitoring and verification measures under the Joint Comprehensive Plan of Action. They represent an enhanced mechanism, although may not be considered a new generation safeguards instrument.

Resum

L'Agència Internacional d'Energia Atòmica ha establert i implementat un conjunt de mesures tècniques, les salvaguardes, per a garantir que el material nuclear, els equipaments, les instal·lacions i la tecnologia no s'utilitzin per a fins militars. El sistema de salvaguardes es basa en acords internacionals entre l'Agència i una gran majoria d'estats. El sistema de salvaguardes de l'AIEA ha experimentat una evolució significativa al llarg del temps, responent a diversos desafiaments. Els canvis van incloure l'adopció de nous instruments jurídics i noves mesures dins del marc jurídic existent. Una mostra de l'evolució de les salvaguardes és l'Iran. Inicialment, el país va col·locar el seu programa nuclear sota les salvaguardes nord-americanes. Tot seguit, l'Iran va concloure un Acord Integral de Salvaguardes amb l'Agència. No obstant això, l'acord no va permetre a l'Agència descobrir el material nuclear i les activitats no declarades de l'Iran, desencadenant el "cas d'Iran". L'Iran també va signar un Protocol addicional i va començar a implementar-lo voluntàriament, pendent de ratificació. Finalment, el país va acordar implementar noves mesures de seguiment i verificació en el marc del Pla d'Acció Comú Integral, representant un mecanisme millorat, tot i que no es pot considerar un instrument de salvaguarda de nova generació.

Introduction

By the present study, I would like to make my original contribution to understanding of the legal dimension of the evolution of the IAEA safeguards system. For that reason, I would like to provide a legal analysis of the panoply of the IAEA safeguards instruments and practices, their relationship with other safeguards systems and their application in the case of Iran.

The IAEA nuclear safeguards system[1] is a major achievement of international governance, imposing such a level of intrusiveness on states that is virtually incomparable with the one in almost any other field. It has also been a constant work in progress, sometimes at a slow pace, sometimes arguably even regressing, but at other times responding rapidly and creatively, to crisis. Trevor Findlay likened the process to the "punctuated equilibrium" of evolution itself, whereby long periods of relative stasis are interrupted by dramatic events that change its course (Findlay, 2007).

The original meaning of the term "safeguards" was broad. It was used by American analysts, policy makers and politicians in the 1940s and early 1950s to mean all of the verification measures needed to ensure nuclear disarmament once the USA has given up its small arsenal. Subsequently, with the establishment of the IAEA, the term narrowed to mean the nuclear accounting, inspection and other technical measures needed to verify states' international legal obligations not to divert nuclear material from declared, peaceful purposes to undeclared purposes, including for weapons. Since the discovery of Iraq's undeclared activities after the 1990 Gulf War, the term has once again widened to encompass a growing number of verification activities, including those directed at discovering undeclared materials and facilities, illicit nuclear transfers, smuggling activities and weaponisation activities. The objectives of safeguards in a State are:

- timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to military purposes including the manufacture of nuclear weapons or of other nuclear explosive devices;
- deterrence of such diversion by the risk of early detection; and
- detection of undeclared nuclear material and activities (IAEA, 2001, p. 13).

[1]For the purpose of avoiding repetitions, the terms "IAEA safeguards", "IAEA safeguards system", "safeguards" and "safeguards system" are used interchangeably unless indicated otherwise.

It should be emphasized that the task of safeguards is therefore not only prevention itself, although a risk of discovery may act as a deterrent for a potential proliferator. Rather, a task of the safeguards might be defined as providing assurance that the States are complying with their peaceful use commitments, and assisting States to realise that the demonstration of compliance to other parties is in their own interest. In the view of the foregoing, the system of safeguards plays an important role in confidence building, and the evolution of the system to meet new challenges should take place in a way that maintains and enhances this confidence-building function.

The present study focuses on the legal aspects of historical development of the IAEA safeguards system, such as:

- main safeguards instruments;
- IAEA initiatives for completing the safeguards system, including protocols;
- International agreements requiring IAEA safeguards;
- Another safeguards systems and their relationship with the IAEA safeguards;
- Case of Iran as illustration of the evolution of IAEA safeguards; and
- Monitoring and verification measures under the Joint Comprehensive Plan of Action.

The legal aspects of safeguards did not attract much of the academics' attention throughout the time, who traditionally focused on the policy side of the issue.

In his book "*History of the International Atomic Energy Agency: The First Forty Years*", David Fischer demonstrated not only a holistic approach towards the Agency's past on the whole but also gave a thorough presentation on the history of the safeguards system, including its genesis and convergence with the Euratom safeguards system; evolution through the safeguards drawn up in the document INFCIRC/66 and its 'revisions'; the safeguards, the NPT and India, Israel and Pakistan; the safeguards and the Nuclear Suppliers' Group Guidelines; the safeguards and the nuclear-weapon-free zones; and challenges posed by cases of Iraq and the DPRK. The general conclusion which Mr Fischer arrived to is widely supported by other academics and consist in the finding that the "development of three of the Agency's main programmes, nuclear power, nuclear safety and safeguards – has been largely shaped by events beyond the IAEA's control, but their impact on the Agency has been determined, to a considerable degree, by the ways in which the Board of Governors and the Director General of the

Agency have responded to them" (Fischer, 1997, p. 3). In particular, the author makes emphasis on the following developments actual in the material time:

1. The end of the Cold War and other events since the late 1980s transformed the environment in which IAEA safeguards operated and the scope of their operations. There was a noticeable expansion of safeguards to the successor States of the former Soviet Union. But that was only one aspect of the transformed picture. Had the Cold War not ended, it is at least questionable whether the UN Security Council would have reached agreement on measures for eliminating Iraq's nuclear weapon potential or on putting some pressure on the DPRK to comply with its safeguards agreement and to negotiate the "Agreed Framework". Or that the UNSC would have been able to achieve unanimity on its 31 January 1992 declaration regarding the threat to international peace and security posed by the proliferation of weapons of mass destruction (UN Security Council, 1992).

2. In the case of South Africa, according to President F.W. de Klerk's statements, the changed international security situation made it counter-productive for South Africa to retain its nuclear armaments. South Africa's decision to scrap its nuclear warheads and join the NPT removed the main obstacle to an African nuclear-weapon-free zone and may have encouraged the negotiation of similar zones in other regions.

3. Even more fundamentally, the end of the Cold War opened the way to major nuclear disarmament by the Russian Federation and the USA. Without such disarmament there might have been little prospect in 1995 of making the NPT permanent and thus making permanent all safeguards agreements concluded pursuant to the Treaty.

4. The IAEA and its safeguards have thus been major beneficiaries of the end of the Cold War. By providing a bridge between the superpowers from the early 1960s until the termination of the Cold War in the late 1980s, and by pioneering the use of institutionalized on-site inspections, they helped in a modest way to bring about that termination (Fischer, 1997, pp. 305-306).

In his study "*Unleashing the Nuclear Watchdog: Strengthening and Reform of the IAEA*", Trevor Findlay makes a brief overview of the safeguards history while thoroughly considering the current state of the safeguards, continuing debates about their efficacy, and the possibility of further strengthening and reforming them. He

makes an emphasis on a limited scope of the universal safeguards utility caused by circumstances beyond the control of the IAEA:

1. The Agency cannot deal with the difficulty that an NPT State Party can, perfectly legally, under safeguards, accumulate the panoply of fuel cycle capabilities, nuclear materials and expertise necessary to build nuclear weapons, and then leave the Treaty giving just three months' notice with a declaration that it considers its supreme interests to have been jeopardized.
2. Determining the effectiveness of safeguards, despite noble attempts at establishing technical criteria and objective decision-making processes, ultimately involves subjective judgments. Safeguards notably cannot usually detect a state's intentions (although in some cases it can, for example through the discovery of documents indicating plans for weaponisation, deployment or use).All that leads to a legitimate debate among experts as to the correct approaches needed.
3. Lastly, nuclear safeguards are only as good as the IAEA membership allows them to be, especially in terms of providing political, technical and financial support (Findlay, 2012, pp. 66-67).

Whatever limited the power of the IAEA may be, Mr Findley nevertheless points out the pressing need for change in the Agency's approach towards implementing the safeguards, including *inter alia* furthering cultural change process within the inspecting staff; taking the broader, strategic view of proliferation threats; implementation of IT reforms; better recruitment, training and management of inspectors and transparency reforms.

The nuclear weapon states ("the NWSs"), as defined in the NPT, see the IAEA safeguards as an important means of preventing proliferation and, therefore, of enhancing their own security. Many non-nuclear weapon states are, however, reluctant to accept the IAEA's Additional Protocol or even consider developing new safeguards instruments. They frequently claim that this is because the NWSs have failed to make sufficient progress toward their disarmament pledge, as embodied in Article VI of the NPT. In his work "*Strengthening Safeguards and Nuclear Disarmament. Is There a Connection?*" James M. Acton discusses whether the NWSs should adopt a strategy of working toward disarmament as a means of strengthening safeguards (Acton, 2007). The work explores three questions. First, are the weapon states right to see safeguards as

an effective means of preventing proliferation? Second, will progress by the NWSs towards disarmament strengthen the safeguards regime? Third, what does that actually involve? He comes to conclusion that there is a "political" connection between safeguards and disarmament. The NWSs should seriously consider exploiting that connection, with the aims of encouraging the adoption of additional safeguards by some states and putting pressure on others that use the slow pace of disarmament as an excuse for recalcitrance.

The issue of compliance with safeguards obligations, as a fundamental part of a country's participation in the global nuclear non-proliferation regime, has also been a continuous object of academic study. Pierre Goldschmidt in his study "*Safeguards Noncompliance: A Challenge for the IAEA and the UN Security Council*" emphasizes that the IAEA's safeguards system plays "a major role in preventing proliferation" (Goldschmidt, 2010). That fact notwithstanding, the author points out that deterrence can be effective only if states believe that non-compliance has a strong chance of being detected and if its detection has consequences. To that end, Mr Goldschmidt concludes *inter alia* the following should be achieved:

1. The IAEA should not be complacent toward states violating their non-proliferation undertakings. One element is how the IAEA Department of Safeguards should distinguish between cases of non-compliance that should be reported to the IAEA Board of Governors as "non-compliance" in accordance with Article XII.C of the IAEA Statute, and cases that constitute only technical or legal compliance failures and therefore need be reported only in the annual Safeguards Implementation Report, if at all. The Board, when it finds that the Agency is unable to resolve a case of non-compliance promptly, should not hesitate to request additional verification rights from the UN Security Council. That said, the weakest link in the non-proliferation regime today is not the performance of the IAEA Department of Safeguards but that of the international community in responding to non-compliance. The burden here falls largely on the IAEA board and the UN Security Council.

2. Considering the precedent that the DPRK set in 2003, it is necessary to plan for the possibility of another state withdrawing from the NPT and therefore from the comprehensive safeguards system. The most critical step would be for the Security Council to adopt a resolution, under Chapter 7 of the UN Charter, deciding that the

withdrawal of a non-compliant state from the NPT would be considered a threat to international peace and security (Goldschmidt, 2010).

Yet another approach to the future of the safeguards system was reflected by James Acton and Carter Newman in their study "*IAEA Verification of Military Research and Development*." While admitting that the most difficult challenge facing a potential proliferator is the acquisition of fissile material and thus the verification of fuel cycle activities under the safeguards system is always going to be at the heart of the nuclear non-proliferation regime, they make a suggestion that the verification of military research and development may, however, be a useful supplement. The reason for that is a possibility for a state to obtain fissile material without first acquiring enrichment or reprocessing technology, for example, by purchase or theft. As the best evidence, the authors cite the case of Iran. At the time of the study, it was not yet known whether Iran was trying to develop nuclear weapons. However, even without conducting systematic searches for them, the authors suggest, the Agency has uncovered various indicators which might point to the existence of a nuclear weapons programme. They therefore conclude, that it is therefore reasonable to suggest that if the Agency were to undertake such searches it would have a reasonable chance of success. Finally, Messrs Acton and Newman make a suggestion that in addition to detecting a clandestine weaponisation programme, IAEA investigations could have two other effects. First, they might act as a deterrent to states developing nuclear weapons. This deterrent effect stems partly from the risk of being caught, but might also result from the increased costs of hiding a weaponisation programme. Second, if the Agency found evidence of weaponisation activities, it could enhance its scrutiny of a state's fuel cycle activities (Acton & Newman, 2006).

As to the Iran's case, the following books should be mentioned. In her study "Iran's nuclear policy and the IAEA: an evaluation of Program 93+2", Chen Zak aimed at presenting and evaluating the strengthened safeguards system, so-called "Programme 93+2" (which eventually resulted in the adoption of the Additional Protocol), and, in particular, examining its potential for contributing to nuclear no-proliferation in Iran (Zak, 2002). Ms Zak arrives at the following conclusions:

1. Programme 93+2 and eventually the Additional Protocol undoubtedly strengthened safeguards by granting the Agency new powers for detecting undeclared facilities.

2. That being said, the strengthened safeguards do no address arms acquisition paths beyond the parallel programme and diversion such as, for example, an open violation or a state's withdrawal from the NPT.

3. Iran's policy towards the Additional Protocol will be a test case with regards to the country's non-proliferation commitments. In order to guarantee effective and speedy implementation of the AP in Iran, all negotiations on adherence of the country to this instrument should for both signature and ratification.

In his book "Iran's Nuclear Program and International Law. From Confrontation to Accord", Daniel H. Joyner provided an international legal analysis of the most important legal questions raised since 2002 in the Iran's case and set those legal questions in a historical and diplomatic context (Joyner, 2016). He concluded that although the Joint Comprehensive Plan of Acton ("the JCPOA") and its associated diplomatic and legal developments was a triumph, the JCPOA is still a non-binding political agreement whose success will "depend solely upon the political will of all sides" (Joyner, 2016, p. 245).

Lastly, a briefing book "Solving the Iranian Nuclear Puzzle. The Joint Comprehensive Plan of Action" (Davenport, et al., 2015) by Kelsey Davenport, Daryl G. Kimball, and Greg Thielmann, and a report "The Iran Nuclear Deal. A Definitive Guide" (Samore, 2015) edited by Gary Samore – both shed light on this complex agreement and also outline its consequences for international peace, security and the nuclear non-proliferation regime.

In the light of the aforesaid, it is necessary to mention the following. The issue of the safeguards system has been examined by numerous academics focusing on its various elements, including history and evolution but mainly the current challenges which the system faces in the present. There is one point in which different viewpoints basically coincide and which consists in the conclusion that the safeguards system has never been static and it went on adapting to the constantly changing environment responding to emerging challenges. Responses of the system scored well enough despite the fact that in particular cases (Iraq, for instance) they use to be one step behind the events. Furthermore, the safeguards system should keep evolving in order to be better equipped for any future challenges.

In the meantime, there exist a broad range of diverging academic opinions with regards to such complicated an entanglement as the future of the safeguards system. As it was partly previously exposed, the proposals vary from encouraging faster implementation of the Additional Protocol into national legislation by States that merely signed it, to undertaking profound reforms within the IAEA itself and to adapting additional international legal instruments which will serve the goal of strengthening the effect of the safeguards.

Lastly, it should be mentioned that there are not many academic studies which wholly scrutinise the safeguards system, from its dawn to the present, and use the peculiar example of Iran. It may be possibly explained by the fact that the Iran's case was partially resolved not long time ago – in July 2015 – with the adoption of the JCPOA. Furthermore, since the safeguards system has quite a complicated intermingled structure and diverse scope, and it tends to evolve (for example, monitoring and verification measures under the JCPOA), there is always a need to summarise the achievements made and draw correspondent conclusions. The present work aims at achieving all these goals.

As it was described above, the present study is focused on genesis and, to a greater extent, on evolution of the safeguards system, and its reflection in the Iran's case. In that regard, the research method used in this paper includes analysis of:

- legal documents which the IAEA safeguards system comprises and rests upon;
- the Agency approaches to conducting monitoring and verification activities;
- international agreements that require conclusion of safeguards;
- two regional and one national non-IAEA safeguards systems and their relation with IAEA safeguards;
- documents related to the implementation of safeguards in Iran, including during the Iran's case (for example, diplomatic efforts, work plans, UN Security Council resolutions, national and international sanctions, the JCPOA, etc.).

The present study is divided into two parts:

- Part One analyses the historical development of safeguards, including non-IAEA safeguards. In particular, it dwells on main IAEA safeguards instruments, safeguards under regional treaties and in a particular case of Japan, international

agreements which include provisions on safeguards; and instruments for complementing and strengthening safeguards, among others.

- Part Two deals a particular case of safeguards implementation in Iran, where safeguards in force at the material time proved to have limited effect on the country's capability of developing undeclared nuclear programme, so a new arrangement was concluded which introduced new monitoring and verification tools.

In addition, in order to better understand the context of application of safeguards to peaceful nuclear activities, it is worth recalling the elements of the nuclear fuel cycle ("the NFC") involving uranium, as is the case of Iran.

The NFC comprises the panoply of operations associated with the production of electricity by nuclear reactions, such as:

1) Mining and processing of uranium ores;
2) Enrichment of uranium;
3) Manufacture of nuclear fuel;
4) Operation of nuclear reactors;
5) Reprocessing of spent fuel;
6) All waste management activities (including decommissioning) relating to operations associated with the production of nuclear energy; and
7) Any related research and development activities.

The first three steps make up the "front end" of the NCF, which starts with mining uranium ores either by excavation or by in situ leach ("ISL"). The obtained raw material is then subjected to milling, in other words the uranium is extracts from the ore or the ISL leachate, and then to concentrating as uranium oxide (U_3O_8). The uranium concentrate is usually called "yellowcake". Roughly 200 tonnes of yellowcake is enough for a large (1000 MW(e)) nuclear power reactor to keep generating electricity for one year (WNA, 2017).

Yellowcake is not directly usable as a fuel for a nuclear reactor, rather it requires additional processing: concentration and enrichment.

At a conversion facility, yellowcake is first refined to uranium dioxide (UO_2), which is ready for use in those types of reactors that do not require enriched uranium.

Alternatively, it is then converted into a gaseous form of uranium hexafluoride (UF_6), a material used for enrichment.

It should be mentioned that natural uranium consists of only 0.7% of unranium-235 isotope (U-235), remainder being uranium-238 (U-238). Only the former is capable of undergoing fission, the process by which energy is produced in a nuclear reactor. However, most kinds of reactor use fuel with the concentration of the fissile U-235 between 3.5% and 5%, which thus requires separation of U-235 from U-238, also known as enrichment. The most widespread enrichment process in commercial plants employs centrifuges, thousands of which are arranged in various cascades. The 1% mass difference between U-235 and U-238 allow separation through the spinning. Another enrichment process involving laser technology is currently under development.

At the fuel fabrication stage, the enriched uranium dioxide (UO2) undergoes transformation into ceramic pellets. Afterwards they are encased in metal tubes to form fuel rods, several of which are then arranged in a fuel assembly ready for introduction into a reactor.

The working principles of a nuclear power reactor is similar to fossil-fuel burning electricity generating plants, where the heat out of burning produces steam that in turn drives a turbine and an electric generator. The only difference is that, in a reactor, U-235 does not burn but splits in a chain reaction and thus produces heat. Unlike a chain reaction in nuclear arms, the process in a nuclear power reactor is fully controlled.

Throughout the operation, the fuel loses fissile elements to the point that it is no longer feasible to use it. Accordingly, the fuel is then removed from the reactor and placed into a temporary storage facility so that it cools down and its radiation levels decrease. Spent fuel usually contains: about 96% of its original uranium, including less than 1% of fissionable U-235; 1% is fissionable plutonium produced during the chain reaction in the reactor; and the remaining 3% is waste products.

Uranium and plutonium may be recovered during reprocessing, so uranium may be thus reintroduced in the NFC stage of conversion and plutonium can be directly blended into mixed oxide (MOX) fuel, in which uranium and plutonium oxides are combined. The remaining waste is processed and put in long-term depositaries. A decision whether to recover uranium and plutonium from spent fuel or treat whole spent fuel as waste

depends on the country's policy. If a country decides to reprocess spent fuel, the NFC referred to as closed; otherwise it is an open NFC.

Lastly, although not directly involved in production of nuclear energy, relevant research and development activities are also included in the NFC owing to their important role in developing the NFC-related activities.

From the proliferation point of view, the most sensitive stages of the NFC are enrichment and reprocessing since they permit obtaining direct use materials:[2] in the former case, it is highly enriched uranium; in the latter – plutonium. Related research and development activities also represent proliferation concerns, although of a lesser degree.

[2] "Direct use material" means nuclear material that can be used for the manufacture of nuclear explosive devices without transmutation or further enrichment. It includes plutonium containing less than 80% Pu-238, high enriched uranium (uranium containing 20% or more of U-235) and U-233. Chemical compounds, mixtures of direct use materials (e.g. mixed oxide (MOX)), and plutonium in spent reactor fuel fall into this category (IAEA, n.d., p. 33).

Contents

I. HISTORICAL DEVELOPMENT OF SAFEGUARDS, INCLUDING NON-IAEA SAFEGUARDS

1. Main safeguards instruments under the IAEA system

1.1. Safeguards under the IAEA Statute

Today, a relatively small amount of countries that possess nuclear weapons is taken for granted. However, this has been made true thanks to a considerable work on non-proliferation carried out by individuals, states and international organisations. One of the most prominent representative of the latter group is the International Atomic Energy Agency (hereinafter "the IAEA" or "the Agency"), whose continuous work enhancing the non-proliferation regime was described as "of incalculable importance" by the Norwegian Nobel Committee when it awarded the IAEA the Nobel Peace Prize in 2005 (Nobel Peace Prize, 2005). The IAEA was created following the U.S. President Dwight D. Eisenhower's proposal called "Atoms for Peace," (Eisenhower, 1953) which envisaged creation of an international body entrusted with a mission of promoting and ascertaining safe and peaceful use of nuclear technology.

Entering into force on 29 July 1957, the Statute of the IAEA enshrined the Agency's fundamental objectives of not only "accelerating and enlarging the contribution of atomic energy to peace" but also "ensuring that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose" (IAEA, 1957), Article II). In other words, the Statute laid foundations of the safeguards system.

Accordingly, Article III.A.5 of the Statute authorises the IAEA to establish and administer safeguards to ensure that special fissionable and other materials, services, equipment, facilities and information provided by the IAEA or at its request or under its supervision or control are not used for military purpose. The Agency is also to apply safeguards in two other cases: in respect to any bilateral or multilateral arrangement– at the request of the parties, or to any of the State's nuclear activities – at that state's request (IAEA, 1957, Article III).

The Statute also provides a definition of "special fissionable material", which means "plutonium-239; uranium- 233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; and such other fissionable material as

the Board of Governors ("the Board") shall from time to time determine", excluding source material, i.e. "uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board shall from time to time determine; and such other material as the Board shall from time to time determine" (IAEA, 1957, Article XX).

Article XII.A further describes the rights and responsibilities of the IAEA when carrying out safeguards, including: the rights to examine the design of specialised equipment and facilities; to require keeping of operating records; to assist in ensuring accountability for and control of source and special fissionable materials; to receive reports; to send IAEA inspectors; and to curtail or suspend assistance and withdraw materials and equipment provided by the IAEA or a Member State in case of non-compliance and non-cooperation (IAEA, 1957) Article XII).

Non-compliance with a safeguards agreement on part of a State may trigger the application of measures on part of the IAEA inspectors, the Director General and the Board such as:

- calling upon the State to remedy non-compliance;
- reporting non-compliance to all IAEA Member States, to the Security Council and the General Assembly of the United Nations;
- calling for the return of materials and equipment made available to the State; and
- suspending the State from the exercise of the privileges and rights of IAEA membership (IAEA, 1957, Article XII.C).

The safeguards described in the Statute, however, are not automatically applicable to a Member State of the IAEA only by virtue of its membership but require a separate safeguards agreement.

In the beginning of 1959 the Board approved by a vote of 16 to 2 with 4 abstentions a first time ever set of ad hoc safeguards, which applied to three tons of natural uranium metal shipped from Canada to a small research reactor JRR-3 in Japan (IAEA, 1959a). In the following year the Agency both started assisting to Finland in a training and research project for peaceful purposes relating to the FiR-1 reactor, and, together with Finland and the United States, signed a Contract for the Transfer of Enriched

Uranium for the reactor, pursuant to which enriched uranium was delivered to Finland (IAEA, 1961b). The Agency safeguards applied to the nuclear facility and its fuel.

Taking into account the vigorous opposition of some Governors which and the consuming and controversial process of the safeguards adoption which lasted several days, it was clear that such ad hoc safeguards was not a viable option for future transfers (McKnight, 1971, pp. 46-47). A need for a general safeguards instrument became obvious. However, the Statute did not provide any specific guidance as to in which particular instruments the safeguards should be embodied. Indeed, in its Article III. A. 5 the Statute merely provided that the Agency was authorised to "establish and administer safeguards." Several Governors thus suggested that it was on the Secretariat to prepare the general safeguards document (Szasz, 1970, p. 551). Accordingly, in May 1959 the Secretariat presented to the Board two documents: "The Relevancy and Method of Application of Agency Safeguards" and "Draft Regulations for the Application of Safeguards" (IAEA, 1959b). Remarkably, both documents emphasized a two-fold function of safeguards and inspection: on the one hand, they were supposed to ensure nuclear safety; on the other, they sought to verify that nuclear plants and materials remained in peaceful use (Szasz, 1970, p. 551). The same approach to the safeguards can be found in the Agency's Statute, whose Article XII "Agency safeguards" provides for the IAEA's right:

> "1. To examine the design of specialised equipment and facilities, including nuclear reactors... that it will not further any military purpose... complies with applicable health and safety standards...;
>
> 2. To require the observance of any health and safety measures prescribed by the Agency;
>
> ...
>
> 5. ...to ensure that this chemical processing [of irradiated material] will not lend itself to diversion of materials for military purposes and will comply with applicable health and safety standards; to require that special fissionable materials... be used for peaceful purposes...;
>
> 6. To send... inspectors... to determine whether there is compliance with the undertaking against use in furtherance of any military purpose ... with the health and safety measures..."

1.2. INFCIRC/26 safeguards

a. Preparatory work

In June 1959 the Board decided that these two issues of nuclear non-military use and nuclear safety should be separated (IAEA, 1959c, paras. 62 and 64). Ultimately, three months later, after the relevant document was redrafted first by the Secretariat and then by a specially established ad hoc drafting committee, the Board provisionally approved the principles concerning only to safeguards against military use. They included the following elements: the maximum limits of nuclear material that was exempted from the safeguards; the types of safeguarded equipment and of the Agency assistance that implies safeguards; and the general principles and objectives for implementing safeguards (USA, 1960, p. 758). These principles provided a basis upon which the Secretariat prepared a further document, "Procedures for the Attachment and Application of Agency Safeguards against Diversion" (IAEA, 1959d).

In January 1960, the Board discussed another document which concerned procedures for the application of safeguards to reactors of less than 100 MW, i.e. mainly research and experimental reactors. The Board then referred both documents and the provisionally approved principles to a "Special Working Group of Expert Representatives on Safeguards," with an aim of fusing, clarifying and simplifying them (USA, 1960, p. 758). Three months later the Board provisionally approved the proposals elaborated by the Working Group and submitted them to the General Conference "for consideration and appropriate action in accordance with the Statute" (IAEA, 1960).

b. INFCIRC/26: the first safeguards instrument

On 31 January 1961, after a lengthy and divisive debate, the Board approved the principles and procedures for applying safeguards to reactors up to 100 MW, the first albeit not complete safeguards instrument (IAEA, 1961a). The first Agency's safeguards had the following features:

1) The initial safeguards procedure applied only to "research, test and power reactors with less than 100 megawatts thermal output,[3] to the source and special fissionable

[3] "Megawatts thermal," or MW(th), means overall power of a nuclear reactor in megawatt, whereas "megawatt electric," or MW(e), means electric output of a power plant in megawatt. The electric output

material used and produced in these reactors and to small research and development facilities" and "to first generation produced material" (IAEA, 1961a, para. 4).

2) The document set out two groups of nuclear materials and facilities:

a) The first one included those to which the safeguards were "attached," i.e. there was a requirement to permanently apply safeguard procedures (e.g. nuclear material "supplied by the Agency whenever the total amount... exceeds a certain minimum" (IAEA, 1961a, para. 25); special fissionable material "produced in or by the use of material to which Agency safeguards are... attached" (IAEA, 1961a, para. 25); nuclear facilities "supplied or substantially assisted by the Agency" unless their maximum calculated power for continuous operation of less than 3 MW(th) provided that the total such power of reactors does not exceed 6 MW(th) (IAEA, 1961a, paras. 26 and 36); nuclear material and facilities with regards to which the Member State requested the attachment of safeguards (IAEA, 1961a, paras. 29(c) and 30(c)).

b) The second group included nuclear materials and facilities to which "appropriate safeguards procedures" were applied. On the one hand, they comprised all the items from the first group. On the other, the second group also included: "nuclear material while it is intermixed with nuclear material to which Agency safeguards are attached (IAEA, 1961a, para. 29(b)) and facilities where the materials with attached safeguards are processed, used, or stored (IAEA, 1961a, para. 30(b)). Furthermore, the document contained a specific provision concerning uranium mines, mining equipment and to ore-processing plants, to which no Agency safeguards were planned to be attached (IAEA, 1961a, para. 27).

3) In Part V "Application of Agency Safeguards", the document sets out the basic elements of the safeguards. First of them is the Agency's right to examine that the design of a nuclear facility will not possibly further any military purpose and is safeguards friendly. It includes not only the facilities that already exist or planned, but also those whose previously approved design undergo any substantial change. The document does not establish any time limit for the design examination; rather, it provides that the procedure should be carried out "as expeditiously as possible after the submission of the information by the State (IAEA, 1961a, para. 43).

---

of a power plant is equal to the thermal overall power multiplied by the efficiency of the plant. See European Nuclear Society website: https://www.euronuclear.org/info/encyclopedia/m/mwe.htm.

Secondly, it imposes an obligation on the State to maintain a system of accountancy of the safeguarded material, equipment and facilities. The storage period shall be no shorter than two years.

Thirdly, the State is obligated to submit to the IAEA routine and special reports on the safeguarded facilities and the nuclear materials. The routine reports are threefold. They include operating reports on the use of the facility and the material in the facility within a certain period of time, the program of future work in the facility and with the material, and accounting reports showing the handling of the safeguarded material. The Agency has the right to require additional information or clarification of the information provided by the State if it considers that there exist "unusual circumstances" (IAEA, 1961a, para. 50). The frequency of routine reports, as established in the document, is twice a year for reactor facilities.

Special reports were designed as an opportunity for the Agency to receive information on such outstanding issues as actual or potential loss, damage or destruction of a safeguarded facility or material. The relevant provision consists of two parts. On the one hand, the State has forty-eight hours to urgently notify the Agency of the issue. On the other, should the State have plans to change the quality of safeguarded materials, or to introduce significant changes to a safeguarded facility or its future nuclear programme, the State is further obligated to submit to the Agency a special report at least two weeks beforehand.

4) Furthermore, the document established a procedure for inspections to check the records of the safeguarded material and to detect possible diversion (IAEA, 1961a, para. 40(d)). The "Agency's Safeguards" distinguished between routine and special inspections. During the routine inspections of the safeguarded facility the inspectors will verify its compliance with the approved design and test any equipment or instruments that is planned to be used to measure material in the facility. Once the safeguarded facility starts operating, the inspectors will: examine it and the safeguarded material; audit reports and records; verify the amounts of safeguarded material through physical inspection, measurement and sampling; and check the measurement instruments. The document sets out a principle of flexibility of conducting inspections, namely even if already planned, the inspections may not be carried out if there is not more need in them. Special inspections are to be applied only in particular two types of situations.

Firstly, a need for a special inspection may surge in order to investigate issued raised in a special report referred to above. Secondly, a special inspection may be conducted if unforeseen circumstances requiring urgent action appear. In this event the Board should receive a report outlining all relevant circumstances.

It should be underlined, in particular in relation to the inspections procedure, that a safeguards agreement is an international treaty. Since a State is a party to the agreement, its Government is therefore the only party to assume responsibility under the agreement on behalf of the whole State. Hence the State's responsibility to guarantee within its jurisdiction or control that persons, both natural and legal, act in line with the treaty obligations. This still holds true in case when a nuclear facility is privately owned. If, for example, the facility operator refused to allow IAEA inspectors to conduct an inspection, the IAEA would then request the Government of the State, and not the operator, to adopt all necessary measures to ensure that IAEA inspectors can have access to the nuclear facility in question. Should the Government fail to do so, then the State, not the operator, would violate the agreement.

It should also be underlined that the document already foresaw the need of further developing the safeguards system owing to the technological development and the relevant experience to be obtained by the Agency (IAEA, 1961a, para. 5). The principles and procedures concerning the application of safeguards by the Agency were thus supposed to undergo a general review two years after the adoption of the document.

5) Lastly, in the view of the fact that a safeguards agreement is considered as an international treaty, so it should be interpreted and applied in line with correspondent principles of international law. Therefore, the principles of domestic law are inapplicable to a safeguards agreement, and national courts do not have jurisdiction on the issues that arise from the implementation of such agreement either. Alternatively, the judicial forum for resolving disputes between sovereign States concerning their rights and obligations under international treaties is the International Court of Justice (hereinafter "the ICJ"). The ICJ comes into play after it is satisfied that the requirements set out in its Statutes are met. Since the IAEA is an international organisation, it is not

eligible to be a party to litigation before the ICJ.[4] With the absence of any judicial body having power to adjudicate on the issues concerning interpretation and implementation of a safeguards agreement, the agreement should contain relevant provisions on dispute resolution. As for INFCIRC/26, and a subsequent INFCIRC/66/Rev. 2, discussed below, they did not contain any such provision; rather, safeguards agreements based on these documents would include correspondent mechanisms.[5] They sometimes had slightly different wording but embodied the same idea of submitting disputes concerning the interpretation and application of the safeguards agreements to binding arbitration process, which basically includes establishment of an arbitration panel composed of one member selected by each of the parties involved, plus one or two[6] members designated by the previously selected panel members.

c. Agency inspectors' status

Since the IAEA enjoy a special status under the international law, so do Agency inspectors. The first mentioning of their special status as the IAEA staff members may be found in Article XV "Privileges and immunities" of the Agency Statute.[7] The staff members' rights were further specified in a separate "Agreement on the Privileges and Immunities of the International Atomic Energy Agency" approved by the Board on 1 July 1959 (IAEA, 1959e). In addition to the general set of internationally recognised privileges and immunities, such as legal immunity from legal process, exemption from taxation and use the United Nations' ("the UN") *laissez-passer*, among others, the Agreement set out some rights for the inspectors while they act or travel in their official capacity as the Agency's officials.[8]

---

[4] Article 34(1) of the Statute of the ICJ provides that "only states may be parties in cases before the Court".

[5] See, for example, (IAEA, 1962, Article V Section 11(a) and (b)) and (IAEA, 1967: Part VII Section 29(a) and (b)).

[6] In case the number of parties to the agreement is an odd number, e.g. two States and the Agency, and they all are involved in a dispute, two other panel members should be picked up in order to avoid the possibility of a tie vote.

[7] A. The Agency shall enjoy in the territory of each member such legal capacity and such privileges and immunities as are necessary for the exercise of its functions.
B. ...the staff of the Agency, shall enjoy such privileges and immunities as are necessary in the independent exercise of their functions in connection with the Agency.

[8] See (IAEA, 1959, Article VI para. 18(b) and Article VII). In particular, the document provides for inviolability for all papers and documents, the right to use codes and to receive documents by courier or in sealed bags when communicating with the Agency, and the same immunities and facilities to apply to the inspectors' personal baggage as are accorded to members of comparable rank of diplomatic missions.

In June 1961 the Board developed the procedures governing the designation of inspectors and the conduct of inspections by adopting the "Inspectors' Document" (IAEA, 1961d). The document consists of four parts:

1) The designation of an inspector to serve in a State required that State's approval, which could be withdrawn at any time (IAEA, 1961d, Annex, para. I). As a guarantee against the abuse of that right to refuse, the Director General had a right to refer the matter to the Board if the State repeatedly rejected proposed candidatures. According to the Board's decision, all inspectors must be full time staff members of the Agency and not, for instance, temporarily seconded national officials, and that the Director General should appoint a staff member as an inspector only after a prior approval by the Board (Fischer, 1997, p. 248). The State should expedite the issuance of visas for the approved inspectors.

2) The Agency shall give at least one week's notice of each routine inspection whereas for special inspection a notice period need not exceed twenty-four hours (IAEA, 1961d, Annex, paragraph II). The notice shall comprise the inspectors' names, the place and approximate time of their arrival and departure, and the items to be inspected. Upon request of the State the inspector may be accompanied by the State's officials without negatively affecting the inspection timeframe. The State designates points of inspectors' entry into and leave from this State as well as the routes they have to follow. The State should cooperate fully with the inspectors, in particular, providing them, when necessary, with appropriate equipment and means of transport. The document also emphasises that the inspectors' activity must keep to the minimum a possible impact on the functioning of the inspected facilities. Some authors concluded that the relatively long prior notice required before an inspection and the limits imposed on the inspectors' freedom of movement during an inspection "reflected the hesitations of many Board Members" since "many governments were taken aback, even shocked, by the idea that foreign inspectors, working for an international agency, must be allowed to intrude into their territories... to inspect what were, at that time, the most advanced and sensitive research and industrial activities" (Fischer, 1997, pp. 247-248).

3) As to the contents of inspections, the "Inspectors' Document" mentions that the agreements on inspections may include the following procedures: examination of the safeguarded items; audit of reports and records; quantitative verification of safeguarded

material by physical inspection, measurement and sampling; and examination and testing of the measurement instruments. The results of each inspection should be communicated to the State which, in case of disagreement with the findings, might raise the matter before the Board.

4) The document affirms the inspectors' privileges and immunities by referring to the above mentioned "Agreement on the Privileges and Immunities of the International Atomic Energy Agency." Likewise, if a dispute arises between a State and the Agency, it should be resolved under the provisions of a relevant safeguards agreement.

As to the legal status of the "Inspectors' Document," in his memorandum the Director General pointed out that, on the one hand, it "intended to serve as a guide to the parties concerned in negotiating provisions that are normally included in project agreements," on the other, its provisions were not mandatory and "would only be given legal effect by the entry into force of the particular agreement which incorporates them" (IAEA, 1961d, para. 3).

The "Inspectors' Document" applied together with the INFCIRC/26-type safeguards agreements and the second safeguards instrument – INFCIRC/66-type agreements (IAEA, 1965c), (IAEA, 1967b) and (IAEA, 1968c)), which will be described below. For States have in force comprehensive safeguards under INFCIRC/153/ (Corr.) (IAEA, 1972c) described further in this study, the "Inspectors' Document" was superseded by the inspection procedures set forth in the text of a safeguards agreement.

d. INFCIRC/26 in practice

Already in 1961 the safeguards system started to gain momentum. For example, the Governments of Canada, Japan and the United States proposed consultations aiming at elaborating new agreements which would transfer to the Agency the task of administering safeguards arising out of the USA–Japan and Canada–Japan agreements (IAEA, 1961e, paras. 228-9). Later, the United States Government made formal proposals to the Agency to place four U.S. reactors under the Agency's safeguards, which culminated in the adoption of a correspondent agreement in 1962 (IAEA, 1962b). The agreement was limited in time, but covered various types of reactor facilities, namely the Brookhaven Graphite Research Reactor, the Brookhaven Medical Research Reactor, the Argonne Experimental Boiling Water Reactor and the Piqua Organic Moderated Reactor. Some authors, among them Mr Szasz, considered that the

submission by the United States was made "in part in order to counter criticisms to the effect that safeguards were only applied to the less powerful, less developed States, and in part to permit the Agency to experiment with the application of its new safeguards system to medium size facilities" (Szasz, 1970, p. 644). The first safeguards inspection took place in the same 1962 in the framework of a joint Agency-Norwegian program of research "NORA" (IAEA, 1961c). The Agency verified the design of a zero power research reactor in Norway and verified the fuel supplied for its operation (IAEA, 1962a, p. 21, para. 118). The Agency analysed the information received during the inspection and the Board assessed the reactor as having a maximum power of less than 3 MW(th), which consequently exempted the facility from the attachment of safeguards. In the same year the Agency concluded safeguards agreements concerning research reactors in Pakistan (AMF reactor), Yugoslavia (Triga reactor), and the Democratic Republic of the Congo (then known as Congo-Leopoldville) (TRICO Triga reactor) (IAEA, 1962a), para. 114). It is worth mentioning that in 1962 and 1963 Israel and South Africa made joint notifications to the IAEA concerning deliveries to Israel of ten tonnes of uranium oxide. Although no safeguards agreement was signed, but the shipping was made under a safeguards spirit commitment, namely that the nuclear material would be used solely for peaceful purposes (IAEA, 1963a, p. 18, para. 114) and (IAEA, 1964a, p. 29, para. 133).

1.3.INFCIRC/66/Rev. 2 or "item specific" safeguards

a. Preparatory work

The "Agency's Safeguards" of 1961 expressly provided that the safeguards provisions be revised in a two years' time, i.e. before January 1963. So, in May 1962 the Board, upon a proposal of the Director General, informed the Conference that "the experience gained by the Agency in the period of approximately a year and a half that the safeguards instrument has been in effect is insufficient to enable a comprehensive review to be made of the principles and procedures on which it is based" (IAEA, 1962c, para. 2). The Board thus proposed the revision of the first safeguards document be delayed until there are sufficient data. However, no further action was taken.

In February 1963, under paragraph 4 of the "Agency's Safeguards" which provided for an opportunity to develop procedures covering other types of nuclear facilities when

such need appears, the Board asked the Director General for proposals to include into the safeguards system reactors of maximum power exceeding 100 MW(th). The need for the extension reflected the changing pattern of trade in nuclear facilities. For example, Canada and the USA were selling large power reactors to India and the United Kingdom – to Japan (Fischer, 1997, p. 249 and 309).[9] Meanwhile the Board entrusted the re-established Special Working Group with two tasks: reviewing the proposals and submitting its own comments and proposals to the Board. Finally, on 19 June 1963 the Board provisionally approved the procedures drafted by the Working Group with a view of further submitting them to the General Conference on the same basis as the original system. On 26 July 1963 the General Conference by a vast majority of votes (57 votes in favour, 4 against and 6 abstentions) also decided to approve provisionally the safeguards instrument to be applied to larger reactors (IAEA, 1963b). Lastly, on 26 February 1964 the Board approved the extension provisions which were later communicated to all Members of the IAEA as document INFCIRC/26/Add. 1 (IAEA, 1964b) and established a working group to carry out the overall review of the system.

In contrast to the discussion process of the initial "Agency's Safeguards" document dominated by controversies and the atmosphere of distrust, the stakeholders now embarked on the process of revision more thoughtfully. Serious studies were thus carried out in order to determine how the system could be "made to work most effectively and unobtrusively and how its provisions could be stated most simply" (Szasz, 1970, p. 554).

The revision process carried out by the Working Group included more than thirty meeting throughout a period between February 1964 and January 1965, split in various rounds. Finally, the Group made a brief report to the Board, which slightly amended it and provisionally approved the revised instrument on 25 February 1965. The document was then submitted it to the General Conference, which at its ninth assembly referred the draft to its Administrative and Legal Committee, and then passed a unanimous Resolution, noting the Board's proposal and inviting it "before giving effect to this document, to take into account as appropriate the views expressed in the General

[9] India was buying the U.S. General Electric nuclear power reactors Tarapur-1 and 2 of 150 MW(e) each (construction started in October 1964), and the Atomic Energy of Canada Limited's Rajasthan-1 of 90 MW(e) (construction started in August 1965) and Rajasthan-2 of 187 MW(e) (construction began in April 1968). Japan bought from the United Kingdom the plant Tokai-1 of 585 MW(th), the country's first commercial nuclear power plant (construction had begun in March 1961).

Conference" (IAEA, 1965a). Lastly, on 28 September 1965 the Board gave its final approval to the revised safeguards instrument known as INFCIRC/66 "The Agency's Safeguards System (1965)."

b. Main provisions of INFCIRC/66 and its subsequent revisions

The provisions of the newly adopted document did not automatically replace those of the previous INFCIRC/26-based agreements; rather, a State was provided with discretion whether to continue applying previous norms or to request the Agency to substitute them with the new ones (IAEA, 1965c, para. 5). Part III concerning safeguards procedures comprised three sections: general procedures which applied to "principal nuclear facilities"; special procedures for reactors; and special procedures relating to safeguarded nuclear material outside principal nuclear facilities. The document thus made reference to "principal nuclear facilities," similarly to the previous INFCIRC/26 agreements (IAEA, 1965c, para. 7). This term apparently did not limit the scope of the revised safeguards to particular types of facilities; rather, it was foreseen in Paragraph 7 that provisions related to nuclear facilities other than nuclear reactors could be developed once necessary. Taking into account the second section of the Safeguards Procedures part, such development would be realised in a form of special procedures for every type of facilities.

The "extension" took place in 1966 and 1968 when the Board provisionally approved the application of the safeguards procedures to reprocessing plants, and conversion plants and fabrication plants, respectively. The provisions were included as Annex I "Provisions for reprocessing plants" and Annex II "Provisions for Safeguarding Nuclear Material in Conversion Plants and Fabrication Plants" to the "The Agency's Safeguards (1965)" and were reissued as INFCIRC/66/Rev. 1 and then INFCIRC/66/Rev. 2.[10]

The provisions of the Agency's Safeguards System (1965) and its subsequent extensions are incorporated by including a corresponding reference into a safeguards agreement between parties. The document is thus not a "model" document, although agreements of this type share some common patterns in the structure and contents.

INFCIRC/66/Rev. 2 consists of four parts and two annexes. Part I "General Considerations" describes the purposes and scope of the document; certain principles

[10] Available in a consolidated document at https://www.iaea.org/sites/default/files/publications/documents/infcircs/1965/infcirc66r2.pdf.

that the Agency is to observe while concluding safeguards agreements; and the Agency's obligations. Among the latter there were obligations to implement safeguards in a manner that in no case would hamper or make less economic legitimate peaceful activities, including the confidential character of information provided to the Agency in connection with safeguards, and an obligation for the Director General to consult with States about the safeguards implementation. Paragraph 15 of the document sets out three groups of possible safeguards agreements:

1) The first one is an agreement concluded pursuant to a project and supply agreement between the Agency and a State without safeguards agreement concluded under the Treaty on the non-proliferation of nuclear weapons (hereinafter "the NPT") (IAEA, 1970e). Under such project and supply agreement, the IAEA itself undertakes to supply, or to assist in obtaining, nuclear material, equipment, facilities and technology to the State. In exchange, the State is obligated to place the supplied items under the Agency's safeguards.

2) The second group comprises so-called "safeguards transfer agreements". These are safeguards agreements which are concluded between the Agency and one or more States, and provide for the application of safeguards to nuclear material, services, equipment or facilities. In this case the nuclear items have been either supplied under a co-operation arrangement between States, or, already being subject to safeguards, retransferred to States without comprehensive safeguards agreements (INFCIRC/153/ (Corr.)-based). In some cases, for example, USA–Japan and Canada–Japan agreements cited above, bilateral co-operation agreements were concluded before the adoption of IAEA safeguards and stipulated that the safeguards be applied by the supplier State. Once the Agency's safeguards entered into force, the Parties to those agreements requested the IAEA to start applying them instead.

3) The third group of safeguards agreements consisted of unilateral submission agreements between the IAEA and a State. They placed some of the State's nuclear energy activities under safeguards at the request of that State.

Part II "Circumstances Requiring Safeguards" of INFCIRC/66/Rev. 2 gives an example of the situation when nuclear materials are to be either subject to or exempted from safeguards. It also lists the conditions for temporary suspension or permanent termination of the safeguards.

Part III "Safeguards Procedures" specifies the verification procedures to be applied to safeguarded nuclear materials. At the beginning, the section contained the general procedures that apply to materials that are produced, processed or used in any type of facility (or are outside any facility): from the provisions for the review of the facility design, the records keeping and the submission of reports to the norms related to the carrying out of inspections. Then the section described the special procedures applicable to materials in reactors, research and development facilities, in sealed storage, or elsewhere.

Part IV contained definitions.

As was mentioned above, Annexes I and II describe verification procedures at reprocessing plants, and conversion and fabrication plants, respectively. In the part "Introduction" each of them specified, among other things, the deadlines for these provisional procedures to be reviewed. Each Annex further describes the special procedures for the newly safeguarded facilities, which are supplementary to the general procedures listed in Part III of the main document. They indicate frequencies of inspections and of submission of routine reports, and the way the safeguards are applied to various mixtures of safeguarded and unsafeguarded nuclear material.

c. Differences between INFCIRC/26 and INFCIRC/66/Rev. 2

The main differences of the new safeguards system from the previous one consisted in the following.

1) The new document is structured in a different way and thus avoids repeating some provisions like principles and procedures.

2) The new safeguards focus more on controlling nuclear materials than facilities. Nor is there an explicit provision on application of the safeguards to non-nuclear materials and equipment. However, even under these circumstances the Agency is entitled to safeguard non-nuclear items in at least two situations. The first one occurs when the Board considers that a principal nuclear facility of a State is "substantially supplied under a project agreement," which evidently means that the facility is sufficiently provided with both nuclear or non-nuclear material and equipment. On the other hand, the Agency can still apply safeguards to non-nuclear items once it is required to do so by State party to a Safeguards Transfer Agreement. For example, in the document INFCIRC/98 either party to the agreement undertook to make subsidiary arrangements

with the Agency that, among other things, would include provisions on putting non-nuclear materials and equipment under the safeguards (IAEA, 1967d, p. 6, section 22).

3) Furthermore, the new safeguards document did not make any distinction between the two types of implementation of safeguards, namely "attachment" and "application". Rather, it uses the terms like, for example, "nuclear materials subject to safeguards", "implementing safeguards" and "principal nuclear facility to which the Agency's safeguards procedures extend" (IAEA, 1968c, paras. 11, 13, 19 et al).

4) The new safeguards document also provided additional information on some particular situations, which had been either not included or very briefly outlined previously. They include, among other things, application of safeguards to nuclear materials outside facilities and to research and development facilities, and exemption from safeguards.

5) Lastly, unlike the restrictions for safeguards set out in the previous document, the new document extended the safeguards control beyond "first generation produced material" (IAEA, 1968c, para. 19(e)). The new document also excluded the previously used notion of "nominal safeguards" (IAEA, 1961a, paras. 32(b) and 60), instead introducing the maximum frequency of inspections subject to effective kilograms of nuclear material involved (IAEA, 1968c, para. 57).[11]

It should be noted that the safeguards implementation is based on an annual cycle, which ends when the Agency draws safeguards conclusions. For INFCIRC/26-type and INFCIRC/66/Rev. 2-type safeguards agreements, such safeguards conclusion is drawn for each item as follows:

> "The Secretariat found no indication of the diversion of nuclear material or of the misuse of the facilities or other items to which safeguards had been applied. On this basis, the Secretariat concluded that, for the State, nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities."[12]

d. Board's initiatives for completing the safeguards system

The safeguards documents referred to above were further developed by subsequent Board's decisions and practices. They aimed at keeping the system up-to-date by filling

[11] The actual frequency of inspections would depend on other three factors: existence of irradiated-fuel reprocessing facilities in the State; the reactor type; and the nature and amount of the nuclear material related to the reactor.

[12] See, for example, (IAEA, 2015j, p. 1).

in some legal gaps in the following areas: duration and termination of safeguards, notion of the "military use", safeguarding technology transfers and non-nuclear material, and introduction of containment and surveillance (Rockwood, 2010).

i. Issue of duration and termination of safeguards

INFCIRC/66/Rev. 2 did not contain a specific provision concerning mandatory safeguards verification of the special fissionable material produced under safeguards. The document merely mentioned, when enumerating conditions for terminating safeguards, the possibility to conclude safeguards agreement on the produced material (IAEA, 1968c, paras. 26(a)(ii) and 26(b)(iii)).[13]It also emphasised in Paragraph 16 that it was "desirable that safeguards agreements should provide for the continuation of safeguards, subject to the provisions of this document, with respect to produced special fissionable material and to any materials substituted therefor." There were some States that included a provision to their agreements which guaranteed that safeguards would remain in force with regard to any special fissionable material produced under safeguards "until the Agency… has terminated safeguards on that material" (IAEA, 1967d, Section 33).

Yet, unlike the agreements concerning the Agency-sponsored projects, which did not foresee any expiration date or right of denunciation (Szasz, 1970, p. 593),[14] all the external supply agreements generally provided for both expiration and denunciation.[15] The Agency was thus concerned about the continuation of the safeguards in connection with the special fissionable material produced, processed or used with regards to safeguarded items. In 1973 the Director General submitted a memorandum (IAEA, 1973a) to the Board, in which he outlined these concerns and made several proposals apparently in line with the above referenced Paragraph 16. Firstly, the duration of a safeguards agreement should be tied to the actual use of safeguarded items. Secondly, the termination clauses should require that the rights and obligations of the Parties to the agreement continue to apply not only to supplied nuclear material, but also to special fissionable material "produced, processed or used in or in connection with supplied

[13] See also, among others, IAEA, 1970, Section 4; and IAEA, 1966, Section 1.

[14] The only exceptions to the rule were agreements leasing nuclear material, which must automatically be returned once a project comes to an end.

[15] See, for example, IAEA, 1968, Section 32: "This Agreement shall remain in force during the term of the Agreement for Co-operation unless terminated by any Party upon six-month notice to the other Parties or as may otherwise be agreed."

items" until the Agency had terminated relevant safeguards. Lastly, it was proposed related facilities, equipment and non-nuclear material would be subject to safeguards during the lifetime of the safeguards on the primary nuclear material.

As a result, in February 1974 the Board adopted a decision endorsing the Director General's proposals. From then on all new INFCIRC/66/Rev. 2-type safeguards agreements (also known as "item specific agreements" – as opposed to the Comprehensive Safeguards Agreements concluded under the NPT and other international treaties) would include a lifetime verification of safeguarded items as well as safeguards on the derived nuclear material. In case of no agreement reached while negotiating the termination clauses, the Director General was entitled to raise the matter before the Board. The first case in which the Director General used this right was related to the termination provisions of a safeguards agreement related to the supply of an Embalse reactor by Canada to Argentina (Rainer & Szasz, 1993, pp. 333-4). Eventually, the parties stroke a compromise which provided the following: on the one hand, the agreement would "should remain in force for an initial period of fifteen years from the date of communication by the Government that the first item is to be included in the Inventory" and renewed for periods of ten years if no party disagrees; on the other, safeguards should continue to apply with respect to heavy water, specialised equipment and nuclear material produced by use of the safeguarded reactor (IAEA, 1975b, Section 26).

ii. Notion of the "military use"

One of the main undertakings of a State under INFCIRC/66/Rev. 2 agreements was that the safeguarded items should "not to be used in such a way as to further any military purpose" (IAEA, 1968c, paras. 1 and 2). However, the completeness of this formulation was challenged on several occasions in 1970s. In March 1972 the USA announced to the Board that it had two understandings applicable to all U.S. co-operation and safeguards transfer agreements: first, that the guarantees with respect to any items precluded their use "for any nuclear explosive device," and, second, that Safeguards Agreements would continue to ensure verification that safeguarded material would not be used for any such device" (Rainer & Szasz, 1993, p. 318). Later in February 1975 the Board was studied a safeguards agreement with Spain (IAEA, 1975a). However, instead of relying on the standard interpretation of the undertaking, Spain opted for the new

one, which consisted in "the obligation, in particular, not to divert [the nuclear material] to nuclear weapons or other nuclear explosive devices" (Rainer & Szasz, 1993, p. 318). Lastly, on 18 May 1974 India conducted a "peaceful nuclear explosion" of a plutonium device (FAS, 2002). Although the issue was raised before the Board, the IAEA did not then condemn the Indian nuclear test (FAS, n.d.). Yet, in reaction to the three events the Board upheld the Director General's initiative to endorse a new interpretation of the undertaking. Given the evident impossibility to technically distinguish between a peaceful and a military nuclear explosion, the Board decided that INFCIRC/66/Rev. 2-type agreements should contain explicit undertakings against any use of safeguarded items for explosive purposes. The correspondent provision was included in safeguards agreements of this type from 1975 on (IAEA, 2001, p. 8).

iii. Safeguarding technology transfers and non-nuclear material

Another Agency's concern was a further use of transferred technological information once the safeguards agreement was terminated. So, the Board's decision of February 1974, cited above, was developed by practice when some agreements started to include provisions for reinstatement of safeguards in case if the recipient State planned to use this information for furthering its nuclear programme.[16] Furthermore, INFCIRC/66/Rev. 2-type agreements did not contain safeguards provisions concerning certain non-nuclear items, such as heavy water production plants, specialised equipment or non-nuclear materials (e.g., heavy water, nuclear grade graphite and zirconium alloy). The definition of "specialised equipment" can be found in Article III.2 of the NPT, which states that it is equipment "especially designed or prepared for the processing, use or production of special fissionable material." The specialised equipment falls into one of three categories: reprocessing plants equipment, fuel fabrication plants equipment and its essential components, and isotope separation equipment (Rainer & Szasz, 1993, p. 325). Non-nuclear materials that cannot be directly used to manufacture a nuclear explosive device but can be employed on different preparatory stages. They are also known as "trigger material" or "'specified material" and are likewise defined in the same NPT Article as material "especially prepared for the processing, use or production of special fissionable material." While not mentioned in INFCIRC/66/Rev. 2, some

[16] See, for example, (IAEA, 1976a), Section 30); and (IAEA, 1977b), Section 34(c)).

safeguards agreements did include this type of items into the safeguarded list. For example, document INFCIRC/251included in Section 1(b) plants for the production of heavy water in the list of safeguarded facilities (IAEA, 1977c). The safeguards agreement between the Agency and India expressly covered the heavy water supplied to the latter by the USSR and in Section 13 provided that the implementation of safeguards would be specified in a Subsidiary Arrangement to the agreement (IAEA, 1977a).

On the other hand, the Agency received a helping hand from the Nuclear Suppliers Group (hereinafter "the NSG"). Established in 1974, this group of nuclear supplier countries "seeks to contribute to the non-proliferation of nuclear weapons" (NSG, n.d.) and, to this end, implemented two sets of Guidelines for nuclear exports and nuclear-related exports. Their so-called London Guidelines of 1978 defined a "trigger list" that contained guidelines for transfers of nuclear items, including physical protection, special controls on sensitive exports, arrangements for exporting enrichment facilities, and controls on nuclear weapons-related material and on retransfers. Furthermore, the London Guidelines provided for continuous safeguards on the items from the "trigger list," which could be transferred "only when covered by IAEA safeguards, with duration and coverage provisions in conformance with the GOV/1621 guidelines" (IAEA, 1978a, Appendix, para. 4, and Annex A).

Another issue that was in the spotlight in 1970s was related to safeguarding nuclear facilities and their major parts built by recipient countries indigenously by using technology obtained through the transfer or by copying items directly imported from third parties, so-called "replicated facilities and equipment" (Rainer & Szasz, 1993, p. 322). The nature of the problem was threefold: it comprised the defining "the same-type facility," establishing the time-span within which the replicated item was built, and an authority to assess whether the disputed item has been built with the use of transferred or "home-made" technology.

On the one hand, the problem was dealt with by the NSG in the context of the nuclear technology exports. Firstly, the group's London Guidelines concerned replicated facilities for enrichment, reprocessing, and production of heavy water. In particular, the document contained an obligation that in case of a transfer of this kind of facilities, their major components or a correspondent technology, the safeguards should apply to "facilities of same type", i.e. those whose "design, construction or operating processes

are based on the same or similar physical or chemical processes" and which were "constructed within an agreed period in the recipient country" (IAEA, 2013a, paras. 6(a) and (b)). Paragraph 6 of the Appendix A to the Guidelines further specify the period to be taken into account for establishing the similarity of a facility: the "same-type" facility should start operating within at least "twenty years from the date of the first operation" of a transferred facility, or a facility that contains transferred major parts, or a facility built with the help of a transferred technology. Lastly, paragraph 6(b) of the Guidelines established that the burden of identifying the replicated facilities falls both on the supplier and the recipient country.

On the other hand, the issue of "same-type" facilities was addressed in a number of safeguards agreements, which provided some further guidance on the types of such facilities, the time-frame to be taken into account and the party that has an authority to indicate a replicated facility. For example, a safeguards agreement between Agency, Brazil and the Federal Republic of Germany contained a list of "same-type" facilities which included facilities for: producing nuclear material compounds of a fuel-cycle purity; manufacturing nuclear reactors and other nuclear facilities including their components; enriching uranium; fuel elements fabrication; and reprocessing of irradiated fuel (IAEA, 1976b, Article 3). While defining a "same-type" facility, the document employed the same definition as the London Guidelines. Furthermore, the Agreement also provided that the obligation to inform the Agency of the replicated facilities was on the supplying State and lasted for twenty years from the moment of the communication of the transfer (IAEA, 1976b, Article 3). Lastly, the Agreement stipulated, without establishing a time-limit, that the State party to the agreement would undertake to place such facilities under safeguards, and the Agency – to perform them (IAEA, 1976b, Articles 2(2) and 4(1)).

In yet another trilateral agreement, INFCIRC/239, for the application of safeguards to a fuel reprocessing plant and all relevant items and information supplied by France to Pakistan the period of presumption of "replication" was to be agreed upon by the two States (Rainer & Szasz, 1993, p. 323). Since the project was eventually cancelled, no such communication has ever taken place (Rainer & Szasz, 1993, p. 323). The responsibility to notify rested primarily with the recipient State, but the supplier State

could also inform the agency of the replicated facilities but only after having held consultations with the former.

Lastly, one safeguards agreement directly empowered the Agency to decide whether a facility if of the same type as a transferred one or whether it was built by using a transferred technology. The two conditions for that was an absence of agreement between the supplier and the recipient o make a joint statement as well as a correspondent referral of the issue to the IAEA by one of State party (IAEA, 1977c, Section 12(c)).

iv. Introduction of containment and surveillance

The initial safeguards agreements generally relied on the accounting for safeguarded nuclear material through records and reports examination, inspections, on-site measurements, and other means. However, with the time the Agency also developed yet another fundamental element of the safeguards - containment[17] and surveillance[18], not expressly included in INFCIRC/66/Rev. 2-based agreements. One of the examples is the use by the IAEA, starting from 1966, of the U.S. Internal Revenue Service seal, also known as the "Type E" seal (Sonnier, n.d.).

e. INFCIRC/66/Rev. 2 in practice and its further development

Overall, the total number of safeguards agreements showed constant growth year by year:

Period, by	Number of agreements	Number of Member States that concluded safeguards agreements
30 June 1965	24	21[19]

[17] "Structural features of a facility, containers or equipment which are used to establish the physical integrity of an area or items (including safeguards equipment or data) and to maintain the continuity of knowledge of the area or items by preventing undetected access to, or movement of, nuclear or other material, or interference with the items. Examples are the walls of a storage room or of a storage pool, transport flasks and storage containers. The continuing integrity of the containment itself is usually assured by seals or surveillance measures (for containment penetrations such as doors, vessel lids and water surfaces) and by periodic examination of the containment during inspection." (IAEA, n.d., p. 66).

[18] "The collection of information through inspector and/or instrumental observation aimed at detecting movements of nuclear material or other items, and any interference with containment or tampering with IAEA equipment, samples and data. Surveillance may also be used for observing various operations or obtaining relevant operational data. IAEA inspectors may carry out surveillance assignments continuously or periodically at strategic points." (IAEA, n.d., p. 66).

[19] (IAEA, 1965b, p. 41, para. 187).

30 June 1966	29	23[20]
30 June 1967	34	27[21]
30 June 1968	39	29[22]
30 June 1969	40	30[23]
30 June 1970	44	32[24]

Further developments of the safeguards system included the following events. The IAEA launched a research and development programme aimed at working out different techniques for safeguarding different types of nuclear facilities and developing new instrumentation that would boost the efficacy and cost effectiveness of safeguards. In September 1964 the first Inspector General was appointed and a new Division of Safeguards and Inspection was established (Szasz, 1970, p. 215). In August 1965, the IAEA held in Vienna the first international symposium on the management of nuclear materials (IAEA, 1966a, p. 47, para. 208). In 1967, the first inspection was carried out at a reprocessing plant West Valley in New York State, during the processing of ten tons of irradiated low enriched uranium from the Yankee power plant. There were ten inspectors that participated in the test verification procedures for accounting for all declared nuclear material, which revealed the nuclear material unaccounted for was less than 0.3% of the total (IAEA, 1968a)) p. 30, paras. 120-1). Lastly, in 1969 the first training course for the Agency inspectors was held (IAEA, 1969, p. 34, para. 124).

INFCIRC/66-type safeguards continue to be implemented in relation to nuclear facilities and material in States not parties to the NPT or to any other regional treaty that required conclusion of comprehensive safeguards (as described further in the present study). On 7 October 2016, INFCIRC/66 safeguards were still in force with regards to certain nuclear facilities in three States not party to the NPT, namely India, Israel and Pakistan (IAEA, 2017b).

[20] (IAEA, 1966a, p. 41, para. 202)
[21] (IAEA, 1967e, p. 28, para. 101).
[22] (IAEA, 1968a, p. 29, para. 114).
[23] (IAEA, 1969, p. 32, para. 110).
[24] (IAEA, 1970a, p. 32, para. 99).

1.4. INFCIRC/153/ (Corr.) or comprehensive safeguards

a. The Treaty on the non-proliferation of nuclear weapons

Before the NPT, the matter of concluding a safeguards agreement with the IAEA in relation to a particular nuclear transaction or activity was at full discretion of a state (either a receptor or a supplier), which did not bear any legal consequences in case it decided not to. Accordingly, despite the above referenced rise in number of safeguards agreements, some important nuclear transfers took place without any IAEA safeguards in place. For example, the USA transferred to Iran, with the assistance of the IAEA, uranium enriched to 93 % (Gaietta, 2015, p. 7); the UK, France and Israel received uranium from South Africa without a IAEA safeguards clause either; likewise, the UK obtained uranium from Australia, and the USSR – from its allies (IAEA, 1998b, p. 12).

So, the adoption of the NPT was the next significant step in development of the safeguards system both qualitatively and quantitatively. The idea of an international treaty impeding the proliferation of nuclear weapons on a global scale was gaining momentum already in 1950s. The following were the initial considerable political efforts in this sphere. Firstly, the "Irish Resolution" adopted by the UN General Assembly on 4 December 1961 which was a culmination of a series of initiatives introduced by Ireland since 1958 (Martin, 2010). The Resolution called for "conclusion of an international agreement" which would contain the following provisions: on the one hand, States that already had nuclear weapons would refrain from providing such weapons and relevant information to non-nuclear weapon States, and the latter would undertake not to seek nuclear weapons on their own, on the other hand (UN GA, 1961). Moreover, in 1961 the Eighteen Nation Committee on Disarmament was established by the Union of Soviet Socialist Republics ("the USSR") and the United States of America ("the USA"). Nonetheless, the international law-making process concerning non-proliferation remained in doldrums until 1965.

The negotiation of the Treaty began in 1965 following two milestone events (Goldschmidt, 1980, p. 73). The first was a nuclear explosion test conducted by China in October 1964. The second one was the vote of the United Nations Commission on

Disarmament in June 1965 requesting the Eighteen-Nation Disarmament Committee[25] to consider the question of an international treaty convention on non-proliferation. Since then and until the negotiating parties reached agreement on the text of the NPT, the Committee was a forum for negotiating the Treaty. The term "non-proliferation" itself was coined around 1965 (Goldschmidt, 1980, p. 73). It covered, putting it in the definitions suggested by an Indian physicist Homi Bhabha, both the "vertical" and "horizontal" proliferation, i.e. increase in the number of nuclear weapons and their geographical distribution by States already possessing them, and the acquisition of nuclear arms by yet nuclear have-nots, respectively. In June 1968 the NPT was commended by the UN General Assembly to the UN Member States. The NPT was eventually signed on 1 July 1968 and entered into force on 5 March 1970. Paragraph 3 of Article VIII of the Treaty established that the operation of the Treaty should take place every five years, whereas Paragraph 2 of Article X provided for a revision conference twenty-five years after its entry into force. Such conference would have two options to decide: either the duration of the Treaty would be indefinite or it would be extended for "an additional fixed period or periods". So, on 11 May 1995 the Review and Extension Conference of the Parties to the NPT voted in favour of the indefinite continuation of the Treaty.[26] With 191 parties that eventually joined it, the NPT is the only global treaty that contains obligation to adopt safeguards.

The essence of the Treaty is easy to spot already in its Preamble that speaks about "an agreement on the prevention of wider dissemination," "benefits of peaceful applications of nuclear technology… should be available for peaceful purposes", and the intention to pursue "the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament." In other words, non-proliferation, peaceful uses of nuclear energy, and disarmament are the three *a priori* equal pillars of the NPT. Furthermore, Preamble also underlines an importance of application of the Agency's safeguards on "peaceful nuclear activities" as well as safeguarding "the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points."

[25] The body was subsequently reconstituted as the Conference of the Committee on Disarmament and now is known as the Conference on Disarmament.

[26] "The Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons… Decides that, as a majority exists among States party to the Treaty for its indefinite extension, in accordance with article X, paragraph 2, the Treaty shall continue in force indefinitely." (UN, 1995b).

Apparently striving to keep stable the number of countries already possessing nuclear weapons, the NPT distinguishes Nuclear-Weapon States (the "NWSs") Party to the Treaty as those that have "manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967" (IAEA, 1970e, Article IX) It may be inferred that the rest of the countries are defined as Non-Nuclear Weapon States (the "NNWSs"). This definition applies both to States Party to the NPT and to States non-Party for the purposes of export (IAEA, 1970e, Article III(2)). According to the NPT's definition, there are thus only five NWSs, all of them now being States Party: China, France, Russia (as the successor State of the USSR), the United Kingdom and the USA.[27] For example, India and Pakistan, which tested their nuclear explosive devices in May 1974 and in May 1998, respectively, are not able to join the NPT as NWSs. The NWS have a special status under the NPT, which is described further in the research. In particular, three of them that originally signed the NPT before it entered into force, are depositaries of the treaty: Russia, the UK and the USA (IAEA, 1970, Article IX.2).

The two fundamental provisions of the Treaty are the following. Under Article I, the NWSs are precluded not only from transferring "nuclear weapons or other nuclear explosive devices" to any recipient, but also from "assisting, encouraging, or inducing" the NNWSs to obtain them. Secondly, Article II stipulates that the NNWSs, for their part, undertake not to manufacture or acquire nuclear weapons or other nuclear explosive devices, or to seek or receive assistance in their manufacture.

Under Article III.1 the NNWSs are required to accept safeguards with a purpose of preventing diversion of peaceful nuclear energy to nuclear weapons or "other nuclear explosive devices". The safeguards would take a form of an agreement concluded with the IAEA on all source or special fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction or control. Such agreements are commonly referred to as "full scope" or "comprehensive" safeguards agreements (the "CSA") and were negotiated on the basis of the document INFCIRC/153/ (Corr.), adopted by the Board on 1 June 1972 and described in detail below. It is interesting to recall that, however criticised the eventual version of the NPT is, at some point of the negotiations

[27] The following are the dates of first nuclear tests: 16 July 1945 – the USA, 29 August 1949 – the USSR, 3 October 1952 – the UK, 13 February 1960 – France, and 16 October 1964 – China (Dahlman, et al., 2009, p. 2).

of the Treaty the USA was prepared to accept a version with no verification provisions (Shea, 2015, p. 22).

The Treaty further specifies that any source or special fissionable material or equipment related to special fissionable material should be subject to safeguards if a State party supplies them to a NNWS (IAEA, 1970e, Article III.2). Paragraph 3 of Article III also contains a provision similar to the one from the safeguards documents cited above. It read that the implementation of safeguards under the NPT should avoid prejudicing the economic or technological development of the State Parties or international co-operation in peaceful nuclear activities.

Lastly, the Treaty established that the State party should start negotiating comprehensive safeguards agreements within 180 days after the Treaty enters into force. If a State deposits its ratification or accession instrument after the referred period, the day on which such deposit occurs should be the starting day for the negotiation of a safeguards agreement. The safeguards agreements are to enter into force within eighteen months counting from the date when negotiations began (IAEA, 1970e, Article III.4).

b. Comprehensive safeguards

i. Elaborating the comprehensive safeguards

The road to the adoption of INFCIRC/153/ (Corr.), referred to above, was all but a plain sail. The idea of submitting the entire peaceful nuclear programme to safeguards was expressed well before the NPT entered into force. For example, already during the 1966 the IAEA General Conference, Czechoslovakia and Poland expressed their readiness to accept comprehensive IAEA safeguards in case the Federal Republic of Germany would do the same, and Norway proposed that all States without nuclear weapons should place their nuclear programmes under safeguards (Fischer, 1997, p. 252). Some countries, among them the Federal Republic of Germany, the USA, the USSR and the UK, studied possibilities of effectively applying safeguards in reprocessing plants (Fischer, 1997, p. 253).

After the NPT was signed, the Agency also began to prepare for its impact on its safeguards. Firstly, in 1969, a Division of Development in the Safeguards Department was established with an aim of carrying out safeguards research and development (IAEA, 1969) para. 109(b). Subsequently, a series of scientific panels were held. For

example, in 1969 a panel on safeguards systems analysis of nuclear fuel cycles was held in Vienna, and another panel on safeguards methods and techniques met in Tokyo (IAEA, 1970, para. 109(b)). The "material balance area" concept (hereinafter "the MBA")[28] gained weight since the two panels "confirmed the importance of the technique of material balance accounting" (IAEA, 1970, para. 109(c)). The MBA would be fundamental for determining:

- the necessary information for design review;
- systems of recording and reporting that are needed to be established for safeguards purposes;
- inspection procedures to be employed; and
- the relationship that should be between inspections and reports (IAEA, 1970, para. 109(c)).

The Tokyo panel also provided the Agency with information concerning, among others, quantification of the results of inspections, possible reaction to appearance of materials unaccounted for[29], safeguarding scrap and to discarded material, and the optimal frequency of physical inventories (IAEA, 1970, 109(c)).

Secondly, in 1970, a symposium on safeguards techniques was held under the auspices of the IAEA at the Nuclear Research Centre in Karlsruhe, Federal Republic of Germany (Fischer, 1997, p. 253).

Thirdly, a working group was created with an aim to draft texts of articles of the comprehensive safeguards agreement, which the non-nuclear weapon States Party to the NPT would conclude pursuant to its Article III.1. Subsequently, the group prepared a complete draft agreement on the basis of which on 9 February 1972 the first safeguards agreement was concluded under the NPT, with Finland (Fischer, 1997, p. 310).

The first model NPT safeguards agreement, as described above, was drafted by the Secretariat in respect of Finland. Obviously, the document was based on the existing INFCIRC/66/Rev.2-type system and included some modifications in the light of the

[28] According to the Safeguards Glossary, "Material balance area (MBA) — … is "an area in or outside of a facility such that:
(a) The quantity of nuclear material in each transfer into or out of each 'material balance area' can be determined; and
(b) The physical inventory of nuclear material in each 'material balance area' can be determined when necessary, in accordance with specified procedures, in order that the material balance for Agency safeguards purposes can be established".

[29] "Material unaccounted for (MUF) can be described as the difference between the book inventory and the physical inventory". (IAEA, n.d., p. 55)

requirements of the Treaty. On 11 March 1970 the Director General communicated the document to the Member States and received 31 replies. They generally emphasised the need to adopt a new approach to safeguarding nuclear facilities and contained, in particular, proposals to stick to the spirit of the NPT stipulated in the Preamble which consisted in "safeguarding the flow of source and special fissionable material by the use of instruments and other techniques at certain strategic points" (Fischer, 1997, p. 254).

The Board then asked the Director General to submit the initial draft to the so-called "Safeguards Committee" (IAEA, 1970c). The document had a three-part structure, which included introduction, general rights and obligations of the State Party, and safeguards procedures and principles to be applied. Among others, the Director General's document proposed not to extend safeguards to obligations under Article III.2 of the Treaty; that States themselves should keep nuclear accountancy and control over safeguarded items; and to apply appropriate procedures in case of a transfer of nuclear materials from peaceful activities to permitted military ones. Such non-prescribed military uses included nuclear propulsion of submarines and warships and excluded, as emphasised in the document, conversion, reprocessing and enrichment, which only changed the chemical or isotopic composition of nuclear material. The Director General considered the latter use as not essentially military, and thus subject to safeguards. The NNWSs therefore were denied an opportunity to have an unsafeguarded full nuclear fuel cycle (Rainer & Szasz, 1993, p. 291). At the same time, the States were now obligated to follow specific procedure when they intended to withdraw nuclear materials for permitted military uses and not merely to make a declaration of withdrawal.

The Safeguards Committee further received two more papers which covered the topics of the statutory authority of the Agency to apply NPT safeguards and of the correspondent responsibility for damage (Rainer & Szasz, 1993, p. 291).

Lastly, one of the most outstanding contributions to the process of elaboration of the safeguards document that would apply to non-nuclear weapon States Party to the NPT was made by the Safeguards Committee. It was established on 6 April 1970 by the Board upon the proposal of the United Kingdom, shortly after the Treaty entered into force. The right to participate in the work of the committee was open to all the Member States of the Agency. In total, around 45 States (nearly a half of the total number of

Member States) submitted their views during the committee meetings held from June 1970 to March 1971 (IAEA, 1998b, p. 13). The work of the Commission was a constant turnover of ideas and feedbacks. The agreements and recommendations elaborated during the negotiations were consolidated and, after the Secretariat's revision, issued as reports by the Director General. After that the countries received them and had an opportunity to make correspondent comments. The members of the Committee intended to arrive at consensus when adopting decisions. The work of the Committee was constantly reflected in the progress reports issued by the Director General. The Committee eventually prepared three reports to the Board, drafted the complete model NPT Safeguards Agreement and advised the Board on calculating the division of safeguards costs among Member States of the Agency (Rainer & Szasz, 1993, p. 290). Some of the findings of the Committee are listed below.

The Committee accepted the principle which obligated each NNWS party to the NPT to establish and maintain a State system of accounting for and control of safeguarded nuclear material (later known as SSAC) (Fischer, 1997, p. 256). The accounting and control system was supposed to be regional in the case of Euratom. It was further proposed by Japan that the IAEA job would only consist in verifying how the State controls its nuclear materials, rather than the findings of the SSAC (Fischer, 1997, p. 256). However, it was agreed that the Agency would independently verify the absence of diversion of nuclear material by examining the results of SSAC and taking into account the "technical effectiveness" of that system (IAEA, 1972c, para. 7).

Among the most complicated topics the Committee dealt with was the application of safeguards to nuclear material during international transports and the frequency and intensity of inspections. Obviously, each member of the Committee had its own vision of the safeguards procedures, which sometimes was in line with the views of several other countries, leading to the appearance of some factions. For example, Canada, most Eastern European States, and two out of the three NWSs adhering to the NPT (the USA and the USSR) were in favour of providing the Agency with more extensive rights of access. Moreover, the two latter States also successfully pushed for the right of the IAEA to use its own "independent measurements and observations" while verifying the findings of the SSAC system (IAEA, 1972c, para. 7).

On the other hand, the Euratom[30] States advocated for the application of safeguards only to nuclear material and not to nuclear facilities, as in the previous generation safeguards, and for rather a technical approach when applying safeguards. The Euratom delegations also insisted on less intrusive routine inspections focused only on the agreed strategic points. This position was eventually reflected in the Preamble to the Treaty which mentioned "the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points."[31] The Treaty thus explicitly favoured the broader use of instruments and a more limited role of human inspectors. However, as to the special and ad hoc inspections, the Euratom did not make any special reservations. Therefore, in the former case, paragraphs 1, 73 and 77 of the Treaty allowed for unlimited access for IAEA inspectors if the Agency considered "information made available by the State… is not adequate for the Agency to fulfil its responsibilities" to verify that "such material is not diverted to nuclear weapons or other nuclear explosive devices." Under paragraphs 71(a, b) and 76(a) of the NPT, the IAEA was also granted unlimited access, until "the strategic points have been specified in the Subsidiary Arrangements", when conducting ad hoc inspections for verification of information provided in the initial report and "changes in the situation which have occurred since the date of the initial report".

The uranium exporters, in turn, successfully insisted on excluding uranium concentrates from safeguards. The Committee agreed that the State should merely notify the Agency of exports and imports of uranium ore and other material containing uranium or thorium not enriched or suitable for fuel fabrication should be notified to the IAEA. Eventually, paragraph 112 of the Treaty expressly excluded uranium ore and ore residue from the list of "nuclear material". Nor should the safeguards apply to material in uranium mines and ore concentration facilities. These principles were further translated into paragraphs 33 and 34 of the final text of the NPT.

[30] Euratom, or the European Atomic Energy Community, is an international organisation founded in 1957 with the purpose of coordinating the Member States' nuclear energy programmes.

[31] Under paragraph 116 of INFCIRC/153/ (Corr.), a "strategic point" means "A location selected during examination of design information where, under normal conditions and when combined with the information from all 'strategic points' taken together, the information necessary and sufficient for the implementation of safeguards measures is obtained and verified; a 'strategic point' may include any location where key measurements related to material balance accountancy are made and where containment and surveillance measures are executed".

The topic that united most of the developing States and was a precondition for their joining the consensus of the Committee was an approach for sharing safeguards costs between the Agency and the States (Rainer & Szasz, 1993, p. 292). Eventually, the Board adopted the text which generally distinguished between Member and non-Member States of the Agency favouring the former, which had to bear only their own costs, whereas the latter should cover both their and the Agency's safeguards-related expenses (IAEA, 1972c, para. 15).[32]

The Safeguards Committee eventually sent the draft comprehensive safeguards agreement to the Board in March 1971. In the next month the latter authorised the Director General to use the document as the basis for the agreements under the NPT. The Agency appointed correspondent negotiating teams were which not only started working on safeguards agreements with NNWSs party to the NPT but also negotiated that two NWSs (the United Kingdom and the USA) offer for safeguarding nuclear material in some of their facilities (IAEA, 1972d, p. 39, para. 119(b)). During the following year the Board approved 23 safeguards agreements required by the NPT.[33]

Unlike INFCIRC/66/ Rev. 2, to which the previous generation safeguards agreements merely made reference, INFCIRC/153/ (Corr.) was the basis upon which all non-nuclear weapon States Parties to the NPT negotiated and concluded their safeguards agreements. The only exceptions to this were the provisions of the Statute and of the Privileges and Immunities Agreement, incorporated in CSAs by reference. Moreover, INFCIRC/153/ (Corr.) expressly provided for further Subsidiary Arrangements to be concluded between the State and the Agency (IAEA, 1972c, para. 39). This document contains the details of implementation of the safeguards agreement and is thus a confidential document. It contains general information on the points of contact and procedures applied at the State level, and also specific facility attachments which specify the safeguards procedures for each facility, sometimes including facilities where nuclear material is customarily used. The specific procedures may include the frequency

[32] The only exception to this formula included the cases when the Agency makes a specific request to the State or plans to carry out additional measuring, the expenses of which should be reimbursed by the Agency itself.

[33] The list of countries included Austria, Bulgaria, Canada, Cyprus, the Czechoslovak Socialist Republic, Denmark, Finland, the German Democratic Republic, Greece, the Holy See, Hungary, Iceland, Iraq, Ireland, Lesotho, Malaysia, Mongolia, Nepal, New Zealand, Norway, Poland, Romania, Uruguay, Yugoslavia and the Republic of Zaire. See (IAEA, 1971c, p. 47, paras. 123(d, e)), and (IAEA, 1972a, p. 39, para. 122(a)).

of routine inspections, the strategic points to be examined during them (Rockwood, 2013, p. 15), and the time-limits for the provision of information in respect of new facilities (IAEA, 1972c, para. 42).

The legal status of the Subsidiary Arrangements is not clear from the text of INFCIRC/153/ (Corr.), which only stipulates that the parties to a CSA should "make Subsidiary Arrangements". A thorough examination of this issue was carried out by Daniel H. Joyner, with whom it is hard to disagree. He concluded that:

> "...from a system perspective it makes perfect sense for the general obligations of a safeguards agreement, which is itself a legally binding treaty, to be implemented by the parties to the treaty through a separate set of legally non-binding subsidiary arrangements, which contain the detailed procedures and forms which are to order the working relationship of the parties in carrying out their various obligations under the treaty" (Joyner, 2016, p. 124).

For most of the States INFCIRC/153/ (Corr.)-type agreements are bilateral, i.e. between the Agency and the State, while the agreements with the NNWSs of Euratom are multilateral, including the Agency, Euratom and its non-nuclear-weapon States as Parties.

Apart from being a reference document for safeguards agreements concluded pursuant to the NPT, INFCIRC/153/ (Corr.) also served as a basis document for negotiating comprehensive safeguards agreements with States Party to the Treaty for the Prohibition of Nuclear Weapons in Latin America (hereinafter "the Tlatelolco Treaty") and to further treaties establishing Nuclear-Weapon-Free Zones. Furthermore, INFCIRC/153/ (Corr.) was used as a basis for unilateral comprehensive safeguards agreements with the NNWS not yet members to the NPT[34] and for the quadripartite safeguards agreement concluded under the 1991 Argentina-Brazil Guadalajara Agreement. The Parties to the Agreement were Argentina, Brazil, the newly established Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (the "ABACC") and the IAEA. Lastly, the NWSs Party to the NPT used INFCIRC/153/ (Corr.) as a standard document for Voluntary Offer Agreements. The above referenced agreements will be further discussed in the present study.

[34] See, for example, (IAEA, 1988).

ii. Provisions of the comprehensive safeguards

INFCIRC/153/ (Corr.) consists of three parts and 116 paragraphs. The principal novel provisions of the document, as compared to the previous safeguards instruments, will be discussed below.

The spirit of the CSA is in essence the same as the one of the INFCIRC/66/Rev. 2, i.e. to guarantee that the nuclear material and activities are used for peaceful purposes. However, in case of the CSA, such undertaking for a nun-nuclear weapon State Party is already contained in the text of the Treaty: under Article III.1 and 4, and it was merely repeated in the text of the safeguards agreement stating that a State should "accept safeguards, in accordance with the terms of the Agreement, on all source or special fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction or carried out under its control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices" (IAEA, 1972c, para.1) The direct incorporation of the undertaking into the text of INFCIRC/153/ (Corr.) without any reference to the NPT would render equal Paragraph 1 of the former and Article II of the latter. Consequently, in the cases where the Board would determine non-compliance with the safeguards commitments, it could also establish a violation of the NPT.

Unlike INFCIRC/66/Rev. 2, or "item-specific agreements", INFCIRC/153/ (Corr.) covers only nuclear (source or special fissionable) material used in peaceful nuclear activities, keeping silence on safeguarding nuclear facilities, equipment, technology or nuclear-related non-nuclear material. The Agency is nevertheless empowered to check the information related to the nuclear-related facilities, such as their design and operating records (IAEA, 1972c, paras. 42-48 and para. 54(b)). On the other hand, the NPT does not provide a definition of the "source" material, nor does INFCIRC/153/ (Corr.). Rather, the latter makes reference to the definition contained in Article XX of the Statute and expressly excludes ore and ore residue from the source material. If the latter items are exported to a NNWS or imported for nuclear purposes, the State should provide the Agency with the relevant information, such as quantity, composition and destination of the material, which is not further verified by the IAEA (IAEA, 1972c, para. 34).

Furthermore, as was previously mentioned, the language of the NPT does not preclude a possibility for a "non-proscribed military activity" involving safeguarded items, such as, for example, nuclear propulsion of submarines and aircraft carriers. However, the States Party are not given a carte blanche for an unlimited withdrawing of nuclear material from safeguards for that purpose since INFCIRC/153/ (Corr.) contains a correspondent procedure "non-application of safeguards to nuclear material to be used in non-peaceful activities" (IAEA, 1972c, para. 14). The procedure includes notifying the Agency of the activity, including the period or circumstances of non-application of safeguards. The State should also make it clear that the activity would not compromise the State's commitments under the NPT and the material withdrawn would not be used for producing nuclear explosive devices. The document provides for a fall-back of safeguards as soon as the withdrawn material is reintroduced into the peaceful use. The withdrawal is subject to the Agency's agreement, although it should only relate to "the temporal and procedural provisions" (IAEA, 1972c, para. 14) since the issue is the right of the State. Moreover, it should be noted that the terms employed in the NPT, on the one hand, and the Statute and INFCIRC/66/Rev. 2 – on the other, are slightly different insofar as they refer to "peaceful use or activities". Some previous safeguards agreements, e.g. a Co-operation Agreement,[35] may have included a provision precluding any non-peaceful use of the transferred nuclear material. This is the reason why, when agreeing on the withdrawal of the nuclear material, the IAEA should possibly assess the terms of relevant agreement and pronounce whether it prohibited any military use. Lastly, in case a State has received the Agency's assistance under a Project Agreement, which usually includes an obligation not to use safeguarded items for furthering any military purpose, such obligation continues to apply (IAEA, 1972c, para. 24).

Unlike INFCIRC/66/Rev. 2, Paragraph 7 of INFCIRC/153/ (Corr.) requires a State to establish an document maintain a State system of accounting for and control of nuclear material (the "SSAC") which serves two primary objectives. On the one hand, there is a national objective to account for and control nuclear material in the State; on the other – an international objective is to lay basis for the application of IAEA safeguards. The SSAC "shall be based on a structure of material balance areas" and shall establish several other measures (IAEA, 1972c, para. 14). The SSAC may comprise national

[35] See, for example, (IAEA, 2015g).

inspection procedures, however, they do not substitute the Agency's independent verification of the findings of the SSAC. Lastly, the IAEA takes due account of the technical effectiveness of the State's system (IAEA, 1972c, para. 7) applying certain criteria (IAEA, 1972c, para. 81(b)).[36]

Under Paragraph 62 of INFCIRC/153/ (Corr.), the State has a maximum of two months after a comprehensive safeguards agreement enters into force to submit to the Agency an initial report of all nuclear material in the State to be safeguarded. The IAEA then verifies the initial report with a view to ensuring that the correctness and completeness of the declaration. Paragraphs 8 and 42-48 stipulate that the State is also required to furnish the IAEA with a list and design information of all of its nuclear facilities, including those under construction. The IAEA then verifies the design information in order to confirm that he design corresponds to a newly built facility or was not altered for the existing facility, and to establish particular features of the facilities, determining material balance areas and adjusting the Agency's verification techniques for each facility. The results of the design information verification are then included into the Subsidiary Arrangements.

Like the previous generation safeguards agreements, INFCIRC/153/ (Corr.) also provides for design information verification and for three types of inspections, namely ad hoc, routine and special inspections. However, under the CSA and VOAs, routine inspections will only be focused on strategic points (IAEA, 1972c, para. 116) identified in the Subsidiary Arrangements and on the records (IAEA, 1972c, para. 76(c)). These limitations, however, do not apply to the rest of inspection types. As to the maximum frequency and intensity of routine inspections, paragraph 78 stipulates that they should be strike a fair balance between minimisation of the inspection effort and its effectiveness, taking into account cost-saving. INFCIRC/153/ (Corr.) thus establishes a new concept of "man-year of inspection" (IAEA, 1972c, para. 109) [37] to be employed differently depending on the type of facilities instead of previously used approach of simply establishing the number of visits by inspectors.

[36] Among those criteria there are, for example, functional independence of a facility operator form the SSAC, promptness in submitting reports to the Agency, etc.

[37] Man-year of inspection means 300 man-days of inspection, a man-day being a day during which a single inspector has access to a facility at any time for a total of not more than eight hours.

It was previously discussed that, in order for an inspector to properly carry out his/her functions while on mission, previous safeguards agreements provide for a set of inspectors' privileges and immunities. Since they are closely related to the inspectors' duties, privileges and immunities are granted to inspectors in the interest of the IAEA and not for the personal benefit of the inspectors, and could thus be waived by the Agency in certain cases. Paragraph 10 of INFCIRC/153/ (Corr.) followed the previously established approach insofar as it contained an obligation for the parties to a safeguards agreement to "specify privileges and immunities which shall be granted to the Agency and its staff" when discharging their functions under the agreement. The document then establishes that the relevant provisions of the Agreement on the Privileges and Immunities of the Agency (the "P&I Agreement") (IAEA, 1967a) should apply. Although INFCIRC/153/ (Corr.) is silent on what provisions should apply in case a State is not party to the latter Agreement, it, however, it sets out two criteria which should ultimately render the privileges and immunities equivalent to those offered by the P&I Agreement.

INFCIRC/153-type agreements stay in force generally as long as a State keeps being party to an underlying treaty, such as, for example, the NPT or a treaty on a nuclear weapon-free zone. Accordingly, INFCIRC/153/ (Corr.) does not contain provisions on application of safeguards to produced special fissionable material after a safeguards agreement comes to an end. Other conditions of termination of safeguards, as provided in paragraphs 11-14, include consumption or dilution of safeguarded nuclear material, its transfer out of the State or use in non-nuclear activities, and its withdrawal to non-proscribed military use, described above. It should be emphasized that some countries had already had safeguards commitments of one kind or another (bilateral or trilateral safeguards agreements, or agreements concluded pursuant to the regional treaties). Their effects are suspended as long as a correspondent NPT safeguards agreement is in force. The suspension protocols will be described further in this paper. Therefore, the termination of the NPT safeguards agreements would entail a fall-back of previous safeguards.

Owing to the nature of the States' commitments under the NPT, INFCIRC/153/ (Corr.) does not contain provisions which would require the application of safeguards as a precondition for exporting safeguarded items. In fact, Article III.2 of the NPT already

prohibits the transfer of nuclear material to a NNWS unless the material is placed under safeguards in that State as the drafters considered it unnecessary in the light of. This fact notwithstanding, INFCIRC/153 (Corr.) contains a provision requiring the exporting State to give advanced notification to the IAEA and to "make arrangements for the Agency to receive… confirmation by the recipient State of the transfer" (IAEA, 1972c, para. 94). Taken together with the NPT Article previously cited, these provisions were apparently designed to apply to the transfers of nuclear material to NWSs.

INFCIRC/153/ (Corr.) is slightly different from the previously adopted texts of INFCIRC/26/Add. 1 and INFCIRC/66/Rev. 2 insofar as it expressly provides for the mechanism of dispute resolution (IAEA, 1972c, paras. 20-22). Firstly, the Parties to the CSA have the right to address the Board to consider any issue of interpretation or application of the agreement. For the issues not involving the Board's decisions that it was not "able to verify that there has been no diversion of nuclear material required to be safeguarded", the next stage of the process would be to submit the dispute to arbitration, like in previous generation safeguards agreements.

As to the safeguards conclusions drawn by the IAEA in respect of a State with a CSA in place, they initially followed a facility-level concept. Safeguards conclusion, therefore, was drawn for each facility or material balance area. However, as a result of the discovery in 1991 of a clandestine nuclear weapons program in Iraq, the Agency started developing a state-level concept of safeguards based on the strengthening measures under existing legal framework (more detailed account is provided further in the present study) (Rockwood, 2014). In other words, the Agency now aimed at concluding that the State's declarations under its CSA were correct and complete, thus arriving to "the broader conclusion" which read as follows:

> "The Secretariat found no indication of the diversion of declared nuclear material. On this basis, it concluded that declared nuclear material in the State remained in peaceful activities."[38]

c. Voluntary offer agreements with Nuclear Weapon States

The Statute of the IAEA does not contain a definition of a nuclear weapon state (NWS). As previously discussed, it is the NPT that provides such definition "for the purposes of the Treaty": of a nuclear-weapon State Party to the treaty as a State which had

[38] See, for example, (IAEA, 2014b, para. A.2).

manufactured and exploded a nuclear weapon or other nuclear explosive device before 1 January1967 (IAEA, 1970e, Article IX (3)). Article III does not contain an obligation for NWSs to conclude safeguards agreements with the IAEA. Each of these States has, however, eventually placed parts or entirety of their civilian nuclear activities under the Agency's safeguards: the United Kingdom in 1978 (INFCIRC/263), the United States in 1980 (INFCIRC/288), France in 1981 (INFCIRC/290), Russia (the former Soviet Union) in 1985 (INFCIRC/327), and China in 1989 (INFCIRC/369).

Already on 2 December 1967, well before the Treaty entered into force, the U.S. President Johnson made voluntary offer to accept safeguards "to all nuclear activities in the United States excluding only those with direct national security significance" (Von Baeckmann, 1988, p. 22). The main purpose of the offer seemed to be twofold. On the one hand, some industrialised NNWSs saw safeguards as capable of putting additional economic burden on their nuclear industries, increasing the risk of industrial espionage and jeopardising the confidentiality of both proprietary information and contractual relationships (Von Baeckmann, 1988, p. 22). On the other, by voluntarily placing its nuclear activities under the safeguards, the USA would show that it did not ask other States to adhere to the principles it did not itself share. So, in his speech commemorating the 25th anniversary of the first sustained fission reaction, President tried to dispel these concerns by stating that the USA Administration did not "believe that the safeguards we propose (in the NPT) would interfere with the peaceful activities of any country" and that "the United States were not asking any country to accept safeguards that we are unwilling to accept ourselves" (Von Baeckmann, 1988, p. 22). Moreover, the safeguards agreement eventually concluded between the Agency and the USA reiterated that it was aimed at "encouraging widespread adherence to the Treaty by demonstrating to non-nuclear-weapon States that they would not be placed at a commercial disadvantage by reason of the application of safeguards pursuant to the Treaty" (IAEA, 1981a, Preamble).

Two days after the U.S. offer, on 4 December 1967 the UK, making reference to the NNWSs' commitment to conclude safeguards agreements under the NPT and welcoming the similar decision of the U.S. President, also pronounced its preparedness to "offer an opportunity for the application of similar safeguards in the United Kingdom

subject to exclusions for national security reasons only" (UK, 1967) The goal was later emphasised in the Preamble to the safeguards agreement.[39]

France started to negotiate its safeguards agreement with the Agency even before it joined the NPT. According to the Preamble of the safeguards agreement, its purpose was to encourage "the acceptance of such safeguards by an ever greater number of States" (IAEA, 1981b). The USSR was the fourth NWS to conclude a voluntary offer agreement in 1985 for the similar purpose outlined in the Preamble, i.e. "of promoting widespread adherence to the Treaty, further development of Agency safeguards and encouraging their acceptance by an even greater number of States" (IAEA, 1985a). Lastly, the China's purpose of entering into the voluntary offer agreement was declared to be the "promoting the peaceful application of nuclear energy throughout the world for the benefit of mankind and supporting the objectives set forth in the Statute of the Agency" (IAEA, 1989, Preamble).

Other reasons for the NWSs to enter into a safeguards agreement with the IAEA are listed below:

• To avoid discrimination between NWSs and NNWSs in respect of their civil nuclear activities;

• To enable verification of international transfers between NWSs and NNWSs Party to the Treaty;

• To offer provide inspectors with access to state of art nuclear technology and to further develop inspection techniques;

• To promote confidence that nuclear material is properly accounted for and protected by national authorities against all kinds of diversion, including illegal withdrawal, by terrorists;

• To guarantee the principle of reciprocity in designating and accepting nationals of NWSs as IAEA inspectors (Von Baeckmann, 1988, p. 22).

The 1985 NPT Review Conference praised the endeavour of the NWSs as "further strengthening the non-proliferation regime and increasing the authority of IAEA and the effectiveness of its safeguards system" and further called NWSs to continue to full

[39] "Whereas the United Kingdom, as a nuclear-weapon State within the meaning of the Treaty, has throughout desired to encourage widespread adherence to the Treaty by demonstrating to non-nuclear-weapon States that they would not be placed at a commercial disadvantage by reason of the application of safeguards pursuant to the Treaty."

cooperation with the Agency in implementing their voluntary offer agreements" (UN, 1985b, p. 2) The voluntary offer agreements of the United Kingdom and the United States give the Agency the right to apply its safeguards at all peaceful nuclear facilities in these countries. The Fourth Conference draft document also called on the NWSs who had not already done so to extend their offers to all of their peaceful nuclear facilities and urged the NWSs to offer for verification any nuclear material and facilities transferred from military use to peaceful use.

Each one of the five voluntary offer agreements is following the lines and principles of INFCIRC/153/ (Corr.), particularly insofar as they concern the safeguards procedures. However, their texts and scope are not equal. Owing to the fact that the NWSs already possess the nuclear weapons, the most important difference between the INFCIRC/153/ (Corr.) and the texts of the safeguards agreements with NWSs consists in the specific safeguards objective. Firstly, the VOAs provide for verification that the safeguarded material is not withdrawn from civil activities except as provided for in each agreement,[40] while the main objective of the CSA is to verify non-diversion of safeguarded nuclear material. Secondly, the VOAs contain a withdrawal clause permitting a NWS to withdraw nuclear material from safeguards whenever it deems necessary upon prior notification of the IAEA.[41]Lastly, the VOAs cover only nuclear material, facilities and activities that have been selected by a correspondent NWS. This tailored approach to the eligible items is completely different from the holistic one of INFCIRC/153/ (Corr.), including all source or special fissionable material in all peaceful nuclear activities within the country's territory, or under its jurisdiction or control. For example, the VOAs concluded by the USA and the UK place under safeguards all source or special fissionable material in facilities within each State, subject to exclusions resulting from the national security concerns.[42]As to the agreements with France, Russia (USSR) and China, they covered only source or special fissionable material designated by each of these States.[43]

There are also some differences in respect of Parties to the VOAs. Since the peaceful use of nuclear energy falls into the ambit of Euratom's competence, Euratom is a Party

[40] See, for example, (IAEA, 1981a, Article 1(a)) and (IAEA, 1985a, Article 1(a)).
[41] See, for example, (IAEA, 1981a, Article 12(a)) and (IAEA, 1985a, Article 12(a)).
[42] See (IAEA, 1981a, Article 1(a)) and (IAEA, 1978c Article 1(a)).
[43] See (IAEA, 1981b, Article 1(a)); (IAEA, 1985a, Article 1(a)); and (IAEA, 1989, Article 1(a)).

to the agreements with the UK and France. This is reflected not only in the texts of correspondent agreements but also Protocols thereto, which provide for the co-ordination of the Euratom and the IAEA safeguards systems. Furthermore, the wording also differs from agreement to agreement. For example, the VOAs with the UK and France provide for the Agency's "the right and the obligation to ensure that safeguards are applied"[44], whereas the US, the USSR and China agreements refer only to the right of the Agency to "apply safeguards"[45].

A voluntary offer agreement and an INFCIRC/153/ (Corr.)-type safeguards agreement concluded with a NNWS also differ insofar as they are implemented. It is obvious that the Agency's verification effort would be concentrated on the NNWS, owing to the global purpose of the NPT of preventing the proliferation of nuclear arms. As a result, the CSAs cover all source and special fissionable material in peaceful activities in the NNWSs Party to the NPT. Unlike the CSA that were explicitly referred to in the NPT text, the VOAs were not provided for in the Treaty. This was the reason why some countries opposed to the idea of financing the verification activities in the NWSs by the Agency. One of such opponents was, for example, France, whose representative to the Board stated the following:

> "…financing in relation to installations placed unilaterally under safeguards by nuclear Powers should be the responsibility of those Powers alone and should in no case be borne by other Members of the Agency, irrespective of whether or not they were nuclear Powers or had signed NPT…If, therefore, a nuclear Power, for reasons of its own, wished to place selected installations under Agency control, France would have no objection provided that the cost of the operation was borne by the nuclear Power in question" (IAEA, 1971a).

Despite the opposition, the VOAs eventually included the finance clause in line with Paragraph 15(a) of INFCIRC/153/ (Corr.), which shared the costs of the implementation of a safeguards agreement between the Agency and the State (and Euratom in cases of the UK and France).[46]However, in order to avoid budgetary constraints while performing verification tasks under the VOAs, the Agency ultimately selected only a handful of facilities to monitor in the NWSs, following certain criteria, among which there were the following ones:

[44] (IAEA, 1978c Article 2), and (IAEA, 1981b, Article 2).
[45] (IAEA, 1981a, Article 2(a)); (IAEA, 1985a, Article 2(a)); and (IAEA, 1989, Article 2(a)).
[46] See (IAEA, 1981a, Article 14); (IAEA, 1978c, Article 15); (IAEA, 1981b, Article 15); and (IAEA, 1985a, Article 14).

- The Nuclear Weapon State's previous record of compliance with its obligations under other agreements, including safeguards agreements suspended under the suspension protocol;
- Advanced design facilities which would provide opportunities for training and development of safeguards techniques, and facilities which are sensitive in terms of international competition;
- Periodic rotation of verification activities in order to avoid discriminatory treatment between similar facilities within a State;
- Keeping cost as low as possible, subject to consistency with the purposes of the VOAs (Von Baeckmann, 1988, p. 24).

For example, in 1984 the total of six nuclear installations were inspected under the three VOAs (two power reactors, a fuel fabrication plant, two enrichment plants and a spent fuel storage pond of a reprocessing plant) (IAEA, 1985b). In 1986 the IAEA safeguards inspections were performed:

- In the USA; at a light-water reactor fuel fabrication plant and two power reactors;
- In the UK: at an enrichment plant using ultracentrifuge technology, a spent-fuel storage pond, and one plutonium storage facility;
- In France: at a spent-fuel storage pond of a reprocessing plant; and
- In the Soviet Union: at a power reactor and a research reactor (Von Baeckmann, 1988, p. 24).

Total verification effort in 1986 comprised 900 man-days of inspection in NWSs whereas about 7400 man-days of inspection were carried out in facilities located in NNWSs (Von Baeckmann, 1988, p. 24). In 1991 the number of nuclear facility under the safeguards in four NWSs was eight (IAEA, 1992a, p. 124). Since 1991, inspection effort in NWSs was gradually minimized, reaching the point in 1993 where there were no inspections in one of the NWSs (UN, 1995a)para. 110. In 2015, the total number of facilities under the safeguards was eleven, comprising a power reactor, a research reactor and critical assemblies, a fuel fabrication plant, a reprocessing plant, three enrichment plants and four separate storage facilities (IAEA, 2016c, p. 124).

1.5. Enforcement of safeguards agreements

The IAEA's role in safeguards is to verify that a State complies with the general undertaking not to use the safeguarded items for military purpose or for fabrication of nuclear explosive devices. Breach of the safeguards provisions may result in the Agency's conclusion about the State's non-compliance. All safeguards documents contain a provision on "non-compliance", in other words, State's violation of its obligations under its safeguards agreement with the IAEA.[47] There is no formal definition of the term and there is no exhaustive list of activities or failures to act which would constitute the non-compliance. However, the following issues may imply the non-compliance:

- The State does not respect the agreed recording and reporting system, does not cooperate on inspection and stymies the work of IAEA inspectors, interferes with the operation of safeguards equipment, or in any other way prevents the IAEA from performing its verification activities;
- Under an INFCIRC/66-type safeguards agreement, the Board the diversion of the safeguarded nuclear material or the misuse of the non-nuclear material, services, equipment, facilities or information placed under safeguards; and
- Under an INFCIRC/153-type safeguards agreement, the Board identifies the diversion of nuclear material from declared nuclear activities, or the undeclared nuclear material required that had to be placed under safeguards.

The safeguards agreements do not set out a detailed procedure that is triggered by the detection of non-compliance. Rather, they refer to Article XII.C of the Statute of the IAEA which provides for possible sanctions as well as specifies the correspondent procedure.

The non-compliance procedure is triggered by an IAEA inspector who detects a breach, namely non-compliance, of a safeguards agreement by a State. He accordingly must submit a report to the Director General who, in his turn, must forward the report to the Board. The Statute does not set out detailed criteria of non-compliance to be reported, for example, whether it was intentional, whether any state organization knew of

[47] See, for example, (IAEA, 1968c, para 18); (IAEA, 2005j, para. 19); (IAEA, 1989, Article 18); and (IAEA, 1981b, Article 19). The only exceptions are the texts of INFCIRC/26 and INFCIRC/26/Add. 1, however, safeguards agreements based on these documents generally include the "non-compliance" clause.

undeclared nuclear material, whether the discrepancies are negligible or purely technical. Hence the inspector's certain margin of discretion. This gap was initially filled by an internal instruction of the Director General which stipulated that an inspector should inform him of any detected diversion and of any refusal by a State to comply with safeguards provisions (Szasz, 1970, p. 604). This view was also spoken out by the Director General Mohamed ElBaradei in November 2002 and became a guideline for the Department of Safeguards: "I believe that while differing circumstances may necessitate asymmetric responses, in the case of non-compliance with non-proliferation obligations, for the credibility of the regime, the approach in all cases should be one and the same: zero tolerance" (IAEA, 2002a). However, such a strict approach was not followed in at least two cases involving the Republic of Korea (IAEA, 2004c, para. 38). and Egypt (IAEA, 2005f, para. 22). In the former case, the State conducted experiments and activities involving uranium conversion, uranium enrichment and plutonium separation for roughly eighteen years without reporting them to the Agency as prescribed by its Safeguards Agreement. The Agency admitted that the quantities of the material were not significant, that the State provided all necessary information of these past activities and ceased them. However, it stated that the issue was of "serious concern" (IAEA, 2004c, para. 41). In case of Egypt, its "failures" consisted in Failure to report on its initial inventory certain imported or domestically produced nuclear items, to report nuclear activities and to provide initial or modified design information for several nuclear facilities. Again, the Agency considered these failures as "a matter of concern" and Egypt attributed them to "a lack of clarity about its obligations under its Safeguards Agreement, particularly as regards small quantities of nuclear material used in research and development activities" (IAEA, 2005f, para. 23). However, if the guidelines of Mr ElBaradei had been be strictly followed, both States would have been found in breach of their correspondent safeguards agreements and the Board could find their non-compliance and report the issue to the UN Security Council.

The Board is the only IAEA body to determine whether or not there has been non-compliance, which is made by a simple majority vote. It should be emphasized that, if the Board decides that there actually was non-compliance, such decision does not have automatic implications. Rather, the State must be provided with an opportunity to remedy the non-compliance. This may take form, for example, of clarification,

provision of additional information, granting access to additional locations, or a mixture of several elements. In a particular case of INFCIRC/153/ (Corr.), its Paragraph 18 expressly empowers the Director General to report to the Board of Governors that action by the State is "essential and urgent to ensure the verification" of non-diversion of the safeguarded nuclear material. The Board then determines what actions are "essential and urgent" and requires that the State implement them "without delay".

Meanwhile, the Board must share its findings with all IAEA Member States as well as with the Security Council and general Assembly of the United Nations. The Board's discretion to decide on non-compliance and to seek the State's response and action in that regard reflect the fact that the IAEA may sometimes be unable to perform verification. It may stem from the previously unknown design of the facility and therefore the absence of adequate technical expertise and instruments, lack of sufficient resources at the IAEA, unexplained time gap before inspectors are accepted by the State, refusal to grant access to a nuclear facility owing to security or safety concerns, etc. On the other hand, the importance of non-compliance was indicated by the UN Security Council in the first operative paragraph of Resolution 1887, adopted on 24 September 2009 during the UN summit on non-proliferation and disarmament (UN, 2009). In particular, the document seemed to limit the Board's discretion in the issue of non-compliance and stated that the Security Council:

> "Emphasizes that a situation of non-compliance with non-proliferation obligations shall be brought to the attention of the Security Council, which will determine if that situation constitutes a threat to international peace and security, and emphasizes the Security Council's primary responsibility in addressing such threats."

Depending on how well the non-compliant State's implements the corrective actions, the Board may consider two options when forwarding the report to the UN Security Council. On the one hand, if the State's cooperation with the Agency is full and proactive, the Board would refer the case to the Security Council for information purposes. On the other hand, should the non-compliant State employ tactics of delaying or covering up the actions in violation of its safeguards agreement, like not providing access to relevant facilities, equipment, documents, or persons, the Agency may report the issue to the UN Security Council for keeping tracking the developments and for a possible action. So far, the Board has reported to the UN Security Council five cases of

States' non-compliance with their comprehensive safeguards agreements: in two of them the reporting was for "information purposes only" (cases of Romania (IAEA, 1992g) and Libya (IAEA, 2004a)) whereas the three did not include this mentioning (Iraq (IAEA, 1991a), the Democratic People's Republic of Korea (IAEA, 2003b, para. 5) and the Islamic Republic of Iran (IAEA, 2006a)). For example, in case of Libya, the country was found in breach of its safeguards agreement (IAEA, 1980). Libya had had programmes for developing weapons of mass destruction and their means of delivery before it voluntarily announced to abandon them. It then requested the Agency to conduct correspondent verification activities and to ensure that the country's safeguarded nuclear activities were under and exclusively for peaceful purposes (IAEA, 2004a, para. (a)). The Board found under Article XII.C of the Statute that Libya's failures to meet the requirements of the safeguards agreement constituted non-compliance, and requested the Director General to report the matter to the UN Security Council, but "for information purposes only" while officially praising the country for its constructive attitude (IAEA, 2004a, para. 4).

This was the case of North Korea's non-compliance, where after a series of Board resolutions and the IAEA general Conference resolutions[48] the Agency decided to report, as provided for in Article XII.C. of the Statute, the country's non-compliance and "the Agency's inability to verify non-diversion of nuclear material subject to safeguards" to all Members of the Agency and to the UN Security Council and General Assembly (IAEA, 2003b, para. 5).

Should the State fail to undertake corrective actions within reasonable time with regards to the non-compliance, the next stage of the procedure would start, which implies the following actions on part of the Agency, as provided for in Articles XII. A. 7 and C of the Statute. Firstly, the Agency has the right to suspend and terminate assistance to the State. Furthermore, the Board may decide to curtail or suspend all assistance being provided by the IAEA or by its Members to the State. Provided that all Members suppliers to the State cooperate with the Board, the impact of such measure would be greater if the level of sophistication and independence from the import of nuclear items

[48] The Board's resolutions GOV/2636, GOV/2639, GOV/2645, GOV/2692, GOV/2711, GOV/2742, GOV/2002/60 and GOV/2003/3; General Conference resolutions GC(XXXVII)/RES/624, GC(XXXVIII)/RES/16, GC(39)/RES/3, GC(40)/RES/4, GC(41)/RES/22, GC(42)/RES/2, GC(43)/RES/3, GC(44)/RES/26, GC(45)/RES/16, and GC(46)/RES/14.

and technology of the State's nuclear programme is low. However, the measure is less effective if the Members, on whose supply the State heavily relies, prefer to continue the flow of assistance into the State. This option is not improbable since the Statute does not contain any provision which would oblige the Members to comply with the Board's decision in this case. Secondly, the Board may opt to call for the return of materials and equipment already made available to the State. The Statute also emphasizes that such withdrawal is among the particular rights and responsibilities of the Agency with regards to projects and arrangements including safeguarded items. Thirdly, the IAEA may also suspend any non-complying Member from the exercise of the privileges and rights of membership, in accordance with Article XIX.

2. Safeguards under regional treaties and in a particular case of Japan

2.1. Comprehensive safeguards applied under treaties establishing nuclear-weapon-free zones

a. Tlatelolco Treaty

The first agreement outlawing nuclear weapons in a populated region of the world[49] is the Tlatelolco Treaty (UN, 1967b). It was opened for signature on 14 February 1967 and entered into force on 25 April 1969, creating a Nuclear Weapon-Free Zone in the territory of Latin America and the Caribbean. It has currently 33 States Party,[50] with Cuba being the last country of the region to ratify it on 23 October 2002.

Under its Article 1, the States Party are required to use nuclear material and facilities exclusively for peaceful purposes as well as to prohibit and prevent in their respective territories:

[49] The first international treaty to include provisions on non-nuclear weapon areas is the Antarctic Treaty of 1959 (in force since 23 June 1961), in particular Articles I (1) and V. There is, however, no permanent population in the Antarctic but rotated staff at a handful of scientific stations.

[50] Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela. See http://www.opanal.org/estados-miembros/

> "(a) The testing, use, manufacture, production or acquisition by any means whatsoever of any nuclear weapons, by the Parties themselves, directly or indirectly, on behalf of anyone else or in any other way; and
>
> (b) The receipt, storage, installation, deployment and any form of possession of any nuclear weapon, directly or indirectly, by the Parties themselves, by anyone on their behalf or in any other way."

Article 7(1) establishes the Agency for the Prohibition of Nuclear Weapons in Latin America (hereinafter "the Latin American Agency") as a supervisory body to ensure compliance with the obligations of the Tlatelolco Treaty. Its principal organs are a General Conference, a Council and a Secretariat (UN, 1967b, Article 8(1)). Article 5 of the Tlatelolco Treaty contains a definition of a nuclear weapon, which is a device "capable of releasing nuclear energy in an uncontrolled manner and which has a group of characteristics that are appropriate for use for warlike purposes." Furthermore, a clear distinction is made between the nuclear weapon and separable means of its transportation or propulsion, the latter not being part of "the device." Furthermore, Article 18 provides for a possibility of explosions of nuclear devices for peaceful purposes, similar to the NPT provisions. The precondition of carrying them out is a State's advance notification of the IAEA and the Latin American Agency. Lastly, the Tlatelolco Treaty is different to the NPT insofar as it does not require the application of safeguards as a precondition of nuclear supply.

For the purposes of verifying the States' compliance with their exclusively peaceful use obligations, Articles 12-17 of the Tlatelolco Treaty establish a control system. It comprises the following elements.

Firstly, each Contracting Party is required to conclude either multilateral or bilateral agreement with the IAEA for the application of its safeguards to its nuclear activities (UN, 1967b, Article 13). Under such safeguards agreement, the Agency is allowed, among other things, to conduct special inspections (UN, 1967b, Article 16(1-1)). It is worth mentioning in this respect that the conclusion of bilateral agreements is one of the conditions for the Tlatelolco Treaty to enter into force "among the States that ratified it" (UN, 1967b, Article 28(1-4)). In addition, the Latin American Agency is empowered to conclude any agreements with the IAEA related to the efficient operation of the control system (UN, 1967b, Article 19).

Secondly, a State Party is required to submit to the Latin American Agency and the IAEA, for information, semi-annual reports "stating that no activity prohibited under

this Treaty has occurred in their respective territories" (UN, 1967b, Article 14). Complementary information on compliance can also be requested by the Latin American Agency (UN, 1967b, Article 15).

Thirdly, Article 16(1a) empowers the IAEA to carry out special inspections in accordance with the bilateral safeguards agreements provided for in Article 13 of the Treaty.

It should be noted that, apart from the possibility of conducting special inspections and submitting routine reports to the Agency, the Tlatelolco Treaty was silent as to the verification measures the IAEA should apply. It may be assumed that the spirit and wording of the Tlatelolco Treaty suggested that the Agency apply its safeguards to check the States Party compliance at least with the principal obligations under the Treaty. Moreover, the first bilateral safeguards agreement between the IAEA and Mexico (IAEA, 1968b), signed by virtue of the Treaty, also follows this logics. The agreement was based on INFCIRC/66/Rev. 2 which, as previously described, offered an opportunity to choose specific items involved in nuclear activities and apply safeguards only to them. Mexico, however, placed under safeguards all nuclear material and "principal nuclear facilities" under its jurisdiction (IAEA, 1968b, Sections 2, 3 and 5). The IAEA-Mexico was the first and the last agreement concluded under the Tlatelolco Treaty which followed the lines of INFCIRC/66/Rev. 2. After the conclusion of the NPT and approval of the CSA, the Latin American and Caribbean countries entered into INFCIRC/153/ (Corr.)-based bilateral agreements with the Agency. Mexico also signed a new safeguards agreement (IAEA, 1973) and accordingly accorded the suspension of safeguards under its previous INFCIRC/118 (IAEA, 1973).

The Tlatelolco Treaty was further developed by two additional protocols. Additional Protocol I to the Treaty is open to states that Article "*de jure* or *de facto*... internationally responsible" for the territories "which lie within the limits of the geographical zone established in that [Tlatelolco] Treaty," (UN, 1968, Add. Prot. I, Article 1), namely France, the Netherlands, the UK, and the USA. All four States are Party to Protocol I:

- France signed it on 2 March 1979 and ratified on 24 August 1992;
- the Netherlands signed it on 15 March 1968 and ratified on 26 July 1971;
- the UK signed it on 20 December 1967 and ratified on11 December 1969; and

- the USA signed it on 26 May 1977 and ratified on 23 November 1981 (OPANAL, 2016).

Article 1 contains the main undertaking, which is to apply the non-nuclear weapon status in the territories of the region under their control, pursuant to Articles 1, 3, 5 and 13 of the Tlatelolco Treaty, which includes conclusion of safeguards agreements with the IAEA. Three out of four States concluded correspondent agreements, covering only the territories located in the geographical area of the Tlatelolco Treaty and based on INFCIRC/153/ (Corr.), as follows:

- By the Netherlands – on 5 April 1973, with respect to the Netherlands Antilles (INFCIRC/229) and Surinam (INFCIRC/230);
- By the USA – on 17 February 1989 (INFCIRC/366); and
- By France – on 21 March 2000 (INFCIRC/718).

In addition, it should also be pointed out that a specific location in the reference geographical zone, the Panama Canal, was proscribed from being use for warlike purposes, including through the deployment of nuclear weapons, by virtue of the Panama Canal Treaty of 1977. In particular, its Article I(2) stipulates that "the Republic of Panama guarantees to the United States of America the peaceful use of the land and water areas which it has been granted the rights to use for such purposes pursuant to this Treaty and related agreements" (UN, 1977, Article 1(2)).

Additional Protocol II to the Tlatelolco Treaty was open to the countries that possessed nuclear weapons. It did not contain a correspondent definition of a NWS, nevertheless, it may be inferred that the Protocol II followed the line of the NPT, taking into account that all five internationally recognised NWSs entered into it: France on 22 March 1974, China on 2 June 1974, United Kingdom on 11 December 1969, the USA on 12 May 1971, and the USSR on 8 January 1979. The Protocol II contains two main undertakings. Under Article 2 the States Party are obligated to respect the regime established by the Tlatelolco Treaty by no "contributing in any way to the performance of acts involving a violation" of the main obligations contained in its Article 1. Article 3 further provides that the Parties should not use or "threaten to use nuclear weapons"

against the Contracting Parties of the Tlatelolco Treaty, a so-called negative security assurance.[51]

b. Rarotonga Treaty

The South Pacific Nuclear Free Zone Treaty ("the Rarotonga Treaty") (UN, 1985a) was signed in Rarotonga (Cook Islands) on 6 August 1985, and entered into force on 11 December 1986 with the deposit of the eighth instrument of ratification, as provided for in its Article 15(1). Currently, there are thirteen States Party: Australia, Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu (UN, 2017a).

The Treaty consists of the text and four Annexes. The territorial scope of the Rarotonga Treaty is limited by the boundaries of the "South Pacific Nuclear Free Zone," as defined in Annex I to the Treaty. The main provisions of the Treaty are described below.

Article 3 requires that each State Party not to manufacture, acquire, possess or control any nuclear explosive device, or seek assistance in this. This provision is thus different from the previously adopted the Tlatelolco Treaty and NPT, which still permitted nuclear explosive devices for peaceful purposes.

Furthermore, under Article 4 each State Party undertakes not to provide source or special fissionable material, or equipment or material especially designed or prepared for the processing, use or production of special fissionable material for peaceful purposes to any NNWS (subject to the IAEA safeguards), or to any NWS (subject to applicable safeguards agreements with the IAEA). In addition, Paragraph (b) of the same Article requires the Parties to support "the continued effectiveness of the international non-proliferation system based on the NPT and the IAEA safeguards system."

Additionally, the Parties should not, in its territory, station any nuclear explosive device, or test any nuclear explosive device or in any way take part in the testing by any State, and should not dump radioactive wastes and other radioactive matter at sea anywhere within the South Pacific Nuclear Free Zone (UN, 1985a, Articles 5-7).

[51] 'Negative security assurances' are guarantees by the five NPT nuclear-weapon states not to use or threaten to use nuclear weapons against states that have formally renounced them (see, for example, Spector & Ohlde, 2005).

For the purpose of verifying compliance with the Parties' obligations under the Treaty, Article 8 establishes a control system, which comprises the following elements:

- Submitting of reports and exchange of information (further developed in Article 9);
- Holding consultations among the Parties (further developed in Article 10 and Annex 4(1));
- Application of IAEA safeguards to peaceful nuclear activities of the Parties. Annex 2 provides that a safeguards agreement negotiated and concluded with the IAEA should cover all source or special fissionable material in all peaceful nuclear activities within the territory of the Party, under its jurisdiction or control. The safeguards agreement should be the one pursuant to an agreement required by NPT, or equivalent in its scope and effect, and its purpose should be the verification of the non-diversion of nuclear material from peaceful nuclear activities to nuclear explosive devices.

The Rarotonga Treaty has three protocols, all of them being adopted at the 17th South Pacific Forum held in Suva (Fiji) on 8-11 August 1986 (UN, 1986).

The main objective of Protocol 1, similar to Additional Protocol I to the Tlatelolco Treaty, is that France, the UK and the USA (the States internationally responsible for the territories situated within the South Pacific Nuclear Free Zone Treaty) comply with the prohibitions of the Treaty (UN, 1986, Prot. 1, Articles 1 and 3). All three countries signed the Protocol on 26 March 1996, but only France and the UK ratified it on 20 September 1996 and 19 September 1997, respectively.

Protocols 2 and 3 were open for signature by France, China, the USSR, the UK and the USA, i.e. the NWSs. Protocol 2 requires the States Party not to use or threaten to use any nuclear explosive device against a State Party to the Rarotonga Treaty or any territory within the South Pacific Nuclear Free Zone for which a State is internationally responsible (UN, 1986, Prot. 2, Article 1). Protocol 3 requires the States Party not to "test any nuclear explosive device anywhere within the South Pacific Nuclear Free Zone" (UN, 1986, Prot. 3, Article 1). So far, all five NWSs signed the two Protocols and only the USA has not ratified it yet.[52]

[52] China signed it on 10 February 1987 and deposited ratification on 21 October 1988; France signed it on 25 March 1996 and deposited ratification on 20 September 1996; the USSR signed it on 15 December

c. Bangkok Treaty

Southeast Asia Nuclear-Weapon-Free Zone Treaty ("the Bangkok Treaty") was open for signature by all States in Southeast Asia, namely, Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam" on 15 December 1995 (UN, 1995d). It entered into force on 27 March 1997, after 30 days following the deposition of the seventh instrument of acceptance, provided for in Article 19. The Bangkok Treaty has 22 Articles and an Annex.

The novelty of the Treaty as to the territorial scope is the fact that it also covered the States' Party "respective continental shelves and Exclusive Economic Zones" (UN, 1995d) , Article 1(a). The Treaty prohibits to each State Party, in particular, to perform or to allow, in its territory, any other State the following:

- to acquire, possess or control nuclear weapons;
- to station or transport nuclear weapons;
- to test or use nuclear weapons.

Article 4 further requires the States Party to use nuclear material and facilities within its territory or under its jurisdiction and control exclusively for peaceful purposes. The Bangkok Treaty also underlines that the States Party should support the "continued effectiveness of the international non-proliferation system based on the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the IAEA safeguards system." In the line with this undertaking is the further prohibition to export source or special fissionable material, or especially designed or prepared equipment or material to NNWSs(except under conditions subject to the NPT safeguards) or to NWSs (except in conformity with applicable safeguards agreements with the IAEA) (UN, 1995d, Article 4(3)).

The Bangkok Treaty further establishes a control system in order to be able to verify the States' Party compliance with their obligations under the Treaty. The control system is fourfold, comprising the IAEA safeguards system, reporting and exchange of information, request for clarification by another State Part, and requesting and procedures for a fact-finding mission (UN, 1995d, Article 10). Accordingly, all States Party with no safeguards agreement in place are required to conclude an agreement with

---

1986 and deposited ratification on 21 April 1988; the UK signed it on 25 March 1996 and deposited ratification on 19 September 1997; and the USA signed it on 25 March 1996.

the IAEA for the application of full scope safeguards to its peaceful nuclear activities (UN, 1995d, Article 5).

Similar to the two Treaties examined above, the Bangkok Treaty has a Protocol open for signature to all NWSs (UN, 1995e, Article 3). The main undertakings for the State Parties are to respect the Bangkok Treaty, not to contribute to any act that constitutes a violation of the Treaty or its Protocol by States Parties (UN, 1995e, Article 1), and not to use or threaten to use nuclear weapons against any State Party to the Treaty or "within the Southeast Asia Nuclear Weapon-Free Zone" (UN, 1995e, Article 2). This last undertaking is not equal to the ones contained in Protocols to the Treaties examined above, since it implies that a State Party must not use nuclear weapons against any contracting State or Party to the Protocol within the zone of application. None of the NWSs have so far signed the Protocol (UN, 2017b).

d. Pelindaba Treaty

The African Nuclear-Weapon-Free Zone Treaty ("the Pelindaba Treaty") (UN, 1996) was opened for signature in Cairo (Egypt) on 11 April 1996 and entered into force on 15 July 2009, when, pursuant to its Article 18, the twenty-eighth instrument of ratification was deposited. The territorial criteria for potential States Party is established in Article 1(a), which reads that ""African nuclear-weapon-free zone" means the territory of the continent of Africa, islands States members of OAU and all islands considered by the Organization of African Unity in its resolutions to be part of Africa." The Treaty has currently 50 Signatory States, of which 40 ratified it.[53]The Treaty comprises 22 Articles and four Annexes.

Under Article 3, each State Party is obligated, either on its own or with external assistance, not to conduct research on, develop, manufacture, stockpile or otherwise acquire, possess or control any nuclear explosive device by any means anywhere. Neither of the above should be encouraged or assisted at by a State Party.

[53] The Treaty is in force in respect to Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Congo, Cote d'Ivoire, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea-Bissau, Guinea, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Swaziland, Togo, Tunisia, Tanzania, Zambia, and Zimbabwe. See http://disarmament.un.org/treaties/t/pelindaba.

Furthermore, the Parties should also prohibit, in their respective territories, the stationing or testing of any nuclear explosive device (UN, 1996, Articles 4(1) and 5(a, b)). They also undertake to:

- declare any capability to produce nuclear explosive devices;
- dismantle and destroy any already manufactured nuclear explosive device;
- destroy, or convert to peaceful uses, facilities for the manufacture of nuclear explosive devices;
- permit the IAEA and the African Commission on Nuclear Energy (established in Article 12) to verify the processes described in the two latter paragraphs (UN, 1996, Article 6).

The most important provisions from the point of view of non-proliferation of nuclear weapons are contained in Articles 8 and 9. The Treaty underlines the States' Party right to use of nuclear sciences and technology for peaceful purposes, and requires them to promote "individually and collectively the use of nuclear science and technology for economic and social development" (UN, 1996, Article 8). Consequently, the States Party are obligated to provide assurance of exclusively peaceful uses of nuclear energy through implementation of strict non-proliferation measures (UN, 1996, Article 9(a)). Accordingly, Article 9(b) obliges each State Party to conclude a CSA with the IAEA. Nor should it export source or special fissionable material, or especially designed equipment or material, to any NNWS, unless the transferred items are covered by a CSA concluded with IAEA (UN, 1996, Article 9(c)).

Like the Rarotonga Treaty, the Pelindaba Treaty has three protocols, which contain the same undertaking though in different order. Protocol I, Article 1, calls on the NWSs not to use or threaten to use a nuclear explosive device against any Party to the Treaty or any territory within the African nuclear-weapon-free zone. Protocol II was also open for signature to the NWSs and included an undertaking not to test, assist or encourage the testing of any nuclear explosive device within the African nuclear-weapon-free zone (Article 1).All NWSs signed the two Protocols, and only the USA has yet to ratify it.[54]Protocol was open for signature by France and Spain as two countries having the

[54] All NWSs but Russia signed it on 11 April 1996 (Russia – on 5 November 1996). China deposited ratification instruments on 10 October 1996, France – on 20 September 1997, the UK – on 12 March 2001, and Russia – on 5 April 2011). See http://disarmament.un.org/treaties/t/pelindaba_1 and http://disarmament.un.org/treaties/t/pelindaba_2.

territories situated within the African nuclear-weapon-free zone for which they are internationally responsible. Accordingly, Article 1 lays down the two States' undertaking to apply the provisions of the Treaty to such territories. So far only France signed it (on 11 April 1996) and deposited the instruments of ratification (on 20 September 1996).

e. Semipalatinsk Treaty

The last treaty establishing a nuclear-weapon-free zone was the Treaty on a Nuclear-Weapon-Free Zone in Central Asia ("the Semipalatinsk Treaty") (UN, 2006c). It was signed by the five States of the region on 8 September 2006 at the city of Semipalatinsk (Kazakhstan), which is close to a nuclear weapons test site of the former Soviet Union (CTBTO, n.d.). The States deposited their ratification instruments within three following years,[55] and the Treaty entered into force on 21 March 2009, creating "the first denuclearized zone situated entirely in the Northern Hemisphere, and the first bordered by two NWSs" (Rockwood, 2013, p. 8).

Similar to other nuclear-weapon-free zone (hereinafter "NWFZ") treaties, the Semipalatinsk Treaty proscribes the Parties to conduct (on its own or with assistance) or encourage research on, develop, manufacture, stockpile or otherwise acquire, possess or have control over any nuclear weapon or other nuclear explosive device by any means anywhere (UN, 2006c, Article 3(a)-(c)). The Parties also undertake to prohibit in their territories, and not to assist or encourage, the production, acquisition, stationing, storage or use, of any nuclear weapon or other nuclear explosive device (UN, 2006c, Article 3(d)).

The Parties further undertake to use the nuclear material and facilities for exclusively peaceful purposes (UN, 2006c, Article 8(a)). It is remarkable that the Semipalatinsk Treaty is the only NWFZ treaty to require that its States Party conclude with the IAEA (unless they have already done so)not only a safeguards agreement in line with INFCIRC/153 (Corr.), but also an Additional Protocol (INFCIRC/540 (Corr.)) (UN, 2006c, Article 8(b)). The same approach applies any NNWS to which a State Party envisages a transfer of source or special fissionable material or especially designed

[55] Kazakhstan – on 19 February 2009, Kyrgyzstan – on 27 July 2007, Tajikistan – on 13 January 2009, Turkmenistan – on 17 January 2009, and Uzbekistan – on 10 May 2007. See http://disarmament.un.org/treaties/t/canwfz.

equipment or material: the transfer is allowed only if such NNWS has concluded with the IAEA a CSA and an Additional Protocol (UN, 2006c, Article 8(c)).

It is worth mentioning that another novelty of the Semipalatinsk Treaty was that its Article 5 introduced certain obligations under the Comprehensive Nuclear-Test-Ban Treaty ("the CTBT"), which was opened for signature on 10 September 1996. So, each Party should not carry out, and should refrain from causing, encouraging or participating at, any nuclear weapon test explosion or any other nuclear explosion; and prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control. This provision reinforced the non-proliferation regime, taking into account that the CTBT has not yet entered into force.

The Semipalatinsk Treaty is supplemented by one Protocol, which is open to signature by the five NWSs (UN, 2014). The Protocol prohibits using or threatening to use a nuclear weapon or other nuclear explosive device against a Party to the Treaty, and contributing to any act that constitutes a violation of the Treaty or the Protocol (UN, 2014, Articles 1 and 2). All NWSs signed the Protocol on 6 May 2014, and only the USA has not so far ratified it.[56]

2.2. Other regional safeguards instruments

a. Euratom

i. Treaty of Euratom

Co-operation in the field of energy was one of the two pillars of the European integration after the World War II, on a par with the economic co-operation. The former pillar was embodied in the Treaty establishing the European Coal and Steel Community ("the ECSC"), signed in Paris on 18 April 1951, and the Treaty establishing the European Atomic Energy Community ("EAEC" or "Euratom"), signed in Rome on 25 March 1957. The former Treaty aimed at organising free movement of coal and steel, free access to sources of production and supervising competition on the market, while the initial purpose of the latter Treaty was to coordinate the Member States' research programmes for the peaceful use of nuclear energy. Eventually, the Treaty of the ECSC expired on 23 July 2002. The economic pillar was initially represented by the Treaty

[56] China deposited ratification on 17 August 2015, France – on 21 November 2014, Russia – on 22 June 2014, the UK – on 30 January 2015. See http://disarmament.un.org/treaties/t/canwfz_protocol.

establishing the European Economic Community ("the EEC"), signed on 25 March 1957. In the following decades, a series of EU Treaties were adopted, setting out the Union's objectives, rules for its institutions, and guidelines for its relationship with its Member States. However, the Euratom Treaty is one of only five EU Treaties currently in force.[57] Article 194 of the Treaty on the Functioning of the European Union deals with the Union policy on energy, however, its wording is formulated in fairly general terms. The Euratom Treaty can be thus considered the only EU Treaty dealing expressly with the co-operation in the ambit of energy, including atomic energy.

The Euratom Treaty is thus also a primary source of the EU norms on safeguards. More specific, technical provisions of the implementation of safeguards are contained in a Commission Regulation No 302/2005 (EU, 2005a), which in turn is further interpreted by two recommendations of the Commission (EU, 2005c) and (EU, 2009). Some other technical details are regulated by further acts.

Initially, the Euratom Treaty comprised 234 articles which are set out under six titles and preceded by a preamble. The number was reduced to 177 after the Treaty amending the Treaty on European Union and the Treaty establishing the European Community were signed in December 2007. Moreover, the Treaty also includes five annexes which concern research in the nuclear energy field, nuclear-related industrial activities (e.g. mining and concentrating uranium and thorium ore, preparation of nuclear fuels, processing of irradiated fuels, etc.), the advantages of joint undertakings, a list of goods and products subject to the provisions concerning the nuclear common market, and the initial research and training programme. The Treaty is appended by two Protocols: one is on the application of the Treaty establishing the European Atomic Energy Community to the non-European parts of the Kingdom of the Netherlands (Netherlands New Guinea, Surinam and the Netherlands Antilles), the other – on the Statute of the Court of Justice of the European Atomic Energy Community.

Already in the Preamble of the Treaty of Euratom did the States Party underline the importance of the peaceful uses of nuclear energy, which "represents an essential resource for the development and invigoration of industry and will permit the advancement of the cause of peace." Article 1 of the Treaty further defines the specific

[57] The other four being Treaty on European Union, Treaty on the Functioning of the European Union, Charter of Fundamental Rights of the European Union, and Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community.

task of Euratom consisting in contributing "to the raising of the standard of living in the Member States and to the development of relations with the other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries." In order to perform this task, Euratom should assume certain responsibilities, including "to make certain, by appropriate supervision, that nuclear materials are not diverted to purposes other than those for which they are intended" (EU, 1957, Article 2(e)). Before turning to the analysis of the provisions on verification of the peaceful nature of the Member States' nuclear programmes, it is worth mentioning a particular legal status of the supply of ores and source and special fissile materials and of property ownership conferred by the Euratom Treaty.

Article 52 of the Treaty provides that the supply of ores, source materials and special fissile materials is to be ensured through a common supply policy based on the principle of equal access to sources of supply. Accordingly, a special Agency is to be established, which has a right of option on ores and source and special fissile materials produced in the territories of Member States as well as an exclusive right to conclude contracts on supply of ores and source and special fissile materials coming from either inside or outside the EU. The special Agency should follow the principle of non-discrimination between users on grounds of the use which they intend to make of the supplies requested. The only exclusions from this rule are the events when such use is unlawful or is contrary to the conditions imposed by suppliers outside the EU on the consignment in question. These provisions are further elaborated in the remaining provisions of Chapter 6 of the Euratom Treaty.

Article 86 of the Treaty stipulates that special fissile materials are property of Euratom. This right of ownership "extends to all special fissile materials which are produced or imported by a Member State, a person or an undertaking and are subject to the safeguards provided for in Chapter 7." The ownership right is nevertheless balanced by the Member State's or a nuclear operator's unlimited right of use and consumption of special fissile materials "which have properly come into their possession" (EU, 1957, Article 87). However, the use and consumption of special fissile materials is subject to the obligations imposed the Treaty, particularly related to safeguards, the special Agency's right of option, and health and safety requirements.

The safeguards provisions are found in Chapter 7 of the Treaty, which consists of nine articles. They are generally similar to the principles of safeguards stipulated in the NPT and in INFCIRC/153/ (Corr.) but have certain distinct features.

The Treaty introduces an extremely comprehensive and strict system of safeguards, entrusting the European Commission with the basic two-level objective. On the internal level, the Commission should address non-proliferation issues by satisfying itself that "the ores, source materials and special fissile materials are not diverted from their intended uses as declared by the users" (EU, 1957, Article 77(a)). It can be inferred that the scope of Euratom safeguards is broader, for example, than the one of INFCIRC/153/ (Corr.), since the latter expressly did not cover ores. Furthermore, Article 197 of the Euratom Treaty provides definitions of the terms "ores," "source materials" and "special fissile materials."[58] The Euratom's definitions of the latter two, also known as nuclear material, are almost identical to the definitions provided in Article XX of the IAEA Statute and, by reference, in Paragraph 112 of INFCIRC/153/ (Corr.).

On the second, or external, level, the Commission is a watchdog of compliance with safeguards obligations assumed by the Union by virtue of an agreement with a third country or an international organisation (EU, 1957, Article 77(b)). The open-ended wording of this provision leaves the scope of safeguards even broader. In view of the above, it may be concluded that the objective of Euratom is different than the one laid down in Article II.1 of the NPT and, accordingly, Paragraph 1 of INFCIRC/153/ (Corr.): in the case of the former, verification is focused on the non-diversion from declared uses, whereas in the latter case there is the exclusive purpose of verifying that the safeguarded material is not diverted to nuclear weapons or other nuclear explosive device.

There is another similarity between safeguards under the NPT and the Euratom Treaty concerning the non-proscribed military uses of nuclear material. As described earlier in

[58] 'Source materials' means uranium as occurring in nature; uranium whose content in uranium 235 is less than the normal; thorium; any of the foregoing in the form of metal, alloy, chemical compound or concentrate; any other substance containing one or more of the foregoing in such a concentration as specified by the Council. 'Ores' means any ore containing, in such average concentration as specified by the Council, substances from which the source materials may be obtained through the appropriate chemical and physical processing. 'Special fissile materials' include plutonium 239; uranium 233; uranium enriched in uranium 235 or uranium 233; and any substance containing one or more of the foregoing isotopes and such other fissile materials as may be specified by the Council, with an exception of source materials.

this study, the NPT proscribes only military use related to nuclear weapons and other nuclear explosive. Similarly, Article 84 of the Euratom Treaty stipulates that safeguards may not extend to materials intended to "meet defence requirements" which are specially processed for this purpose or which, "after being so processed, are, in accordance with an operational plan, placed or stored in a military establishment." Provided that no nuclear weapons or other nuclear explosive device is involved, such use is therefore compatible with the NPT provisions and with Paragraph 14 of INFCIRC/153/ (Corr.) but not with Paragraph 1 of INFCIRC/66/Rev. 2, which precludes the use of safeguarded nuclear material in order "to further any military purpose."

Unlike States' safeguards agreements with the IAEA, which are international agreements and therefore define State obligations vis-à-vis the Agency, the Euratom Treaty establishes that it is for "anyone setting up or operating an installation for the production, separation or other use of source materials or special fissile materials or for the processing of irradiated nuclear fuels" (hereinafter "a nuclear operator" or "an operator") to comply with certain obligations. The Euratom safeguards are therefore a supranational system with certain sovereign rights received by the Commission form Member States. As for nuclear operators, their obligations under the Treaty include:

- declaring to the Commission the basic technical characteristics of the installations "for the production, separation or other use of source materials or special fissile materials or for the processing of irradiated nuclear fuels" (EU, 1957, Article 78);
- keeping operating records that permit accounting for ores and nuclear material used or produced, including during the transport of nuclear material (EU, 1957, Article 79).

The requirement to provide the basic technical characteristics under the Euratom Treaty is essentially similar to the requirements contained in Paragraphs 8 and 42-48 of INFCIRC/153/ (Corr.).Similarly, the obligations to maintain records is comparable to the ones under Paragraphs 51-69 of INFCIRC/153/ (Corr.).

The Commission is further authorised to require that any excess special fissile materials obtained as by-products, and for which no prospective of a further use exists, should be deposited with the special Agency or in other stores under the Commission's

supervision (EU, 1957, Article 80). This provision does not have any equivalent in the NPT or INFCIRC/153/ (Corr.). It should nonetheless be noted that Article XII.A.5 of the Statute of the IAEA grants the Agency the right "to require deposit with the Agency of any excess of any special fissionable materials recovered or produced as a by-product over what is needed for the above-stated uses [or research or in reactors] in order to prevent stockpiling of these materials."

The Euratom Treaty empowers the Commission to recruit inspectors to carry out verification duties through obtaining and verifying the operating records (EU, 1957, Article 82), and through inspections to the Member States. In case the inspectors reveal an infringement, they are obliged to report it to the Commission. These provisions are similar to Paragraphs 9, 19 and 70-89 of INFCIRC/153/ (Corr.).

The Commission's right to conduct inspections is not absolute and is subject to some limitations. First of all, if an inspector is sent to a Member State on his or her first assignment, the State should be previously consulted in that regard (EU, 1957, Article 81). Such consultation will subsequently cover all future assignments of this inspector. However, the Treaty does not provide any guidance in a case when a Member State refuses to approve the nomination of the inspector. Moreover, a Member State has also a right to request that its representatives accompany an inspector. The Treaty then adds that such request should not in any form impede or delay the flow of the inspection, even though it does not specify for how long an inspector should wait until the access to a nuclear installation is granted.

For the purpose of applying safeguards to ores, source materials and special fissile materials, inspectors have the right to have access to all places, data and persons that deal with safeguarded materials, equipment or installations (EU, 1957, Article 81). The Euratom Treaty also provides for a mechanism of urgent dispute resolution arising from a Member State's opposition to an inspection. Article 81 stipulates that when carrying out of an inspection is opposed, the Commission has two options. In case there is danger in delay, the Commission has a right issue a written order (in the form of a decision) to proceed with the inspection. Under Article 288 of the Treaty on the Functioning of the European Union ("the TFEU"), a decision is binding in its entirety to whom it is addressed. The Commission's decision should subsequently be submitted without delay to the President of the Court of Justice of the European Union ("the ECJ"), who has to

approve it. In other cases, the Commission should first request the President of the ECJ to issue an order within three days to ensure that the inspection is carried out. Some authors concluded that the Commission's powers to directly inspect nuclear operators, in other words, private parties, as well as to issue or obtain binding orders from the ECJ constitute "extraordinary powers for the Commission."[59]

There is no comparable right for an urgent provision of access for IAEA inspectors. Rather, in those circumstances, Paragraph 18 of INFCIRC/153/ (Corr.) stipulates that the Director General is required to report the issue to the Board. The Board, in turn, should decide that an action by the State is "essential and urgent" in order to ensure verification of non-diversion of the safeguarded nuclear material, which should be taken "without delay."

The Euratom Treaty foresees a special procedure triggered by an infringement of its provisions, providing the Commission with enhanced rights. It is a two-tier procedure that applies to infringing Member States or operators. First of all, it has a right to issue a directive "calling upon the Member State concerned" to take all necessary measures in order to bring the infringement to an end (EU, 1957, Article 82). Although such directive by definition sets a goal and leaves some discretion to the Member State as to the form and methods of achieving it (EU, 2007a, Article 288), it contains a strict time limit. Should a Member State fail to meet the directive requirements within the set time limit, the Commission or any other Member State may "refer the matter to the ECJ" (EU, 1957, Article 82). The Euratom Treaty expressly foresees this derogation from the standard infringement procedure enshrined in Articles 258 and 259 of the TFEU. Under these provisions, the Commission should first give the Member State concerned an opportunity to submit its observations on the matter, then deliver a reasoned opinion and set a time limit for the State to comply. And only if the State fails to comply with the opinion within the time limit, the Commission has the right to refer the issue to the ECJ.

In case the infringement is done by a nuclear operator, the Commission has a right to impose sanctions on it (EU, 1957), Article 83. The Treaty provides an exhaustive list of sanctions in order of severity:

- a warning;
- the withdrawal of special benefits, including financial or technical assistance;

[59] See, for example, (Kilb, 2014, p. 99).

- the placing under the administration appointed jointly by the Commission and the correspondent Member State, with the maximum duration of four months; and
- withdrawal, total or partial, of source or special fissile materials.

Similarly to the inspection powers, referred to above, the Commission right to impose sanctions not only onto the Member States but also, directly, on private parties, constitute further enhanced powers of the Commission. Furthermore, such leverage clearly outweighs the one conferred to the IAEA by virtue of Paragraphs 18 and 19 of INFCIRC/153/ (Corr.), regardless of such similarities as the publicity of the infringement case and the withdrawal of assistance and materials. In the case of Euratom, if a Member State is unable to put an end to a continuing infringement, the Commission or any Member State concerned refer the non-compliance to ECJ, whereas the IAEA is not authorised by its Statute to refer non-compliance to any judicial body. Moreover, the Commission may impose sanctions directly onto nuclear operators whereas the IAEA deals in this respect directly with States.[60]

ii. Developments of the Euratom Treaty provisions related to safeguards

In 1959, Euratom adopted first two Regulations in respect of safeguards in order to further develop certain provisions of the Euratom Treaty. Commission Regulation (Euratom) No 7[61] established the implementing procedures for the declarations required by Article 78 of the Euratom Treaty, whereas Commission Regulation (Euratom) No 8[62] defined the nature and the extent of the requirements referred to in Article 79 of the Euratom Treaty. After Euratom and its NNWS Members entered into an NPT safeguards agreement with the IAEA, INFCIRC/193, it became necessary for Euratom to amend its legislation accordingly. It thus replaced the two 1959 Regulations by Regulation No 3227/76, which was adopted in 1976 and entered into force on 15 January 1977 (EU, 1976). This Regulation consisted of six parts:

- Part I dealt with basic technical characteristics and particular safeguards provisions. It corresponded to Articles 15, 42-46, 49 and 91-97 of INFCIRC/193

[60] Although operators may be affected indirectly through, for example, curtailing or suspension of assistance or the requirement to return materials or equipment.
[61] OJ No 15, 12.3.1959, p. 298/59.
[62] OJ No 34, 29.5.1959, p. 651/59.

and was in close relation to the Facility Attachments established by Euratom for each facility (Schleicher, 1980, p. 47).

- Part II dealt with the accounting system and corresponded to Articles 13, 32, 35, 36, 38, 54-59, 61-69, 97 and 98.2.D of INFCIRC/193.
- Part III dealt with nuclear transfers, namely import/export. The relevant provisions of INFCIRC/193 were to be found in Articles 92-93 and 95-97 of INFCIRC/193.
- Part IV contained specific provisions, correspondent to Articles 33 and 34 and recording and reporting obligations of INFCIRC/193.
- Part V dealt with specific provisions applicable in the territories of France and the UK. It is remarkable that the reference to the Euratom NWS Members proves that Regulation No 3227/76 was aimed to meet both the IAEA requirements and Euratom requirements for the purposes of the Euratom Treaty.
- Lastly, Part VI comprised final provisions reflecting Article 98 of INFCIRC/193.

Regulation No 3227/76 was, in turn, repealed by another Regulation No 302/2005, referred to above. The reasons for adoption of a new regulation, as outlined in the proposal presented by the Commission to the Council (EU, 2002b, pp. 2-3), consisted in the following:

- The New Partnership Approach between Euratom and the IAEA concluded on 28 April 1992 (IAEA, 1992f) introduced changes in the procedures for reporting to the IAEA to be reflected in the new Regulation.
- Conclusion of the Protocols Additional to the Safeguards Agreements between the Euratom Member States, Euratom and the IAEA. They imposed additional requirements on the Euratom's reporting to the Agency.
- Continuous European Community enlargement increased the number of nuclear installations reporting to Euratom.
- Developments in the nuclear industry, such as "the commissioning of large bulk handling installations, the use of MOX fuel, the use of long-term storage installations, as well as the closing down and decommissioning of installations."

- Modernised reporting implying the use of computer recording and reporting as well as the data transmission by electronic means. Hence removal of "volume and format limitations" under Regulation No 3227/76.

Regulation No 302/2005 is based on Article 79 of the Euratom Treaty, which provides that "the nature and the extent of the requirements referred to in the first paragraph of this Article shall be defined in a regulation made by the Commission and approved by the Council." The Regulation lays down a more detailed list of nuclear operators' obligations under Chapter 7 of the Euratom Treaty. Firstly, it is on an operator of a nuclear installation to declare the basic technical characteristics of the installation. The information should be submitted is at least 200 days prior to "the first consignment of nuclear material is due to be received" (EU, 2005a, Article 4) and include information on general arrangements at the installation, nuclear material accountancy and control (EU, 2005a, Annex I). Furthermore, a Member State is obliged to submit to the Commission "an inventory or annual throughput of nuclear material of more than one effective kilogram, all relevant information relating to the owner, operator, purpose, location, type, capacity and expected commissioning date" 200 days before the construction of a new installation starts (EU, 2005a, Article 4). On the basis of the basic information referred to above, the Commission should adopt "particular safeguard provisions in respect of a specific installation," including provisions on the procedures for drawing up physical inventories (EU, 2005a, Article 6). The particular safeguards provisions should be in form of a Commission's decision which is binding on a nuclear operator of the particular nuclear installation, subject to consolations with the latter. Given a confidential nature of the information they contain, the particular safeguards provisions are not published in the Official Journal.

The particular safeguard provisions should outline the procedures complying with which a nuclear operator would satisfy the imposed safeguards requirements. The procedures involve:

- determining and designating material balance areas and strategic points for checking the flow and storage of nuclear materials;
- procedures for keeping records of nuclear materials;
- procedures for conducting physical inventories;
- type and content of the reports to be submitted to the Commission; and

- contents of the documents presented for control (EU, 2005a, Article 6(2)).

Secondly, the Commission should be provided with an outline programme of activities relating to each installation covered by safeguards (EU, 2005a, Article 5 and Annex XI). This would enable the Commission to better design safeguards activities. The Regulation lays down the requirements as to both the contents of an outline programme of activities and the intervals of its communication. On an annual basis a Member State should furnish an outline programme of activities for the next two years, including, among other things, amount and physical conditions of materials, types of operations (e.g. fuel fabrication or reprocessing, enrichment, reactor operating, planned shutdowns, etc.), expected dates of arrival of materials and estimated schedule of waste processing, and schedule of conducting physical inventory. Minimum 40 days before a physical inventory is carries out, the programme for such work should be submitted to the Commission.

Furthermore, an operator is under obligation to establish a system of accounting for and control of nuclear materials which are handled with at the installation (EU, 2005a, Article 7). It serves a two-fold goal of ensuring that the nuclear materials currently in the facility are properly supervised and provides the basis for the declarations submitted to the Commission.

The Regulation provides that the SSAC should include accounting records, operating records and "information on the quantities, category, form and composition," actual location and the particular safeguards obligation of nuclear materials. In addition, in the event of transfer of the nuclear materials, the SSAC should details of the recipient or shipper.

An operator is responsible for submitting regular reports to the Commission. Among them there are accounting reports, inventory change reports, material balance reports describing changes in materials, and an annual summary of all accounted quantities of nuclear materials located in a material balance area at a certain time (EU, 2005a, Articles 10-13).

In some special circumstances, such as the loss of nuclear materials or threat of unauthorised removal due to unexpected transformation of containment or "a considerable delay during transfer," an operator is obligated to submit "without delay" to the Commission a special report (EU, 2005a, Articles 14, 15 and 22). Operators can

apply for derogation form reporting in respect of their material balance areas holding small quantities of nuclear materials, depleted or natural uranium or thorium used exclusively in non-nuclear activities, or plutonium with an isotopic concentration of plutonium-238 exceeding 80 % (EU, 2005a, Article 19).

Ore producers are allowed to derogate from the accounting system requirements (EU, 2005a, Article 24). Their accounting records should merely indicate the quantity of extracted ore, its average uranium and thorium content, and the stock of extracted ore at the mine, on the one hand, and details of shipments (the date, consignee, and quantity in each case) – on the other.

The Regulation lays down provisions concerning export and import of nuclear materials. Prior to any correspondent transaction, the Commission should receive notification of any exports of source materials and special fissile materials[63] exceeding one effective kilogramme from an operator to a third country, from a NNWS Member to a NWS Member and vice versa (EU, 2005a, Article 20(1 and 2)). The requirement of the advance notification also applies to transfers between installations within the same Member State in case the transfer involves nuclear materials the total quantity of which over a twelve-month period could exceed one effective kilogramme.[64]The same conditions apply in case of import and when an operator receives nuclear materials from another Member State (EU, 2005a), Article 21).

Export of ores to third countries is also covered by the Regulation. It obligates exporters of ores to inform the Commission of such export before or on the date of dispatch (EU, 2005a), Article 25).

The Regulation also specifies rules on nuclear waste management. Once an operator has plans to conduct waste treatment operations (except for "repackaging or further

[63] Under Article 197 of the Euratom Treaty, 'special fissile materials' means plutonium 239; uranium 233; uranium enriched in uranium 235 or uranium 233; and any substance containing one or more of the foregoing isotopes and such other fissile materials as may be specified by the Council. It does not include source materials.

[64] Under para.72 of INFCIRC/66/Rev.2 and para. 104 of INFCIRC/153/ (Corr.), "Effective kilogram" means a special unit used in safeguarding nuclear material. The quantity in "effective kilograms" is obtained by taking:
(a) For plutonium, its weight in kilograms;
(b) For uranium with an enrichment of 0.01 (1%) and above, its weight in kilograms multiplied by the square of its enrichment;
(c) For uranium with an enrichment below 0.01 (1%) and above 0.005 (0.5%), its weight in kilograms multiplied by 0.0001;
(d) For depleted uranium with an enrichment of 0.005 (0.5%) or below, and for thorium, its weight in kilograms multiplied by 0.00005.

conditioning without separation of elements"), it should forward in advance a notification to the Commission (EU, 2005a, Article 31). In the case of transfers of conditioned waste,[65] an operator must also notify the relevant details to the Commission and submit an annual report on the location of the conditioned waste containing certain nuclear materials such as plutonium and high enriched uranium (EU, 2005a, Article 32).

The Regulation also contains specific provisions applicable to NWS Members, i.e. France and the UK. The Euratom safeguards do not apply to nuclear installations or nuclear materials intended to serve the defence needs of NWS Members (EU, 2005a, Article 34). However, the safeguards do apply to the rest, civil-use, nuclear installations or materials. Moreover, certain controls are applied to those civil-use installations that are simultaneously or sporadically used for defence purposes, unless such controls constitute a threat to national security.

Lastly, Article 37 provides the Commission with a right to adopt further guidelines for application of the Regulation in form of Recommendations. The Commission has so far sued this right on two occasions, as described further in this study.

The following two Regulations have an auxiliary nature with regards to the Euratom safeguards system. Regulation (Euratom) No 3 (EU, 1958b) implements Article 24 of the Euratom Treaty. It determines the security grading and the security measures applied to information acquired by the Community or communicated by Member States. Regulation (Euratom) No 9 (EU, 1960) defines the average concentrations of uranium and thorium for ores to qualify as 'ores' under Article 197(4) of the Euratom Treaty.

As previously mentioned, the Commission adopted two sets of non-binding norms related to the safeguards in the form of Recommendations. First of them, Recommendation 2006/40/Euratom, provides guidance to nuclear operators on the information to be provided to the Commission. The second one, Commission Recommendation 2009/120/Euratom, describes how a nuclear operator should implement a high quality Nuclear Material Accountancy and Control system in order to comply with requirements of Regulation 302/2005, referred to above.

[65] Under Article 2 of Commission Regulation (Euratom) No 302/2005, "conditioned waste" means waste, measured or estimated on the basis of measurements, which has been conditioned in such a way (for example, in glass, cement, concrete or bitumen) that it is not suitable for further nuclear use.

iii. Euratom safeguards in practice

The Euratom safeguards were further developed not only through a legislative process but also by the supervising European Commission and the European Court of Justice.

As previously discussed in this paper, Articles 82 and 83 of the Euratom Treaty grant the European Commission particularly broad powers for urging compliance with the Treaty not only by Member States but also by nuclear operators. The following two examples illustrate the use of these powers.

In the case of Sellafield pond B30[66] the UK operator, British Nuclear Fuel plc (BNFL), managed a number of facilities at the Sellafield site in the UK, including spent fuel storage facility B30. The Euratom Treaty requires that these installations be put under Euratom safeguards, which includes, *inter alia*, verification by inspectors of accounting records of the nuclear material held by the operators against the results of facility inspections. However, throughout the years, the spent fuel stayed in the storage for longer periods than planned, which resulted in decay of the elements, the high level of radiation and poor visibility in the part of the facility concerned. As a result, the Commission inspectors were not able to inspect the facility properly, i.e. to determine accurately the quantities of material stored, which was in contravention of Articles 79 and 81 of the Euratom Treaty. BNFL was informed accordingly on several occasions and requested to submit schedule of measures to be undertaken in order to remedy the situation. BNFL, nevertheless, failed to come up with a formal action plan or adopt rectifying measures.

So, on 30 March 2004 the Commission adopted a Directive under Article 82 of the Euratom Treaty imposing on the UK an obligation to furnish to the Commission before 1 June 2004 "an overall plan ensuring adequate accounting for the nuclear material in question, as well as physical access to the facilities concerned," and to submit to the Commission a report on implementation progress every six months (EU, 2004b).

It is remarkable that, if the UK authorities fail to meet these obligations within the prescribed deadlines in the case of Sellafield pond B30, the Commission could impose penalties directly on BNFL under Article 83 of the Euratom Treaty.

This eventually happened to the BNFL's successor, British Nuclear Group Sellafield (BNG SL). On 15 February 2006 the Commission issued a formal warning, provided for

[66] See (EU, 2004a) and (EU, 2004d).

in Article 83 (1) (a) of the Euratom Treaty, against BNG SL, finding that its accounting and reporting procedures did not fully meet Euratom standards (EU, 2006e). This decision was a consequence of a series of inspections at the Sellafield plant. The Commission also requested BNG SL to implement the appropriate remedies within a specified timeframe and to ensure the adequate quality of its system of accounting for nuclear material.

It should be nevertheless underlined that although Article 83 (1) of the Euratom Treaty provides a wide range of sanctions against a nuclear operator imposed as a consequence of a breach of safeguards obligations, as previously described in this paper, so far the EU only issued warnings or, in the case examined below, placed a nuclear operator under administration.

According to some studies, by 2011 there were around only 30 cases which mainly concern Euratom's primary or secondary law.[67] The research of the ECJ database has not revealed any significant shift in recent years. Out of this group of judgments, three had certain relationship to nuclear safeguards, and two of them are of particular interest for the purposes of the present study.[68]

Case C-61/03 concerns the Commission's efforts to extend the scope of the Euratom law to security and defence policy. The Commission argued that the UK failed to fulfil its obligations under Article 37 of the Euratom Treaty, which applies to disposal of radioactive waste from both civil and military installations (ECJ, 2005). The reason for such allegation was that the UK had "not provided general data relating to a plan for the disposal of radioactive waste associated with the decommissioning of the Jason reactor," which was operated by the UK Ministry of Defence to train personnel and for research in support of the nuclear propulsion programme for the nuclear submarines of the Royal Navy. As a result, there were safety risks emanating from the damaged nuclear-powered submarine. The ECJ, however, did not endorse the Commission's arguments. It admitted that the Euratom Treaty did expressly exclude activities connected to defence from its scope. However, the ECJ had regard to other factors: the *travaux préparatoires* of the Treaty, the fact that the Euratom Treaty did "not contain

[67] See, for example, Wolf, S., 2011. Euratom Before the Court: A Political Theory of Legal Non-Integration. *European Integration online Papers (EIoP)*, Vol. 15, Article 10, pp. 10-12, http://eiop.or.at/eiop/texte/2011-010a.htm.

[68] The third not described here is Ruling 1/78 of 14 November 1978, ECLI:EU:C:1978:202.

any derogating provisions specifically intended to safeguard the national defence interests of Member States," the fact that Articles 24 – 28 to some extent concern the defence interests of Member States, among others –and ruled against the Commission emphasizing "the fact that the Treaty is not applicable to uses of nuclear energy for military purposes" (ECJ, 2005, Sections 44 and 45).

The second case concerns enrichment export from Germany via Luxembourg to the USA of nuclear materials unaccounted for, which resulted in two Commission Decisions 90/413 (EU, 1990a) and 90/465 (EU, 1990b) and one ECJ Judgment C-308/90 (ECJ, 1993). Owing to the peculiarity of the case, it is worth summarising its key. A loading pallet with two containers, each containing two boxes, was moved from the storage area to the material entry lock at the plant for the purpose of removing one box containing uranium pellets enriched to 3.3% U-235. Upon completion of this operation, the pallet, together with its two containers, was mistakenly placed outside, close to the storage area for empty containers, and forgotten about. The two containers on the pallet now only contained three boxes: one with 49.84 kg of uranium dioxide enriched to 2.7% U-235 and the two others, weighing 49.86 kg and 47.29 kg respectively, with uranium enriched to 3.95% U-235.

Since the containers were standing in this area, the employee in charge of their further transfer believed them to be empty and destined for shipment. He then removed the labels indicating the presence of radioactive materials, replacing them with ones indicating that the containers were empty, and the pallet was thus loaded by mistake by another employee on to a lorry belonging to a normal goods transport company. Subsequently, the lorry was unloaded at an airport in Luxembourg, the consignment packed for transport by air and transported by cargo plane to the USA, where the containers were transported by road to ANF-Richland, arriving on 15 May 1990.

The U.S. recipient carried out a routine dosimeter check and then promptly informed the nuclear operator of the presence of nuclear material in the two containers which were supposed to be empty, while the seals on them were untouched. The nuclear operator duly notified the Safeguards Directorate at the Commission and the Euratom Supply Agency of the occurrence. As a consequence, the Commission placed the operator under administration for four months by virtue of Decision 90/413, and appointed a board responsible for its implementation – by Decision 90/465. The Commission admitted

that, form a subjective point of view, there was no indication of intention behind the occurrence, and that these should not be seen as a form of diversion. However, it attached particular importance to the control of exports to nuclear materials, in particular, and the functioning of the system of accountancy and control – in general. So the Commission concluded that, from an objective point of view, the provisions breached are essential elements of Community legislation in the field of safeguards.
Such rigorous application of the Euratom Treaty, which guarantees its effectiveness and efficiency, was eventually upheld by the ECJ, which ruled, in particular, that "the Commission was entitled to adopt the contested measure, even though the infringement had already ceased" and the sanctions imposed were proportionate to the infringement.

iv. Euratom's international agreements containing safeguards provisions

As described above, one of the Euratom's objectives is to assure compliance with safeguards obligations contained in an agreement with either a third State or an international organisation. All such agreements signed so far qualify for either of two groups: the first one comprises bilateral agreements between Euratom and third countries whereas the second group contains multilateral agreements concluded between Euratom, the IAEA and either NNWS or NWS Members of Euratom.

a) Euratom's bilateral agreements with third countries

Pursuant Article 101 of the Euratom Treaty, Euratom has entered into a series of bilateral international agreements. They were mainly focused on various areas of the civil use of nuclear energy, although they were complemented by provisions related to non-proliferation, safeguards, nuclear security or nuclear export controls.
The basic agreement with the USA (EU, 1958a) was signed on 25 May 1958 and remained in force until 31 December 1995, when it was replaced by a new agreement (EU, 1995). The main safeguards provisions of the current agreement include:

- Nuclear material or special fissile material related to non-nuclear materials, nuclear materials or equipment transferred to Euratom should be covered by provisions of the Euratom Treaty and of one of safeguards agreements: between the IAEA, Euratom and its NNWS Members, between the IAEA, Euratom and its NWS Members, or between the IAEA and the USA (EU, 1995, Article 6(2-A)). Otherwise Euratom should conclude a safeguards agreement with the IAEA

or provide the USA with assurances that Euratom's safeguards system is effective and offers the same coverage as the Agency's safeguards (EU, 1995, Article 6(3-A and B)).

- Nuclear material or special fissile material related to non-nuclear materials, nuclear materials or equipment transferred to the USA should be placed under the safeguards of the IAEA-USA agreement (EU, 1995, Article 6(3-B)). Should the said safeguards not apply, the USA is under obligation to conclude a safeguards agreement with the IAEA (EU, 1995, Article 6(4-A)).
- In case none of the safeguards agreements apply, the Agreement obligates the Parties to "immediately establish safeguards arrangements for the application of safeguards" of the equivalent coverage and effectiveness as the ones under correspondent agreements with the IAEA (EU, 1995, Article 6(3-C and 4-B)).

Euratom signed a bilateral agreement with Canada (EU, 1959) on 6 October 1959 in order to "collaborate with each other in order to promote and enlarge the contribution which the development of the peaceful uses of atomic energy can make to welfare and prosperity in Canada and within the Community" (EU, 1959, Preamble). The Agreement contains, among other things, the Parties' undertakings that the transferred material or equipment or special fissile material obtained through the use of the transferred items should not be used for any military purpose, subject to application of Euratom's safeguards and Canada's measures for accounting of material or equipment (EU, 1959, Article IX(1 and 2)). Article IX(3) further stipulates that the Parties not only should carry out consultations and arrange visits for mutual reassurance of effectiveness of the measures referred to above, but also may seek relevant advice and expertise from the IAEA. Lastly, it should be noted that Article IX(4) explicitly talks about the "recognition of the importance of the International Atomic Energy Agency."

The Euratom-Canada agreement was further amended in 1978 as a result of the adoption of NPT safeguards. So, Paragraph C of the new Agreement (EU, 1978) complemented the Euratom's safeguards with the safeguards under the Agreements between the IAEA, Euratom and its NNWS or NWS Members, and substituted the Canada's accounting measures with safeguards in accordance with the IAEA-Canada Agreement (IAEA, 1972b).

The Euratom-Australia Agreement (EU, 1982) was concluded on 21 September 1982. Its provisions were envisaged to "ensure the furtherance of the objective of non-proliferation under which nuclear material could be transferred from Australia to the Community for peaceful purposes" (EU, 1982, Preamble). The scope of the Agreement covered nuclear material not only imported from Australia but also produced by equipment or using technology "of Australian origin," subject to bilateral agreements between Australia and an Euratom Member State, with all military uses being prohibited (EU, 1982), Articles II(1) and IV. Similar to the Euratom-USA agreement, the Euratom-Australia agreement reads that the nuclear material should be placed under the Euratom's and the NPT safeguards, otherwise the parties should enter into a separate agreement establishing safeguards of equivalent efficacy and coverage (EU, 1982, Articles V and VII). The new agreement with Australia (EU, 2011a) replaced the one referred to above on 1 February 2012. Its safeguards provisions are almost identical to those under the earlier agreement and the only novelty was the inclusion of the Additional Protocol concluded between the IAEA, Euratom and its NNWS or NWS Members, and between the IAEA and Australia.

The same principles of application of safeguards are contained in the bilateral treaties with Uzbekistan (EU, 2003), Japan (EU, 2006a), Ukraine (EU, 2005d), Kazakhstan (EU, 2006c), and South Africa (EU, 2013).

b) Safeguards and relations Euratom-IAEA

i) Safeguards agreement between the IAEA, Euratom and Euratom's NNWSs Members

On 20 September 1971 the Council of Ministers of Euratom gave it a mandate to negotiate an agreement with the Agency which would enable its NNWSs Members to implement their obligations under the NPT. The negotiations started on 9 November 1971 and by 30 June 1972 there had been six rounds of discussion and "very substantial progress had been achieved" (IAEA, 1972d, p. 39, para. 121). The Agreement was finally signed on 5 April 1973 in Brussels, Belgium.

The Agreement between the IAEA, Euratom and its NNWS Members consists of two parts: an Agreement and a Protocol, which is integral part thereof (IAEA, 1973, Agreement, Article 26). The text of the Agreement follows the lines of

INFCIRC/153/Corr. with some particular feature, describe below, whereas the Protocol aims at specifying how certain provisions of the Agreement should apply to Euratom.
The particularity of the Agreement consists in two facts. First, Euratom is a Party to the Agreement without being a Party to the NPT. Second, NNWS did not conclude such agreement one by one, rather, altogether. In that connection, the seventh Paragraph of the Preamble already provides an explanation emphasizing that Member States of Euratom have transferred certain aspects of their sovereignty to Euratom:

> "WHEREAS the States are Members of the European Atomic Energy Community (EURATOM) hereinafter referred to as 'the Community') and have assigned to institutions common to the European Communities regulatory, executive and judicial powers which these institutions exercise in their own right in those areas for which they Article competent and which may take effect directly within the legal systems of the Member States."

Moreover, Article III.4 of the NPT already foresaw the possibility to conclude a safeguards agreement with the IAEA "either individually or together with other States in accordance with the Statue of the IAEA." The Article nevertheless does not mention an opportunity for an international organisation, such as Euratom, to be Party to this type of agreements. This possibility is found in Article III.A.5 of the IAEA Statute, which authorises the Agency to apply safeguards upon request of Parties to "any bilateral or multilateral arrangement." The absence of definition of "Parties" permits a broader interpretation including international organisations. Lastly, Euratom and NNWS Members being Parties to the Agreement is fully in line with the spirit of the NPT. In fact, should Euratom not be allowed to enter the Agreement, Member States would not be able to fully comply with the NPT provisions, owing to their limited individual competence in the field of civil nuclear activities.
The roles of and relations between the IAEA and Euratom are established in Articles 1 to 4 of the Agreement. First of all, it is for the Member States to accept safeguards since they are Parties to the NPT. Secondly, the Agency alone is responsible for ensuring that safeguards are applied, which is also in line with Article III.1 of the NPT.
Mindful of the fact that Euratom also has a safeguards system, Article 3 further details the relationship between Euratom and the IAEA. Firstly, while applying its safeguards in all peaceful nuclear activities in the Member States, Euratom should co-operate with the Agency, so that no diversion of the safeguarded material to nuclear weapons or other nuclear explosive devices could be ascertained by the latter. Meanwhile, the IAEA

should also apply its safeguards in order to verify findings of the Euratom's safeguards system, taking due account of its effectiveness and making use of independent measurements and observations. It follows that it is not Euratom but the IAEA who is empowered to make its own conclusions as of the diversion, as required by the NPT.

Paragraph 7 of a standard agreement based on INFCIRC/153/Corr. includes a State Party's undertaking to establish a national system of accounting for and control of nuclear materials. Paragraph 81(b) further specifies the criteria of its effectiveness,[69] which, however, for the majority of NPT States Party was hard to assess at the moment their safeguards agreements were negotiated. In contrast, Euratom already had had in place a fully operational safeguards system for a prolonged time when it entered into negotiation on its NPT agreement. It was thus possible or the IAEA to make conclusions as to effectiveness of such system. INFCIRC/193 does not mention the SSAC but instead directly refers in the text of the Agreement and Protocol to the already existing Euratom safeguards, acknowledging their "effectiveness" for the purposes of the Agreement.

Articles 4 and 31 further refer to the Euratom safeguards. The first part of Article 4 is substantively identical to Paragraph 3 of INFCIRC/153/Corr. insofar as it obligates the IAEA and Euratom to co-operate to facilitate the implementation of the safeguards provisions of the Agreement. The second part is, however, unique to the Agreement since it stipulates that the IAEA and Euratom should "avoid unnecessary duplication of safeguards activities" when each of them carries out safeguards activities. Article 31 further requires the Agency to "make full use of Euratom's system of safeguards" every time the Agency carries out verification activities. The fact that the Euratom's safeguards system basically substitutes the SSAC is further reinforced by Article 32 which stipulates that the Euratom's system of accounting for and control of nuclear material (an important part of safeguards) should comply with the same requirements as a SSAC provided for in Paragraph 32 of INFCIRC/153/Corr.

[69] They include "the extent to which the operators of facilities are functionally independent of the State's accounting and control system; the extent to which the measures specified in paragraph 32 above have been implemented by the State; the promptness of reports submitted to the Agency; their consistency with the Agency's independent verification; and the amount and accuracy of the material unaccounted for, as verified by the Agency."

Protocol further develops the issues concerning the role of Euratom safeguards, Euratom's co-operation with the IAEA and avoidance of duplication of the two entities' safeguards activities, stating in its Article 1 that:

> "This Protocol amplifies certain provisions of the Agreement and, in particular, specifies the conditions and means according to which co-operation in the application of the safeguards provided for under the Agreement shall be implemented in such a way as to avoid unnecessary duplication of safeguards activities."

The activities described by the Protocol involve those ones for which the IAEA and Euratom are in charge individually, and those handled by them jointly.

Lastly, it should be emphasized that the co-operation with the IAEA should follow the basic patterns established in the Agreement. Euratom is, however, free to apply additional safeguards measures beyond the Agreement provisions in order to fulfil its safeguards tasks prescribed by the Euratom Treaty.

The starting point of safeguards is generally the provision of design information by a State but, under the Agreement, it is the responsibility of Euratom (IAEA, 1973f, Articles 8, 42, 44 and 49). The procedure is further specified in the Protocol. For example, its Article 2 requires Euratom to collect and provide the Agency with information on facilities and nuclear material outside facilities making use of the agreed indicative questionnaire annexed to the Subsidiary Arrangements, which are confidential and not made public.

Articles 46 and 48 of the Agreement and Article 3 of the Protocol, which develops them, further provide that the IAEA and Euratom should jointly analyse the design information and ultimately include the results they agree upon into the Subsidiary Agreements. Moreover, Euratom is entitled to participate in verification of the information. This marks a significant novelty in comparison with a standard NPT safeguards agreement where a State has no similar role in examination of design information or having a say in whether the results of the examination should be included in the Subsidiary Arrangements (IAEA, 1972c, paras. 8 and 46), let alone in its verification.

Article 39 of the Agreement further excludes the States from the process of drafting the Subsidiary Arrangements with the IAEA and Article 5 – form preparation of the

Attachments thereto. Instead, these activities should be performed jointly by Euratom and the Agency.

Furthermore, Euratom is responsible for arranging that the records specified in the Agreement be kept in respect of each MBA (IAEA, 1973f, Articles 51-58). The Protocol further specifies that, upon receiving the information reported by nuclear operators in the European Union, Euratom should keep it in centralised accounts and process it accordingly (including accounting control and analysis) (IAEA, 1973f, Prot., Article 6), providing the Agency with material balance reports, inventory information and notifying it of all changes in the inventory (IAEA, 1973f, Prot., Articles 7 and 8). Pursuant to Paragraph 32, such procedure of control and analysis is not foreseen for a SSAC of States Party to a standard NPT safeguards agreement.

Euratom has further competence in the area of import and export of nuclear material. It should be reiterated that in the context of the Agreement, import or export does not involve a transfer of nuclear material from one Euratom Member State to another, rather from/to a State beyond the EU territory (IAEA, 1973, Articles 92, 93, 95, 96, 98.1.B and 98.2.J(a)(ii) and (b)(ii)). So, under Articles 92 and 95 of the Agreement, Euratom should notify the Agency of any intended international transfers after the conclusion of a transfer contract (for export) or "as much in advance as possible" and within the time limits established by the Subsidiary Arrangements.

In addition, the whole area comprising the territories of all Euratom Member States is taken into account at the moment of establishing the limits of the quantities of nuclear material that may be exempted from safeguards in accordance with Article 37 of the Agreement. Accordingly, if none of the individual Member States has on its territory, for example, more than "one kilogram in total of special fissionable material" or more than "twenty metric tons of thorium," but the total quantity of the material is higher in all Member States combined, so the exemptions do not apply.

One of the most important parts of the joint IAEA-Euratom activities is the conduction of inspections. Article 70-89 of the Agreement cover general safeguards-related issues, such as the purpose and scope of inspections, rules of access for inspections, frequency and intensity of routine inspections, notice of inspections, designation of Agency inspectors, and conduct and visits of Agency inspectors. Inspections provisions are further detailed in Articles 10-24 of the Protocol.

It should be first to provide a brief historical outlook on the negotiations of the inspection provisions. One of the most sensitive issues in the negotiations was the determination of an inspection effort, in other words, the number, intensity, duration, timing and mode of routine inspections at a facility (Rainer & Szasz, 1993, p. 385). Articles 79 and 80 of the Agreement set out rules for the determination of the maximum routine inspection effort, but do not establish figures for actual routine inspection effort. Certain criteria for the determination of the actual number, duration, timing and mode of routine inspections in relation to any facility are included in Article 81 of the Agreement and are in line with the standard provisions of INFCIRC/153/ (Corr.). However, Euratom wished to determine specific figures, which would result in certain problems for the IAEA since it was not possible to determine definitive maximum inspection figures for each and every facility: conditions were constantly changing and it was not possible to anticipate every new situation that might arise. In the outcome, the actual articles of the Agreement and the Protocol reflected a compromise between the Euratom's more conservative and the IAEA's flexible approaches.

Article 10 of the Protocol provides that the Agency and Euratom, in accordance with provisions of further Articles 11 to 23 should coordinate routine inspection activities, including unannounced inspections. Notwithstanding the obligation to coordinate inspection efforts, it is Euratom who is primarily entrusted with carrying out routine inspection activities.

Article 11 of the Protocol further stipulates that when determining the "actual number, intensity, duration, timing and mode of the Agency inspections" for each individual facility, account should be taken of the Euratom's inspection effort in the framework established by the Euratom Treaty. Article 12 also provides that the criteria established in Article 81 of the Agreement should be used to determine inspection effort for each facility. Those criteria are to be implemented by using the approaches set forth in the Subsidiary Arrangements. Such rules and methods, developed especially for the case of Euratom, were then used in respect of different types of facilities. The figures determined in the specific examples cannot of course be regarded as definitive for every facility of the same type. They may nevertheless be perceived as indicators of what to expect in respect of similar facilities (Stein, 1973, p. 330).

The inspection efforts, expressed as agreed estimates of the actual inspection efforts to be applied, are to be set in the Subsidiary Arrangements together with relevant verification approaches and scopes of inspection to be conducted by Euratom and the IAEA (IAEA, 1973f, Prot., Article 13). The verification approaches and scopes of inspections specify the various inspection activities required in respect of each individual facility for the purpose of ensuring its effective inspection, and are expressed in terms of man-days[70] of inspection for each inspection activity for both Euratom and the Agency (Stein, 1973, p. 331). The inspection efforts referred to above are to be considered the actual maximum inspection efforts at a facility under normal operating conditions and provided the following:

- Information on Euratom safeguards provided for in Article 32 of the Agreement, and as specified in the Subsidiary Arrangements, is still valid;
- Information on facility and on nuclear material at LOFs is still valid;
- Euratom keeps providing reports pursuant to Articles 60-61, 63-65 and 67-69 of the Agreement, as specified in the Subsidiary Arrangements;
- As stipulated by Articles 10-23 and specified in the Subsidiary Arrangements, the co-ordination arrangements for inspections continue to apply; and
- Euratom applies its inspection effort in respect of the facility, as specified in the Subsidiary Arrangements, under Article 13 of the Protocol (IAEA, 1973f, Prot., Article 13).

As a result, the actual maximum inspection efforts remain unchanged only as long as normal operating conditions persist and the additional five conditions are satisfied, which gives the system certain flexibility once the conditions change.

Articles 14-24 of the Protocol provide a detailed description of how the co-ordination of routine inspections should be implemented. Article 14(a) provides that, subject to the conditions set out in Article 13, IAEA inspections should be conducted simultaneously with the inspection activities of Euratom and that the Agency inspectors are required to be present while Euratom performs certain inspections. Furthermore, paragraph (b) of the same article reads that, in case the IAEA can achieve the purposes of its routine inspections, it has to implement the provisions of Articles 74 and 75 of the Agreement

[70] Under Article 98(2-L), a 'man-year of inspection' means 300 man-days of inspection, a man-day being a day during which a single inspector has access to a facility at any time for a total of not more than eight hours.

(concerning the scope of inspections) "through the observation of the inspection activities" of the Euratom inspectors. It is a general rule which is, however, subject to the following limitations:

- The Subsidiary Arrangements should specify IAEA inspection activities that are to be implemented other than through observation of Euratom inspection activities; and
- IAEA may still carry out inspection activities other than by observing Euratom inspection activities in case they find it essential and urgent, and if there is no other option and the situation was not foreseeable.

The fact that IAEA inspectors will generally conduct their inspection activities through observation of Euratom inspections and that they will not be present at all Euratom inspections is further reinforced by Article 21 of the Protocol. It requires Euratom to furnish to the Agency its working papers on Euratom inspections at which the IAEA was present, and inspection reports for all other Euratom inspection conducted pursuant to the Agreement. Accordingly, the IAEA will have a comprehensive outlook on the results of all Euratom inspections.

Technically, the co-ordination of inspection activities of Euratom and the IAEA is governed by the following rules. The general scheduling and planning of Euratom inspections are subject to consultation with the Agency (IAEA, 1973f, Prot., Article 15), which can thus determine its own schedule and planning for inspections. Moreover, the physical presence of IAEA inspectors while Euratom perform certain inspections is to be agreed in advance between Euratom and the Agency for each type of facility and, in some cases, for an individual facility (IAEA, 1973f, Prot., Article 16). Since it is eventually the IAEA's prerogative to decide on its inspectors' presence during a particular Euratom inspection, Euratom should provide the Agency an advance statement of the numbers, types and contents of items to be inspected according to the information previously furnished to it by the facility operator (IAEA, 1973f, Prot., Article 17). General technical procedures should also be agreed upon in advance. They are to include, in particular, the determination of techniques for random selection of statistical samples, and the checking and identification standards (IAEA, 1973f, Prot., Article 18). The co-ordination arrangements for each type of facility, as provided for in the Subsidiary Arrangements, should be the basis for the co-ordination arrangements

included in each Facility Attachment (IAEA, 1973f, Prot., Article 19). The co-ordination action on the co-ordination arrangements specified in the Facility Attachment should be taken by specially designated Euratom and the IAEA officials (IAEA, 1973f, Prot., Article 20).

One particular feature of the technical side of co-operation between the two entities is the taking of samples of nuclear materials. Article 22 of the Protocol stipulates that samples for the Agency should be drawn from the same randomly selected batches of items as for Euratom and be taken together with Euratom samples. There is one exception to this rule. It says that the Agency has a right to conduct an independent sampling on its own "the maintenance of or reduction to the lowest practical level of the IAEA inspection effort" so requires. The exception is, however, to be agreed in advance and specified in the Subsidiary Arrangements.

The guidelines for the frequencies of physical inventories, that a required to be taken by facility operators and to be verified for the purposes of safeguards, are generally set out in the Subsidiary Arrangements and to be followed (IAEA, 1973f, Prot., Article 23). Should additional activities under the Agreement be considered as essential, the same article provides that they are to be discussed in the Liaison Committee (established by Article 25 of the Protocol) and agreed before implementation.

Article 24 of the Protocol contains provisions related to the IAEA ad hoc inspections. Like in case of routine inspections, the approach is for the Agency to achieve purposes of ad hoc inspections through observation of Euratom inspection activities, where possible.

The Protocol established a body, the Liaison Committee, entrusted with the task of "facilitating the application of the Agreement and this Protocol" (IAEA, 1973, Prot., Article 25). The Liaison Committee is composed of representatives of the Parties to the Agreement and consists of two elements: the Higher Level Liaison Committee (hereinafter "the HLLC") and the Lower Level Liaison Committee ("the LLLC") (IAEA, 1996a, p. 3). The HLLC should meet at least once a year, and among its tasks there are reviewing the co-ordination between the Parties and the development of safeguards procedures, and examining issues addressed to it by the LLLC. The LLLC should meet on a more often basis. It deals with technical and other aspects of the Agreement, including those related to effective and efficient safeguards implementation

at individual facilities for which it establishes routine inspection procedures and prepares and negotiates facility attachments. Any questions not settled at the level of the LLLC are to be referred to the HLLC (IAEA, 1973f, Prot., Article 25(c)). Should any issue arise in relation to the application of Article 13 of the Protocol (concerning inspection efforts), in particular, if the Agency considers that the conditions specified in Paragraphs (a)-(e) are not met, the Liaison Committee is required to hold a meeting "at the suitable level" (IAEA, 1973f, Prot., Article 25(d)). The Liaison Committee is then to evaluate the situation and discuss the measures to be taken. In case the issue still persists, the Liaison Committee has a right to make proposals to the Parties, for example, to modify the estimates of routine inspection efforts (IAEA, 1973f, Prot., Article 25(d)). Lastly, Article 25(e) of the Protocol empowers the Liaison Committee to elaborate proposals concerning questions requiring the agreement of the Parties.

ii) Development of co-operation

Until 1992 the co-operation between the IAEA and Euratom was primarily based on the two-fold approach stemming from the Agreement and based on "observation" and "joint team" arrangements (IAEA, 1996a, Footnote 1). The former arrangement was based on the idea that the Agency would generally observe the inspection activities of Euratom. Consequently, the IAEA and Euratom used an equal number of inspectors. The latter arrangement was supposed to rationalise the use of resources at facilities which required a higher inspection effort than those under the observation arrangement (in other words, enrichment facilities and facilities handling plutonium and high enriched uranium). The IAEA and Euratom would thus conduct their inspections jointly in order to reduce the level of intrusiveness to the operator and to avoid unnecessary duplication of work, but at the same time they would be able to arrive at independent conclusions.

The Board, however, concluded that these arrangements, however effective, did not comply with important requirements that safeguards pose the least burden to industry when implemented (IAEA, 1996a, para. 2). Moreover, a question of efficiency in the use of safeguards resources was also in focus, leading to the establishment in September 1991 of a Working Group by the HLLC with a task of exploring the ways to enhance co-operation and co-ordination between Euratom and the IAEA. As a result, in the following year the Working recommended to discontinue the Observation and Joint Team arrangements and therefore to elaborate a new partnership approach to enable

Euratom and the Agency to meet their responsibilities under INFCIRC/193 in the most effective and efficient manner (Thorstensen & Chitumbo, 1995, p. 26). These recommendations were endorsed by an agreement on the initiation of a "New Partnership Approach" ("the NPA"), signed by the IAEA's Director General Hans Blix and the European Commission's Commissioner for Energy Cardoso e Cunha (IAEA, 1992f). The objective of the NPA was to "strengthen safeguards collaboration in a way that takes into account not only the effectiveness of safeguards but also safeguards efficiency and, in so doing, gives full effect to the purposes of the Agreement" (IAEA, 1992f, para. 3).

The NPA has three fundamental principles that:

- The common activities performed by Euratom and the IAEA under INFCIRC/193 are separate from activities of Euratom under the Euratom Treaty;
- Each organisation has the right to independently determine the activities to perform in order to fulfil its own safeguards obligations; and
- The way both organisations perform their inspection activities should enable them to reach their own independent conclusions and required assurances (IAEA, 1992f, para. 5(ii)).

Accordingly, the NPA comprised the following elements:

- Optimising the necessary practical arrangements and making use of commonly agreed safeguards approaches, inspection planning and procedures, inspection activities, and inspection instruments, methods and techniques;
- Avoiding unnecessary duplication of effort by carrying out inspection activities on the principle of "one job – one person," supplemented by quality control measures to enable Euratom and the IAEA to reach independent conclusions and required assurances, as required by their respective obligations;
- Sharing analytical capabilities in order to reduce the number of samples to be taken, transported and analysed; and
- Increasing common use of technologies in order to replace the physical presence of inspectors.

The outcome of the application of the new approach is the following. Within the period of 1991-1995, inspection effort in NNWS Members of Euratom was reduced from

around 3,000 to about 1,200 man-days (or person-days) of inspection (the "PDIs") (IAEA, 1996a, para. 19). Out of 1,800 PDIs saved, around1,100 were attributable to the improved inspection arrangements and the separation of common inspection activities necessary to meet IAEA Safeguards Criteria.[71] Furthermore, the implementation of the NPA led to the increase in co-operation not only through joint inspection activities with common procedures, approaches and instruments but also through sharing capabilities and activities such as laboratories, training, and research and development (IAEA, 1996a, para. 20).

Lastly, it should be noted that Article 23(a) of the safeguards agreement between the IAEA, Euratom and its NNWS Members provides that the Agreement should come into force for a NNWS Party to NPT which becomes member of Euratom, subject to notification to the IAEA by each the State and Euratom. So far the last accession was recorded in respect of Romania.[72]

Lastly, Euratom and its NNWS Members also concluded a Protocol Additional to the NPT safeguards agreement, on 22 September 1998 (IAEA, 2005). Its provisions follow the line of the Model Additional Protocol, which is described further in the present study. Article 17.a. of requires that, for the Protocol Additional to enter into force, the Agency should receive from Euratom and the State a written notification that their respective requirements for entry into force have been met. Again under Article 23(a) of INFCIRC/193 a non-signatory State of the Additional Protocol to may express its consent to be bound by the Additional Protocol. The last Euratom Member State to do that was again Romania.[73]

b. Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials

By 1980s, Brazil and Argentina had developed research initiatives in the sphere of nuclear activities involving military institutions, which aroused international suspicion as to the countries' heading towards the acquisition of nuclear weapons (Dias, et al.,

[71] Under the Safeguards Glossary, "Safeguards Criteria" is the set of nuclear material verification activities considered by the IAEA as necessary for fulfilling its responsibilities under safeguards agreements.

[72] Accession reproduced in the IAEA document INFCIRC/193/Add.27, 24 June 2010. (Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc193a27.pdf).

[73] Accession reproduced in the IAEA document INFCIRC/193/Add.28, 24 June 2010. (Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc193a28.pdf).

2011, p. 151). Hence the two countries' willingness to take actions in an attempt to demonstrate to the international community the peaceful nature of their nuclear programmes. So, in 1980 Argentina and Brazil signed the Cooperation Agreement for Development and Application of the Peaceful Uses of Nuclear Energy (UN, 1980), which was followed by a series of joint declarations on nuclear policies.[74]

The next significant step was made on 28 November 1990, at Foz do Iguaçu (Brazil), where the Presidents of Argentina and Brazil signed Declaration on Common Nuclear Policy (IAEA, 1990). The Declaration established the basis for bilateral control of nuclear activities. In particular, the document approved the Common System of Accounting and Control ("the SCCC"), which would apply to all nuclear activities of both countries, and laid down a list of activities the Parties were required to carry out shortly after:

- exchange the respective descriptive lists of all their nuclear facilities;
- exchange the declarations concerning the initial inventories of the nuclear materials in the territory of each country;
- conduct first reciprocal inspections to the centralized record systems;
- communicate to the IAEA the records and reports system, which is a part of the SCCC, in order to harmonize it with the records and reports submitted to the Agency by the two countries under their respective safeguards agreements (IAEA, 1990, para. 2).

Furthermore, the two countries showed their willingness to start negotiations with the IAEA with regards to the conclusion of a joint safeguards agreement, which would have the SCCC as a basis (IAEA, 1990, para. 3). Lastly, once the said safeguards agreement is concluded, the countries undertook to adopt "pertinent measures leading to the full entry into force for both countries of the Tlatelolco Treaty" (IAEA, 1990, para. 4).

The next milestone in the co-operation of Argentina and Brazil in the ambit of safeguards was the signing by the Governments of the two countries of the Bilateral Agreement on 18 July 1991 in Guadalajara, Mexico. The main undertakings of the

[74] See, for example, the Declaration of Iguaçu, 30 November 1985, para. 31 (unofficial translation): "Both Presidents congratulated each other for the Joint Declaration on the Nuclear Policy signed on the same date, which focuses on the peaceful purposes of nuclear development programmes of their countries and is framed in the best traditions of co-operation and peace that inspire Latin America." (Available at: https://www.abacc.org.br/en/wp-content/uploads/2016/09/1985-Declara%C3%A7%C3%A3o-do-Igua%C3%A7u-espanhol-assinada.pdf).

Parties under that agreement are "to use the nuclear material and facilities under their jurisdiction or control exclusively for peaceful purposes" and to prohibit, prevent or not to take part in the testing, use, manufacture, production, acquisition, receipt, storage, installation or deployment of any nuclear weapon in their respective territories (UN, 1991), Article I. These undertakings are similar to those contained in the Tlatelolco Treaty, also covering the territories of Argentina and Brazil. However, Paragraph 3 of Article 1 of the Bilateral Agreement, unlike Article 18 of the Tlatelolco Treaty, stipulates that it is not technically possible to distinguish between nuclear explosive devices for peaceful purposes and those for military purposes. Hence the Parties' undertaking to abstain from carrying out, promoting, authorising, or participating in the testing, use, manufacture, production or acquisition by any means of any nuclear explosive device "while the above mentioned technical limitation exists."

Similar to the NPT, the Bilateral Agreement reiterates that the Parties' have inalienable right to "carry out research on, produce and use nuclear energy for peaceful purposes" (Article II) and the right to use nuclear energy for the "propulsion of any type of vehicle, including submarines," considering propulsion to be a peaceful application of nuclear energy (Article III).

The Bilateral Agreement establishes the SCCC, whose objective is to verify that the nuclear materials in all nuclear activities of the Parties are "not diverted to the purposes prohibited by the present Agreement" (Article V). Accordingly, the Parties undertake to submit all the nuclear materials in all nuclear activities carried out in their territories or anywhere under their jurisdiction or control to the SCCC (Article IV).

Furthermore, the Bilateral Agreement establishes a body responsible for the administration and implementation of the SCCC– a bilateral inspectorate called the Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials ("ABACC") (Articles VI and VII). ABACC consists of two organs – the Commission and the Secretariat (Article IX). Some of ABACC functions are:

- To conduct and evaluate inspections and carry out other procedures required for implementation of the SCCC;
- To designate inspectors; and
- To represent the Parties before third parties in connection with the implementation of the SCCC (UN, 1991, Article VIII).

A co-operation agreement with the IAEA was signed between ABACC, Argentina and Brazil on 13 December 1991 and entered into force in March 1994 ("the Quadripartite Agreement") (IAEA, 1994). By concluding the Agreement, Argentina and Brazil voluntarily requested the IAEA to apply its safeguards taking into account the SCCC. With an exclusion of bilateral supply arrangements, the Quadripartite Agreement is "a unique example of a safeguards agreement concluded at the request of States party to a bilateral non-proliferation arrangement" (Rockwood, 2013, p. 9).

The structure and provisions of the Quadripartite Agreement are almost identical to those of the NPT safeguards agreement with Euratom and its NNWS Members. However, experts regard ABACC safeguards as not having quite the same verification credibility as those of Euratom (Findlay, 2012, p. 63). In any event, the Quadripartite Agreement also consists of the texts of the Agreement and of Protocol. It is remarkable that NPT provisions, in fact, did not apply to the two countries since they joined it later, as described further in this study.

Given the high degree of similarity of the Quadripartite Agreement with INFCIRC/193, as stated above, it would be worth, for the purposes of the present study, concentrating just on some provisions of the Agreement.

The basic undertakings of the Quadripartite Agreement are examined in continuation. Firstly, for the States Party the main undertaking is to accept application of safeguards on all nuclear activities carried out within their territories or under their jurisdiction or control, for the sole purpose of verifying that such materials are not "diverted to nuclear weapons or other nuclear explosive devices" (Article 1). The main right and at the same time obligation for the IAEA is to ensure that safeguards are applied to all nuclear material in all nuclear activities under the jurisdiction or control of the States Party, for the purpose of ensuring non-diversion to unauthorized purposes (Article 2(a)). In doing this, the Agency should apply safeguards in a manner to allow verification of the results of the SCCC. The Agency, however, retains the right to independently carry out measurements and observations taking "due account of the technical effectiveness of the SCCC" (Article 2(c)). The other Party to the Quadripartite Agreement, ABACC, also undertakes to apply its own safeguards to nuclear materials in all nuclear activities within the territories of Argentina and Brazil, and to co-operate with the IAEA (Article 2(b)). Lastly, the States Parties, the IAEA, and ABACC should co-operate to

facilitate application of the safeguards under the Quadripartite Agreement whereas the IAEA and ABACC should work to avoid unnecessary duplication of their respective safeguards activities (Article 3).

The Protocol further specifies several core principles of co-operation between the Parties in implementation of safeguards (IAEA, 1994, Protocol, Article 1). First of all, ABACC and the Agency each should be able to reach its own independent conclusions. For example, Article 4 of the Protocol stipulates that ABACC and the Agency each may examine design information provided for in Article 44(a) to (f) of the Agreement[75] to include the results of such examination into the Subsidiary Arrangements. Secondly, when carrying out activities under the Agreement, the Agency should take into account the issue of preservation of technological secrets.

The last principle upon which the co-operation between parties is based is the need for the Parties to co-ordinate their efforts in order to guarantee the optimal implementation of the Agreement, including in avoiding duplication of ABACC's safeguards and, where possibly, working jointly according to compatible safeguards criteria of the two organisations. For example, it is for the Agency, albeit in co-operation with ABACC and the State Party concerned, to carry out the verification of design information through sending inspectors to facilities (IAEA, 1994, Protocol, Article 4).

The Quadripartite Agreement provides for the following procedures for the implementation of safeguards. To ensure cost-effectiveness and apply the principle of effective verification of the flow of safeguarded nuclear material, the Agency should make use of instruments and other techniques "at certain strategic points" (Article 6(a)). In addition, Article 6(b) establishes a tentative list of techniques to be used to further guarantee the cost-effectiveness:

- containment and surveillance;
- statistical techniques and random sampling in evaluating the flow of nuclear material; and

[75] The design information would be used for the purpose of: identifying facilities and nuclear material features relevant to the application of safeguards; determining material balance areas; establishing the nominal timing and procedures for taking of physical inventory of nuclear material; establishing the requirements concerning records, reports and records evaluation procedures; establishing mechanisms of verification of the quantity and location of nuclear material; and choosing combinations of containment and surveillance methods.

- "concentration of verification procedures on those stages in the nuclear fuel cycle involving the production, processing, use or storage of nuclear material from which nuclear weapons or other nuclear explosive devices could readily be made, and minimization of verification procedures in respect of other nuclear material."

Furthermore, ABACC, the IAEA and the State Party concerned should prepare the Subsidiary Arrangements jointly (Protocol, Article 6); ABACC should provide the Agency with inventory change reports (Protocol, Articles 7 and 8), the material balance reports and inventory listings (Protocol, Article 9); and ABACC and of the Agency should, to the possible extent, coordinate the routine inspection activities since ABACC would keep conducting its own inspections (Protocol, Articles 11-18).

Lastly, as in case of the Protocol to the NPT Agreement between the IAEA, Euratom and its NNWS Members, the Protocol in INFCIRC/INFCIRC/435, Article contains a provision establishing the Liaison Committee composed of representatives of the Parties to the Agreement. Holding its meetings on an annual basis, the body's functions consist in reviewing the co-ordination between the Parties, development of safeguards procedures, and examining issues addressed to it by the Sub-Committee. The main task of the Sub-Committee is to discuss relevant issues on more often occasions.

The adoption of the Quadripartite Agreement affected the application of the safeguards agreements previously concluded by the parties, which became suspended.[76]

In addition, it should be mentioned that both Argentina and Brazil were parties to the Tlatelolco Treaty and both countries also eventually joined the NPT, and thus assumed correspondent obligations as to conclusion of safeguards agreements with the Agency. Argentina deposited its accession to the NPT on 10 February 1995. Brazil acceded to the NPT on 18 September 1998 (UN, 2017c). Accordingly, with the existing NPT-type safeguards under the Quadripartite Agreement already in force, it was not feasible to enter into two new safeguards agreements. That was the reason why the two countries opted for modifying the Quadripartite Agreement adding an agreement that stipulated that the safeguards set forth in the Quadripartite Agreement should also apply, as

[76] See, for example, the Agreement between the Republic of Argentina, the Federative Republic of Brazil, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials and the International Atomic Energy Agency for the Application of Safeguards came into force on 4 March 1994, INFCIRC/202/Mod.1, 12 April 1995. (Available at: https://www.iaea.org/sites/default/files/infcirc202m1.pdf).

regards Argentina and Brazil, “in connection with the Tlatelolco Treaty and the NPT” and as long as the two States are “party to either the SCCC Agreement, the Tlatelolco Treaty or the NPT” (IAEA, 1997c, para. 1); (IAEA, 1998a, para. 1); and (IAEA, 2000a, para. 1).

c. Japan’s national nuclear material accounting and control system and its NPT safeguards agreement

By the time Japan was negotiating its NPT Safeguards Agreement, the country already had an established a national nuclear material accounting and control system, which also included safeguards inspection. Accordingly, having a precedent of the Euratom NNWSs Agreement, which was pending approval by the Board, the Governor from Japan underlined that the substance of this types of safeguards agreements should be equally applicable to agreements concluded not only with States and multinational organisations they are parties to but also with individual States (IAEA, 1972d, paras. 33 and 34). In particular, the Governor stressed that the extent of the Agency verification activities should take into account the technical effectiveness of a national system. As a result, the Japan’s NPT Agreement is very similar to the Euratom’s and it took into consideration technical features of the national verification procedures. Moreover, Japan managed to obtain an Agency’s commitment to accord the country treatment with respect to safeguards at least equal treatment as the one accorded to Euratom, subject to equal functional independence and technical effectiveness of the country’s system of safeguards (IAEA, 1978, Prot., Article 2).

The Japan’s NPT Agreement was 4 March 1977 and entered into force on 2 December 1977. Like the Euratom NPT Agreement, the text of the Japan’s Agreement consists of the Agreement itself and of the Protocol, which is an integral part thereof (IAEA, 1978, Prot., Article 26). Overall analysis of the document reveals that it is almost identical to INFCIRC/193 save a few exceptions in the wording. For example, the document does not make any reference to the country’s National System as being a safeguards system or to activities under it as being safeguards activities. Moreover, the eighth recital of the Preamble to the Japan’s Agreement apparently does not include mentioning of the Euratom realities, rather it states that:

> "Whereas the Government of Japan is prepared to carry out, through Japan's national system including inspections, necessary controls on all nuclear activities, including, inter alia, fabrication, reprocessing, and establishing and operating reactors;"

In the two following recitals, however, the Agreement in substance repeats INFCIRC/193:

> "WHEREAS this system includes examination of design 'information, maintenance of records and submission of reports to permit nuclear material accounting for Japan, inspection by Japan's inspectors and a system of sanctions;
> WHEREAS it is the desire of the Government of Japan and the Agency to avoid unnecessary duplication of their activities;"

Substantially different from the provisions of the Euratom Agreement is Article 3(a) of the Japan's Agreement, which requires the Government of Japan to maintain a system of accounting and control of all nuclear material subject to safeguards (including independent verification of such material), which "the Government of Japan may designate as 'the National System of Safeguards'." Article 3(b) and (c) that follow, nevertheless, are identical with the provisions of Article 3(a) and (b) of the Euratom Agreement.

The Protocol to the Agreement contains the basis for the co-ordination of Japan's and the Agency's safeguards systems in order to avoid duplication of the two systems. It is has fewer Articles than the Protocol of INFCIRC/193 (18 and 25, respectively). The substantial differences between the two Protocols are as follows:

- The Protocol to the Japan's Agreement does not *mutatis mutandis* include provisions on: agreements concerning the presence of IAEA inspectors during the performance of certain Euratom inspections to be concluded in advance (IAEA, 1973f, Prot., Article 16); general technical procedures for each type of facility also to be agreed in advance (IAEA, 1973f, Prot., Article 18); co-ordination arrangements for each type of facility should serve as a basis for co-ordination arrangements in each Facility Attachment (IAEA, 1973f, Prot., Article 19); specific co-ordination actions on matters specified in the Facility Attachments to be taken by IAEA and Euratom officials (IAEA, 1973f, Prot., Article 20); the taking of samples of nuclear material (IAEA, 1973f, Prot., Article 22); and the frequencies of physical inventories to be in accordance with those set out in the Subsidiary Arrangements (IAEA, 1973f, Prot., Article 23).

- Article 4 of the Japan Protocol is different from Article 3 of the Euratom Protocol insofar as the former does not provide Japan with a right of agreement to the results of the examination of design information included in the Subsidiary Arrangements.
- The substance of Articles 6-8 of the Euratom Protocol was transposed in just one Article 7 of the Japan Protocol.
- The Japan Protocol contain Article 2, the provisions of which (not less favourable treatment to be accorded to Japan) are not included in the Euratom Protocol, apparently because the treatment accorded to Euratom and its NNWS Members was the benchmark.
- Lastly, the tasks of tackling issues of implementation of the Agreement and the Protocol, and of examining the development of safeguards procedures are delegated to a single formation called Joint Committee, which would hold its meetings periodically.

Article 2 of the Japan Protocol provides that, in the implementation of the Agreement, the Agency should accord to Japan treatment with respect to safeguards "not less favourable than the treatment it accords to other States or a group of States, provided that the National System achieves and maintains a degree of functional independence and technical effectiveness equivalent to that of such States or group of States." As previously mentioned, under "a group of States" this provision obviously implied Euratom. Furthermore, Article 3(a) of the Agreement stipulated that the country's SSAC is to include independent verification of such material. The notion of "impartiality" in this context is thus of particular interest.

For example, in the case of Euratom, used as a benchmark of functional independence, the verification activities are carried out by an entity that is independent from both the Member States and nuclear operators in their territory. Japan is, however, is not bound by any international agreement equivalent to the Euratom Treaty. For an answer to the question how the "independent verification" may be achieved by an individual State, one should turn to the Report of the Panel on Systems of Accounting for and Control of Nuclear Material (IAEA, n.d.). The Panel was convened by the Agency in Tokyo on 5-9 November 1973. It noted that both the SSAC and international safeguards pursued a common goal of guarantee non-diversion of nuclear material to proscribed uses. The

Panel, however, considered that the SSAC has a broader objective, which included, among other things, the deterrence of diversion of nuclear material by risk of detection and is directed against the diversion also by operators, individuals or groups within the State's jurisdiction. The Panel further determined the following levels of increasing assurance that a State may wish to provide in relation to reliability of its SSAC:

- Level Ia: Assurance that the operator has an adequate capability to account for and control of nuclear material;
- Level Ib: Assurance that the operator's performance of accounting for and control of nuclear material is adequate;
- Level II: Assurance through independent verification that facility accounting for and control of nuclear material have been effective (IAEA, n.d.).

The first two levels of assurance are related to a facility operator's capability to employ and its effective employment of various elements of accounting and control, such as nuclear material accountancy, containment and surveillance. Meanwhile, the latter level implies the involvement of a State, which is to protect against the potential threat of misuse by those entrusted with accounting and control responsibilities and also against diversion in case the accounting and control system of the facility fails. The Panel further determined the State's activities corresponding to Level II assurances:

- Establishing verification criteria in order to provide Level II assurance of State objectives (timeliness, limits of accuracy and confidence levels);
- Establishing procedures in order to independently verify the credibility of quantities for receipts , shipments, discards and inventory;
- Conducting inspections in order to carry out independent measurements; and
- Evaluating of inspection data for the purpose of making statement on the fulfilment of the State's objectives (IAEA, n.d.).

So, the State's "independent verification" means verification activities independent form the operators. And the IAEA can take into account the effectiveness of the State system when carrying out its own activities.

However, the equation of the Japan's SSAC, however effective it is, to the Euratom supranational system of safeguards does not fully resolve a potential problem when a diverter is not an operator of the facility, rather the State itself. So, it is for the Agency

to conduct the supervision of the State's SSAC and to have a final say on the State's compliance with its non-proliferation obligations.

3. Completing the system

Some of safeguards agreements were accompanied by special legal instruments called protocols, which, due to the panoply of issues they cover, deserve a separate examination.

Protocols may be classified into two groups depending on their relations with the main agreement. The first group comprises most of the protocols except for two types described in continuation. These protocols may be considered as "treaties" pursuant to Article 2(1)(a) of the Vienna Convention on the Law of Treaties ("the VCLT"). Although subsidiary to safeguards agreements, protocols of this group have independent character and are subject to independent ratification. The second group consists of protocols that are integral part (or, following the wording of Article 2(1)(a) of the Vienna Convention, "related instruments… whatever its particular designation") of correspondent safeguards agreements. In this group there are Co-operation Protocols with ABACC, Euratom and Japan, and Protocols to the VOAs with the USA, France and the UK.

The protocols may also be classified depending on the type of safeguards agreements in relation to which they were adopted. All protocols except two (Suspension Protocols and Additional Protocols) relate exclusively to NPT Safeguards Agreements.

Lastly, some of protocols are temporary by nature. Those that apply indefinitely concentrate mainly on completing and avoiding duplications of safeguards activities, and on supporting and strengthening safeguards.

3.1. Temporary protocols to safeguards agreements

a. Suspension protocols

Some countries that concluded safeguards agreement pursuant the NPT obligations had already had a safeguards agreement or agreements in force. INFCIRC/153/ (Corr.) foresaw such a possibility and thus contained a special provision in that regard. In particular, Paragraph 24 of the document provided for a suspension of other safeguards agreements as long as the safeguards agreement, comprehensive by its scope, is in force.

As described earlier in this research, the pre-NPT safeguards agreements could be in form of a project agreement, unilateral submission agreement, a transfer agreement or a trilateral safeguards agreement. Therefore, the practical realisation of Paragraph 24, cited above, was twofold. On the one hand, in cases where there were only two parties to an agreement, namely the State and the IAEA, there was no need to conclude any additional agreement. On the other hand, the suspension of an agreement was to be officially documented when a third State was involved as a party to a safeguards agreement. The appropriate form was found in a Suspension Protocol, an agreement between three parties involving two States and the Agency. The basic provision of a Suspension Protocol stipulates that the application of safeguards, and not the whole safeguards agreement, in a State is suspended pursuant to the correspondent CSA.[77] Moreover, since the pre-existing safeguards agreement remains in force, its provision banning any military use of the safeguarded items thus remains in force too (IAEA, 1972c, Article 24).[78]

It should also be added that if a State has an NPT safeguards agreement in force and then joins the European Union, in general, and Euratom, in particular, the State should join the NPT safeguards agreement between the Agency, Euratom and a Member State (INFCIRC/193). Accordingly, in order to avoid the duplication, the State's own agreement should be suspended. However, no suspension protocol is then concluded;

[77] See, for example, *Protocol of Suspension of the application in Japan of the safeguards of the Agreement between the International Atomic Energy Agency, the Government of Japan and the Government of the United Kingdom of Great Britain and Northern Ireland for the Application of Agency's Safeguards in respect of the Agreement between those Government for Co-operation in the Peaceful Uses of Atomic Energy*. INFCIRC/125/Mod. 1, 1 March 1978. Article I (available at: https://www.iaea.org/sites/default/files/infcirc125m1.pdf), and *Protocol to Suspend the Application of Safeguards Pursuant to the Agreement between the International Atomic Energy Agency, the Government of Switzerland and the Government of the United States of America for the Application of Safeguards and Providing for the Application of Safeguards Pursuant to the Treaty on the Non-proliferation of Nuclear Weapons and Pursuant to the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, Approved by the Board of Governors of the International Atomic Energy Agency*. INFCIRC/161/Mod.1, 1 December 1981, para. 1 (available at: http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/44/089/44089101.pdf).

[78] See also, for example, INFCIRC/161/Mod.1, para. 3, and *Protocol of 14 April 1975 Suspending the Agreement of 1 March 1972 between the International Atomic Energy Agency, the Government of Sweden and the Government of the United States of America for the Application of Safeguards and Providing for the Application of Safeguards Pursuant to the Non-Proliferation Treaty*. INFCIRC/165/Mod.1, para. 2 (available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1975/infcirc165m1.pdf).

rather, the suspension is recorded as a modification of the State's safeguards agreement.[79]

b. Protocols on financing safeguards

Protocols with regards to financing of safeguards were concluded in respect of NPT safeguards agreements, which were signed between 20 April and 27 September.[80]The Protocol was of a temporary nature for the following reason. On 20 April 1971 the Board endorsed the arrangements for the financing of safeguards as proposed by the Safeguards Committee Section. However, it was for the General Conference to fix the scale of Member States' contributions towards the administrative expenses of the Agency, which was done on its closest, fifteenth, regular session on 27 September 1971 (IAEA, 1971d), (IAEA, 1971b). After this date, the Parties to a safeguards agreement with a protocol on safeguards financing would treat Article 15 ("Finance") of the agreement as "authentic and definitive".

c. Protocols on accession to the agreement between the Agency, the Euratom and its NNWSs members

Another Protocol, which was planned to be temporary by nature, was concluded with the Agency separately by Denmark, Norway and Ireland.[81] At the time they concluded their NPT safeguards agreements they all were candidates for membership in Euratom. Denmark and Ireland already were signatories of a Treaty of accession to Euratom, which was pending ratification, whereas Norway was still contemplating to become an

---

[79] See, for example, *The text of the Agreement, which was approved by the Agency's Board of Governors on 12 September 1990 and signed in Vienna on 13 November 1990, and of the Protocol thereto, between the Republic of Malta and the Agency for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons. Suspension*. INFCIRC/387/Mod.1, 23 May 2008 (available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1990/infcirc387m1.pdf), and *The text of the Agreement between the Republic of Slovenia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons. Suspension*. INFCIRC/538/Mod.1, 29 October 2007 (available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1997/infcirc538m1.pdf).

[80] See, for example, *The text of the Agreement, and the Protocol thereto, between the Republic of Finland and the Agency for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons*. INFCIRC/155, 27 October 1971 (available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1971/infcirc155.pdf), and *The text of the Agreement, and of the Protocol thereto, between the Republic of Austria and the Agency for the application of safeguards in connection with the Treaty on the Non-proliferation of Nuclear Weapons*, INFCIRC/156, 19 November 1971 (available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1971/infcirc156.pdf).

[81] (IAEA, 1973e); (IAEA, 1973d); and (IAEA, 1973g), respectively.

Euratom Member (Rainer & Szasz, 1993, p. 339). So, Paragraph I of these States' protocols to their NPT safeguards agreements stipulated that they should be replaced to NPT safeguards agreements between the Agency, the Euratom and its NNWSs Members once the three countries become Euratom Members and once the latter agreement entered into force "with a view to ensuring continued application of safeguards without interruption". Eventually, Denmark and Ireland became Members of Euratom. Therefore, NPT safeguards agreements of Denmark (with some exceptions including the Faroe Islands and, since 1985, Greenland) and Ireland were replaced by the Euratom Agreement upon its entry into force on 21 February 1977. Norway did not join Euratom, so the correspondent Protocol is still in force.

3.2. Protocols aimed at completing and avoiding duplications of safeguards activities

a. Co-operation Protocols with ABACC, Euratom and Japan

The Agency is the only body that operates safeguards on a global scale. However, it does not have an exclusive monopoly in this field. For example, ABACC, Euratom and Japan also established either multinational (the former two) or national safeguards systems (the latter). In order to avoid unnecessary duplication of the safeguards activities, the IAEA concluded with ABACC, Euratom and Japan protocols for cooperation and coordination with multinational or national inspectorates, which are an integral part of each Party's NPT safeguards agreement. All three protocols are similar in structure and, in particular, underline the importance of the IAEA's ability to reach independent conclusions concerning compliance with the correspondent safeguards agreement.

In case of ABACC, as previously described in the present study, the Quadripartite Agreement including a Protocol was signed. The Protocol consists of nineteen Articles which specify the arrangements for the co-operation between the Parties.

As provided in its Article 1, the Euratom Protocol amplifies the NPT Safeguards Agreement between the Agency, Euratom and its non-nuclear weapon States Members, and contains provisions concerning the co-operation in implementing safeguards systems in the manner that would eliminate duplication of the Agency's and Euratom's safeguards. According to Article 26 of the Agreement, the Protocol forms an integral

part of it; hence the same legal standing of both parts. The Protocol is examined in detail further in the present study.

Likewise, the Protocol to the Japan's NPT Safeguards Agreement contains the basis for the co-ordination of Japan's and the Agency's safeguards systems in order to avoid duplication of the two systems, safeguards previously examined in detail in the present study.

b. Protocols to the VOAs with the USA, France and the UK

The voluntary offer agreements concluded by three NWSs, France, the USA and the UK, each contain a protocol. The U.S. Protocol provides for cooperation in the conclusion of "transitional subsidiary arrangements" in respect of facilities that are included on the list of safeguarded facilities but not selected for inspections purposes. Under their Article 26, Protocols concluded by France and the UK should be considered an integral part of their respective NPT Safeguards Agreements. These Protocols have the same legal status and purpose as the Protocol to the NPT Safeguards Agreement between the Agency, Euratom and its non-nuclear weapon States Members, referred to above.

3.3. Supporting and strengthening safeguards

a. Small Quantities Protocol

Article III of the NPT requires each NNWS Party to the Treaty to accept safeguards. The provision does not distinguish between countries with well-established nuclear activities and those who have no significant nuclear activity. For the latter group of States, the requirement to take certain legislative and administrative steps while implementing the safeguards agreement would represent a disproportionate burden. So, in 1971 the Secretariat started negotiations on a protocol to the CSA with States that had notified the Agency about limited or no amounts of nuclear material in their possession or no nuclear material in nuclear facilities (IAEA, 2005a, para. 2). In 1974 the Secretariat developed a text of the so-called Small Quantities Protocol (the "SQP") (IAEA, 1974a) which was in force in 86 countries by 19 May 2017 (IAEA, 2017c). Paragraph I(1) provides that implementation of most of the provisions contained in Part II of the Agreement should "be held in abeyance" until the country starts having nuclear

material in facilities[82] or possesses quantities of nuclear material crossing the limits set out in Article 37 of INFCIRC/153/ (Corr.).[83] Since nuclear material cannot be issued in facilities in order for a State to qualify for a SQP, it is thus used at "locations outside facilities" ("LOF").[84] It should be emphasized that the State that concluded a SQP would still need to comply with obligations under Part I of a CSA, such as the obligation concerning the non-diversion of the safeguarded nuclear material to nuclear weapons or other explosive devices, the obligation to cooperate with the Agency in order to facilitate the implementation of the agreement, and the obligation to establish and maintain a SSAC. Furthermore, the provisions of a safeguards agreement concerning the following issues would still apply to the State:

- the structure of the State's SSAC and establishment of a unified inventory;
- re-application of safeguards on the exempted nuclear material if processed or stored with the safeguarded material;
- starting point of safeguards; and
- submission of information on design and on imports/exports of nuclear material (IAEA, 1972c, Articles 32, 33, 38, 41 and 90).

Should a State no longer qualify for a SQP, the SQP becomes automatically non-operational.

On the other hand, a SQP exempts the State from the obligation to submit an initial report on all nuclear material subject to safeguards in the State. Accordingly, the Agency would not be able to check this information and would thus be unable to verify

---

[82] Article 106 of INFCIRC/153/ (Corr.) defines "facility" as "(a) A reactor, a critical facility, a conversion plant, a fabrication plant, a reprocessing plant, an isotope separation plant or a separate storage installation; or (b) Any location where nuclear material in amounts greater than one effective kilogram is customarily used."

[83] The following limits for exemption were established, subject to a possibility of being further revised by the Board "for uniform application":
(a) One kilogram in total of special fissionable material, which may consist of one of more of the following: (i) Plutonium; (ii) Uranium with an enrichment of 0.2 (20%) and above, taken account of by multiplying its weight by its enrichment; and (iii) Uranium with an enrichment below 0.2 (20%) and above that of natural uranium, taken account of by multiplying its weight by five times the square of its enrichment;
(b) Ten metric tons in total of natural uranium and depleted uranium with an enrichment above 0.005 (0.5%);
(c) Twenty metric tons of depleted uranium with an enrichment of 0.005 (0.5%) or below; and
(d) Twenty metric tons of thorium.

[84] Under INFCIRC/540, a LOF is "any installation or location, which is not a facility, where nuclear material is customarily used in amounts of one effective kilogram or less". A similar term is used in Article 49 of INFCIRC/153/ (Corr.), where LOF is described as a location containing "nuclear material customarily used outside facilities".

that a State qualifies or continues to qualify for an application of the SQP. Moreover, the State was not obliged to provide the Agency with facility design information on a planned nuclear facility at an early stage. These issues were brought to the attention of the Board by the Secretariat,[85] further outlined by the Director General (IAEA, 2005a, para. 4) and, owing to these issues, the Board considered the SQP as "a weakness in the safeguards system" and was of an opinion that a decision to resolve the issues should be taken in a timely manner (IAEA, 2005m).

Accordingly, in 2005, the Board decided that the SQP should be modified insofar as it concerned both the prerequisites for a State to comply and its substantive requirements. So, on 21 February 2006 a revised version of the SQP was adopted which endorsed the recommendations made by the Director General in GOV/2005/33 (IAEA, 2006c). The novelty of the modified document provides consists in the following:

- for a State to be eligible for a SQP, it should have no planned or existing facility;
- the States is required to provide initial reports on nuclear material, and to provide early design information; and
- the State should allow the Agency's ad hoc inspections within its territory.

After the adoption of the modified SQP, the IAEA initiated an exchange of letters with each State with an original version of the protocol. The idea was twofold: on the one hand, the Agency was trying to convince a State to swap to the new version, on the other – a State was requested to rescind its SQP in case it no longer qualified for eligibility under the new criteria (IAEA, 2013e).

b. Additional Protocol

Although the document INFCIRC/153/ (Corr.) represented a considerable step forward in the development of safeguards, compared to the previous safeguards systems, it contained two fundamental flaws concerning proliferation risks. First, after conclusion of the agreement, a State party is required to provide the IAEA with the information concerning all nuclear material and all nuclear facilities, both existing ones and under construction. The completeness of the declaration depends in a large part on goodwill of

[85] The Safeguards Implementation Report for 2003, Report by the Director General, GOV/2004/32, para. 50: "For a State in which an SQP is implemented but which does not have an additional protocol in force, the Agency has only very limited means to evaluate any potential nuclear activities in the State which might need to be declared to the Agency, or to confirm that the State meets or continues to meet the conditions required for having an operative SQP."

the State. Thus the CSA entrusts the IAEA with verification that all declared nuclear material was not diverted from the peaceful uses ("correctness" of State declarations of nuclear materials). Even the paragraphs 18 and 19 of the document do not address "non-compliance", rather "non-diversion". The Director General Blix compared such situation to a person "looking for a lost key near a lighted street lamp who, when asked whether he was sure he had lost the key there, said 'No, but it's easier to look here'" (Rockwood, 2014). Secondly, the IAEA's power to discover undeclared activities ("completeness" of the State declarations) was limited. The IAEA comprehensive safeguards do not cover uranium mining and ore processing, only requiring general information concerning import-export of "any material containing uranium or thorium which has not reached the stage of the nuclear fuel cycle". Moreover, the CSA provides for IAEA's access to verify the design information, and for three types of inspections, namely ad hoc, routine and special ones, with only the latter being capable of accessing sites and materials beyond the State's declaration. However, as the Board concluded in 1992, special inspections are "only expected to occur on rare occasions," (Bunn, 2007, p. 52) so in practice they did not have much use and were seen as having "substantial accusatory and political overtones."

In the beginning of 1990s the following three events triggered a substantial change of the system. The first one occurred in Iraq. The IAEA had been aware of several declared nuclear facilities that comprised two research reactors located at Tuwaitha, a small fuel fabrication laboratory and a storage facility, and conducted routine inspections there (ElBaradei, 2011, p. 9). However, in the aftermath of the 1991 Gulf War a series of unreported nuclear activities throughout the country was revealed. The fact that Iraq's clandestine nuclear programme had been in place for a long time proved the theoretical safeguards system shortcomings reality.

The second event concerned a decision of South Africa to conclude a CSA with the IAEA in September 1991 and submit its initial declaration on facilities and nuclear material. The declaration did not contain any reference to the country's past nuclear weapons programme. South Africa provided the IAEA with historical accounting and operating records of enrichment plants and other facilities, which did not include any reference to conversion of "highly enriched uranium hexafluoride to uranium metal and further to weapon components" (Heinonen, 2014, p. 90). Later the IAEA General

Conference requested the IAEA Director General to "verify the completeness of the inventory of South Africa's nuclear installations and material and to report to the Board of Governors and to the General Conference" (IAEA, 1991c, para. 2). The IAEA's first verification report submitted to the General Conference in September 1992 did not reveal any indications of a weapons program. Therefore, the existence of the South Africa's nuclear weapons program had not been established before it was disclosed by President W. de Klerk in March 1993. After it, the Agency revised its verification measures in the country, albeit it apparently relied to a great extent on the co-operation of the State (Heinonen, 2014, p. 95)

The third event concerned inconsistencies that emerged between the Democratic People's Republic of Korea's ("DPRK") initial declaration, submitted in May 1992, and the IAEA's findings. According to Fact Sheet on DPRK Nuclear Safeguards, the Agency revealed a mismatch between "declared plutonium product and nuclear waste solutions and the results of the Agency's analysis," which suggested existence of undeclared plutonium. Trying to resolve the inconsistencies and to determine the completeness and correctness of the initial declaration, the IAEA requested additional information and access to two suspicious sites, but received refusal.

After the events in Iraq, the IAEA already started strengthening its safeguards process in order to verify not only correctness but also completeness of States' declarations. For example, in 1992 the Board conceived a universal reporting system under which States were expected to furnish to the Agency information on transfers of nuclear equipment and certain non-nuclear materials (IAEA, 1992c). Until the system was officially adopted, the Secretariat, "with the concurrence of the Board," invited Member States to voluntarily provide the Agency with information about "exports, imports, production and inventories of nuclear material and exports and imports of specified equipment and non-nuclear material, in addition to that required under existing safeguards agreements" (IAEA, 1993b), para. 2.

Should all the States comply, a genuinely "closed system" of nuclear accountancy would be created.

Furthermore, the Director General, Hans Blix, emphasized the Agency's "unequivocal right" to access to any sites that might require inspection, even at short notice, with the UN Security Council backing and support if necessary (IAEA, 1991b, para. 16). The

UNSC, in turn, reiterated its support to the Agency in the Council President's declaration of 31 January 1992 made on behalf of its members:

> "The members of the Council will take appropriate measures in the case of any violations notified to them by the IAEA" (UN, 1992, p. 4).

The Board also reaffirmed the Agency's right to conduct special inspections "when necessary and appropriate" under safeguards agreements in order to "ensure that all nuclear materials in peaceful nuclear activities are under safeguards," emphasizing, however, that such special inspections should only occur "on rare occasions" (IAEA, 1992e, paras.48, 83, and 84). In general, special inspections are perceived as a tool of "last resort" and are reluctantly used by the Agency in the view of connotations of more than possible non-compliance. Some authors even suggest that, although the lack of formal use of the special inspections is not clear, "the situation appears to have become self-reinforcing, i.e. the longer the provisions were not used, the more they came to be regarded as being available only in very exceptional circumstances" (Carlson & Leslie, 2005, p. 1).

Furthermore, in the shadow of the Iraqi case, the IAEA Director General laid down several conditions he deemed essential if "the IAEA were to justify "a high degree of confidence" in its ability to uncover clandestine nuclear activities" (IAEA, 1991b, para. 16). Among them, there also was the access to information obtained through "national technical means." Two of these means were of particular interest: satellite imagery and environmental monitoring. In fact, satellite photographs provide to the IAEA by the USA played an important role in the discovery of two undeclared nuclear facilities in North Korea and helped determine the true size of Iraq's Tuwaitha nuclear site (Zak, 2002, p. 11). On the other hand, the environmental monitoring, or environmental sampling, means collection of samples from the environment with a view to analysing them for traces of materials that can reveal information about nuclear material handled or activities conducted. Environmental sampling was seen as "having promise with respect to the detection of undeclared activities (Pellaud & Hooper, 1995, p. 16).

In the meantime, in 1992, the Director General requested the Standing Advisory Group on Safeguards Implementation ("the SAGSI") to examine the implementation of Agency safeguards, in particular, addressing the issues of detection of undeclared

facilities and activities, and of the use of alternative safeguards approaches (IAEA, 1993a, para. 1). So, as a result, in 1993, following a Board of Governors' request to the Director General, the IAEA Secretariat launched "Programme 93+2" that aimed at elaboration of concrete steps for strengthening safeguards and improving its cost effectiveness within two years starting from 1993.

Accordingly, it took the Secretariat roughly two years to identify a list of strengthening and efficiency measures and propose them to the Board's consideration. The proposal contained two layers: the first one included measures that could be implemented within the existing framework while the second group of measures required complementary authority to be granted to the IAEA (IAEA, 1995a). The first group comprised the following:

1. Measures involving broader access to information:
    a. Provision of Expanded Declaration, which should include information on the SSAC or RSAC SSAC, and on present and planned nuclear activities (paras. 9-18);
    b. Environmental sampling, which the Agency may take "wherever and whenever [it] has a right of access to conduct inspections or design information verification visits" (paras. 19-21); and
    c. Improved analysis of information available to the Agency, enabling it to identify at an early stage activities inconsistent with the State's declarations (para. 22).
2. Measures related to physical access, consisting in no-notice inspections (para. 23). It has a legal basis in Paragraph 84 of INFCIRC/153/ (Corr.), enabling the Agency to carry out without advance notification "a portion of the routine inspections."
3. Measures for optimizing the use of the present system, including:
    a. Keeping in pace with safeguards technology advances, such as, for example, the use of non-destructive assay[86]and containment-surveillance equipment capable of operating in an unattended mode and remote transmitting of data (para. 29).

[86] Under the Safeguards Glossary, 'Non-destructive assay' is a measurement of the nuclear material content or of the element or isotopic concentration of an item without producing significant physical or chemical changes in the item.

b. Increased Co-operation with States and SSACs, including on granting multiple-entry visas for inspectors, accepting the inspectors' use of available systems (including satellite systems) for direct communication with the IAEA Headquarters, etc. (paras. 30-33).

The second group of measures requiring complementary legal framework are as follows:

1. Measures involving broader access to information:
    a. Expanded Declaration on the SSAC or RSAC, and on present and planned nuclear activities is to include more information, for example, on nuclear fuel cycle-related R&D not involving nuclear material, on the location and status of known uranium and thorium ore deposits and mines, etc. (paras. 40-45);
    b. Environmental sampling at the sites to which the Agency should have access by virtue of measures set out below (paras. 46-48).
2. Measures involving increased physical access:
    a. Broad access, i.e. access during routine inspections beyond strategic points to any location on the sites or LOFs and to other location specified in the Expanded Declaration (paras. 49-52).
    b. No-notice inspections to locations to which the broad access is granted (para. 53).
3. Measures for optimizing the use of the present system: Increased Co-operation with States and SSACs which is not possible under the existing legal framework (para. 54).

As described earlier, under the CSA the Agency lacked any legal leverage to obligate a State to provide necessary information save through reluctantly used special inspections. The Board concurred with the Secretariat's opinion to implement the first part measures at an early date and entrusted it with development of a new legal instrument in order to implement measures from the second part (Rockwood, 2010, p. 253). In fact, on 26 February 1992 the Board already adopted a Director General's recommendation (IAEA, 1992d) on the early provision of design information concerning new interpretation of paragraph 42 of the CSA, which states that the design information should be provided by a State "as early as possible before nuclear material

is introduced into a new facility." The new interpretation required provision of such information as soon as the decision to construct, authorise construction or to modify a facility has been adopted, or the design is developed. The decision was formalised through the modification of existing Code 3.1 of the General Part of Subsidiary Arrangements (prescribed by the CSA agreements between a State and the IAEA detailing implementation of the safeguards agreement), which previously prescribed submission of the design information 180 days before nuclear material was introduced into a new facility.

In 1995 the Secretariat's view was that the complementary authority should be on "a firm legal basis," but the form of this basis was not yet defined and ranged from "an extension of the subsidiary arrangements, an exchange of letters, or a protocol to the safeguards agreement," depending on the choice of each State (IAEA, 1995a, para. 38). Nevertheless, in the following 1995 and 1996, in consultation with the Agency's Member States, the Secretary elaborated a draft model of a protocol additional to a safeguards agreement. The draft served as a basis document for the work of the Committee on Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System ("Committee 24"), an open-ended body established by the Board on 14 June 1996 (IAEA, 1996b, para. 17). During the final, fourth, session on 2-4 April 1997, the Committee agreed on the text of a draft Model Protocol Additional to Safeguards Agreements (GOV/2863) to be submitted to the Board (IAEA, 1997b, para. 16).

In a special session on 15 May 1997 the Board of Governors approved the document as a new mechanism enhancing efficiency and effectiveness of the comprehensive safeguards system, known as "The Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards".

This Additional Protocol ("AP") has eighteen articles and two annexes, which are "an integral part thereof' (IAEA, 1997a, Article 16(a)). The AP complements the CSA and establishes that in case of conflict its provisions prevail over those of the CSA (Article 1). The AP generally follows the lines of the Report by the Director General (GOV/2807), referred to above, covering three areas, as described below. The first two areas comprise broader scope of information that States should provide to the IAEA and

broader access rights for the IAEA and its inspectors. The AP expands the scope of safeguards to the whole nuclear fuel cycle, expanding it beyond nuclear material and facilities containing it, as required by INFCIRC/153/ (Corr.). So, the State is obligated to:

- provide the Agency with all information and grant complementary access to all nuclear-related facilities, including uranium mines, uranium and thorium concentration plants and any other location outside the facility where nuclear material is customarily used;
- provide information on, and possibility for inspection of, nuclear fuel-cycle related research and development ("R&D") not involving nuclear material;
- submit information on further processing of intermediate and high-level waste containing already not under safeguards, on imports and exports of certain quantities of uranium and thorium, specified equipment and non-nuclear material; and
- furnish information on State's general plans for the ten-year period concerning the development of the nuclear fuel cycle. (IAEA, 1997a), Article a. (i)-(x).

The AP also broadens the access rights, which were generally confined to "strategic points" by INFCIRC/153/ (Corr.). The AP thus guarantees a "complimentary access" of IAEA inspectors to any location on a nuclear site, to mines or to "nuclear cycle-related locations" even if there is no nuclear material present. The reason for such access should be the need for inspectors to "assure the absence of undeclared nuclear material and activities," clarify a question related to "the correctness and completeness of the information provided pursuant to Article 2 or to resolve an inconsistency relating to that information" (Article 4 b. (i)-(ii)).

Article 4 of the document establishes that a notice for complementary access must be given 24 hours in advance, save the cases when access is sought in conjunction with design information verification, ad hoc or routine inspections on that site. In that case the period of advance notice shall be at least two hours or, in exceptional circumstances, less (4 b. (i)-(ii)).

In order to conduct the verification of the absence of undeclared nuclear material and activities, Agency inspectors have the authority to carry out "location specific" and

"wide area" (i.e. beyond locations) environmental sampling (e.g., air, water, vegetation, soil, smears) at any site specified by the Agency (Articles 5(c) and 9).

The third area covered by the AP is the simplified administrative procedures related to the effective implementation of safeguards. The correspondent provisions include the following:

- the simplification of the procedure for designation of IAEA inspectors, which applied the rule of presumed consent: a State should expressly reject the candidature of an inspector approval by the Board (Article 11);
- the issuance of multiple entry/exit and, if needed, transit visas (Article 12); and
- use of internationally established systems of communications by Agency inspectors in a State for communicating with the Agency Headquarters or Regional Offices (Article 14).

A State's adoption of the AP is voluntary, save in case of the State's accession to the Semipalatinsk Treaty, described above. Furthermore, it may be concluded not only in relation to a CSA, but also in relation to an item specific safeguards agreement. Currently, the AP is in force in respect to 129 States and one "other Party" (Euratom) (IAEA, 2016i).

As previously examined in the present study, the Agency generally draws conclusions on a State's fulfilling its safeguards obligations. In case of the AP, the Agency may or may not draw a broader conclusion. In the former case, the conclusion will be as follows:

> "The Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for this States, all nuclear material remained in peaceful activities."

In the latter case, the conclusion will be formulated differently:

> "The Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities. Evaluations regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities."

4. The IAEA's own efforts to strengthen safeguards

As previously described in the present study, the discovery of the clandestine nuclear weapons programme in Iraq in 1991 and subsequent cases of North Korea and South Africa During the 1990s, pushed the IAEA Secretariat to act in two dimensions. On the

one hand, the Agency involved its Member States in elaborating additional legal authority, which resulted in the Model Additional Protocol (INFCIRC/540). On the other hand, the Agency kept confirming its right and obligation to verify the completeness of information provided by a State through mechanisms already available in under existing safeguards agreements. Accordingly, the Agency started adopting an approach based on evaluation of a State's nuclear activities as a whole, rather than focusing on individual nuclear facilities.

The said approach did not entail adoption of a new legal mechanism; rather, it was translated into four concepts of planning, implementation and evaluation of strengthened safeguards, which are not separate but intermingled: information-driven safeguards, integrated safeguards, state-level approach (SLA), and state-level concept. They are described below.

Previously, the Agency generally used two types of information sources: a) information supplied by a State under its CSA (e.g. nuclear material accounting reports), AP (e.g. declarations), or voluntarily (e.g. reports); and b) data obtained from IAEA verification activities, including inspections results, design information verification, and complementary access under the AP. The information-driven concert implied making use of information from "all sources available to the Agency, including the public media, scientific publications and existing Secretariat databases… as well as other information made available by Member States" (IAEA, 1995b, para. 56(iii)). Armed with the fullest possible information about the State's nuclear programme, the IAEA would be capable of developing a physical model, or "proliferation critical path," describing all known combinations of processes for "the production of weapons-usable material and weaponization" (IAEA, 1995c), para. 58.

For States that have both a CSA and an AP in force, the IAEA has developed a concept of "integrated safeguards" (the "IS"). The IS "denoted the optimum combination of all safeguards measures available to the Agency under comprehensive safeguards agreements and Additional Protocols which achieves the maximum effectiveness and efficiency within available resources in fulfilling the Agency's right and obligation in paragraph 2 of INFCIRC/153 (Corr.)" (IAEA, 2000b, para. 2). In other words, the IS meant that the AP would "no longer simply be "layered" on top of existing measures but integrated synergistically" (Boureston & Feldman, 2007, p. 10), thereby increasing

efficiency and effectiveness. A specific IS approach is developed for each State that has both a CSA and an AP in force and implemented if the Secretariat has been able to draw the Broader Safeguards Conclusion that, for a given year, "all nuclear material of the State remained in peaceful activities."

That basis would reassure the IAEA that it can reduce the State's routine safeguards burden, although keeping implement measures to verify the non-diversion of declared nuclear material. If, afterwards, the Agency were not able to keep the conclusion, certain corrective actions would need to be taken, including restoration of traditional-level safeguards activities alongside the measures under the additional protocol, if needed. In sum, the CSA and the AP taken together seem to provide a complete outlook on a State's ongoing and future nuclear programme. The combined mechanism strengthens the IAEA's ability to draw the conclusion that all nuclear material in the State has been declared. It also encompasses procedures to detect indicators of undeclared nuclear material and nuclear activities, or indicators of diversion or intended diversion of nuclear material.

Under the SLA, safeguards focus on a specific State as a whole, consider all relevant information on all nuclear material, nuclear installations and nuclear fuel cycle related activities of the State, and enable the IAEA to "draw and maintain a conclusion of the absence of undeclared nuclear material and activities in that State" (IAEA, 2001, p. 19).

The SLAs were developed under the "state-level concept" (SLC), the term used for the first time in 2005 in the Director General's Safeguards Implementation Report on safeguards operations in 2004 (IAEA, 2005b, para. 68). The SLC described safeguards implementation that was based on SLA developed using safeguards objectives common to all States with CSAs and taking State-specific factors into account. On the surface, the Agency's sticking to the SLC might look like a breakaway from the principle of safeguards objectiveness resulting from non-discriminating use of purely technical measures. Indeed, this concern was voiced during the IAEA General Conference in 2012 by representatives of several countries. For example, a Russian representative stated that the "notion of a State-level approach to safeguards appeared to be increasingly infused with political considerations" (IAEA, 2012b, para. 31), and suspected that state-level safeguards approaches developed by the Secretariat "behind closed doors" were able to introduce political and subjective considerations into what

should be a "non-political and objective exercise" (IAEA, 2012a, para. 40). Accordingly, the Russian proposal was that, since the structure and content of CSAs required approval by the Board, any changes to the safeguards concepts should also require the Board's approval (IAEA, 2012a, para 51). Similarly, a representative of Iran insisted that the Agency should "remain a technical body, whereas use of the State-level concept carried with it the risk of politicizing the Secretariat's safeguards activities" (IAEA, 2012a, para. 39). At the same time, the UK and the USA were of the opposite opinion, emphasising that the SLC did not require any change to the legal basis of safeguards, and that the SLC was not "new or radical" and the information about its development was provided to Member States (IAEA, 2012a, paras. 49 and 53).

In view of the above, the Director General prepared a report called "The Conceptualization and Development of Safeguards Implementation at the State Level," in a supplementary document to which he concluded that the implementation of safeguards in the context of the SLC did not entail any additional rights or obligations for either a State or the Agency, nor any modification of existing rights and obligations under CSAs or APs (IAEA, 2014f, para. 11). The SLC is applicable to all States, although, at the beginning, the SLC was used in respect of States with the IS, but the Agency planned to extend the SLC to all states subject to a CSA (IAEA, 2005b, para. 68). In 2014 the IAEA informed Member States it would progressively develop and implement SLAs (and thus the SLC) for States with CSAs in force without an AP, for States with item-specific safeguards agreements in force, and for States with VOAs in force (IAEA, 2014f, para. 196).

II. IRAN'S CASE AND THE EVOLUTION OF SAFEGUARDS

1. Implementation of Safeguards in Iran until 2003

1.1. Iran joins the international safeguards regime

The "Atoms for Peace" speech of the USA, previously described in Part I of the present study, set in motion the creation of the program of the USA nuclear assistance to the developing states. The USA provided "research reactors, fuel and scientific training to developing countries wanting civilian nuclear programs," receiving in exchange the recipient states' commitment to only use the transferred technology and education for peaceful, civilian purposes (Rowberry, 2013). Iran was one of such recipient states after it concluded a bilateral agreement with the USA on 5 March 1957, desiring "to pursue a research and development program looking toward the realization of the peaceful and humanitarian uses of atomic energy" (UN, 1957, fifth Recital of the Preamble). Under Article IV(2) the USA undertook to lease Iran six kilograms of enriched uranium. Article IX(b) required that Iran, in return, should not use the transferred items for the "development of atomic weapons or for any other military purposes." In addition, under Article VIII.1 Iran undertook to place under safeguards special nuclear materials received, and reactor materials purchased, from the USA. The Parties further agreed to exchange information on design, construction, and operation of research reactors (UN, 1957, Article III.1(a)).

Signing of the USA-Iran agreement was the moment of establishment of Iran's civil nuclear program (Bruno, 2010). Iran also became a member of the IAEA on 16 September 1959.Economic arguments were one of the justifications for the development of nuclear energy, the fact reflected in the Shah's 1960 statement published in New York Times on 17 May 1962:

> "The oil we call the noble product will be depleted one day. It is a shame to burn the noble product for the production of energy to run factories and lighthouses. About 70,000 products can be derived from oil. We plan to get as soon as possible, 23,000 MW(e) from nuclear power stations. Added to the electricity generated by our dams, this will give us one of the highest per capita supplies in the world" (Patrikarakos, 2012, p. 26).

However, the nuclear move did not gain momentum for a prolonged time. Initially, Iran's capacity was limited to a 5 MW light-water Tehran Nuclear Research Reactor ("TRR"), which moreover stood idle in Tehran University until late 1960s owing to the country's "limited scientific establishment" (Patrikarakos, 2012, p. 16). Finally, in November1967 the TRR started operating, having been fuelled by uranium enriched to 93 %, transferred to Iran by the USA with the assistance of the IAEA (UN, 1967a). It is remarkable that the contract of transfer did not include any provision concerning safeguards of the delivered uranium and plutonium. In 1968 the Atomic Research Centre affiliated to Tehran University was opened (Patrikarakos, 2012, p. 17).

In 1970Iran ratified the NPT, and thus on 19 June 1973 it concluded a comprehensive safeguards agreement with the IAEA, which entered into force on 15 May 1974 (IAEA, 1974b). The Agreement generally followed the lines of INFCIRC/153/Corr. Accordingly, Iran accepted the obligation to use nuclear energy exclusively for peaceful purposes and to allow application of safeguards on nuclear material in all nuclear activities "for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices" (IAEA, 1974b), Article 1. On the other hand, the IAEA undertook to verify the correctness of Iran's declarations concerning the nuclear material subject to safeguards, including the types, quantities and location of the declared nuclear material. On 12 February 1976 Iran and the IAEA concluded Subsidiary Arrangements to the Safeguards Agreement,[87] the contents of which are, as a rule, confidential.

In 1974 Iran joined the Agreement on the Privileges and Immunities of the International Atomic Energy Agency (INFCIRC/9/Rev.2) (IAEA, 2016f, para. 3.1.2). The regulatory authority of Iran in the field of nuclear safeguards (as well as security) is the National Nuclear Safeguards Department.

Also in 1974 Shah Reza Pahlavi established the Atomic Energy Organization of Iran ("the AEOI") and set an objective to generate about 23,000 MW(e) of electrical power within 20 years through the construction of 23 nuclear power reactors and the development of a full nuclear fuel cycle (Davenport, 2015). To achieve that goal, Iran entered into negotiations and/or concluded the variety of contracts, in particular:

[87] This date was mentioned in the IAEA document "Communication dated 18 April 2007 from the Secretariat to the Resident Representative of the Islamic Republic of Iran," GOV/INF/2007/10, 18 April 2007, Attachment.

- A contract with Kraftwerk Union AG (a joint venture of Siemens AG and AEG Telefunken subsidiary of then-West Germany). The company was to construct two 1,294 MW(e) reactors at Bushehr (IAEA, 2016f, para. 2.1.1);
- An agreement with the French company Framatome, concerning the construction of two additional 900 MW(e) reactors (Iran Watch , 2012);
- A provisional agreement with the USA of 1974 concerning the supply of two nuclear power reactors and enriched uranium fuel and a 1975 broad trade agreement concerning the purchase of eight reactors and the supply of fuel for them (Patrikarakos, 2012, p. 42);
- Contracts with South African companies Nufcor and Rössing, concerning the supply of 13,000 tonnes of uranium between 1978 and 1990 (Patrikarakos, 2012, p. 44);
- An agreement under which Iran bought a 10 % share in a European consortium Eurodif (formed in 1973 by France, Belgium, Spain and Sweden) which operated a French uranium enrichment plant (ElBaradei, 2011, p. 118);
- Contracts related to laser enrichment. For example, under a contract of 1975 Germany was to establish of a laboratory to study the spectroscopic behaviour of uranium metal (IAEA, 2007f), footnote 1;
- An agreement with the Belgian company Belgonucleaire in respect of the construction of a 30 MW(e) research reactor (Joyner, 2016, p. 9);
- Several agreements with France and the U.S. concerning the training of personnel (Patrikarakos, 2012, pp. 46-47).

The country also had plans to develop indigenous nuclear programme, in particular, at the premises of the Isfahan Nuclear technology Centre (Patrikarakos, 2012, p. 47).

1.2. Breakdown

a. Halt and resumption of nuclear programme

The following events had a substantial impact on the further development of the Iran's nuclear programme in late 1970s-1990s. The first of them was the Iranian Revolution of 1979, following which Iran's relationship with the West significantly deteriorated, including the complete severance of the US-Iran relations. As a result, most of the Iranian nuclear projects were halted. The second event was the eight-year war with Iraq,

which lasted from 1980 to 1988 and "permanently altered the course of Iranian history" (Venter, 2005, p. 45). In particular, the prolonged war consumed the country's resources and negatively impacted Iran's existing nuclear infrastructure, including partial destruction of the unfinished reactors at the Bushehr site, which forced Siemens to abandon the project (Islamic Republic News Agency, 2004).

The Iran's nuclear programme revived under the presidency Akbar Hashemi Rafsanjani in the late 1980s, and in 1990 it started to move forward (Iran Watch , 2012). Owing to the severance of ties with Western countries, Iran's option, apart from developing the nuclear technology indigenously, was to rely on assistance from other nuclear countries, such as Russia, China, Argentina and Pakistan. For example, Iran and China signed an umbrella protocol on peaceful nuclear the complainant-operation in June 1985, which had a broad list of the complainant-operation fields, covering, among other things, the supply of materials and equipment, and the provision of training (Medeiros, 2009, p. 59). In 1995 Iran signed a protocol of the complainant-operation with Russia in order to complete the reactor construction at the Bushehr site and possibly supply a uranium enrichment plant (Iran Watch, n.d.). The Russian side was also prepared to supply Iran with three more reactors (Evstafiev, 1998). Furthermore, in 1993 the Argentina's Applied Research Institute converted the TRR to use uranium enriched to 20 % level, pursuant to the 1987 agreement (ISIS, n.d.). Argentina also delivered 115 kilograms of fuel for it. Lastly, in 2007 Iran furnished to the IAEA information concerning its yet undeclared research and development activities that the country carried out in 1987-1993 on the P-1 centrifuge design and components obtained from Pakistan (IAEA, 2007f, para. 25).

b. First U.S. sanctions and IAEA special visits

On the other hand, the USA imposed a series of sanctions against Iran, with some of them having a direct impact on the country's nuclear programme. In particular, on 23 January 1984 the U.S. Secretary of State designated Iran a "state sponsor of terrorism" following the October1983 bombing of the U.S. Marine barracks in Beirut, Lebanon, which killed 200 people (Katzman, 2017, p. 3). The bombing was carried out by elements that later became Hezbollah. The designation of Iran as a terrorism sponsoring state triggered a range of sanctions under the U.S. legislation, namely Section 6(j) of the Export Administration Act of 1979 (P.L. 96-72, as amended), among

them being the restrictions on sales of U.S. dual use items to Iran. Moreover, on 29 October 1987, U.S. President Reagan implemented Executive Order 12613, which imposed a ban on U.S. imports of Iranian crude oil and all other Iranian imports (USA, 1987).

In 1992 the U.S. Congress passed the Iran-Iraq Arms Non-proliferation Act (USA, 1992) prohibiting the transfer of controlled goods or technology that might contribute "knowingly and materially" to Iran's proliferation of advanced conventional weapons.

On 5 August 1996 the USA Congress adopted the Iran-Libya Sanctions Act (or "Iran Sanctions Act"), that penalised foreign and U.S. investment exceeding 20 million U.S. dollars in Iran's energy sector in one year with an objective of "denying Iran the financial means to sustain its nuclear, chemical, biological, and missile weapons programs" (USA, 1996**,** Section 2 Findings, para. 2).

Already in 1991 the USA National Intelligence Estimate concluded that Iran was developing a nuclear weapons capability and that "Iran's nuclear program is disorganized and only in an initial stage of development" (Sciolino, 1991).

In reply to such allegations, the President of the AEOI Reza Amrollahi agreed, in addition to routine monitoring activities under the CSA, to allow the IAEA to conduct a visit to any nuclear-related locations in the country in order "to familiarize itself with the current status of the Iranian Nuclear Research and Development Programme" (IAEA, 1992b). In total, four such special visits followed. It is remarkable that "the visits" were not conducted in the framework of routine inspections or even special inspections, since the places to be visited had been previously selected by the Agency and accepted by Iran.

The first visit of a IAEA team took place on 7-12 February 1992 and included the following locations: the Esfahan Nuclear Technology Centre, the Tehran Nuclear Research Centre and the Karaj Agricultural and Medical Research Centre, "the site of a uranium exploration project at Saghand in Yazd Province and a facility under construction in the mountains north of Tehran near Mo'Allem Kalayeh" (IAEA, 1992b). It is worth emphasising that most of these locations were not under safeguards since routine safeguards inspections related to the CSA were to be carried out only in respect of the TRR (IAEA, 1992b). As a result of the visit, the Agency concluded that the above-mentioned facilities and sites were "consistent with the peaceful application of

nuclear energy and ionizing radiation," however, adding that those conclusions were "limited to facilities and sites visited by it and are of relevance only to the time of the Team's visit" (IAEA, 1992b).

Following the Iran's representative's speech at the IAEA General Conference, where he underlined the country's commitment to the peaceful nature of its nuclear programmes (IAEA, 1993c, para. 103), Iran allowed a second visit of a IAEA team to the facilities in Esfahan, Karaj and Tehran. This time the visit was based on the information furnished by the USA which, in turn, had received it from an Iranian opposition group based in Baghdad called the People's Mojahedin (Skootsky, 1995). The outcome of the visit was the IAEA's report which stated that the officials found no evidence which was inconsistent with Iran's declaration that all its nuclear activities were peaceful" (Ronen, 2010, p. 43). In addition, Iran allowed foreign journalists and non-governmental organisations, including the Federation of American Scientists, to visit all sites previously visited by the IAEA team, which found no activities inconsistent with peaceful nuclear uses (Zak, 2002, p. 21).

The third visit to Iran was conducted on 20-21 July 1997 by the Director General Hans Blix at two new research centres of Bonab and Ramsar, during which no undeclared nuclear activities were found (Associated Press, 1997). The fourth visit was carried out in May 2000 by the next Director General, Mohamed ElBaradei, at the Bushehr nuclear power plant, which was still in construction and thus not under the CSA. ElBaradei concluded that Iran's nuclear programme was peaceful and complied with international regulations (Zak, 2002, p. 22).

Later, on 3 July 2001, the IAEA Director General also made a statement that the Agency had not seen "any violation of [Iran's] obligation under the Non-Proliferation Treaty" (NPR, 2001). However, during his State of the Union address, U.S. President George W Bush referred to Iran as "aggressively" pursuing weapons of mass destruction ("WMDs") and "exporting terror" (USA, 2002b). In its response delivered a week later, Iran reiterated it did not seek WMDs, rather it pursued disarmament; that it had an inalienable right to develop its nuclear, chemical and biological industries for peaceful purposes (UN, 2002). Therefore, it is the USA's deliberate campaign to deprive Iran of this right that should be considered as a violation of the non-proliferation regimes.

c. Export controls

Another dimension which was relevant to the Iran's nuclear programme, and was in focus of international attention, was the export controls. For example, during the 1995 NPT Review and Extension Conference, the UK delegation made a statement that export controls exclusively affect countries like Iran, "about whose ultimate intentions there were widespread doubts" (UN, 1995c, para. 36). Furthermore, at the G7 Summits of 1995-1997 contained the call on all states to avoid any collaboration with Iran which might contribute to the acquisition of a nuclear weapons capability.[88] In addition, in 1998 the G8 States called on Iran to "respect the international conventions or arrangements it has signed regarding the development of weapons of mass destruction" and urged "all states to avoid providing assistance to Iran that might contribute to its ability to develop these weapons or missile capabilities in violation of international conventions or arrangements" (G8, 1998), para. 41). Lastly, it should be mentioned that in July 1996 the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies entered into operation (WAS, 2017). The main purpose of this arrangement was to contribute to regional and international security and stability "by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing destabilising accumulations." Participating States therefore undertook to seek to ensure that transfers of these items do not contribute to the development or enhancement of military capabilities which undermine these goals, and are not diverted to support such capabilities. The Wassenaar Arrangement thus was designed to complement the existing controls of the NSG.

The Iran's reply was to reiterate that the Parties to the NPT which fulfilled their correspondent obligations should enjoy their inalienable right, pursuant to Article IV of the NPT, to have free access to research, production and use of nuclear energy for peaceful purposes without discrimination (UN, 1995c, para. 167).

[88] See, for example, G7 Summit 1995 in Halifax, Chairman's Statement, 17 June 1995, para. 19, (available at: http://www.g8.utoronto.ca/summit/1995halifax/chairman.html);G7 Summit 1996 in Lyon, Chairman's Statement: Toward Greater Security and Stability in a More Cooperative World, 29 June 1996, para. 3, (available at: http://www.g8.utoronto.ca/summit/1996lyon/chair.html); and G8 Summit 1997 in Denver, Comminiqué, 22 June 1997, para. 86 (available at: http://www.g8.utoronto.ca/summit/1997denver/g8final.htm).

The European Union also voiced its stance on the Iran issue. Subsequently, the EU became one of the most active participants of the negotiations process related to the issue. On 7 February 2001 the European Commission issued a recommendation to the European Council to develop closer relations with Iran on the basis of, among other things, strengthening the Common Foreign and Security Policy dialogue in the following areas: regional security, weapons of mass destruction, and nuclear proliferation (EU, 2001a). As a result, the European Parliament adopted a resolution advocating a two-tier policy for co-operation with Iran. The first element of the complainant-operation would comprise a critical dialogue to raise issues including nuclear, chemical and biological weapons of mass destruction. The second element would consist in starting initial the complainant-operation in certain fields, which would lay foundation to a further broader co-operation between the EU and Iran (EU, 2001b). On 17 June 2002 the EU Council requested the European Commission to start negotiations on an agreement related to trade and co-operation, which had to have links to separate instruments on political dialogue and counter-terrorism issues. Moreover, the EU encouraged Iran to adhere to international instruments relevant to non-proliferation (EU, 2002a).

1.3. The crisis

The whole timeline of the Iran's case, from 2002 to the moment when the JCPOA was agreed, comprises several consecutive periods. The first period terminated in 2003 when Iran agreed to implement the AP and the modified Code 3.1. The second period lasted before the Iran's case was referred to the United Nations Security Council ("the UNSC") on 4 February 2006 and Iran stopped implementing the two previously referenced instruments. The third period ended in 2013 with the signing of the Framework for Cooperation Agreement between the IAEA and Iran, and adoption of the Joint Plan of Action between Iran and the P5+1 countries (China, France, Germany, Russia, the United Kingdom, and the United States), which both provided the IAEA with an access to broader information concerning the Iran's nuclear programme. Finally, the fourth period culminated in adopting the JCPOA on 14 July 2015. Throughout the whole period Iran was bound by its commitments under the CSA.

a. First period (2002-2003)

i. Iran's clandestine nuclear programme

In mid-2002, according to then Director General Mohammed ElBaradei, the Agency began receiving information about the construction of a possible nuclear-related site in the town of Natanz (ElBaradei, 2011, p. 112). Later on 14 August the National Council of Resistance of Iran ("the NCRI"), a Paris-based Iranian opposition group, held a press conference in Washington. According to the NCRI, Iran was conducting a range of secret nuclear programmes, which included a nuclear fuel production plant and a research laboratory in Natanz and a heavy water reactor in Arak (Jafarzadeh, 2002). The NCRI further declared that that the AEOI was using a number of front companies in order to facilitate its contacts and deals with foreign companies through unofficial channels. Subsequently, the NCRI revealed additional information on another site that could be used for uranium enrichment.[89]

The press conference gave birth to the so-called "Iran's case" that generated more than 50 reports by the Director General to the Board and the Security Council, as well as number of oral reports, technical briefings and string of bilateral and multilateral meetings.

In addition to the NCRI press conference, in December 2002 CNN showed satellite pictures of the facilities in Natanz and Arak, from which the USA made conclusion that, taking into account the circumstances of the particular nuclear sites, Iran's nuclear programme was "not peaceful and was certainly not transparent" (USA, 2002a).

After the public revelation of its possible non-compliance with the obligations under its CSA, Iran's representative stated that Iran:

- had always condemned the possession of WMDs;
- had always maintained strong ties with the IAEA and had "submitted all its nuclear activities to the Agency's supervision," thus ensuring complete transparency in Iran's nuclear activities; and
- was embarking on a long-term plan to construct nuclear power plants with a total capacity of 6000 MW(e), and the associated fuel cycle, safety and waste

[89] (IAEA, 2003), para. 10: the Report refers to "open source reports."

management technologies, within two decades. The "technologically advanced Member States" were invited to take part in it (IAEA, 2002b, paras. 99 and 100).

Later in February 2003 President of Iran Khatami announced his country's plans to extract uranium from mines 200 km off the city of Yazd, and to set up ore processing plants in Esfahan and Kashan (near Natanz). The President added that Iran needed to complete the nuclear fuel cycle from uranium mining to managing spent fuel in order to produce electricity from its nuclear power plants (IRNA, 2003). It was considered that, complementing the existing uranium Gchine mine, the Saghand mine was a key element for Iran's independence in producing nuclear fuel (Iran Watch , 2012).

ii. Response

The IAEA, in turn, first sought to resolve the issue diplomatically and through the inspections and visits. Iran agreed to a visit to the Natanz and Arak sites to be carried out by the Director General and accompanying safeguards experts (IAEA, 2003f, paras. 3-4). However, an inspection to which Iran had agreed for October 2002 did not take place until February 2003 after "a long list of excuses" (ElBaradei, 2011, p. 113). From that moment, the IAEA started its verification of Iran's "undeclared programme" (IAEA, 2004b).

So, on 21-26 February 2003 the Director General and other officials carried out visits to the two sites in Iran. The results of the visits were included by the Director General in his report to the Board of 6 June 2003 on implementation of the NPT Safeguards Agreement in Iran (IAEA, 2003f). It was the first written report of the DG on the "Iranian case." The following parts of the report are of particular interest for the present study. First, the Director General was officially informed by the Iran's authorities of the existence of a pilot fuel enrichment plant ("the RFEP") and a large commercial-scale fuel enrichment plant ("the FEP") in Natanz (IAEA, 2003f, para. 5). Iran also confirmed the ongoing construction of a heavy-water production plant in Arak, notwithstanding the fact that heavy water production facilities are not considered nuclear facilities under a CSA and are thus not required to be declared to the Agency (IAEA, 2003f, para. 5). Moreover, Iran acknowledged not having declared the import of 1,800 kg of natural uranium occurred in 1991, and facilities and ways of its subsequent storage and processing (IAEA, 2003f, para. 7).

The Report also referred to other issues not raised during the visit, such as failure to provide information on updated design information for the Molybdenum, Iodine and Xenon Radioisotope Production Facility and the TTR, and on the waste storage at Esfahan and at Anarak (IAEA, 2003f, para. 32). Furthermore, the report stated that in a letter dated 5 May 2003 Iran had informed the Agency for the first time of its plans to construct a heavy water 40 MW(th) research reactor at Arak and to start construction in 2003 of a fuel manufacturing plant at Esfahan (FMP) (IAEA, 2003f, para. 10). Lastly, another reported issue was the possible enrichment activities at the workshop of the Kalaye Electric Company in Tehran. Having acknowledged that the workshop had been used for the production of centrifuge components, Iran, however, stated that there had been no operations on centrifuge enrichment development with the use of nuclear material (IAEA, 2003f, para. 8). Since no nuclear material was used in the centrifuges, those activities were not covered by the safeguards; hence, the issue was not included as failure into the assessment part of the Report. The Agency, however, asked for permission to send Agency inspectors to the workshop and to take environmental samples "to assist the Agency in verifying Iran's declaration and confirming the absence of undeclared nuclear material and activities" (IAEA, 2003f, paras. 8, 11 and 34(b)).

Such visit of IAEA experts occurred on 7-13 June 2003. During the visit, the environmental sampling revealed possible presence in sites in Iran of high enriched uranium ("HEU"), to which Iran provided an explanation that some imported centrifuge components had arrived already contaminated (IAEA, 2003e, para. 36).

It is remarkable that the Director General did not employ the term "non-compliance", rather "failures" in his first report. The possible reason for that might be that the Director General considered the failures as not significant for setting in motion the whole mechanism of response to non-compliance. Furthermore, Iran showed the signs of co-operation with the Agency, and its "policy of transparency," remarked by the Director General (IAEA, 2003f, para. 8), was a basis for obtaining the valuable information on its nuclear activities. For example, in a letter of 19 August 2003 Iran acknowledged having conducted uranium conversion experiments in early 1990s, which had not been reported to the IAEA under the country's Safeguards Agreement. This came in contradiction with its previous statements that no activities in respect of

research and development of the conversion had used nuclear material (IAEA, 2003e, paras. 14-15), (IAEA, 2003, Annex I, para. 6).

On 18-19 June 2003 the Board examined the first Report of the Director General. It eventually shared the DG's views reflected in it concerning a number of failures to report certain activities as required by Iran's CSA (IAEA, 2003h, paras. 52-58). In particular, the Board urged Iran to promptly address the safeguards issues identified in the Report and resolve the open questions. For those purposes, and in order to create the necessary confidence in the international community, the Board expected Iran to grant the IAEA all access deemed necessary by the latter. The Board also encouraged Iran, as a confidence-building measure, not to introduce nuclear material at the RFEP, pending resolution of related outstanding issues.

The second Report of the Director General to the Board on implementation of the CSA by Iran was produced on 26 August 2003 (IAEA, 2003e) and raised a number of questions about the nuclear activities previously not declared by the country. In particular, according to the Report, the results of environmental sampling carried out in the chemical traps of PFEP at Natanz indicated the presence of high enriched uranium particles, which "was not consistent with the nuclear material declarations made by Iran" (IAEA, 2003e, para. 5). Secondly, Agency inspectors had reported that Iran undertook extensive modifications of the premises at the Kalaye Electric Company workshop since the last visit, which might "impact on the accuracy of the environmental sampling and the Agency's ability to verify Iran's declarations about the types of activities previously carried out there" (IAEA, 2003e, para. 32). Thirdly, the Director General also pointed out the inconsistency of the country's statement with the previous ones (IAEA, 2003e, para. 72). Lastly, the report stated that Iran first had introduced UF_6[90] into the first centrifuge for the purpose of single machine testing, and later on had begun the testing of a small ten-machine cascade with UF_6 (IAEA, 2003e, para. 33). On the other hand, the Director General reported that Iran had demonstrated an "increased degree of co-operation" in respect of the amount and details of information provided, the access allowed to additional locations and the environmental sampling allowed (IAEA, 2003e, para. 52). The Director General nevertheless added that the procedure of

[90] The material of which fuel for certain nuclear power reactors is produced (IAEA, 2001, p. 19).

provision of information and allowing the access was sometimes "slow in coming and incremental" (IAEA, 2003e, para. 52).

On the basis of the two DG's reports, the Board adopted, without a vote, resolution on 12 September 2003 (IAEA, 2003d). Apart from the calls on Iran to provide accelerated co-operation and full transparency with the Agency, and to avoid any further failures in reporting material, facilities and activities pursuant to the CSA, the resolution:

- called for the suspension of all further uranium enrichment activities;
- as a confidence-building measure, called for the suspension of any reprocessing activities, pending, the Director General's assurances that the country's nuclear activities had all been declared and pending satisfactory application of the provisions of the additional protocol;
- established the deadline of two months for Iran to "remedy all failures identified by the Agency and co-operate fully with the Agency to ensure verification of compliance with Iran's CSA, with the list of relevant provided (IAEA, 2003d, paras. 1-4).

Iran, however, retorted by arguing that in the years prior to the Board's Resolution, it had been subject to severe sanctions and export restrictions in respect of nuclear material and nuclear-related technology and equipment necessary for a peaceful nuclear programme, which pushed the country to exercise a certain amount of discretion (IAEA, 2003a). Furthermore, during the UN General Assembly later in the same year, Minister of Foreign Affairs of Iran rejected the calls for the suspension of certain nuclear activities by stating that Iran "will not give in to unreasonable, discriminatory and selective demands that go beyond the requirements of non-proliferation under existing IAEA instruments" (UN, 2003a). Meanwhile Iran reiterated that nuclear or other types of WMDs had no place in its defence doctrine and that the information the country provided to the Agency would be sufficient for it to verify that all Iranian activities were exclusively in the peaceful domain and in compliance with the country's obligations under the NPT and the CSA (UN, 2003b, p. 2). The country nevertheless suspended later in November same year, with immediate effect, all enrichment and reprocessing activities, operation or testing of centrifuges even without nuclear material, and the imports of enrichment-related materials (UN, 2003b, p. 2), and allowed the Agency to

fully supervise storage of all centrifuges during the suspension period (IAEA, 2004j, paras. 58-61).

In October 2003 Iran admitted some undeclared activities, such as carrying out limited testing of centrifuges at the Kalaye Electric Company between 1998 and 2002 using UF_6imported in 1991, a laser enrichment programme in place between 1991 and 2000 that had used 30 kg of undeclared uranium metal, and extraction of small quantities of plutonium between 1988 and 1992 (IAEA, 2003, para. 16).

Another actor that became involved in the Iran case was Russia. As previously discussed, its co-operation with Iran in nuclear sphere began after the conclusion of an agreement concerning the assistance in finalising the construction at the Bushehr site. In November 2003, during the UN General Assembly debate on the IAEA annual report, Russia made a statement on Iran. In particular, Russia declared that it was convinced that the only solution for the future problems between Iran and the IAEA would be the co-operation.[91] Noting that the Iran case had become excessively politicised, Russia expressed a hope that the issue could be put back into the framework of regular inspections activities under the CSA. Consequently, the country would keep its nuclear co-operation with Iran, which was transparent and did not violate the two countries' international obligations.

The next the Director General's report on implementation of the Iran's CSA was produced on 10 November 2003 and contained a bolder language related to the country's obligations. In particular, the Report enumerated a number of additional failures not included in the previous two reports, for example:

- to report experiments on centrifuge and laser enrichment, and on reprocessing;
- to report the import of natural uranium metal in 1994;
- to report uranium conversion;
- to provide design information for a number of facilities; and
- to "co-operate to facilitate the implementation of safeguards, through concealment" (IAEA, 2003, para. 48).

The Director General thus concluded that these disclosures showed that in the past Iran had concealed many aspects of its nuclear activities and called them "breaches" of the

[91] UN General Assembly, Report of the International Atomic Energy Agency, Statement by the Russian Federation, A/58/PV.533, 3 November 2003, p. 6, https://documents-dds-ny.un.org/doc/UNDOC/GEN/N03/592/60/PDF/N0359260.pdf?OpenElement.

country's obligation to comply with the provisions of the CSA (IAEA, 2003, para. 50). Eventually, according to the Director General, there was no evidence that "the previously undeclared nuclear material and activities referred to above were related to a nuclear weapons programme," however, the Iran's past pattern of concealment led to a conclusion that it would "take some time before the Agency is able to conclude that Iran's nuclear programme is exclusively for peaceful purposes" (IAEA, 2003, para. 52).

Following the language and spirit of the DG's Report, the Board also adopted a rather harder stance on the issue. After considering the Report, the Board adopted a Resolution without a vote, which, among other things, "welcomed" the Iran's "active co-operation and openness" but nevertheless "strongly deplored" Iran's past failures and breaches of its undertakings under the CSA (IAEA, 2003c, paras. 1 and 2). Moreover, in case of further serious Iranian failures, the Board decided that it would meet immediately to consider "all options at its disposal, in accordance with the IAEA Statute and Iran's Safeguards Agreement" (IAEA, 2003c, para. 8). It may be inferred that the Board gave Iran the last chance to declare its past activities, and was prepared to set in motion the non-compliance mechanism. Iran maintained its previous stance justifying the concealment of its nuclear programme by the existence of illegal sanctions and external pressure (IAEA, 2003i).

As was previously examined in Part I of the present study, the main weakness of a State's Safeguards Agreement concluded on the basis of INFCIRC/153/ (Corr.) consisted in the fact that by default the Agency was able to verify basically the correctness of the State's declarations. The special inspections mechanism, available for verifying completeness of such declarations, was virtually the means of last resort and thus reluctantly used owing to potential stigmatisation of a state as non-compliant. The Agency was not able to discover Iran's undeclared nuclear material and activities also because the country had not incorporated the provisions of Part I of Programme 93+2 into its CSA. The provisions, which included the submission of an expanded declaration; expanded access rights; expanded use of no-notice routine inspections at strategic points within nuclear facilities and sites, and of special inspections at locations in which the State has declared the presence of nuclear material, other than at strategic points within a facility; use of improved verification techniques; and the IAEA access to relevant national intelligence reports – would be a sound legal basis for conducting

more effective, albeit intrusive verification activities in Iran. However, the absence of this legal basis shifted the balance towards diplomatic field, where the sporadic non-comprehensive measures (for example, visits, some environmental sampling, etc.) were adopted by agreement between the IAEA and Iran.

In these circumstances, the most obvious legal instruments able to shed considerable light on the nuclear programme of Iran were the modified Code 3.1 and the Additional Protocol. In particular, the Director General stated that with no such protocol in force, "the Agency's ability to provide credible assurances regarding the absence of undeclared nuclear activities was limited" (IAEA, 2003f, para. 35). In fact, the calls on Iran to adopt the AP started already in 2000. One of the first international bodies to encourage Iran to conclude an AP was the G8, whose Foreign Ministers called on Iran to sign with the IAEA an additional safeguards protocol and to co-operate fully in not developing and in preventing the proliferation of WMDs and missiles for their delivery (G8, 2000, para. 37). During the 2000 Summit in Okinawa, foreign ministers of the G8 again stressed the importance of Iran's full compliance with its obligations under the NPT and

The European Union was also keeping its pace with the developments in the Iran case. According to some reports in the press, France, Germany and the UK, as well as the High Representative of the EU (altogether so-called "EU3"), offered to assist Iran with nuclear technology provide that the country stopped the fuel enrichment programme as well as agreed to sign the AP (De Luce, 2003). However, the deal did not succeed.

The Director General was also among those ones who had repeatedly encouraged Iran to conclude an AP, stressing its importance to enable the Agency to provide comprehensive and credible assurances about the peaceful nature of Iran's nuclear programme.[92] The Chairman of the Board, summarising the discussions, also urged Iran to promptly and unconditionally sign, ratify and implement an AP in order to enhance the IAEA's capability of providing credible assurances of the peaceful nature of the country's nuclear programme, in particular in respect of the absence of undeclared nuclear material and activities (IAEA, 2003h), paras. 52-58.

iii. Iran's acceptance

[92] (IAEA, 2003f, para. 35); (IAEA, 2003e, para. 6); and (IAEA, 2003, para. 52).

Iran started responding to the above calls since 2003. In a letter dated 24 August 2003, the Resident Representative of Iran to the Agency informed the Director General that Iran was "prepared to begin negotiation with the [IAEA] on the Additional Protocol" and expressed the hope that, "in this negotiation the concerns of [Iran] and the ambiguities on the Additional Protocol are removed" (IAEA, 2003e, para. 11). During the 58th Session of the UN GA, Minister of Foreign Affairs of Iran, Dr. Kamal Kharrazi, in his speech also mentioned that his the country had "nothing to hide, and in principle have no problem with the additional protocol" (UN, 2003a). On 16 October 2003 Iran expressed its readiness to conclude an AP and, until it was ratified by the Iran's parliament, to act in accordance with its provisions and with a policy of full transparency (IAEA, 2003, para. 13). On 21 October Iran and the EU3 issued a Tehran Statement, in which the country made public its decision to co-operate fully with the IAEA and to sign and ratify the A, to act in accordance with the AP until it was ratified (UK Parliament, 2008, para. 2(a) and (b)). By a letter of 10 November 2003 Iran notified the Agency of its preparedness to sign and apply the AP pending its entry into force (UK Parliament, 2008, para. 18).

Eventually, the Board approved Iran's Additional Protocol on 21 November 2003, and Iran signed it later on 18 December (IAEA, 2004j), para. 5. In 2003 Iran also accepted and started implementing the modified Code 3.1. On 21 May 2004 Iran submitted a declaration under the AP with regards to fuel cycle activities and to sites where nuclear material was kept) (IAEA, 2004i, para. 19). Iran also pointed out to the Agency that since the country had signed the AP and decided to apply it "voluntarily" as a confidence-building measure prior to the AP formal entry into force, the declarations had been submitted well before the due date of 18 June 2004.[93]

b. Second period (2003-2006)

i. Iran's reluctance to furnish information and the adoption of diplomatic measures

Overall, the reports since 2004 grew more complex and longer since the IAEA was reporting on three issues: Iran's compliance with the CSA and the AP, its voluntary "suspension" of enrichment and reprocessing activities, and the unaddressed concerns.

[93] (IAEA, 2004i, para. 19).

The Agency started using the AP provisions, in particular, when obtaining complementary access, as reflected in the first DG's Report to the Board after Iran signed the AP.[94]For example, during the Agency's complementary access to the laboratories at Karaj in December 2003, inspectors examined two mass spectrometers that had not been previously included by Iran in its declarations. Iran later acknowledged that this equipment had been used in the past to provide isotope enrichment measurements to the Atomic Vapour Laser Isotope Separation programme (IAEA, 2004j, para. 53). The Agency then collected environmental samples from the mass spectrometers and eventually no uranium particles were found in these samples. Consequently, the laboratory containing the equipment was included in the list of the safeguarded facilities (IAEA, 2014b, para. 55).

In the same Report, the Director General again notified the Board of the activities and items previously not included in the supposedly complete declarations (IAEA, 2004j, para. 46). In particular, the country did not furnish information on research on advanced P-2 centrifuge designs or on experiments with Po-210. The purpose of Iran's activities related to the production and intended use of Po-210 remained a concern for the IAEA (IAEA, 2004j, para. 76). Upon examining the Report, the Board adopted a Resolution on 13 March 2004, where it welcomed the signing of the AP and urged its prompt ratification (IAEA, 2004g, para. 2). The Board further "deplored" that Iran did not declare its possession of P-2 centrifuge design drawings and to activities in its letter of 21 October 2003, which was to have provided the "full scope of Iranian nuclear activities" and a "complete centrifuge R&D chronology" (IAEA, 2004g), para. 4). The Board did not arrive at any conclusion, rather, it deferred the consideration of progress made by the Agency in Iran and also postponed the decision on how to respond to the omissions until the meeting in June (IAEA, 2004g, paras. 8-9). Consequently, in April, Iran agreed to accelerate co-operation with the Agency on a number of outstanding matter specified in the Director General's February Report with a view to having them resolved before the June meeting of the Board (IAEA, 2004i, para. 7).

Before the Board June meeting, the Director General submitted another Report on Iran's implementation of its CSA (IAEA, 2004i). It noted, in particular, that the verification of

[94] (IAEA, 2004j), para. 64: "The dismantled pilot enrichment facility at the Kalaye Electric Company workshop in Tehran has also been monitored, using complementary access under the Additional Protocol."

Iran's suspension was not "comprehensive because of the continued production of centrifuge equipment by some private companies" and "Iran's decision to proceed with the generation of UF_6" (IAEA, 2004i, para. 44). As the outstanding issues the Director General noted the origin of HEU and the extent of activity with regards to P-1 and P-2 centrifuges (IAEA, 2004i, paras. 46 and 47).

Finally, on 18 June the Board met to consider the Report. It adopted a Resolution drafted and sponsored by the EU3 countries, which again "deplored" the Iran's not full, timely and proactive co-operation, referring to the postponing by one month of IAEA visits which in some cases resulted in a delay in the taking of environmental samples and their analysis (IAEA, 2004f, para. 2). Furthermore, the Board praised Iran for signing the AP and kept urging its ratification, and, apart from other confidence-building measures such as refraining from the production of UF_6, the Board invited Iran to adopt an addition alone, namely to reconsider its decision to start construction of a research reactor moderated by heavy water, "as the reversal of those decisions would make it easier for Iran to restore international confidence undermined by past reports of undeclared nuclear activities in Iran" (IAEA, 2004f, para. 8). Iran, in turn, declared that the latter measures violated the letter and spirit of the NPT and the IAEA Statute as well as were unprecedented in the Agency history where no other country had ever been asked to suspend activities declared under its CSA (IAEA, 2004m), para. 10. However, later in the same month the country agreed to implement the voluntary suspension measures set out in February 2004 and resume centrifuge-related activities under IAEA supervision (IAEA, 2004h, para. 7).

The September Report of the Director General to the Board pointed out that Iran had been providing information in response to the Agency requests, although "the process of providing information needs, in certain instances, to be accelerated" (IAEA, 2004h, para. 56). The key outstanding issues remained the source of uranium contamination, the extent of activities relate to the use of P-1 and P-2 centrifuges, and plutonium separation experiments (IAEA, 2004h, paras. 58 and 59). The Board's resolution that followed was, in substance, similar to the previous one (IAEA, 2004e). In addition, the Board decided to request additional information from the DG and that at its next session in November it would decide whether or not further steps were "appropriate in relation to Iran's obligations under its CSA and the requests made of Iran, as confidence

building measures, by the Board in this and previous resolutions" (IAEA, 2004e, paras. 7-9). One of possible interpretations of such Board's conclusion is the fact that it intended to consider referring the Iran case to the UN Security Council.

The emphasis on the resolution of the case within the framework of the IAEA was made by China and Russia during the UN GA debate on the IAEA annual report (IAEA, 2004l, paras. 17, 18, 41, 45, 64, 67, 71, 123, and 142). In addition, Russia expressed its opinion on importance of a prompt switch of Agency monitoring activities in Iran into routine channels, considering the Board's last Resolution as a "plan of action" (UN, 2003c).

Parallel to Iran-IAEA interaction, there existed diplomatic efforts on part of the EU, one of the most remarkable fruit of which was the conclusion of the Paris Agreement on 15 November 2004 (IAEA, 2004n). The document was based upon the above referenced Tehran Statement of 21 October 2003. Under the Agreement, the EU3 "recognise Iran's right under the NPT exercised in conformity with its obligations under the Treaty, without discrimination," whereas Iran ensured that "it did not and would not seek to acquire nuclear weapons." Furthermore, Iran declared that it would continue its suspension and extend it, on a voluntary basis, to "all enrichment-related and reprocessing activities, and specifically: the manufacture and import of gas centrifuges and their components; the assembly, installation, testing or operation of gas centrifuges; work to undertake any plutonium separation, or to construct or operate any plutonium separation installation; and all tests or production at any uranium conversion installation." The suspension was to be implemented before the November Board meeting to be sustained until negotiations resulted in "a mutually acceptable agreement on long-term arrangements." The EU3 also recognised that this suspension was a legal obligation of Iran, rather, its voluntary confidence-building measure. As a reward, once the suspension had been verified, the negotiations with the EU on a Trade and Cooperation Agreement would resume. Lastly, the Paris Agreement also set up the Political and Security Working Group.

Subsequently, the Director General mentioned the Agreement in his November Report to the Board (IAEA, 2014b, para. 132), which welcomed the Agreement, although recognising that this suspension was a voluntary measure rather than a legal obligation (IAEA, 2004d, para. (h)). The Board underlined that Iran's policy of up to October 2003

had resulted in "many breaches" of Iran's obligations to comply with its CSA (IAEA, 2004d, para. 4). The Resolution was nevertheless drafted in a neutral tone, with the Board mainly "welcoming" the country's co-operation, for example, in implementation of suspension or voluntary application of the AP (IAEA, 2004d, paras.1-3 and 5). It may possibly be concluded that the two latter factors influenced the Board in its decision not to refer the Iran case to the UN Security Council at that time. Consequently, Iran stated that this Resolution "was a start towards normalisation of the case of Iran" which "confirmed the Director General's assessment in November 2003 concerning the absence of any diversion" (IAEA, 2004k), para. 101.

Following the Paris Agreement and the favourable Resolution of the Board, Iran and the EU began negotiations for a long-term arrangement, which, according to the Council of the EU, would provide objective guarantees that the country's nuclear programme was pursuing exclusively peaceful purposes (EU, 2004a, paras. 4 and 5). The European Council also confirmed its willingness to resume the negotiations on an agreement with Iran concerning trade and co-operation and expressed readiness to explore ways to further develop political and economic cooperation with the country (for example, in the ambits of the fight against terrorism, human rights and Iran's approach to the Middle East Peace Process) (EU, 2004c), para. 42.

One of the first steps in the Iran-EU negotiations was made in January 2005 when Iran submitted to the Political and Security Working Group a draft joint statement which contained reference to general principles of non-use of force, non-intervention and peaceful settlement of disputes, elimination and non-proliferation of WMDs as well as co-operation in export control, among others (Iran, 2005a). The draft stated, in particular, that Iran would remain "committed not to pursue nuclear weapons and other weapons of mass destruction under any circumstances" whereas the EU3 would undertake to reject to use or threaten to use nuclear weapons against Iran. Moreover, the two Parties would emphasise the inviolability of peaceful and safeguarded nuclear facilities and agree that a possible direct or indirect attack against any Iranian nuclear facility would trigger action by the UNSC under the provisions of the UN Charter. Reaffirming the Iran's right to self-defence, as set out in Article 51 of the UN Charter, the EU3 would remove restrictions on the transfer of conventional armaments and the relevant sensitive dual-use goods and technology to the country. Iran also proposed

some additional assurances, *inter alia*, increased verification and certain restrictions on the level and extent of the uranium enrichment programme. In addition, Iran would undertake to take nuclear security measures, including with co-operation with the EU3.
The EU3 stressed that the suspension was vital for the negotiating process and that the fuel cycle programme was "the core of the problem" (Iran Watch, 2005). That was the reason why cessation, dismantlement of the sensitive part of its nuclear programme included the fuel cycle. On the other hand, the EU3 had no objections to the further functioning of light water power reactors, reactors with no significant capacity to produce plutonium, waste storage sites, uranium mines, or concentration plants. As a result, the EU3 asked Iran to provide a more detailed proposal.
The Iran-EU3 negotiations were welcomed by the USA, which declared that it would make an effort to actively support the negotiations, even admitting that, in this context, the USA would lift its objection to Iran's application to the WTO (USA, 2005a). It should be, however, noted that on 4 February 2005 U.S. Secretary of State said in respect of a possible U.S. military action against Iran that, "while no one ever asked the American President to take... any option off the table," the USA had "plenty of diplomatic means" to handle the nuclear issue (UK, 2005).

ii. Iran's offer for "objective guarantees"

Meanwhile, Iran took the next step in the negotiations, offering on 23 March 2005 "a collection of solutions for objective guarantees" suggested by independent scientist and observers from the USA and Europe (IAEA, 2005l). The measures were allocated in four groups. The group concerning the enrichment programme included the following: exclusion of spent-fuel reprocessing from the country's nuclear fuel cycle, imposing a cap on the enrichment level (only low-enriched uranium) and in amounts to solely satisfy fuel requirements of Iran's power reactors, and immediate conversion of all enriched uranium to fuel rods to prevent "even the technical possibility of further enrichment." The legislative and regulatory measures comprised ratification of the AP, introduction of a permanent ban on the development, stockpiling and use of nuclear weapons through binding national legislation, and enhancement of Iran's export control regulations. Further in 2005 Iran made a new offer to the EU3, which it called "the most flexible solution" intending "to salvage the process" (IAEA, 2005l). The offer included commencement of the work of Esfahan uranium conversion plant ("the UCF") at low

capacity and under full scope monitoring, further negotiations on an arrangement for an initial limited operation at Natanz, and continuation of negotiations for full scale operation of Natanz on the premise that it would be synchronized with the fuel requirements of light water reactors. These offers were not accepted by the EU3.

Meanwhile, in a separate attempt to prevent Iran from extracting plutonium from the spent nuclear fuel, Russia concluded with Iran a nuclear fuel supply agreement on 27 February 2005. It stipulated that Iran would return the spent nuclear fuel from the Bushehr reactor to back to Russia (BBC, 2005).

On 16 June the Board examined a Director General's Report on Iran's safeguards. The Board again underlined the importance of transparency and proactive co-operation with the Agency on part of Iran by providing the detailed information on the outstanding issues (IAEA, 2005c, para. 115). Additionally, the Board emphasised the urgency of ratification of the AP by Iran.

The Paris Agreement started collapsing already at the beginning of August 2005. Firstly, Iran informed the IAEA of its decision to resume uranium conversion activities at the UCF, justifying it by the EU3's policy of protraction of "negotiations without the slightest attempt to move forward in fulfilling their commitments under the Tehran or the Paris Agreements, in order to keep the suspension in place for as long as it takes to make it a *fait accompli*," which Iran considered contrary to the letter and spirit of the Agreement and to the principle of good faith negotiations (IAEA, 2005l). Lastly, in view of the Board's conclusion that the suspension was a voluntary, rather than legally binding, measure, the Board did not have any "factual or legal ground, not any statutory power, to make or enforce such a demand, or impose ramifications as a consequence of it."

The EU3's response was to remind Iran that the resumption of the conversion would be in breach of the Paris Agreement as well as of the Board's Resolution of 29 November 2004, and would consequently put an end to the negotiations of the long-term agreement (IAEA, 2005k). In three days, the EU3 forwarded to Iran their proposals concerning a Framework for a Long-Term Agreement (Iran, 2005b). The document comprised three main areas of co-operation: political and security co-operation, long-term support for Iran's civil nuclear programme, and economic and technological co-operation. In the second area, the EU3 reaffirmed "Iran's inalienable right to the peaceful use of nuclear

energy, exercised in conformity with the NPT," and reassured the supply of fuel for light water power and research reactors (Iran, 2005b, paras. 32 and 34). In exchange, Iran would undertake, among other things, to:

- make a legally binding commitment not to withdraw from the NPT and to keep all Iranian nuclear facilities under IAEA safeguards;
- ratify its Additional Protocol by the end of 2005 and fully implement it before the ratification;
- allow IAEA inspectors to visit any site or interview any person they deem relevant to their monitoring of nuclear activity in Iran; and
- stop construction of its Heavy Water Research Reactor at Arak, thus limiting its fuel cycle activities to operation of light-water reactors.

iii. Iran removes IAEA seals

Iran rejected the proposal as "clear violation of international law and the Charter of the United Nations" as well as the NPT and two previous agreements (Iran, 2005c). The country considered the proposal as seeking to intimidate it into accepting "illegal and intrusive" inspections beyond the CSA and the AP and other legal instruments, and to abandon "most of its peaceful nuclear programme." In accordance with its precious declaration, on 10 August 2005 Iran, now under the rule of President Mahmoud Ahmadinejad (newly elected on 24 June 2005), decided to remove all IAEA seals and resume uranium conversion at Esfahan (IAEA, 2005f, para. 2).

At the following day's meeting urgently convened by the EU3, the Board adopted a Resolution could do little but to urge Iran to reverse its decision and to re-apply suspension on the same voluntary, non-legally binding basis as requested previously, permitting the Director General to re-instate the seals (IAEA, 2005i, para. 3). Using the NPT and the CSA as a prop, Iran retorted by stating that its actions were in full conformity with its international obligations. (IAEA, 2005j). As a result, it declared that it would be a nuclear fuel producer and supplier within a decade, however, leaving a space for negotiations without preconditions and in a spirit of good will.

In his next Report to the Board, the Director General reiterated the flaws of the CSA which was generally designed to verify correctness and not completeness of information concerning nuclear material and activities. The Director General reported, in particular,

that although the results of analysis "tend, on balance, to support Iran's statement about the foreign origin of most of the observed HEU contamination," the Agency was still not able to conclude that there were no undeclared nuclear materials or activities in Iran (IAEA, 2005e), paras. 12 and 51. Moreover, given Iran's past concealment, the Director General emphasised the expanded scope of the transparency measures, which should extend "beyond the formal requirements of the Safeguards Agreement and Additional Protocol and include access to individuals, documentation related to procurement, dual-use equipment, certain military owned workshops and research and development locations" (IAEA, 2005e, para. 50).

The seriousness of Iran's plan to develop indigenous nuclear programme that would include enrichment was illustrated by the speech of the country's President before the UN GA on 17 September 2005. He reiterated the country's inalienable right to have access to a nuclear fuel cycle, however, also admitting possible partnership with foreign countries and recognising the centrepiece position of co-operation with the IAEA (UN, 2005b, paras. 8 and 9).

The next Resolution of the Board, adopted by 22 votes in favour and two abstentions (including Russia and China), "deplored" the Iran's resumption of enrichment-related activities at the UCF (IAEA, 2005g, Preamble, para. (k)). The language of the Resolution became starker: the Board found that the previously established failures and breaches of Iran's CSA constituted "non-compliance" as defined in Article XII.C of the IAEA Statute (IAEA, 2005g, para. 1). Furthermore, the Board predicted a future referral, finding that the past concealment of nuclear activities, their nature, and the resulting absence of confidence in peaceful nature of Iran's nuclear programme gave rise to questions that were "within the competence of the Security Council, as the organ bearing the main responsibility for the maintenance of international peace and security" (IAEA, 2005g, para. 2). The issue was, nevertheless, not referred to the UNSC. Rather, the Board requested a further report from the Director General and finally decided to address the timing and content of the report required under Article XII.C and the notification required under Article III.B.4" (IAEA, 2005g, para. 3).

c. Third period (2006-2013)

i. The Iran's case is referred to the UN Security Council

Between the afore mentioned Resolution and Resolution GOV/2006/14 of 4 February 2006, by which the Iran's case was referred to the UNSC, a number of relevant efforts were undertaken by the EU3, Russia, the USA, and the Nuclear Suppliers Group, with the first three later becoming the main participants in the negotiation process with Iran.

On 13 October 2005 the EU Parliament adopted a resolution which, among other issues, stressed the importance with the USA, Russia, China and non-aligned countries for the purpose of achieving a comprehensive agreement with Iran, and made the conclusion of the Iran-EU co-operation and trade agreement subject to Iran's full co-operation with the IAEA and objective guarantees of peaceful nature of the nuclear activities (EU, 2005b, paras. 12 and 15). Iran eventually refused to resume negotiations with the EU3, to which the EU3's response was that it was the time for the Security Council to step in to reinforce the authority of IAEA resolutions (Douste-Blazy, et al., 2005). In fact, it was the EU who on 16 January 2006 requested an emergency meeting of the Board to vote on a draft resolution to refer the Iran's case to the UNSC.

As to Russia, at the UN General Assembly debate on the IAEA report in October 2005 Russia's representative stated that the Agency's potential was "far from being exhausted" and therefore the settlement process should be within the Agency (UN, 2005a, p. 6). Subsequently Russia offered that Iran enrich uranium in Russia. At the beginning, Iran rejected the offer relying on its right to domestic enrichment, and later, after reconsidering it, because the offer was not sufficient for Iran's nuclear technology (BBC, 2006a). The offer was definitively rejected by Iran on 12 March 2006, when the country's Minister of Foreign Affairs stated that the proposal was "not on the agenda anymore" (Vick, 2006).

The U.S. President declared support to the Russian offer that the material used to power the plant would be "manufactured in Russia, delivered under IAEA inspectors to Iran, to be used in that plant, the waste of which will be picked up by the Russians and returned to Russia" (WP, 2006).

On 30 January 2006 the foreign ministers of the EU3, China, Russia, the USA and the High Representative of the EU (further commonly referred to as "the EU3+3") held a

meeting in London. In the final statement the participants, *inter alia*, called on Iran to restore the full suspension of enrichment-related activity (including the R&D) under the IAEA's supervision, and agreed that the IAEA should report to the UNSC its decision on the steps required from Iran (Straw, 2006). It is remarkable that the participants agreed that the UNSC should not decide to take immediately after receiving the referral, rather it should await the Director General's report to the March meeting of the IAEA Board and any Resolution from that meeting.

The NSG also became involved in the Iran's case. Already at the 15th Plenary Meeting of the Group on 23-24 June 2005, it agreed to establish a procedure for suspending, through national decisions, nuclear transfers to countries that were found non-compliance with their safeguards agreements (NSG, 2005). The NSG also agreed that supplier and recipient states should elaborate appropriate measures to invoke fall-back safeguards if the IAEA can no longer undertake its safeguard mandate in a recipient state. After the Board declared Iran's non-compliance with its safeguards obligations, the NSG held an extraordinary plenary meeting on 17-18 October 2005, where the EU announced that it

would make no transfers of NSG trigger list items to Iran and would exercise special vigilance with regard to other items that could nonetheless be "useful in enrichment and reprocessing" (Ford, 2006, p. 590).

Lastly, on 3 December 2005 Iran's Guardian Council[95] approved a law which required the Iran's Government to cancel all previously taken voluntary measures and to implement all scientific, research and executive programmes to enable the rights of the nation under the NPT if the Iran's case is referred or reported to the UNSC (The Telegraph, 2005). Already in early January 2006 Iran informed the IAEA, relying on the "full privilege and inalienable rights for research and development on nuclear energy as recognised in Article III of the Agency Statute and Article IV of the NPT," it had decided to resume from 9 January the previously voluntarily suspended R&D on the peaceful nuclear energy programme (IAEA, 2006g). Iran therefore resumed enrichment testing and other activities in Natanz and elsewhere (IAEA, 2006e, paras. 41-45), and, in addition, ceased to voluntarily apply the AP (IAEA, 2006e, paras. 30 and 31).

[95] A 12-member body of jurists that acts in many ways as an upper legislative house, for example, by reviewing all legislation passed by the Majles to determine its constitutionality and compliance with Islamic law. (See https://www.britannica.com/topic/Council-of-Guardians).

Finally, on 4 February 2006 the Board adopted a Resolution with 27 votes of approval (China and Russia joined), 3 objections (Cuba, Syria and Venezuela), and five abstaining States (Algeria, Belarus, Indonesia, Libya and South Africa) (IAEA, 2006b). The Resolution recalled "Iran's many failures and breaches of its obligations to comply with its NPT Safeguards Agreement and the absence of confidence that Iran's nuclear programme is exclusively for peaceful purposes resulting from the history of concealment" (IAEA, 2006b, Preamble, para. (g)). It therefore requested the Director General "to report to the Security Council of the United Nations" in March the steps required of Iran[96] and "to report to the Security Council all [adopted] IAEA reports and resolutions" (IAEA, 2006b, para. 2). As in the previous resolutions, the Board decided in Paragraph 9 to "remain seized of the matter." Following the Resolution, the Director General submitted a report to the UNSC (IAEA, 2006e, para. 3).

In response, Iran notified the IAEA that it stopped applying all voluntary non-legally binding measures, including the voluntary implementation of the AP and inspection procedures (IAEA, 2006e, para. 31), and began enrichment tests at Natanz (IAEA, 2006e, para. 44).

Furthermore, on 29 March 2007 Iran stopped implementing the modified Code 3.1 effectively restoring a 1976 version of the code, justifying it by the fact that it "had not yet been ratified by the parliament" (IAEA, 2007g, para. 12). It is interesting that the Agency dismissed this reason, setting out three arguments: first, impossibility to modify Subsidiary Arrangements unilaterally; then, the CSAs provide no mechanism for the suspension of provisions agreed to in Subsidiary Arrangements; lastly, it is the Agency's continuous right to verify design information, not dependent on the construction stage of a facility or the presence of nuclear material there (IAEA, 2007g, para. 14).

At that point the UNSC and Iran's negotiating partners continued a "sticks-and-carrots strategy," which consisted in combination of resolutions and "hard-law" sanctions, and inducement to negotiate full suspension of possible proliferation activities.

[96] They included: re-establishing full and sustained suspension of all enrichment-related and processing activities; reconsidering the construction of a heavy-water research reactor; prompt ratification and full implementation of the AP and, until then, acting in accordance with its provisions; and implementing transparency measures beyond the formal requirements of the CSA and the AP ((IAEA, 2006b, para. 1).

The EU Parliament adopted a resolution on 15 February 2006 that affirmed the primacy of the rules of international law in resolving the Iran's case as well as considering the involvement of the UNSC a necessary step in that regard (EU, 2006b, paras. 7 and 8).

On 29 March 2006 the UNSC unanimously adopted a presidential statement, which was fairly balanced and omitted references to nuclear proliferation being a threat to international peace and security. In particular, the statement expressed the concern about the Iran's decision to resume enrichment-related activities and suspension of the AP, and called on Iran to take steps specified by the Board, entrusting the Director General with reporting on the progress in the issue (UN, 2006d).

The UNSC did not impose sanctions this time, and Iran threatened to suspend contacts with the IAEA otherwise (BBC, 2006). The country offered to keep allowing access to IAEA inspectors under its CSA as long as the Iran's case remained in the IAEA framework, and was prepared to provide timetable for resolving outstanding issues within three weeks (IAEA, 2006h), para. 10.

The next the Director General's Report, now submitted both to the Board and the UNSC, contained a new conclusion that the IAEA could not "exclude the possibility... that the plutonium analysed by the Agency had been derived from source(s) other than the ones declared by Iran" (IAEA, 2006f, para. 17). In addition, the Report noted that safeguards obligations and confidence-building measures were "different, distinct and not interchangeable" (IAEA, 2006f, para. 36).

On 6 June 2006 the EU3+3 made a proposal to Iran that concerned, *inter alia*, the nuclear field. The latter included: reaffirmation of Iran's inalienable right to nuclear energy for peaceful purposes without discrimination; support of the building of new light water reactors; co-operation on nuclear R&D; guarantee fuel supply (including through Iran's participation as a partner in an international enrichment facility in Russia); and suspension of Iran's case discussion at the UNSC once the negotiations were resumed (EU, 2006d). What was required in exchange from Iran was its commitment to addressing all the outstanding concerns of the IAEA through full co-operation; suspension of all enrichment-related and reprocessing activities under verification the Agency during the negotiations; and resumption of implementation of the AP. As a result, Iran was left with two options, either to accept the proposal or to expect the next steps to be taken in the UNSC.

ii. UNSC Resolution 1696 (2006)

With no reply from Iran on the proposal, on 31 July2006the UNSC adopted Resolution 1696 by fourteen votes of approval and only one against (Qatar) (UN, 2006a). The Resolution firstly emphasised the proliferation risks presented by the Iranian nuclear programme. Moreover, it acknowledged a legally binding force of the IAEA's calls for Iran to suspend enrichment-related and reprocessing activities, and therefore requested Iran both to endorse the steps set out in the Board resolutions and to accept the EU3+3 proposal (UN, 2006a, paras. 3 and 4). The Resolution also "strongly supported" the role of the IAEA in the process and underlined the necessity of its work (UN, 2006a, para. 6). Lastly, in the event of Iran's failure to comply with the Resolution by 31 August, the UNSC was prepared to adopt measures under Article 41 of the UN Charter (measures not involving the use of armed force) (UN, 2006a, paras. 7 and 8).

Iran commented again reiterating that the demand of suspension violated the fundamental principles of international law, the NPT and IAEA Board resolutions (UN, 2006f). Later in August 2006 Iran rejected the EU3+3 proposal, particularly the double suspension policy, namely Iran's suspension of enrichment-related and reprocessing activities in exchange for the suspension of action of the UNSC, which was "intrinsically in contradiction" with the mutual understanding and concord of negotiations (Iran, 2006, paras.7 and 7-1). In line with its response discussed above, Iran's President made two following declarations. In first one, at the 50th IAEA General Conference, he told that if the IAEA restricts the country's access to peaceful nuclear capabilities, Iran would regard it as impingement on its inalienable rights and therefore would be under no legal obligation to comply with IAEA safeguards (UN, 2006e). The second speech occurred at the UN General Assembly on the following day, where Iran's President shared his "grave concern" about the abuse of the Security Council by some of its members as an "instrument of threat and coercion" (UN, 2006g, p. 38). Meanwhile, on 13 October 2006 Iran started testing a 164-centrifuge cascade with UF_6 gas (IAEA, 2006d, para. 2).

iii. UNSC adopts sanctions

The call of the UNSC Resolution 1696 was in fact rejected by Iran, and the Agency was "unable to make further progress in its efforts to verify the absence of undeclared

nuclear material and activities in Iran unless Iran addresses the long outstanding verification issues" (IAEA, 2006d, para. 21). So, on 23 December 2006 the UNSC unanimously adopted Resolution 1737 under Article 41 of the UN Charter. The Resolution required Iran to suspend immediately the proliferation sensitive nuclear activities under the verification of the IAEA (enrichment-related and reprocessing activities, including R&D, and works on all heavy water-related projects) (UN, 2006b, para. 2). The Resolution also imposed sanctions on Iran. In particular, the document prohibited countries from transferring sensitive nuclear- and missile-related technology to Iran and prescribed to freeze the assets of ten Iranian organizations and twelve individuals for their involvement in country's nuclear and missile programmes (UN, 2006b, paras. 10 and 12). Furthermore, the Resolution invited all states to prevent specialized teaching or training of Iranian nationals in proliferation sensitive and weapons disciplines (UN, 2006b, paras. 17 and 24(a)). On the other hand, the Resolution left an open door for negotiations, underlining the existence of the EU3+3's June 2006 proposals to be used as a basis and emphasising the "suspension for suspension" approach, like the one previously proposed by the EU3+3: for negotiations to continue, the UNSC was to suspend the implementation of the Article 41 measures only if Iran was to suspend all enrichment-related and reprocessing activities, to allow for negotiations (UN, 2006b, para. 21). From that moment on, the Director General Reports to the Board started including information on the implementation not only of the country's CSA but also of the UNSC resolution(s).

Resolution 1737 established the so-called "1737 Committee," which had a right to include additional items or individuals in the "stop list" and monitor compliance with the embargo – in general (UN, 2006b, paras. 3(d) and 10). The 1737 Committee's mandate was subsequently extended to apply to the measures of further UNSC Resolutions 1803 and 1929. It furnished its first report to the UNSC on 23 March 2007, according to which the total of 58 Member States and the EU had already submitted reports on implementation of the Resolution, of which 51 already had legislation in force covering the relevant provisions of the Resolution and others had taken steps in that direction.[97]

[97] See UN Document S/PV.5646, 23 March 2007, p. 3 (available at: https://documents-dds-ny.un.org/doc/UNDOC/PRO/N07/279/89/PDF/N0727989.pdf?OpenElement).

In reply to the Resolution, Iran's Parliament passed a bill which would revise its co-operation with the IAEA "based on the interests of Iran and its people" (Fathi, 2006). Iran also rejected the IAEA's request for use of remote monitoring[98] and asked to provide a detailed legal basis for its implementation as well as examples of its use in sensitive facilities in other States (IAEA, 2007e, para. 8).

The whole situation with the Iran's case was perceived to be deteriorating and the possibility to find a way out through negotiations was vanishing, which possibly forced the Director General to call all parties for a timeout, implying that Iran would suspend part of its nuclear programme and the UNSC – its sanctions (IAEA, 2007d).

The following UNSC Resolution 1747, unanimously adopted in March 2007, reiterated the double suspension policy and broadened the scope of sanctions against Iran. In particular, it introduced a ban on export of arms or related material from Iran, and designation of additional legal and natural persons as subjects to assets freeze and travel restrictions (UN, 2007a, paras. 5 and 2). In addition, the Resolution called upon all States to exercise "vigilance and restraint" in the supply of some types of conventional weapons and related services, and requested all states and international financial institutions not to enter into new commitments for grants, financial assistance, and concessional loans, to the Government of the Islamic Republic of Iran, save for humanitarian and developmental purposes (UN, 2007a, paras. 6 and 7). Iran considered the Resolution illegitimate and saw the sanctions as depriving the Iranian people of their inalienable rights (UN, 2007b).

In addition to the UNSC sanctions, some the EU3+3 countries also adopted similar measures.

The majority of USA sanctions were imposed against Iranian entities and individuals designated by the United States as "proliferators of weapons of mass destruction and their supporters," pursuant to Executive Order 13382 issued President George W. Bush on 29 June 2005 (USA, 2005b). Designated persons and entities are subject to assets freeze and prohibition form transactions with U.S. persons, thus isolating them from the U.S. financial and commercial systems. Designations under the Order are implemented

[98] "Remote monitoring" — a technique whereby safeguards data collected by unattended containment and surveillance, monitoring and measurement systems are transmitted off-site via communication networks (to IAEA Headquarters, a regional office or another IAEA location) for review and evaluation (IAEA, 2001, p. 70).

by the Department of the Treasury's Office of Foreign Assets Control and the Department of State.

Other sanctions were imposed in the form of acts adopted by the Congress. For example, in 2006 the Congress adopted the Iran, North Korea, and Syria Non-proliferation Act, which expanded the scope of the previous Iran Non-proliferation Act of 2000). The Act provided for "penalties on entities and individuals for the transfer to or acquisition from Iran since January 1, 1999, the transfer to or the acquisition from Syria since January 1, 2005, or the transfer to or acquisition from North Korea since January 1, 2006, of equipment and technology controlled under multilateral control lists (the Missile Technology Control Regime, Australia Group, Chemical Weapons Convention, Nuclear Suppliers Group, Wassenaar Arrangement)" (USA, 2006). The Act also prohibited the transfer of equipment or technology that might contribute to the development of WMD, cruise, or ballistic missile systems, even by non-U.S. entities.

So, in October 2007, under the same procedure, the USA imposed sanctions against three of Iran's largest state-owned banks, Bank Melli, Bank Mellat, and Bank Saderat, and also listed the Revolutionary Guards as a proliferator of weapons of mass destruction (Stockman, 2007).

Iran's co-operation with the Agency as well as with the EU3+3 after the adoption of Resolution 1747 continued experiencing its ups but mainly downs, which forced the Director General to repeat his call for a "double time-out" on 12 September 2007 (IAEA, 2007a). As for the "downs," the following is worth mentioning. First is Iran's refusal to allow the IAEA's inspection of the Arak site. The country justified it by the suspension of implementation of the modified Code 3.1, which had been "accepted in 2003, but not yet ratified by the parliament." Accordingly, Iran "reverted" to the implementation of the 1976 version of Code 3.1, which only required the submission of design information for new facilities "normally not later than 180 days before the facility is scheduled to receive nuclear material for the first time" (IAEA, 2007g, para. 12). As a result, the Agency had no rights to conduct design information verification.

Secondly, on 1 May 2007 Iran deplored the intervention of the UNSC into the issue that were in the exclusive domain of the IAEA (UN, 2007c).

Thirdly, the G8 leaders expressed support for "further appropriate measures" in respect of Iran if it further refused to meet the requirements of the UNSC Resolutions (G8, 2007). Similarly, the EU Council reasserted its full support for the UNSC further appropriate measures under in case Iran continued "not to comply with its international obligations" (EU, 2007c). On 14 December 2007 the EU Council also expressed regret about the lack of positive outcome in the EU3-Iran negotiations, reiterated its support for additional UNSC sanctions, and contemplated possibility of additional unilateral measures on part of the EU (EU, 2007d, para. 86). At the same time the EU Parliament called on the USA "and all other actors involved to renounce all rhetoric on military options and regime change policies against Iran," meanwhile insisting on the USA's direct participation in the negotiations with Iran along with the EU (EU, 2008b, paras. 5 and 7).

Fourthly, the Director General's Report to the Board of 23 May 2007 stated that the Agency's level of knowledge of certain aspect of Iran's nuclear programme had "deteriorated" owing to non-provision of relevant information for over a year (IAEA, 2007g, para. 19). He further concluded that, contrary to the Resolutions of the UNSC, Iran had not suspended the enrichment-related activities and kept implementing heavy water-related projects, the latter observation being made upon satellite imagery (IAEA, 2007h, paras. 3, 4 and 8).

On the other hand, Iran and the IAEA did not severe all the ties and still tried to find some solutions to the verification stalemate. For example, on 21 August 2007 the two parties signed Understandings on the Modalities of Resolution of the Outstanding Issues, which contained a detailed "work plan" for co-operation: the IAEA provided the exhaustive list of remaining issues and ambiguities regarding Iran's past nuclear program and activities, Iran was to respond to them, and consequently the IAEA would close these issues and continue to conduct verification in a routine manner (IAEA, 2007b, Section IV). The list of the remaining issues covered, among other things, the enrichment programme, Arak heavy-water research reactor, plutonium experiments, P-1 and P-2 centrifuges programme, source of contamination, Ghachine (also written "Gchine") uranium mine and alleged weapons studies (IAEA, 2007b, Sections I, II and III). At the beginning, though, Iran's co-operation on the work plan was "reactive rather than proactive" (IAEA, 2007f, para. 42). So, the issue was raised during the

Director General's visit to the country, where Iran's leaders agreed to "accelerate" implementation of the work plan (IAEA, 2008b, paras. 2 and 3).

In his Report to the Board, the Director General underlined that Iran had provided certain information under the work plan, some of which was consistent with the Agency's findings (Po-210 experiments and Gchine mine) but some – not (contamination sources and procurement activities) (IAEA, 2008b, para. 53). For this reason the Agency considered the former questions no longer outstanding. Of the latter issues, one was of particular, "major", importance – the alleged studies on weapons, in respect to which Iran had not provided any information. It should be mentioned that the Agency itself received that information allegedly from the U.S. intelligence sources (Strohecker, 2008). The Report referred to the matter as of "serious concern and critical to an assessment of a possible military dimension to Iran's nuclear programme." (IAEA, 2008b, para. 54).

Notwithstanding some modest progress in the Iran-IAEA co-operation, on 3 March 2008 the UNSC adopted Resolution 1803 by fourteen votes in favour and only one abstention of Indonesia (UN, 2008b). The Resolution further broadened sanctions on Iran insofar as it required increased efforts from the States to prevent Iran from acquiring sensitive nuclear or missile technology; introduced a travel ban in respect of persons individuals designated in Annex II to this resolution as well as of additional persons involved in Iran's proliferation-sensitive nuclear activities or for the development of nuclear weapon delivery systems; and increased the list of persons and entities subject to assets freeze and travel notification requirement (UN, 2008b, paras.3, 5, 7 and 8). In addition, the UNSC asked all States to "exercise vigilance" when dealing with Iran in the spheres of trade, financial support for trade, or banking; to inspect "the cargoes to and from Iran, of aircraft and vessels" provided that there were reasonable grounds to believe that they transported goods prohibited under the UNSC Iran resolutions (UN, 2008b, paras. 9, 10, 11). Lastly, the Resolution reiterated the double suspension approach (UN, 2008b, para. 19).

Since that moment and until 2013 the Iran's case was a stalemate, both in the area of the IAEA verification activities under the country's Safeguards Agreement and in the negotiations process.

Firstly, from March 2008 until November 2013 the Director General's Reports generally remained unchanged in contents as to the conclusions. The Agency was only able to continue to verify the non-diversion of declared nuclear material since Iran kept providing access and information only in this respect, which was not sufficient to permit the Agency to confirm that all nuclear material in Iran was in peaceful activities.[99] Meanwhile, there was Iran's non-compliance with the UNSC Resolutions and there was not any substantive progress on the outstanding issues, which gave rise to concerns about possible military dimensions of the country's nuclear programme, and, under those circumstances, the Director General kept urging Iran to implement required confidence-building measures, *inter alia*, suspension of enrichment-related activities and implementation of the AP.[100] It is remarkable that from 2008 the Director General's Reports to the Board began to include a separate section on the possible military dimensions of the country nuclear programme (IAEA, 2008c, paras. 14-25). Mark Hibbs considers that this change of policy had direct links to the change of the Director General: ElBaradei "avoided taking actions that, in his view, would escalate the crisis" whereas Amano "personally reversed this policy" (Hibbs, 2015).

Some of the Reports reflected the Director General's additional observations and conclusions, or information made available to the Agency by Iran or by other Member States. For example, on 8 November 2011 the Director General concluded that Iran had carried out activities "relevant to the development of a nuclear explosive device," and before end of 2003those activities had been under a structured programme (IAEA, 2011, para. 53). The Report also included in his Report an extended Annex called "Possible Military Dimensions to Iran's Nuclear Programme" with two attachments (IAEA, 2011, Annex). It consisted of three sections: Section A provided an historical overview of the

[99] See, for example, Reports by the Director General *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007) and 1803 (2008) in the Islamic Republic of Iran*. GOV/2008/38, 15 September 2008, para. 22 (available at: https://www.iaea.org/sites/default/files/gov2008-38.pdf); *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran*. GOV/2008/59, 19 November 2008, para. 19 (available at: https://www.iaea.org/sites/default/files/gov2008-59.pdf); GOV/2009/55, 28 August 2009, para. 26, (available at: https://www.iaea.org/sites/default/files/gov2009-55.pdf); *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran*. GOV/2010/62, 23 November 2010, para. 37 (available at: https://www.iaea.org/sites/default/files/gov2010-62.pdf); GOV/2011/54, 2 September 2011, para. 51 (available at: https://www.iaea.org/sites/default/files/gov2011-54.pdf).

[100] See GOV/2008/38, paras. 23 and 25; GOV/2008/59, paras. 19 and 21; GOV/2009/55, paras. 28 and 29; GOV/2010/62, paras. 38-41; and GOV/2011/54, para. 50.

Agency's efforts to resolve questions about the scope and nature of Iran's nuclear programme and its possible military dimensions; Section B contained a general description of the information sources available to the IAEA and assessment of its credibility; and Section C covered the Agency's analysis of the available information with a view of finding out existence or development of nuclear-related processes, including weaponisation. The latter Section read, in particular, that information provided by other Member States indicated that in 2000 Iran constructed a large explosives containment vessel in which to conduct hydrodynamic experiments (IAEA, 2011, Annex, para. 49). On 30 August 2012 the Director General reported that since the Agency's first request for access to this location, satellite imagery showed extensive changes, such as: from removal of external fixtures from the building itself and presence of light and heavy vehicles to demolition of five other buildings or structures at the location, removal of power lines, fences and all paved roads, significant ground scraping and landscaping over an extensive area at and around the location, establishment of new dirt roads and shrouding the containment vessel building (IAEA, 2012e, para. 42). In May 2013 the Director General reported that a significant proportion of the site had been covered with asphalt (IAEA, 2013c, para. 55).

Secondly, Iran's actions during the referred period were mainly directed at developing its missile programme and nuclear fuel cycle, which included uranium enrichment, since Iran repeatedly declared that the referral of the Rain's case to the UNSC and the UNSC's action were illegal, which entailed no obligation to comply with its Resolutions (UN, 2008a). In JulyandAugust2008, the country tested two types of medium range ballistic missiles, Shahab 3 and Safir, both capable of carrying a nuclear warhead (BBC, 2009). In May 2009, Iran tested a missile of new type–Sajjil-2 – with the longer range of about 2,000 km (BBC, 2009).

As to the nuclear fuel cycle, the country continued increasing its capacity at the front end, namely uranium mining and yellow cake production, and enrichment. This was done in defiance of the UNSC Resolutions and sanctions, which, as Iran's President Mahmoud Ahmadinejad commented, should be thrown in the dustbin like a "used handkerchief" (BBC, 2010a). For example, on 4 November 2009 satellite images suggested increase in scale of uranium production at the Gchine mine. (Bloomberg, 2009). In December Iran has become "self-sufficient in the production of yellowcake," a

uranium concentrate powder, the hallmark of which was the first shipment of domestically produced yellowcake from the Gchine mine to the conversion plant in Isfahan (NTI, 2011).

Furthermore, Iran was gradually increasing its enrichment capacity by employing a growing number of centrifuges and conducting tests on advanced types of them. On 26 July 2008 Iranian President declared that Iran had 6,000 centrifuges (The Guardian, 2008). In the Director General's Report of 5 June 2009, the number of centrifuges observed by the Agency was 7,000 (IAEA, 2009a, footnote 2). Iran also revealed that since 2007 it had been constructing a previously undeclared enrichment plant at the Fordow site to be used as a substitute to the plant in Natanz in case the latter was attacked by foreign armed forces (IAEA, 2009b, paras. 7 and 12). And already at the end of 2011 the country started enrichment processes at the underground Fordow Fuel Enrichment Plant, producing 20% enriched uranium (IAEA, 2012d, para. 25). By November 2013, Iran obtained a stockpile of 196 kg of 20% enriched uranium (IAEA, 2013b, para. 13). In the view of the sanctions and calls of the UNSC Resolutions, it was almost impossible for Iran to obtain legally any nuclear-related and missile technology, which forced the country to develop the indigenous programme. However, in the time span in question, Iran succeeded to strike a deal with North Korea, a country against which the UNSC also had imposed proliferation-related sanctions but which, on top of that, had withdrawn from the NPT and ceased to be a Member State of the IAEA. The Iran's Supreme Leader Ali Khameini stated that the two countries had "common enemies" (Reuters, 2012). The co-operation covered the spheres of research, student exchanges and joint laboratories, among other things (Reuters, 2012).

Thirdly, Iran's principal negotiating partners, the EU3+3, continued the "carrots-and-sticks" approach, which combined the inducement for the country to enter into negotiations with sanctions for refusing to do it. Russia kept advocating for the peaceful methods of resolving the Iran's case, preferably through the IAEA legal framework. Consequently, to verify Iran's compliance with its NPT obligations, the Agency's observers should continue their work in the country (Russia, 2008b). In addition, in an interview on 25 August 2008 Russian Foreign Minister stated that attitude towards Iran's nuclear programme would be the same as to similar programmes of other States

Party to the NPT only when trust had been restored in its peaceful character (Russia, 2008a).

iv. The USA and EU sanctions

The USA, however, changed their attitude to the negotiations. A USA's representative for the first time since 1979 participated directly in a meeting with Iran in July 2008 in Geneva (ACA, 2014).

Furthermore, the EU3+3 made yet another offer to Iran in June 2008, which was based upon the previous June 2006 proposal. In particular, the EU3+3 were contemplating to recognise Iran's right to develop "research, production and use of nuclear energy for peaceful purposes in conformity with its NPT obligations" (IAEA, 2008a). Moreover, the EU3+3 were prepared to provide technological and financial assistance to the development Iran's peaceful nuclear activities, including the nuclear R&D; resume technical co-operation with Iran under IAEA auspices; technologically support construction of light-water reactors; guarantee the fuel supply; and assist in management of spent fuel and radioactive waste. From Iran, the EU3+3 required co-operation with the IAEA and compliance with the UNSC Resolutions. Iran did not accept the offer, however, later in October 2009 it agreed to allow the IAEA inspectors into the Fordow enrichment plant and to participate in further discussions concerning its enrichment activities (IAEA, 2009b, para. 8). Notwithstanding the above, a number of negotiations rounds that followed did not result in any breakthrough, regardless a series of incentives packages were proposed to Iran by the EU3+3 countries in exchange for lifting the existing or non-imposition of new sanctions. The conditions basically included: Iran's complete freeze of the enrichment programme or submission at least a part of it under international supervision,[101]resolving long-standing questions about its nuclear activities, and confidence-building measures.[102] However, the overall situation did not significantly change since Iran continued with its enrichment programme, as previously described in the present study.

[101] The so-called "fuel swap" proposal. It offered Iran to export the majority of its domestically enriched 3.5 % uranium in return for 20 %-enriched uranium fuel for the TRR. For the general information see https://www.armscontrol.org/factsheets/Iran_Nuclear_Proposals.

[102] See, for example, the EU3+3 proposals discussed during diplomatic negotiations in April-June 2012 (available at: https://www.armscontrol.org/factsheets/Iran_Nuclear_Proposals).

Meanwhile, some participants of the EU3+3, namely the USA and the EU, adopted several packages of sanctions against Iran.

The USA continued designation entities and individuals in a list of proliferators, in accordance with the procedure established by Executive Order 13382 and through adoption of acts by the Congress, as described previously in the present paper. Some of the designations are discussed below.[103] Intending to increase pressure on Iran, on 8 July 2008 the USA designated under the Order four legal and four natural persons related to Iran's nuclear and missile programs (USA, 2008b). On 10 September same year the Iran's maritime carrier, Islamic Republic of Iran Shipping Lines, and eighteen affiliates were designated for the list, for allegedly supporting Iran's nuclear and missile programs (The Economic Times, 2008).

On 22 October 2008 the U.S. Treasury Department introduced assets freeze, and ban to do business with, in respect of the Export Development Bank of Iran, since "Iran has adopted a strategy of using less prominent institutions, such as the Export Development Bank of Iran, to handle its illicit transactions" (USA, 2008a).

On 24 June 2010 the U.S. Congress approved new sanctions against foreign companies trading with Iran. The new sanctions affected entities that supplies Iran's Revolutionary Guards or contributed to the Iran's energy industry (BBC, 2010b). Lastly, on 1 July 2010 U.S. President Obama signed Iran Sanctions Act, a set of unilateral sanctions against Iran proscribing exports of gasoline and other refined petroleum products to Iran and banning U.S. banks from doing business with foreign banks providing services to Iran's Revolutionary Guard (RT, 2010).

The European Union also adopted a series of sanctions against entities for their links to Iran's nuclear or ballistic missile activities, for providing support to Iran's Government, or for having close ties with the Islamic Revolutionary Guard Corps or the Islamic Republic of Iran Shipping Lines. The EU sanctions targeted by and large the same individuals and entities and the U.S. sanctions.

On27 February 2007 the EU adopted a Common Position concerning restrictive measures against Iran, which was in line with the UNSC Resolutions on Iran (EU, 2007b, p. 49). The restrictive measures included the ban on export to Iran of items and technology related to enrichment-related, reprocessing or heavy water-related activities

[103] The full list of entities and individuals under the U.S. sanctions related to the Iran's case may be found on the webpage of Iran Watch: http://www.iranwatch.org/sanctions/united-states-america.

or the missile development (Articles 1 and 2); travel ban and assets freeze in respect of individuals associated with proliferation-sensitive nuclear activities or with the development of the missile programme (Articles 4 and 5); prohibition of specialised teaching of Iranian nationals of disciplines which would contribute to the country's proliferation-sensitive nuclear activities and the missile programme (Article 6).The contents of the document were subsequently used as a basis for further EU sanctions.

For example, on 19 April 2007 the EU adopted Regulation No 423/2007 (EU, 2007e), which followed the structure of the Common Position. The Regulation banned, *inter alia*, export to or import from Iran of dual-use items and technology or assist the country in obtaining them (EU, 2007e, Articles 2, 4 and 5), and introduced an assets freeze on individuals and entities associated with support for Iran's proliferation-sensitive nuclear activities or Iran's development of nuclear weapon delivery systems (EU, 2007e, Article 7).

On 23 June 2008 the EU decided to amend the list of persons, entities and bodies associated with proliferation-sensitive nuclear activities or with the development of the missile programme. In particular, the EU thus imposed financial sanctions in respect of Iran's largest bank Bank Melli (EU, 2008a).

On 26 July 2010 the EU adopted a new set of sanctions against Iran, comprising:

- export and import restrictions on nuclear-related, military and dual-use items and technology;
- prohibition of Iran's investment into Member States' uranium mining, production or use of nuclear materials and technology, in particular uranium enrichment and reprocessing activities, all heavy-water related activities or technologies related to ballistic missiles capable of delivering nuclear weapons;
- restrictions on financial support for trade with Iran and on providing loans to the country;
- inspecting Iranian vessels and aircrafts; and
- restrictions on admission to the territory of Member States of individuals associated with Iran's proliferation-sensitive nuclear activities and missile programme, and imposition of assets freeze in respect to those individuals and entities related to such activities (EU, 2010).

The list of individuals and entities related to Iran's proliferation-sensitive activities was further extended on several occasions, in particular on 24 May 2011 (EU, 2011b) and 21 December 2012 (EU, 2012b). On 23 March 2012 the EU adopted new Regulation No 267/2012, which mainly targeted financial sources of Iran's nuclear programme (EU, 2012c). In addition to the repeated ban on export of nuclear- or missile-related items and technology, the Regulation, among other things, introduced prohibition on import to the EU of Iranian crude oil, petroleum and petrochemical products (EU, 2012c, Articles 11 and 13), ban on trade with Iran in gold, precious metals and diamonds (EU, 2012c, Article 15), and assets freeze of Central Bank of Iran and of Export Development Bank of Iran (EU, 2012c, Article 23(2) and Annex IX). Following the EU Council's decision of 15 March 2012, companies such as the Society for Worldwide Interbank Financial Telecommunication ("SWIFT") were prohibited to continue to provide specialised financial messaging services to Iranian banks under the EU sanctions (SWIFT, 2012). Since SWIFT is incorporated under Belgian law, it had to comply with the decision. Lastly, on 15 October 2015 the EU adopted additional sanctions which, among other things, prohibited the sale, supply or transfer to Iran of graphite, and raw or semi-finished metals, such as aluminium and steel, which were "relevant to industries controlled directly or indirectly by the Iranian Revolutionary Guard Corps" (EU, 2012a), para. (3).

Fourthly, in the reference period 2008-2013, the UNSC adopted an additional series of resolutions on the Iran's issue. Resolution 1835 was adopted unanimously on 27 September 2008. It reaffirmed the demands made in the previous Resolutions, did not impose additional sanctions and reaffirmed the UNSC's commitment to double suspension (or "dual-track") approach (UN, 2008c, paras. 1, 2 and 4). The UNSC reiterated provisions of the previous Resolutions related to the Iran's case, and imposed a fourth round of sanctions with the adoption of Resolution 1929 on 9 June 2010. In particular, it imposed an additional arms embargo (including battle tanks, armoured combat vehicles, large calibre artillery systems, combat aircraft, attack helicopters, warships, missiles and related materiel) (UN, 2010, para. 8), and banned any activity related to ballistic missiles capable of delivering nuclear weapons (UN, 2010, para. 9). The UNSC also called on Iran to ratify promptly the AP and, which is more remarkable, emphasised that it was impossible to amend or suspend the provisions of the country's

Safeguards Agreement and its Subsidiary Arrangement, including modified Code 3.1, since there was no mechanism in the Agreement for the suspension of any of the provisions in the Subsidiary Arrangement (UN, 2010, para. 5). The Resolution broadened the travel ban and assets freeze lists of individuals and entities involved in nuclear or ballistic missile activities and of entities owned or controlled by the Islamic Revolutionary Guard Corps (UN, 2010, para. 10, Annexes I and II). For the first time the UNSC referred (UN, 2010, para. 13) to two documents which contained the Guidelines for the Export of Nuclear Material, Equipment and Technology (IAEA, 2007c) and Guidelines for Transfers of Nuclear-Related Dual-Use Equipment, Materials, Software and Related Technology (IAEA, 2013a), adopted by the NGS in 2008 and 2013, respectively. The two documents were further used as reference documents in the procurement channel established by the JCPOA.

d. Fourth period (2013-2015). Re-establishing confidence

The breakthrough occurred in November 2013 and resulted in two events. The first one occurred on 11 November, when the IAEA and Iran signed a Joint Statement on a Framework for Co-operation Agreement, "aimed at ensuring the exclusively peaceful nature of Iran's nuclear programme through the resolution of all outstanding issues" (IAEA, 2013d). The Agreement provided that within three months Iran would take certain initial practical steps, such as:

- granting IAEA's access to the Heavy Water Production Plant at the Arak site and to the Gchine uranium mine;
- providing the Agency with information on new research reactors and planned nuclear power plants; and
- Clarification on the Iran's additional enrichment facilities and further clarification on the country's laser enrichment technology.

This agreement seems to have embraced certain provisions of both the AP and modified Code 3.1 earlier abandoned by Iran.

Secondly, on 24 November Iran and the EU3+3 reached an interim agreement called the Joint Plan of Action ("the JPA") (The Guardian, 2013). It set out specific step-by-step mechanism in a six-month first-phase agreement, Iran's implementation of which

guaranteed a limited sanctions relief. During the first phase, Iran accepted to undertake the following "voluntary measures":

- To reduce by half the stockpile of uranium enriched to 20 % Uranium-235, diluting the other half to a 5 % level;
- To further enrich uranium up until a 5 % level;
- To freeze further developments in its nuclear program, particularly the part of enrichment, which would be limited only to two sites: Natanz and Fordow;
- Not to carry out reprocessing activities or to construct any reprocessing facility;

More importantly, the agreement granted the IAEA more extensive monitoring rights. Accordingly, Iran was to provide information to the IAEA on planned nuclear sites, a description of each building on each nuclear site, a description of the scale of operations for each location engaged in specified nuclear activities, information on uranium mines and mills, and information on source material. Furthermore, Iran was obligated to submit to the Agency a design information questionnaire in relation to the Arak reactor, and, together with the IAEA, agree on conclusion of the Safeguards Approach to be applied to the facility. Agency inspectors were also to be granted daily access and a right to conduct unannounced inspections at Fordow and Natanz installations. In addition to that, IAEA inspectors were allowed "managed access" to nuclear-related sites, such as centrifuge workshops and uranium mines and mills. Lastly, the Plan provided for placing all research and development activities, including on enrichment, under IAEA safeguards. In may be thus concluded that the above mentioned measures in fact copied certain provisions of an AP and *de facto* obligated Iran to implement the modified Code 3.1.

The partial sanctions relief contained the JPA did not concern the lists of individuals and entities related to Iran's nuclear and missile programs, nor did it cover the export and import of nuclear- and missile-related items and technology. Rather, the relief included the following:

- Suspension of the EU and U.S. sanctions on insurance and transportation services associated with crude oil export;
- Establishing a financial channel using Iranian oil revenues held abroad to facilitate humanitarian trade for Iran's domestic needs and to enable transactions

to pay Iran's UN obligations and direct tuition payments to universities and colleges for Iranian students studying abroad;

- Suspension of U.S. and EU sanctions on Iran's petrochemical exports, on trade in gold and precious metals, on Iran's civil aviation and on Iran's auto industry.

The EU3+3 also undertook to guarantee no new nuclear-related UNSC and EU sanctions, whereas the USA undertook to "refrain" from imposing new nuclear-related sanction, owing to "the respective roles of the President and the Congress."

To monitor the implementation of the near-term measures and address other possible issues that might arise, a Joint Commission of the EU3+3 and Iran was established, with the IAEA responsible for verification of nuclear-related measures. Another goal of the Joint Commission was a co-operative work with the IAEA to "facilitate resolution of past and present issues of concern," which, as it may be inferred, also included possible military dimension of Iran's nuclear programme.

The Plan also established the framework for negotiating a future comprehensive solution, which was supposed to start being implemented within one year after the adoption of the JPA. The said solution, although behind the schedule, was eventually embodied in the JCPOA, following successful implementation of which "for its full duration, the Iranian nuclear programme would be treated in the same manner as that of any non-nuclear weapon state party to the NPT."

Following the IAEA Co-operation Agreement of November 2013 and before the JPA took effect, IAEA inspectors visited the Arak heavy water reactor for the first time since 2011 (BBC, 2013). On the implementation of the JPA began on 20 January 2014, initially for six months, the IAEA confirmed that Iran had already started complying with the voluntary measures (IAEA, 2014e, paras.1 and 2), which it continued to do throughout 2014. The sole issue which Iran failed to address was the concerns about possible military dimensions, i.e. "possible existence in Iran of undisclosed nuclear related activities involving military related organizations, including activities related to the development of a nuclear payload for a missile" (IAEA, 2014a, para. 62).

Without access to such information on those issues, the IAEA was not able to integrate all of the issues into a system and assess that system comprehensively.

Meanwhile, the EU3+3 and Iran continued negotiations on a comprehensive solution of the Iran's case, as stipulated in the JPA. Within a year between 24 November 2013 and

24 November 2014, the negotiating parties held ten rounds of negotiations, which, however, did not lead to a final solution (IAEA, 2014d). Since the implementation of the JPA was originally envisaged for six months, the Agreement was extended on three occasions. The first one occurred on 19 July 2014, when the negotiating parties, acknowledging "tangible progress" achieved on some of the issues and working together on a text of a "Joint Comprehensive Plan of Action," however, pointed out the existence of certain gaps "on some core issues which would require more time and effort" (IAEA, 2014c). The EU3+3 and Iran thus decided to extend the implementation of JPA measures until 24 November 2014. The second extension happened on 24 November 2014. The parties agreed to "continue their diplomatic efforts" and decided to extend the measures of the JPA until 30 June 2015 to allow for subsequent negotiations, consequently entrusting the IAEA with the continuing monitoring of the voluntary measures under the JPA (IAEA, 2014d). The latter deadline was not eventually respected, and the EU3+3 and Iran decided to continue their negotiations "after 30 June to reach agreement on the final text of the JCPOA regarding Iran's nuclear programme," and requested the IAEA to continue to carry out necessary nuclear-related monitoring and verification under the JPA (IAEA, 2015e).

An issue of possible military dimension ("PMD") of the Iran's nuclear programme was developing separately. Like in 2014, Iran was not furnishing relevant information in the first half of 2015 either. Moreover, on 24 June 2015, the country's Guardian Council ratified a law that banned international access to Iran's "military, security and sensitive sites," as well as to "key documents and scientists," allowing only conventional inspections to declared nuclear sites (Haghighatnejad, 2015), (Associated Press, 2015). However, the stalemate over the issue of PMD was broken with adoption of the "Roadmap for Clarification of Past and Present Outstanding Issues regarding Iran's Nuclear Program" (IAEA, 2015f). The document was signed by Iran and the IAEA on 14 July 2014 prior to the announcement of the JCPOA, and was described as "a significant step forward towards clarifying outstanding issues regarding Iran's nuclear programme" (IAEA, 2015a). Its main provisions and their relation to the monitoring and verification mechanism of the JCPOA are discussed further in the present study.

2. The Joint Comprehensive Plan of Action

2.1. Main provisions of the Joint Comprehensive Plan of Action

The JCPOA was agreed upon by China, France, Germany, the Russian Federation, the UK, the USA, the High Representative of the European Union for Foreign Affairs and Security Policy, and Iran on 14 July 2015 in Vienna. As referred to above, the document "builds on the implementation of the Joint Plan of Action agreed in Geneva on 24 November 2013."[104] Under the Preface, and Paragraph (ii) of the Preamble and General Provisions, the main objective of the document is to ensure that Iran's nuclear programme is operating exclusively for peaceful purposes. Accordingly, Iran is required to fully cooperate in demonstrating peaceful nature of its nuclear programme. In response, the United Nations, the EU and the United States undertake to lift the existing sanctions against the country, including "steps on access in areas of trade, technology, finance and energy."[105]The adoption of the document was welcomed by the Director General of the IAEA who stated that it would "facilitate the IAEA's further verification work in Iran."[106]

The JCPOA comprises 159 pages and consists of the following parts: Preface, Preamble and General Provisions, Voluntary Measures (nuclear, sanctions, implementation plan, and dispute resolution mechanism), and five Annexes that contain technical details of the implementation of the JCPOA (Annex 1 – Nuclear-Related Commitments, Annex 2 – Sanctions-Related Commitments, Annex 2 – Attachments, Annex 3 – Civil Nuclear Co-operation, Annex 4 – Joint Commission, and Annex 5 – Implementation Plan). Accordingly, the provisions of the whole document may be allocated in the following four groups: measures aimed at blocking the "uranium" and "plutonium routes"[107] of obtaining nuclear weapons;[108]establishment of a Joint Commission that will be in

[104] (JCPOA, 2015), Preamble and General Provisions, para. viii.
[105] (JCPOA, 2015), Preamble and General Provisions, para. v.
[106] Director General's Statement on the Announcement by the E3/EU + 3 and Iran on the Agreement of the Joint Comprehensive Plan of Action, 14 July 2015, https://www.iaea.org/newscenter/pressreleases/director-general%E2%80%99s-statement-announcement-e3/eu-3-and-iran-agreement-joint-comprehensive-plan-action.
[107] Terms used by several authors, including Davenport, K. et al (2015), *Solving the Iranian Nuclear Puzzle. The Joint Comprehensive Plan of Action*, available at: http://www.armscontrol.org/files/ACA_Iran-BB_2015%20Aug6_FINAL.pdf (accessed 14 December 2015), Samore, G. (2015), *The Iran Nuclear Deal: A Definitive Guide*, available at: http://belfercenter.ksg.harvard.edu/files/IranDealDefinitiveGuide.pdf
[108] (JCPOA, 2015, paras. 1-12; Annex I paras. 2-63).

charge of supervising of implementation of the JCPOA and of dispute resolution;[109]implementation plan with certain deadlines;[110]timeline of the sanctions relief;[111] cooperation on civil nuclear projects,[112] and "transparency and confidence building measures", in other words, provisions concerning monitoring and verification of the Iran's commitments to peaceful use of nuclear energy.[113]

From the outset it should be underlined that the JCPOA is not a treaty in the sense as it is understood under the VCLT, or "hard law", as defined, for example, by Kenneth Abbot and Duncan Snidal (Abbott & Snidal, 2000). Rather, it may be classified as a political agreement, or a sort of "soft law". First of all, the JCPOA was not signed by the representatives of the Parties. Nor does it contain any provisions which require its ratification by the national parliaments or any other method of coming into force. Moreover, it does not appoint a depositary of the document. Lastly, the very wording of commitments of the Parties to the JCPOA reveals that the Parties apparently did not wish to be legally bound by them, for example:

"Iran and the E3/EU+3 will take the following voluntary measures...";

"Iran will...";

"The EU will...";

"The United States will..."

The JCPOA emphasised its complementary role, acknowledging the "cornerstone" role of the NPT in the non-proliferation regime and its being "the essential foundation" for the pursuit of peaceful uses of nuclear energy.[114] Moreover, in case of its successful implementation, Iran will be "enabled to fully enjoy its right to nuclear energy for peaceful purposes under the relevant articles of the NPT" in line with its correspondent obligations, so that the country's nuclear programme will be treated in the same manner as that of any other NNWS.[115]

Alongside its complementary role, the JCPOA underlined its ad hoc nature, therefore its provisions and measures should not be considered "as setting precedents" for any other

[109] (JCPOA, 2015, paras. ix, 7, 24, 36-37; Annex IV).
[110] (JCPOA, 2015, paras 34-35; Annex V).
[111] (JCPOA, 2015, paras. 18-33; Annex II).
[112] (JCPOA, 2015, para. xii; Annex III).
[113] (JCPOA, 2015, paras. 13-17; Annex I paras. 64-82.4).
[114] (JCPOA, 2015, Preamble and General Provisions, para. vii.
[115] (JCPOA, 2015, Preamble and General Provisions, para. iv.

state or for fundamental principles of international law and the provisions of the NPT or any other relevant instrument.[116]

The JCPOA was endorsed on 20 July 2015 by the unanimously adopted UNSC Resolution 2231 (UN, 2015b). The UNSC affirmed that the JCPOA marked a "fundamental shift" in its consideration of this issue, expressed its "desire to build a new relationship with Iran," and strongly supported "the essential and independent role of the IAEA in verifying compliance with safeguards agreements, including the non-diversion of declared nuclear material to undeclared purposes and the absence of undeclared nuclear material and undeclared nuclear activities, and, in this context, in ensuring the exclusively peaceful nature of Iran's nuclear programme" (UN, 2015b, Preamble). The Resolution provided for the termination of the provisions of previous UNSC Resolutions concerning the Iran's case, as described further in this research (UN, 2015b, paras. 5-9).

In addition, in Resolution 2231 the UNSC requested the IAEA to carry out necessary verification and monitoring of Iran's nuclear-related commitments under the JCPOA throughout their full duration, and to provide regular updates to the Board and to the Security Council (UN, 2015b, paras. 3 and 4).

Lastly, the UNSC decided that on the date ten years after the JCPOA Adoption Day, as defined in the JCPOA, all the provisions of this resolution should be terminated, and none of the previous UNSC Resolutions on the Iran's case should be applied. The Security Council will therefore have concluded its consideration of the Iranian nuclear issue, and "the item "Non-proliferation" will be removed from the list of matters of which the Council is seized" (UN, 2015b, para. 8).

a. Nuclear-related commitments

The JCPOA blocks the uranium route to nuclear weapons using high enriched uranium[117] ("HEU") for over a decade. According to the scientific calculation, the breakout time, i.e. the time required to produce "significant quantity" of weapons-grade uranium[118]for one nuclear weapon, in this case will be extended to around 12 months as a result of implementation of the deal (ACA, 2015). The measures provided for by the

[116] (JCPOA, 2015, Preamble and General Provisions, para. xi.

deal address the three-fold issue: enrichment capacity, the level of enrichment, and Iran's stockpile of enriched uranium.

Firstly, Iran is permitted to continue enrichment by operating 5,060 out of its 15,420 first-generation IR-1 centrifuges, and only at Iran's Natanz Fuel Enrichment Plant. It is also permitted to additionally keep 328 working and 700 idle IR-1 centrifuges at the Fordow Fuel Enrichment Plant for stable isotope production for medical purposes. The rest of the centrifuges, including more advanced IR-2m, and the associated infrastructure for uranium-enrichment cascades, are required to be removed and placed under IAEA monitoring for ten years. As a result, Iran will not be able to turn on quickly the stored centrifuges back into existing cascades in order to resume enrichment as fast as possible. Lastly, for the first 10 years the JCPOA prohibits Iran from producing any additional IR-1 centrifuges save in the case the stored number of machines becomes less than 500. In that event, Iran is allowed to produce additional IR-1 centrifuges taken into account the average breakage rate and under monitoring of the IAEA.

Moreover, the JCPOA imposes certain to limitations as to testing and development of advanced centrifuge machines for the first ten years. The IR-1 machines, permitted for enrichment at the initial stage, are reported as inefficient and crash-prone (ACA, 2015). Iran also has second generation centrifuge IR-2m and more advanced machines IR-4, IR-5, IR-6, and IR-8. During the first 8.5 years of the deal Iran is allowed to keep one machine of each of the advanced type at the pilot plant for the purposes of research and introduce uranium gas in the centrifuges on condition that it cannot withdraw any enriched and depleted uranium materials. After the initial period, Iran will be able to gradually test cascades of advanced machines, then produce more of them and finally after ten years of the deal to begin using the advanced machines for enrichment. However, the total enrichment capacity will remain the same for the years 11–13, i.e.

[117] High enriched uranium (HEU) – uranium containing 20% or more of the isotope uranium-235. HEU is considered a special fissionable material and a direct use material, the latter meaning that nuclear material that can be used for the manufacture of nuclear explosive devices without transmutation or further enrichment. (IAEA, 2001, pp. 32-33).

[118] According to the IAEA Safeguards Glossary, "significant quantity" means the approximate amount of nuclear material for which the possibility of manufacturing a nuclear explosive device cannot be excluded. For example, 25 kilograms of U-235 enriched above 20% level is enough to qualify as significant quantity.

equalling to 5,060 IR-1 centrifuges, since the introduction of any advanced machines required removal of the equivalent enrichment capacity in IR-1s.

Secondly, the JCPOA introduces the maximum level of uranium enrichment. For 15 years Iran is permitted to enrich uranium only up to 3.67 % level, enough for fuelling nuclear power reactors.

Lastly, Iran is required to retain the maximum of 300 kg of the low-enriched uranium ("LEU")[119] in form of UF_6 gas or the equivalent in other chemical forms. The fact that the stockpile cap covers all forms will impede Iran from evading the provisions by converting uranium in different forms. This limited amount does not include enriched uranium in fabricated fuel assemblies for use in Iran's nuclear reactors. The exceeding amount must be either down-blended to natural uranium or sold based on international prices and delivered to the international buyer in return for natural uranium delivered to Iran.

Not only will the enriched uranium be subject to strict accountancy but also the initial part of the nuclear fuel cycle, namely mining of uranium ore. Under the JCPOA, Iran is required to provide the IAEA with all necessary information concerning the production of the uranium ore concentrate produced in Iran (at Gniche and Saghand uranium mines) (IAEA, 2015i, para.2(xi)), or obtained from any other source, for 25 years. Consequently, if Iran possibly chooses to pursue nuclear weapons through covert activities during that period of time, it will have to find an alternative source of uranium for enrichment.

The second possible way for obtaining nuclear weapons by Iran is through producing plutonium, since plutonium containing less than 80% of Pu-238 is considered direct use material.[120] The restrictions placed on the country by the JCPOA concern a currently incomplete 40 MW(th) heavy-water research reactor at Arak site. If completed and operated as planned, the reactor would be able to produce enough weapons grade plutonium in its spent fuel "for one or two nuclear weapons annually" (Samore, 2015, p. 18). Alternatively, another option is extracting plutonium from spent fuel of the Bushehr light-water power reactor built by Russia. However, Iran has agreed to return all Russian-origin spent fuel to Russia for the lifetime of the reactor (WNA, 2017a).

[119] Low enriched uranium – enriched uranium containing less than 20% of the isotope uranium-235 (IAEA, 2001, p. 31).
[120] (IAEA, 2001, p. 33)..

Under the JCPOA, Iran will be required to remove the core of the Arak reactor and make it inoperable by filling the openings with cement. The reactor will then be rebuilt following a new design so that the production of weapons grade plutonium is minimised. The new design shall be developed by an international partnership including all the EU3+3 countries and such other countries as may be mutually determined. The new design will reduce the reactor's power level from 40 MW(th) to 20 MW(th), and will use LEU fuel enriched to 3.67 % level instead of the natural uranium fuel. Initially the fuel load for the redesigned reactor will arrive from outside of Iran, and the international partnership will provide technical assistance to Iran in building facilities for fuel testing and manufacturing. All spent fuel from Arak is required to be shipped out of the country for the lifetime of the reactor, and Iran shall not build a separation facility for 15 years. During that period, Iran will only be permitted to build small hot cells[121] for producing medical isotopes. Taking into account these last provisions and also the fact that Iran would need to run the reactor for over four years in order to be able to produce enough weapons grade plutonium (Ahmad, et al., 2014), the risk of the "plutonium route" is minimised.

Another Iran's commitment concerns deposits of heavy water, used as a moderator in natural uranium fuelled reactors. Not only is the country obligated not to build any additional heavy water reactors for 15 years but it also shall not accumulate any additional heavy water for the same time period beyond Iran's needs, estimated to be 130 metric tonnes. Excess of heavy water produced at the Arak site should be offered for an open international market and delivered to an international buyer. This provision, however, has a loophole that was subsequently discovered by some specialists in the following case (Albright & Stricke, 2016). The USA, as an "international buyer," agreed to purchase 32 metric tonnes of heavy water from Iran in 2016 (Solomon, 2016). According to some sources, this amount of heavy water was shipped to Oman and is awaiting the closing of the purchase agreement (Albright & Stricke, 2016, pp. 1-2). The February 2016 Report by the Director General confirmed the shipment of 20 tonnes of heavy water that occurred shortly after Iran's stock of heavy water had reached 130.9 metric tonnes (IAEA, 2016k, paras. 16 and 17). The Report, however, did not specify

[121] Highly shielded tight casing in which highly radioactive substances can be remotely handled by manipulators observing the processes through lead-glass windows so that there is no hazard to personnel. See https://www.euronuclear.org/info/encyclopedia/h/hotcell.htm.

the destination country. Meanwhile, the IAEA did not report that Iran had ceased to produce heavy water (IAEA, 2016k, para. 16), which may lead to the conclusion that its stocks were steadily increasing. Taking into account the latter consideration, and the facts that the U.S. purchase of 32 metric tonnes of heavy water had not been formalised and the water stored in Oman continues to be property of Iran (hence the possibility of its return back to the country), the question remains open whether the whole amount heavy water owned by Iran should be no more than 130 metric tonnes set out in the JCPOA.

b. Joint Commission

The JCPOA establishes an eight-member Joint Commission, composed of one representative of China, France, Germany, Russia, the United Kingdom, the United States, the EU and Iran. The commission will hold quarterly meetings in New York, Geneva, or Vienna. Its main task will consist of monitoring of the implementation of the document. The Joint Commission is planned to comprise at least four Working Groups that focus on procurement, sanctions lifting, Arak heavy water reactor modernization, and other technical issues. The Joint Commission is also authorised to review and approve various nuclear measures, such as: the final plans for the redesign of the Arak reactor and requests on part of Iran to obtain certain types of hot cells, test new types of centrifuges, or begin research on uranium metal fuel for the Tehran Research Reactor. Decisions of the Commission require consensus among all members, save decisions concerning authorisation of IAEA access to suspect sites, which is discussed in detail further in this study. In the latter case a simple majority is required.

Third, and probably the most important, prerogative of the Joint Commission is dispute resolution. To launch this procedure, any member of the Joint Commission that believes the JCPOA commitments are not being met should refer the issue to the Commission. The Joint Commission will then dispose of 15 days to resolve the issue, with a possibility to extend this time-limit by consensus. The Commission can also decide to convene a review at the level of Ministers of Foreign Affairs, who will also have 15 days to review the issue. At the same time, complementary to the ministerial level consideration or instead of it, the Joint Commission may also request an Advisory Board for an advisory opinion. The Advisory Board, which consists of three members (two of them appointed by each participant in the dispute and one is independent), will

have 15 days to review the dispute and issue a non-binding advisory opinion. The Joint Commission will then have five days to review it.

There still exists a possibility that the issue remains unresolved, in which case the complaining party can regard the issue as significant non-compliance and thus cease implementing the deal in whole or in part. Alternatively, the party to the JCPOA, which considers that there is "significant non-performance" of commitments under the JCPOA," may ask the UNSC to put previous sanctions back in place. This way of recourse will be discussed below in the subsection concerning sanctions relief. It should nevertheless be noted that, although there are no restrictions as to the timing for the use of the UN route, the UNSC Resolution 2231 encourages the JCPOA participants to resolve any issues arising with respect to implementation of JCPOA commitments "through the procedures specified in the JCPOA" (UN, 2015b, para. 10).

In the light of the foregoing, it may be concluded that the Joint Commission will face a hard task of differentiating between purely technical issues and genuine non-compliance. That will require a highest degree of competency, since an abrupt reinstatement of sanctions will inevitably put an end to the deal whereas complacency and untimely response to any proliferation challenge will undermine the world security. In order to avoid ambiguity about technical issues, the Joint Commission has so far adopted seven decisions that provide clarifications for the implementation of nuclear-related measures (IAEA, 2016b), (IAEA, 2017a).

c. Implementation timeline

The JCPOA contains a fairly elaborate description of the implementation timeline, which was further developed by UNSC Resolution 2231. The main goal of the schedule is to assure that the sanctions relief does not take place until Iran has implemented, and the IAEA has verified, its nuclear commitments.

Firstly, after the day the negotiations on the JCPOA were finalised, the EU3+3 countries and Iran will work through domestic procedures to review and approve the deal.

Secondly, the document establishes an Adoption Day, or a "critical first step" as described by the U.S. Secretary of State John Kerry (Kerry, 2015). The Adoption Day is set to occur after the 90 days since the JCPOA has been unanimously agreed upon and endorsed by UNSC Resolution 2231 on 20 July 2015. So, on 18 October 2015, EU High Representative Mogherini and Iranian Foreign Minister Zarif jointly announced the

Adoption Day, stating that "all sides remain strongly committed to… implementation of the Joint Comprehensive Plan of Action… as soon as possible" (EU-Iran, 2015). The JCPOA stipulates that, from this day on, all JCPOA participants will start implementing the deal. Moreover, Iran and the IAEA will start developing necessary arrangements to implement all transparency measures provided in the deal. For Iran that means implementing previously discussed restrictions concerning enrichment of uranium that push its "breakout timeline" from the previously estimated 2-3 months to over 12 months. The USA and the EU will at the same time launch sanction-lifting mechanism.

Thirdly, the JCPOA defines an Implementation Day, which will occur after the IAEA arrives to conclusion that Iran has adopted nuclear-related measures, specified in paragraphs 15.1–15.11 of Annex V of the JCPOA. At that point, the EU terminates the application of the nuclear-related sanctions, a major part of the U.S. sanctions are ceased to apply, and UN sanctions are "terminated subject to re-imposition" save the restrictions regarding the transfer of proliferation sensitive goods, which will continue to apply. The absence of any certain date corresponding to the implementation of the deal reflects the difficulty in determining the speed of the Iran's pace on its way to complete restrictions. Dismantling, sanitizing, and storing around 13,000 centrifuges, which is among the nuclear-related measures, is regarded as a particularly time-consuming task and could take an hour per machine, so the implementation day was expected in early 2016 (ACA, 2015). So, on 16 January 2016 the Director General's report to the Board of Governors, and in parallel to the Security Council, confirmed that the Agency had verified that Iran had implemented nuclear-related measures (IAEA, 2016l, para. 2). As a result, "Implementation Day occurred on the same day" (IAEA, 2016d).

The JCPOA then establishes a Transition Day, which occurs either eight years after the Adoption Day or after rendering of the Broader Conclusion by the IAEA, whichever is earlier. The broader conclusion should state that all nuclear material in Iran remains in peaceful activities, for which the Agency need to analyse all possible information about nuclear activities of Iran, including its possible military dimensions. It thus requires Iran to implement an AP. Simultaneously, the IAEA is in charge of making a two-fold conclusion: on the one hand, that there is no diversion of declared nuclear material from use in peaceful purposes, and on the other – that there is no indication of undeclared

nuclear material or activities. Upon reaching the Transition Day, the U.S. will seek a full termination of congressionally mandated nuclear-related sanctions. Similarly, the European Union will terminate the rest of its sanctions.

Finally, a Termination Day occurs ten years after the Adoption Day. At this point, as previously described in the present study, the UN Security Council will no longer have the Iran's case on agenda.[122]

d. Sanctions relief

The mechanism of sanctions relief is tightly connected with the implementation timeline described above. The JCPOA makes reference to the three types of sanctions then in force: those imposed by the UN, by the USA and by the EU. All of nuclear-related sanctions will be lifted or suspended once Iran implements its commitments under the IAEA's verification. The remaining U.S. and EU sanctions, essentially targeting certain individuals and entities associated with Iran's ballistic missile and nuclear proliferation activities, will be lifted on the Transition Day. It is noteworthy that UNSC Resolution 2231 codifies a mechanism for restoring the sanctions, described in the JCPOA (UN, 2015b, paras. 10 and 11). As was previously described in this paper, any participant in the JCPOA can bring a non-compliance complaint with the UNSC. The Security Council will then dispose of 30 days to vote on a new resolution that will continue the sanctions relief. Any UNSC Permanent Member is entitled to veto such resolution, whereas the re-imposition of sanctions relief would require consensus of all Permanent Members (UN, 1945, Chapter V, Articles 23 and 27). In this event, the sanctions under the previous Security Council resolution will be automatically reinstated. At any time the proceedings at the Security Council may be halted at the complaining party's notification that the issue has been resolved (UN, 2015b), para. 13.

e. Co-operation in peaceful uses of nuclear energy

The JCPOA enshrines extended cooperation between E3/EU+3 countries and Iran in the field of peaceful uses of nuclear energy and their engagement in mutually determined civil nuclear cooperation projects. These benefits may be regarded as twofold: first, they aim at advancing Iran's non-sensitive civil nuclear energy programme; secondly, they can integrate it more fully in the international nuclear system and render it more

[122] See also the JCPOA, Annex V, para. 24.

accountable. The deal does not contain any commitments to assistance in such sensitive areas as enrichment or reprocessing, save the assistance in redesigning and launching the Arak research reactor and in the area of stable isotope separation with the help of IR-1 centrifuges at the Fordow site.

The agreement provides for three formats of cooperation projects: bilateral or multilateral cooperation arrangements, projects under the auspices of IAEA, and projects through International Science and Technology Centres. The relevant fields of co-operation are: reactors, fuels and associated technologies, facilities and processes; research and development; nuclear safety, safeguards and security; nuclear medicine and radioisotopes, and waste management and facility decommissioning.

In particular, the deal envisages the following:

- The EU3+3 will facilitate Iran's acquisition of light water research and power reactors, and assist with construction, supply of instrumentation, supply of equipment, training, and technical review.
- The EU3+3 will provide assistance to Iran in meeting international qualification standards for the fabrication of nuclear fuel, and co-operate on the supply of fabrication technologies and equipment.
- Iran will seek cooperation on a variety of research and development activities and request proposals for co-operative international nuclear, physics, and technology projects.
- In a joint partnership with Russia, Iran will set up two centrifuge cascades for stable isotope production in the Fordow facility.
- A Nuclear Safety Centre will be established by Iran. The country will also seek to engage regulatory authorities in other countries to share lessons learned and best practices on, *inter alia*, regulatory independence, safety culture, emergency preparedness, and accident management.
- In the area of nuclear medicine, Iran will seek co-operation for upgrades to its infrastructure for radio-isotope production, among other topics.
- Co-operation in the field of safeguards in the form of trainings and workshops on strengthening nuclear material accounting and control process, human resource development, strengthening nuclear materials security.

- The EU3+3 are prepared to co-operate on issues of waste management and facility decommissioning, including the supply of appropriate equipment and systems for waste management and depository facilities.

The list of cooperation projects is open-ended and may involve other fields, subject to mutual determination by the participants to the JCPOA.

2.2. Monitoring and verification mechanism under the JCPOA

Taken separately, each element of the deal may not be regarded as completely reassuring that Iran's nuclear programme is about to be developed in a civil dimension. Taken together, the nuclear restrictions are likely to make a strong system that will put nuclear weapons out of Iran's reach for at least 15 years. However, this system could not be regarded as comprehensive and complete without an effective monitoring and verification system provided by the IAEA.

The JCPOA expressly requested the Agency to monitor and verify the voluntary nuclear-related measures, and to provide regular updates to the Board and to the UNSC (JCPOA, 2015, Preamble and General Provisions, para. x). As described previously in this study, UNSC Resolution 2231 also contained the same request.

The JCPOA provides for a three-layer international monitoring of every element of Iran's nuclear fuel cycle. The monitoring mechanism includes Iran's CSA currently in force (with a modified Code 3.1 of the General Part of Subsidiary Arrangements), the AP to the CSA, which shall be implemented by Iran in virtue of the JCPOA, and additional verification measures (so-called "Transparency and Confidence Building Measures"), which have been introduced for the first time by the JCPOA. As a State party to the NPT, Iran will have an obligation to adhere permanently to the two types of safeguards agreements, the CSA and the AP.As to the specific verification measures stipulated in the deal, they will remain in force for a period of 10 to 25 years. Alongside with the above referenced mechanism, the deal also set out some specific provisions concerning IAEA's supervision of import of materials and technologies for its nuclear program and verification of the county's outstanding issues related to the nuclear programme.

Iran's existing NPT Safeguards Agreement remains the basis of the IAEA verification activities in the country. It requires Iran to provide the IAEA with a complete list of the quantities and locations of all nuclear material on its territory and the related activities.

In order to enjoy the most complete protection that the existing safeguards provide, the JCPOA also obligates Iran to accept the modified version of Code 3.1, which requires Iran to notify the IAEA of any new facilities as soon as a decision to build them has been taken, and before nuclear material is introduced. Iran will also allow design information verification (DIV) visits to the declared sites. This JCPOA provision will bring Iran back into compliance with this safeguards obligation provisionally implemented in 2004-2006, the discontinuation of which was never accepted by the Agency, as described before in this study. Such early provision of information will enable the Agency to design safeguards activities more in advance.

As was already described in this paper, Iran already implemented the AP on a "voluntary basis" from 2003 to 2006. According to the deal, Iran will resume the "provisional implementation" since Implementation Day until Transition Day. At that point Iran will pursue ratification of the AP by its parliament.

Since the AP basic requirements has already been described in the first part of the present research, only particular provisions will be described further. The IAEA can request on a short notice a "complementary access" to any location on the site of declared nuclear facilities: in case if the IAEA inspector is already on the site carrying out an inspection or DIV, the notification time of is 2 hours; for all other cases it is 24 hours. In case of Iran's inability to allow access to the requested location, the AP does not establish any deadline for resolving disputes over complementary access. The AP also allows for "managed access" to sites in order to protect sensitive or proprietary information. Under Article 7 of INFCIRC/540, the goal of managed access is to "prevent the dissemination of proliferation sensitive information, to meet safety or physical protection requirements, or to protect proprietary or commercially sensitive information." For instance, when at a sensitive location, such as a military base or a factory with intellectual property to protect, IAEA inspectors will be allowed to gather only the information they need to satisfy their specific request.

The AP also empowers the IAEA to access locations outside of declared nuclear facilities if it considers it necessary to complete verification.

In case if a question or inconsistency arises, the AP prescribes the following procedure. Firstly, the IAEA is required to provide Iran with an opportunity to clarify and try to resolve the question or inconsistency. Second, if no plausible response was received and

if the IAEA considers that any delay in access is prejudicial to the purpose of the access, the IAEA makes a request for a broader access. It should be noted that no conclusions on the question or inconsistency may be drawn by the IAEA unless it first gives this opportunity to Iran. Thirdly, in case the requested access is not provided, Iran will be required to make every reasonable effort to meet the IAEA's requirements without delay through other means, such as location-specific or wide area environmental sampling.

Iran's application of the AP will without any doubt enhance the monitoring and verification system of its nuclear program for indefinite time. It will provide the IAEA with greater inspection powers to ensure the absence of undeclared nuclear activities in Iran more effectively. However, there also exist certain risks. Since the commencement of ratification of the AP is staved off until the Transition Day, it is uncertain whether Iran's parliament will vote for it. Since ratification requirement is an integral part of the JCPOA, failure to do so would inevitably lead to a breach of the agreement. Accordingly, the EU3+3 would be expected to restore the sanctions or terminate the deal.

Some expert criticised the definition of "provisional" application since it such commitment seemed to be weak and would permit Iran to unilaterally cease it, as the country did in 2006 (Joyner, 2016, p. 235). Moreover, according to Olli Heinonen, former IAEA Deputy Director General(Safeguards), legally binding application of the non-ratified AP did not have historical precedents:

> "Implementation of the Additional Protocol (AP) remains provisional until the time when the IAEA has reached a "broader conclusion" on the peaceful nature of Iran's nuclear program. This contradicts current safeguards practices. Such conclusions have only been drawn by the IAEA when an AP is in force and ratified. This is not a matter to easily dismiss as we need to be mindful of potential complications down the road should Iran seek to leverage, pull back, or dilute some of its obligations at some point in time under its 'provisional' status" (Heinonen, 2015).

However, an analysis of the term reveals that the legal effects of provisional and voluntary application of the AP are not equal, with the former being virtually equal to full application. Article 25(1) of the Vienna Convention of on the Law of Treaties provides that a treaty may be applied provisionally pending its entry into force if (a)

there is a correspondent provision in the treaty itself, or (b) the negotiating States have in some other manner so agreed (UN, 1969). The Vienna Convention also provided for a mechanism of termination of the provisional application of a treaty in case the treaty did not contain correspondent provisions or the Parties thereto did not accord the procedure. Accordingly, the provisional application of a treaty with respect to a State should be terminated after the State notifies the other States between which the treaty is being applied provisionally of "its intention not to become a party to the treaty" (UN, 1969, Article 17(2)). These provisions were, however, silent on the process of provisional application and its legal consequences. In that regard, it should be noted that, in 2012, the International Law Commission included the topic "Provisional application of treaties" in its programme of work and appointed Mr. Juan Manuel Gómez-Robledo form Mexico as Special Rapporteur for the topic (UN, 2017d). The Special Rapporteur has so far provided four reports which shed some light on the issue. The third report underlined that "consent to be bound is the pivotal act by which a State expresses its willingness to be bound by the terms of the treaty" (UN, 2015a, para. 36). The Special Rapporteur then took into account the flexibility that characterised provisional application and a consequent wide variety of means by which States may express their wish to avail themselves of it, whilst "maintaining the distinction between provisional application and entry into force of a treaty" (UN, 2015a, para. 43). The Special Rapporteur's conclusion on this issue was nevertheless a big ambiguous since it stated that a State might employ the means of expressing consent to be bound by a treaty, as provided in article 11 of the 1969 Vienna Convention, to agree to its provisional application (UN, 2015a, para. 44).

As to the issue of legal effect, the Special Rapporteur's report concluded that the provisional application produced the same legal effects as any other international agreement and was thus subject to the rule *pacta sunt servanda* ("agreements must be kept"). As a consequence, legal effects provisional application are "definite and enforceable and cannot subsequently be called into question in view of the "provisional" nature of the treaty's application" (UN, 2015a, para. 48).

Turning to the AP, it is noteworthy that Condition (a) of Article 25 of the Vienna Convention applies to this agreement, since Article 17 of the AP expressly stipulates that, after a State signed the AP, the State may declare at any date before this Protocol

enters into force that "it will apply this Protocol provisionally." Taken into account the aforesaid, and bearing in mind the spirit of the JCPOA, it is hard to infer any practical difference between the provisional application of the AP and its application after ratification, since in both cases adherence to the AP provisions is fully binding. It is evident that the compulsory, legally binding character of the provisional application of the AP renders Iran's commitment a stronger status than its past "voluntary implementation" had.

If Iran fails to fully comply with the AP, the whole JCPOA will be undermined. It will have further repercussions taking into account the fact that the additional verification measures are limited in time (to maximum of 25 years).

In addition, the JCPOA provides that the IAEA will be able to reach the Broader Conclusion that "all nuclear material in Iran remains in peaceful activities," with the CSA, the AP and other verification measures in place. The conclusion obviously requires an enormous work to be done by the Agency, which can take several years. Moreover, the absence of the conclusion does not automatically entail non-compliance. In fact, according to the IAEA's statistics, there are several countries with both CSA and AP in force for which the Agency had not yet drawn a broader conclusion (IAEA, 2015h, para. 69). That may be the reason why arriving to the conclusion is only one of the two alternative preconditions for the Transition Day to occur, the second being the eight-year period.

The third layer of monitoring and verification activities is expressly provided by the JCPOA itself. According to it, the IAEA will be entrusted with the task of confirming that Iran it is implementing provisions of the deal. To that end, the powers of the IAEA go beyond the normal requirements of the CSA and the AP.

As was previously described, already in 2003 Iran started submitting to the IAEA the information concerning its undisclosed nuclear activities, which the Agency was not capable of detecting through verification neither under the CSA nor, since November 2006, under the AP. In 2005 the Director General underlined this lack of verification capacity and urgent need of Iran's full transparency, and called for enhanced verification tools beyond the CSA and the AP, reporting to the Board that:

> "Given Iran's past concealment efforts over many years, such transparency measures should extend beyond the formal requirements of the Safeguards

> Agreement and Additional Protocol and include access to individuals, documentation related to procurement, dual use equipment, certain military owned workshops and research and development locations. Without such transparency measures, the Agency's ability to reconstruct, in particular, the chronology of enrichment research and development, which is essential for the Agency to verify the correctness and completeness of the statements made by Iran, will be restricted" (IAEA, 2005e, para. 50).

The call for these transparency measures was further repeatedly spelled out by the Board in its Resolutions. However, as it was previously described, at the same time such measures kept being not legally binding (IAEA, 2005i, Recital (d)), which only changed when they were included into UNSC Resolutions as Iran's obligations. Eventually the weak points identified by the Director General and some additional verification procedures beyond the CSA and the AP, were addressed both by the JCPOA and by the Roadmap for the Clarification of Past and Present Outstanding Issues, and possibly by further confidential IAEA-Iran agreements on PMD, as explained below.

Firstly, Iran shall provide necessary conditions for increasing the efficiency of the IAEA's monitoring for 15 years "or longer." This implies meeting the IAEA needs of its long-term presence in the country such as authorisation of long-term visas for IAEA inspectors and providing them with appropriate working space at nuclear sites or near them. Iran also will allow the increase of designated IAEA inspectors to 130-150 within nine months from the Implementation Day and let them use "approved and certified" modern technologies. Among such equipment are the apparatus for continuous on-line monitoring the enrichment level of uranium and electronic seals that automatically communicate changes in their status to inspectors on site. One example of such equipment is an Online Enrichment Monitor, which is used to verify that Iran keeps its level of uranium enrichment at up to 3.67 % (IAEA, 2016g). The use of such equipment is a step forward compared to traditional methods of sampling and analysis, results of which can take three weeks or longer to obtain, mostly because of the time it takes to ship a sample from Iran to the IAEA's laboratories in Seibersdorf, Austria. The use of new seals increases to certain extent responsibility and at the same time provides certain discretion to inspectors on site since the seals will not be able to transmit data directly back to IAEA headquarters. The JCPOA also sets out a condition that inspectors should

be from nations that have diplomatic relations with Iran. In other words, U.S. nationals are excluded from the list (USA, 2017).

Secondly, Iran will permit the IAEA to monitor for 25 years that all uranium ore concentrate present in Iran is transferred to the Uranium Conversion Facility at the Esfahan site or any other future facility. Agreed measures will therefore include containment and surveillance. It may be inferred that this provision could fall victim to the classical CSA fault should Iran try to provide incomplete initial declaration. In fact, there is no indication that Iran is somehow obligated to allow the IAEA to prove completeness of its initial uranium declaration. One option is to use mechanism stipulated in the AP, but the issue is not clear for the moment.

Thirdly, the JCPOA empowers the IAEA to perform thorough scrutiny of Iran's enrichment process. The relevant provisions make reference to two basic elements: centrifuges and their parts, and the Natanz enrichment site. For 20 years the Agency will carry out containment and surveillance on centrifuge rotor tubes and bellows. In turn, Iran is obligated to provide an initial inventory of all existing centrifuge rotor tubes and bellows, provide reports on changes in the inventory, and allow the IAEA to verify the numbers by item counting and numbering them. Furthermore, Iran will declare locations and equipment, namely flow forming machines, filament winding machines and mandrels used in the production of rotor tubes, and permit IAEA to exercise continuous monitoring regarding their use. Lastly, for 15 years Iran will permit the IAEA to implement continuous monitoring, including through containment and surveillance measures, to verify that stored centrifuges and infrastructure remain in storage in Hall B of Fuel Enrichment Plant at the Natanz enrichment site, and they are used only to replace failed or damaged centrifuges.

As to buildings at the Natanz site, for 15 years Iran will permit the IAEA regular access to them, including daily access as requested. The relevant buildings include all parts of the FEP and the Pilot Fuel Enrichment Plant (centrifuge research and development facility). The JCPOA provides that for 15 years all enrichment and safeguarded R&D activities with take place solely at the Natanz site.

Alongside with monitoring Iran's declared facilities, the JCPOA establishes a procedure designed to ensure IAEA inspectors' access to Iran's possibly undeclared material and sites where nuclear activities are suspected to be carried out. The provision will last for

15 years. The deal expressly stipulates that this kind of access will not cause prejudice to Iran's safeguards agreement and the AP thereto. As it was described above, their mechanism gives the IAEA the right to access in some cases within 24 hours any site in Iran, but the mechanism of dispute settling is not perfect. Moreover, the IAEA experience with Iran routinely denying access requests to suspicious sites did not add to the efficiency of the access procedure and did not entail severe consequences to the country (IAEA, 2004f, para.2).[123] The access provision in the JCPOA thus establishes a new mechanism that evidently was planned to cover the loopholes of the previous one by rendering IAEA access requests more enforceable. Firstly, in case the IAEA has concerns regarding undeclared nuclear materials or activities, or activities inconsistent with the JCPOA, a trigger event will be the IAEA's submission of its basis for concerns to Iran with a request for clarification. Then, if Iran's explanations do not resolve the concerns, the Agency is entitled to request access to locations to verify the absence of undeclared nuclear materials and activities inconsistent with the JCPOA, and will provide Iran in writing the basis for its requests and information about the concerns. In turn, Iran can propose to the IAEA an alternative means for resolving the concerns. In case both parties are unable to reach agreement for access within fourteen days of the IAEA's original request, the Joint Commission enters in the dispute. In the event of the further absence of agreement between the IAEA, Iran, and the Joint Commission with regards to access, the Joint Commission would by consensus or by a vote of five or more of its eight members within seven days decide that access be granted. As a result, Iran would grant access within three additional days. In case Iran refuses to grant IAEA access, any member of the EU3+3 can start a process before the UNSC to restore sanctions.

The access provision seems to have certain shortcomings. To begin with, it is the extension of the granting period from previous 2-24 hours to overall 24 days. Some authors believe that this period could be enough time for Iran to relocate undeclared activities that are in violation of the JCPOA or to hide evidence that would not necessarily leave a trace in environmental sampling (ISIS, 2015, p. 5). Moreover, Iran

[123] "The Board of Governors deplores the fact that… Iran's cooperation has not been as full, timely and proactive as it should have been, and, in particular, that Iran postponed until mid-April visits originally scheduled for mid-March - including visits of Agency centrifuge experts to a number of locations involved in Iran's IR-2 centrifuge enrichment programme."

has certain experience in hiding its nuclear activities. The specialists, however, assess that the larger the scale of Iran's nuclear and nuclear-weapon-related activities, the higher the probability that their traces will be detected (ISIS, 2015, p. 6). These former include, for example, high explosive testing related to nuclear weapons, small centrifuge manufacturing plant, and small centrifuge plant that uses advanced centrifuges organized in specially designed facilities suitable for rapid removal and with a containment system (ISIS, 2015, p. 6). The latter group includes facilities that use significant amounts of uranium or plutonium, such as large-scale uranium conversion, centrifuge plants with thousands of gas centrifuges, reactors or reprocessing plants, high explosive works with natural uranium as a surrogate (ISIS, 2015, p. 6).

The fact that the provision will not last indefinitely, rather for only 15 years, can be regarded as another weak point of the access provision. Thirdly, the following language of the provision may seem to discourage IAEA inspectors from seeking routine access to military sites: "requests for access... will be kept... to the minimum necessary to effectively implement the verification responsibilities under this JCPOA," and will not be aimed at "interfering with Iranian military or other national security activities" (JCPOA, 2015, Annex I, Q, Article 74).

The last point that some of authors emphasize is that this provision prescribes a new form of interaction for the IAEA (Findlay, 2015). Now it will not be the Board of Governors that will decide a case of non-cooperation on part of Iran within a non-determined period of time, but the Joint Commission, and finally the UNSC, which will resolve the dispute according to a fixed timetable. Furthermore, there is no indication in the deal that the Joint Commission cannot make conclusions as to Iran's non-compliance. This fact can have negative implications on the Board's role to direct the verification work of the IAEA and to pronounce on non-compliance. However, whether the Commission chooses to substitute the Board lies beyond the legal analysis, rather in the political one.

The IAEA will also have an important role in verifying how Iran will apply nuclear import policies and practices concerning nuclear material, equipment and technology obtained through the so-called "Procurement Channel". The country shall engage in enrichment-related exports after it receives approval of the Joint Commission and provide the IAEA with access to the locations of intended use of all items, materials, equipment, goods and technology set out in INFCIRC/254/Rev.12/Part 1, or the Nuclear

Suppliers Group direct nuclear use list, imported following the procedure under Section 6 of Annex IV to the JCPOA. An exporting State will also be permitted to verify the end use of all items, materials, equipment, goods and technology set out in INFCIRC/254/Rev.9/Part 2, or the NSG nuclear dual-use goods list, imported following the same procedure. These two provisions reveal inconsistency of the approach to the two types of goods. In other words, the IAEA cannot directly verify that it was a declared end user that has received a dual-use item. One of the viable options for the Agency would be to recourse to its right to access if it has concerns that the item is being used for undeclared nuclear activities, or activities inconsistent with the JCPOA. This provision will remain in force for 10 years.

The JCPOA requires Iran to fully implement the Roadmap on PMD, officially called "Road-map for the Clarification of Past and Present Outstanding Issues," which was agreed by the IAEA Director General Yukiya Amano and the Iranian Vice-President, President of the Atomic Energy Organization of Iran, Ali Akbar Salehi on 14 July 2015. Information on possible military dimension of Iran's nuclear programme was needed for the Agency to have a point of departure in understanding the country's capability to produce nuclear weapons, and would therefore permit the Agency to elaborate safeguards goals and safeguards implementation strategy. Taken together with the Iran's commitment not to "seek, develop or acquire any nuclear weapons," as stipulated in the JCPOA's Preface, the Roadmap on PMD seems to represent a solid shield against possible weaponisation activities.

Under provisions of the Roadmap, Iran was obligated to clarify on the possible military dimensions of its nuclear programs because "since 2002 the Agency has become increasingly concerned about the possible existence in Iran of undisclosed nuclear related activities involving military related organizations, including activities related to the development of a nuclear payload for a missile" (IAEA, 2011, p. 7). The Roadmap was based on the 2013 Framework for Cooperation, described earlier in the present study, which required Iran to further co-operate with the IAEA to "resolve all present and past issues, and to proceed with such activities in a step-by-step manner." However, by the time the JCPOA was negotiated, Iran had implemented only the first and some of the second step measures of the framework (Findlay, 2015).

The Roadmap required Iran to "provide explanations regarding outstanding issues set out in the annex of the 2011 Director's General report" (IAEA, 2015b, para. 1). The IAEA would then review the received information and submit to Iran questions on any possible ambiguities (IAEA, 2015b, para. 3). The Roadmap provided for technical-expert meetings and discussions, as well as a separate arrangement regarding the issue of the Parchin site (a military research and development complex and testing ground). The specific commitments of Iran with regards to technical expert meetings and discussions, and access to the Parchin site are contained in two separate documents between Iran and the IAEA that are not available to public.

The activities under the Roadmap were completed by 15 October 2015 and afterwards verified by the IAEA. Consequently, on 2 December 2015 the IAEA released a report entitled "Final Assessment on Past and Present Outstanding Issues regarding Iran's Nuclear Programme" (IAEA, 2015c). Two important conclusions are placed in paragraphs 77 and 88 of the document. The first one reads that the Agency "has not found indications of an undeclared nuclear fuel cycle in Iran, beyond those activities declared retrospectively by Iran." The statement reinforces confidence that Iran used all nuclear and nuclear-related material for peaceful purposes. In other words, it establishes the "point zero" for the monitoring and verification of the IAEA, so that the Agency will focus basically on the declared facilities. Paragraph 88 states that "the Agency has found no credible indications of the diversion of nuclear material in connection with the possible military dimensions to Iran's nuclear programme." Overall, the statement may serve as a solid start both for the implementation of the deal and for the IAEA work on drawing the broader conclusion that all of Iran's nuclear material has been declared to the IAEA and is placed under safeguards. However, the language employed in the final conclusion is less affirmative than, for example, the one used by the Secretariat when concluding on a State's compliance with provisions of the CSA or the AP. On the one hand, in the December 2015 report the IAEA stated that there were no "credible" indications of the diversion, which may lead to a conclusion that there might have actually been certain indications, however, unidentified. On the other hand, the Agency refrained from asserting that there was no diversion and all the nuclear material remained in peaceful use, rather it referred to the absence of any "credible indications."

Without undue delay, on 10 August 2012 the Director General has approved the establishment in the Department of Safeguards of the Iran Task Force, a special unit for performing functions related to the implementation of the Iran's CSA and the relevant provisions of Resolutions of the Board of Governors and the United Nations Security Council, including UNSC Resolution 2231 (IAEA, 2012c). The unit reported directly to the Deputy Director General for Safeguards and had around 50 staff members, about half of whom are inspectors only doing inspections in Iran, and analysts that report to the head of the Task Force. Other more than 100 inspectors, taking into account that the JCPOA sets their total number of 130-150 (JCPOA, 2015, Annex I, para. 67.3), may be assigned from other regular safeguards divisions, provided that such inspectors have been approved by Iran and therefore received designation for this country, or recruited additionally (Shea, 2015, p. 33). The unit's functions were transferred to a new, bigger Office for Verification in Iran ("the SGVI") on 1 March 2016 (IAEA, 2016h), since the Agency needed to accommodate the Department of Safeguards' additional work in connection with the Agency's verification and monitoring of Iran's implementation of its commitments under the JCPOA.

In line with the Director General's predictions that the Agency would need extra funding for checking the implementation of the AP and conducting verification and monitoring of Iran's nuclear-related commitments under the JCPOA (IAEA, 2016d), additional funding was allocated. Out of estimated annual cost of € 9.2 million per year, only € 3 million, relating specifically to the provisional application of Iran's Additional Protocol, was covered by the regular budget (IAEA, 2017f, para. 4 and footnote 3). By 21 February 2017, € 13.7 million was pledged by Member States as extra-budgetary contributions for JCPOA-related activities (IAEA, 2017f, para. 4 and footnote 3). The additional costs stemmed from the additional:

- inspection effort (around 1,042 man-days of inspection (IAEA, 2017e, p. 75), 100 % increase from verification of just Iran's compliance with its CSA);
- images transmitted by remote surveillance systems (a 90 % rise from the period before the AP and the JCPOA);
- human resources (120 % increase from pre-AP/JCPOA times) (IAEA, 2016e, p. 26).

It is remarkable that the estimated cost of implementing safeguards in Iran in 2015 was the second highest following Japan (€ 13.110 million from the Regular Budget plus €5.5 million of extra-budgetary resources, and € 18.993 million, respectively) (IAEA, 2016j, p. 48), whereas Iran had only eighteen facilities under safeguards and Japan – 125 (IAEA, 2016a, p. 28).

CONCLUSIONS

1. The main safeguards instruments have undergone a long way of evolution, expanding the scope of safeguards as well as the tools. The development was generally reactive, with changes introduced as a response to obvious needs or failures of the system. An evident reason for this is that the more extensive the scope of safeguards, which were based on a binding agreement between a state and the IAEA, the more sovereignty the States had to cede to the Agency. Accordingly, the first safeguards instrument, the Statute of the IAEA, contained only general and fairly limited safeguards provisions to ensure that special fissionable and other materials, services, equipment, facilities and information are not used for military purpose. Moreover, the safeguards which were not automatically applicable to a Member State of the IAEA only by virtue of its membership but required a separate safeguards agreement for each transaction. Lastly, at that stage the Agency still treated the health and safety issues as part of safeguards.

However, soon it became evident that concluding an ad hoc safeguards agreement for every nuclear transfer would not be a sustainable solution. Furthermore, the Agency decided to distinguish between safeguards, which covered the non-proliferation issues, and nuclear safety, which meant protection of people and the environment against radiation risks. As a result, the Board approved a first specialised legal instrument dedicated exclusively to safeguards – INFCIRC/26 "The Agency's Safeguards." The safeguards under this document applied to nuclear reactors with less than 100 MW(th), nuclear material in them and to the first generation produced material. INFCIRC/26 also set out the basic elements of the safeguards: state's obligation to run nuclear material accountancy and to submit reports on the safeguarded facilities and the nuclear materials to the Agency, and inspections conducted by the Agency. Later, as a reaction to the changing pattern of trade in nuclear facilities, in which a share of large power reactors was increasing, the Board decided to broaden the scope of safeguards to include reactors of maximum power exceeding 100 MW(th).

The next generation of safeguards, INFCIRC/66/Rev. 2-type, further broadened the scope of safeguards procedures, which started to include reprocessing, conversion and fuel fabrication plants. The provisions of both instruments are incorporated into a safeguards agreement between parties by including a corresponding reference, thus the

document is not a "model" document, although agreements of this type share some common patterns in the structure and contents.

The further extension of scope of safeguards was definitely revolutionary. It happened with the conclusion of the truly global NPT, whose Article III.1 required all but five States Party to submit all of their nuclear activities, which are by definition peaceful, under IAEA safeguards. Accordingly, the Board adopted a document INFCIRC/153/ (Corr.) "The structure and content of agreements between the Agency and States required in connection with the Treaty on the non-proliferation of nuclear weapons." Consequently, safeguards agreements concluded on its basis were almost identical and were called "full scope" or "comprehensive" because the safeguards covered all source or special fissionable material in all peaceful nuclear activities within the territory, jurisdiction or control of the state. Therefore, almost the whole fuel cycle was to be covered by the safeguards, save uranium mining and milling, waste storage, and research and development not involving nuclear material. A state was required to submit information on all nuclear material within its territory or control or jurisdiction, then the Agency was to verify its correctness using universal non-discriminatory implementation criteria. Such system had thus a fundamental flaw of being dependent on good faith of states submitting the information. The only powerful tool for discovering undeclared activities was the mechanism of special inspections, which, however, was hardly used due to strong political connotations. In addition, the Agency was initially focused on checking individual facilities in a State rather than drawing state-level conclusions.

With the purpose of encouraging the universal acceptance of comprehensive safeguards, the NWS voluntarily subjected their peaceful nuclear programmes to safeguards too. However, the scope of CSA and VOA is different since in the case of the latte the Agency verifies that the safeguarded material is not withdrawn from civil activities except as provided for in each agreement.

2. Pursuant to the VCLT, a safeguards agreement is an international agreement with binding force, to which one party is a state or a group of states whereas the other is the IAEA. Therefore, safeguards agreements themselves contain relevant provisions on resolution of dispute, which can have a dual nature: disputes concerning the verification of non-diversion and all other disputes. The latter would invoke a binding arbitration

process whereas the former would be solved in accordance with special procedure stipulated in Article XII.C of the IAEA Statute.

The resolution of non-diversion disputes may develop at two levels: the Agency and the UNSC. The first stage mainly involves an inspector, the Director General, the Board and a potentially non-complying state, which is given an opportunity to clarify reasons for, and rectify, discrepancies. Such arrangement is designed to distinguish between cases of unintentional negligible or purely technical discrepancies and cases of deliberate non-compliance. If the case is not resolved at this level, the Board may undertake punitive actions and report the case of non-compliance to the UNSC for information or possible action, including sanctions. The practice shows that the Agency tries to use the reporting to the UNSC as a last resort.

3. Apart from the NPT, a number of multilateral agreements require application of nuclear safeguards. All treaties establishing nuclear weapon-free zones require States Party to conclude a safeguards agreement with IAEA for the purpose of verifying compliance with their undertakings. The Tlatelolco Treaty does not specify a type of safeguards but by default accepts CSA, the Semipalatinsk Treaty provides for the most solid verification requiring the conclusion of a CSA with an AP; and the other three treaties require the conclusion of a CSA.

Apart from IAEA safeguards, Euratom, ABACC and Japan also developed their independent safeguards instruments. The Euratom safeguards differ a lot from INFCIRC/153/ (Corr.). It is a supranational system with Member States having ceded certain extraordinary rights to the Commission, which thus bypasses them in its interaction with nuclear operators. So, the Commission has a right to impose sanctions not only onto the Member States but also, directly, on private parties. It is also unique that all special fissile materials are property of Euratom of which a nuclear operator has an unlimited right of use and consumption subject to safeguards. As to the scope of Euratom safeguards, the Commission should verify that not only special fissile materials but also the ores and source materials are not diverted from their intended uses as declared by the users. The scope is thus broader than the one of INFCIRC/153/ (Corr.) in two aspects: the latter expressly does not cover ores and verifies only the non-diversion of safeguarded material to weapons or other nuclear explosive device. Lastly, Euratom safeguards is not an impermeable system since one of the Euratom's objectives

is to assure compliance with safeguards obligations contained in an agreement with either a third State or an international organisation.

Argentina and Brazil followed the principles of the IAEA safeguards system. They created a Common System of Accounting and Control covering all nuclear materials in all nuclear activities in both countries, and ABACC as a body responsible for the administration and implementation of the SCCC, including for conducting inspections.

By the time Japan was negotiating its NPT Safeguards Agreement, the country already had an established a national nuclear material accounting and control system, which also included safeguards inspection. However, the point of contention is whether its SSAC includes independent verification of such material. There seems to be no problem when the State verifies non-diversion at facilities of independent nuclear operators, but the situation is more complicated in a possible case when a diverter is the State itself. Accordingly, it is for the Agency to conduct the supervision of the Japan's SSAC and to have a final say on the State's compliance with its non-proliferation obligations.

Article II.4 of the NPT provided the basis for interaction of the IAEA safeguards with the said safeguards systems, permitting Agency inspectors to co-ordinate their verification activities with the regional/Japanese counterparts meanwhile being able to arrive at their own conclusions.

4. The complex nature of the safeguards system, which stemmed from a big number of interconnected safeguards instruments, international treaties requiring safeguards, regional and national safeguards systems, triggered action for harmonisation and completion. They were embodied in the protocols to safeguards agreements. Depending on their format, they are either integral part of safeguards agreements or independent documents. Some of protocols are temporary by nature providing smooth transition from one safeguards instrument to another. Those that apply indefinitely concentrate mainly on completing and avoiding duplications of safeguards activities between the IAEA and other safeguards systems. The rest are supporting and strengthening safeguards.

The crisis in the CSA verification system in 1990s led to elaboration and adoption of a so far the last safeguards instrument, the Additional Protocol. It aimed at covering loopholes in CSAs and item-specific agreements. In particular, the AP required the broader scope of information that states should provide to the IAEA and broader access

rights, expanding the scope of safeguards to the whole nuclear fuel cycle, expanding it beyond nuclear material and facilities containing it. The AP did not, however, provide for a perfect safeguards system and had certain limitations, such as: no mentioning of weaponisation or non-nuclear or dual-use equipment unrelated to production of nuclear material; procedure governing a state's response to IAEA requests for information or clarification did not establish deadlines; no obligations for states to report on indigenously made nuclear equipment; no provisions concerning the Agency right of access to persons in a state; and strict limitations on the scope of IAEA complementary access.

5. It is remarkable that the safeguards were developed not only through new legal instruments but also by subsequent Board's decisions and practices. At the initial stage, they aimed at keeping the system up-to-date by filling in some legal gaps in the following areas: duration and termination of safeguards, notion of the "military use", safeguarding technology transfers and non-nuclear material, and introduction of containment and surveillance. These decisions were ultimately reflected in later safeguards agreements.

As a first response to the crisis of the CSA verification system in 1990s, the Agency elaborated a set of measures that could be implemented within the existing framework without the need for complementary authority to be granted to the IAEA, in order to be able to verify completeness of States' declarations. Additionally, the Agency modified Code 3.1 of the General Part of Subsidiary Arrangements.

The Agency also adopted approaches based on evaluation of all accessible information on State's nuclear activities and on assessing them as a whole, rather than focusing on individual nuclear facilities. As a consequence, four interconnected concepts of planning, implementation and evaluation of strengthened safeguards appeared: information-driven safeguards, integrated safeguards, state-level approach, and state-level concept.

6. At the dawn of its nuclear programme, the Iran-U.S. nuclear co-operation through "Atoms for Peace" programme was accompanied with application of U.S. safeguards on the transferred items. However, even after Iran became member of the IAEA, neither Iran nor the USA requested the Agency to conduct safeguards activities in respect of the supplied U.S. nuclear material, technology and equipment. Implementation of

safeguards in Iran began in 1974 with the CSA which remained the principal tool for monitoring and verification of the Iran's nuclear programme for roughly twenty years.

It is noteworthy that shortcomings of the CSA consisting in the "classic catch-22 of the NPT"[124] started to appear approximately at the time when the IAEA launched the "Programme 93+2". The revelation in 2002 of the undeclared nuclear activities in Iran, hence the start of the Iran's case, was itself not made by the Agency, rather by an Iran's opposition group using as a prop satellite images provided by an IAEA Member State. Subsequently, even with an Additional Protocol being "voluntarily implemented" by Iran pending its ratification by the Parliament, the Agency received a significant portion of information not through its verification activities, but from Iran itself or from Member States.

7. After discovery of the Iran's undeclared nuclear activities, three groups of measures were chosen as viable for the Agency to carry out its safeguards verification mandate, as follows: verification of Iran's implementation of its CSA, the AP and voluntary "confidence-building" measures. Their patchy implementation may not be considered as successful.

Firstly, measures under the CSA admittedly had some success in disclosing some undeclared activities, but the IAEA called them "breaches" or "failures" instead of using the term "non-compliance." That fact notwithstanding, the Agency was not able to conclude the absence of undeclared nuclear activities equipped only with the CSA, without an AP in force.

Secondly, as a result of diplomatic effort of the Agency along with several Member States and international blocks, Iran signed the AP implemented it for roughly two years on a "voluntary" basis as a confidence-building measure pending ratification. Even the voluntary implementation of the AP was capable of giving the Agency enhanced verification tools, so the Agency was able to discover the previously undeclared equipment. The fundamental fragility of the mechanism of voluntary implementation of the AP and of the implementation of voluntary measures was in their non-legally binding nature and dependence on the good faith and co-operation on part of Iran. As a result, as soon as the Iran's case was referred to the UN Security Council, Iran stopped

[124] (ElBaradei, 2011, p. 116): "...the Iranians had not declared the Kalaye Electric Company in their safeguards agreements, therefore we were not authorised to inspect it, absent some clear nexus to nuclear material."

voluntary implementation of the AP, refused to further apply all voluntary measures and stopped implementing the modified Code 3.1.

Thirdly, the Agency was verifying the implementation of a patchwork of voluntary measures proposed by the IAEA and the EU3. Some of them went beyond the CSA and AP requirements, but were not fully successful either. The IAEA only started gaining access to certain facilities and to certain information only after conclusion of the IAEA-Iran's Joint Statement on a Framework for Co-operation Agreement, and the JPA.

8. The UNSC, U.S. and EU sanctions may be considered to have played a vital role in the Iran's case. Voluntary measures attained a legally binding character through endorsement by the UNSC in a series of resolutions. The USA and the EU applied "carrots-and-sticks" approach, promising increased economic and technological co-operation with Iran and adopting a series of rounds of sanctions. In view of the above, the negotiations between the EU3+3 and Iran followed a "dual-track" (or double suspension) approach, where the EU3+3 States offered suspension of the sanctions in exchange for Iran's suspension of enrichment and reprocessing activities, among other voluntary measures.

9. It may be concluded that the IAEA was also trying to use a "state-level concept" of safeguards with regards to Iran, a term which was coincidentally coined at the same time as the Iran's case commenced. In particular, the Agency strived to design its verification activities after developing a comprehensive and routinely updated country profile, which in turn would only be possible after the Agency received and analysed all possible information about the country's nuclear programme, including Iran's own declaration and disclosures, trade data concerning nuclear and nuclear-related items and technology, satellite imagery, and information provided by third parties including Member States. For that reason the Agency needed to draw a baseline, i.e. understanding of Iran's nuclear past, which required Iran's clarification on certain outstanding issues including possible military dimension activities. Even more important is the fact that the Director General started to dedicate a separate section in his reports to the Board to the description of possible military dimension of the country's nuclear programme.

However, under the existing safeguards obligations, Iran was not required to implement the transparency measures and submit any information on possible past weaponisation

since military-related activities were not a part of the nuclear fuel cycle. The Board's calls for co-operation and transparency measures gained a legally binding force only after the intervention of the UN Security Council through its resolutions, which initially "called for" and subsequently "decided" under Article 41 of the UN Charter that Iran should co-operate with the Agency in order to resolve all outstanding issues. Some of the issues remained outstanding, and the IAEA was not thus able to conclude that all nuclear material in Iran remained in peaceful use, up until 2015 when Roadmap was agreed between the IAEA and Iran.

10. The main goal of the JCPOA is to prevent Iran from obtaining resources for developing nuclear weapons by guaranteeing its transparency. Applying the "carrot-and-stick" method, the deal promises lifting of existing sanctions previously imposed by the UNSC, the USA and the EU in case Iran fully implements the physical constraints on its nuclear programme. The JCPOA thus contains an implementation plan with certain deadlines, and provisions establishing a body in charge of supervising of implementation of the JCPOA and of dispute resolution.

The vital part of the deal is its regime of monitoring and verification by the IAEA that has "technical mandate and not strays into politics" (IAEA, 2015d). There are three main monitoring and verification tools available to the Agency: the CSA, the AP and measures specific to the JCPOA. The CSA accompanied by the modified version of Code 3.1, represents a basis of the IAEA verification activities in the country. The AP, which reinforces the CSA, is to be implemented "provisionally" until Transition Day. Although the prospects of provisional application of the AP are tainted by Iran's previous "voluntary" application between 2003 and 2006, following the letter and spirit of the VCLT, the provisional application of the AP is fully binding.

Both CSA and AP have certain loopholes that in various periods of time undermined their successful separate implementation. As Secretary of State Hillary Clinton said in one of her speeches, "The International Atomic Energy Agency doesn't have the tools or authority to carry out its mission effectively. We saw this in the institution's failure to detect Iran's covert enrichment plant" (Clinton, 2009). That is the reason why the JCPOA empowers the IAEA to monitor Iran's compliance with provisions limiting the country's enrichment program and other sensitive nuclear activities that exceed provisions of the standard IAEA safeguards documents. Implemented together in a

mutually reinforcing mechanism, they provide for a new enhanced monitoring and verification super-tool, which on the surface may be regarded as a new generation safeguards instrument. However, the following factors lead to the conclusion that the monitoring and verification measures under the JCPOA are not to be treated as such.

Firstly, the JCPOA is not a binding international treaty; rather, it is a political agreement. Certainly, it does not automatically entail deficiencies as to its implementation, but it is not comparable to the previous safeguards agreements which are "hard laws".

Secondly, the JCPOA expressly states its ad hoc and temporary nature meanwhile accentuating that it is the NPT and Iran's CSA that continue to be the cornerstone of verification, accompanied by the AP. Accordingly, the monitoring and verification activities beyond the CSA and the AP are also limited in time, the longest of them being the monitoring of all uranium ore concentrate, which is to last for 25 years.

Thirdly, the enhanced monitoring and verification activities under the JCPOA, which focus only in one country, and their endorsement by the UNSC, may be treated as stigmatising the country and discriminatory. This point is even more reinforced by the nature of the enhanced monitoring and verification activities under the JCPOA, some of which are tailored expressly to Iran's nuclear activities.

Fourthly, the verification mandate which the Agency was granted by the UNSC resulted in a considerable increase of the safeguards staff and the volume of its operations. For the time being, the IAEA has been receiving extra-budgetary financing for that purpose, possibly owing to the global concern the Iran's case provoked. However, it is hard to imagine that other similar agreements would succeed in receiving the same amount of financial support.

Fifthly, the JCPOA contains a provision that the Joint Commission, and subsequently the UNSC, are empowered to resolve disputes involving the grant of access procedure. In addition, the Joint Commission is not expressly prevented from making conclusions as to Iran's non-compliance. The aforesaid procedures can substantially impinge the mandate of the Agency and are unlikely to be included in the new hypothetical safeguards agreement.

Lastly, some of experts point out that the countries do not still have any desire to revise the existing safeguards system or to adopt a new safeguards instrument (Rockwood, 2017). The following arguments may prove the accuracy of this statement. To begin

with, some of the IAEA Member States, like Russia, previously expressed their concerns as to the state level approach since, in their view, the IAEA was "getting ready to move beyond the AP including by extending the scope of the SLA into countries which do not have an AP in force" (Hibbs, 2012). As a result, according to Laura Rockwood, the safeguards-related discussions at the 2012 General Conference were tainted by "suspicion and distrust" towards the Secretariat (Rockwood, 2014). Moreover, the most recent attempt to conduct consultations in the area of improving safeguards was undertaken by the Board in 2005 when it set up its own Advisory Committee on Safeguards and Verification, also known as "Committee 25", upon the suggestion of the USA. However, in two-year time during which the Committee 25 was officially active and operated by consensus, it was unable to produce any result and was let "to die a quiet and natural death" (ElBaradei, 2011, p. 175). According to Trevor Findlay, the main reasons for that were the reluctance of the USA, the main supporter of the Committee 25, to push it forward, poor international atmosphere caused by the Coalition invasion of Iraq, the failure of the 2005 NPT Review Conference, "the hostile attitude of the administration of President George W. Bush to multilateralism generally," the principle of consensus which was used by Iran, and the lack of progress on nuclear disarmament (Findlay, 2012, p. 65). In addition, although the level of acceptance of the AP is relatively high and arrives at 129 APs currently in force (IAEA, 2017d), it is nevertheless far from universal, with the prominent absence of APs for Argentina, Brazil, Israel and Pakistan, among others. Accordingly, it does not seem to be likely that a new safeguards instrument comprising the monitoring and verification measures of the JCPOA would be adopted before the previous one, the AP, achieves universal adoption.

Lazarev A. Monitoring and verification in iran: from a comprehensive safeguards agreement to the joint comprehensive plan of action. XXII Nuclear Inter Jura 2016, Proceedings of the Congress. 2016; 533-49.

BIBLIOGRAPHY

Abbott, K. W. & Snidal, D., 2000. Hard and Soft Law in International Governance. *International Organization,* 54(3), pp. 421-56.

ACA, 2014 . *History of Official Proposals on the Iranian Nuclear Issue.* January (last updated). [Online]
Available at: https://www.armscontrol.org/print/2570 [Accessed 1 May 2017].

ACA, 2015. *Solving the Iranian Nuclear Puzzle: The Joint Comprehensive Plan of Action (Section 3: Understanding the JCPOA).* August. [Online]
Available at: http://www.armscontrol.org/reports/Solving-the-Iranian-Nuclear-Puzzle-The-Joint-Comprehensive-Plan-of-Action/2015/08/Section-3-Understanding-the-JCPOA
[Accessed 14 December 2015].

Acton, J. M., 2007. Strengthening Safeguards And Nuclear Disarmament. Is There a Connection? *The Nonproliferation Review,* 14(3), pp. 525-535.

Acton, J. & Newman, C., 2006. *IAEA Verification of Military Research and Development,* London: VERTIC.

Ahmad, A., von Hippel, A. & Glaser, A., 2014. *A Win-Win Solution for Iran's Arak Reactor.* 1 April. [Online]
Available at: https://www.princeton.edu/sgs/faculty-staff/zia-mian/Arak-reactor-ACT-April-2014.pdf
[Accessed 15 July 2017].

Albright , D. & Stricke, A., 2016. *U.S. Purchase of Iran's Heavy Water: Encouraging a Dangerous Nuclear Supplier.* Report. Institute for Science and International Security, 23 May. [Online]
Available at: http://isis-online.org/uploads/isis-reports/documents/Heavy_Water_Purchase_23May2016_final.pdf
[Accessed 1 March 2017].

Associated Press, 1997. *Chief in Tehran to Inspect Research Facilities.* 20 July. [Online]
Available at: http://www.nti.org/learn/facilities/228/
[Accessed 26 February 2017].

Associated Press, 2015. *Iran hardens nuke stance: No research freeze, no access to bases, scientists.* 25 June. [Online]
Available at: http://www.japantimes.co.jp/news/2015/06/25/world/politics-diplomacy-world/iran-hardens-nuke-stance-research-freeze-access-bases-

scientists/#.WRsZJlWGPRY
[Accessed 26 February 2017].

BBC, 2005. *Russia-Iran nuclear deal signed.* 27 February (updated) [Online] Available at: http://news.bbc.co.uk/2/hi/middle_east/4301889.stm [Accessed 14 December 2015].

BBC, 2006a. *Russia plan 'not enough' for Iran.* BBC News, 27 January. [Online] Available at: http://news.bbc.co.uk/2/hi/middle_east/4653376.stm [Accessed 1 March 2017].

BBC, 2006b. *Iran threatens to end UN contacts.* BBC World News, 25 April. [Online] Available at: http://news.bbc.co.uk/2/hi/middle_east/4941438.stm [Accessed 9 March 2017].

BBC, 2009 . *Iran's arsenal of missiles.* 20 May (last update). [Online] Available at: http://news.bbc.co.uk/2/hi/middle_east/7499601.stm [Accessed 1 May 2017].

BBC, 2010a. *UN votes for new sanctions on Iran over nuclear issue.* News Middle East, 9 June. [Online] Available at: http://www.bbc.com/news/10276276 [Accessed 1 May 2017].

BBC, 2010b. *U.S. Congress Backs New Sanctions Against Tehran.* BBC News, 25 June. [Online]
Available at: http://www.bbc.com/news/10409847 [Accessed 16 June 2017].

BBC, 2013. *Iran nuclear crisis: UN inspectors visit Arak plant.* BBC News, 8 December. [Online] Available at: http://www.bbc.com/news/world-middle-east-25288267 [Accessed 23 March 2017].

Bloomberg, 2009. *Gchine increases yellowcake production.* 4 November. [Online] Available at: http://webcache.googleusercontent.com/search?q=cache:8QArr4THiiAJ:www.armscontrolverification.org/2009/11/gchine-increases-yellowcake-production.html+&cd=2&hl=es&ct=clnk&gl=at&client=firefox-b-ab [Accessed 1 May 2017].

Boureston, J. & Feldman, Y., 2007. Integrated nuclear safeguards: development, implementation, future challenges. In Findlay, T. (ed.). *Compliance Chronicles: Research from the Canadian Centre for Treaty Compliance.* Ottawa: Canadian Centre for Treaty Compliance, Issue 4.

Bruno, G., 2010. *Iran's nuclear program.* [Online] Available at: http://www.cfr.org/iran/irans-nuclear-program/p16811 [Accessed 14 December 2015].

Bunn, G., 2007. Nuclear safeguards: how far can inspectors go? *IAEA Bulletin,* 48(2), pp. 49-55.

Carlson, J. & Leslie, R., 2005. Special Inspections Revisited. *Paper presented at INMM 2005 symposium.* Phoenix.

Carlson, J. 2006. Nuclear Weaponisation Activities: What Is the Role of IAEA Safeguards? *Paper at the annual Meeting of the Institute of Nuclear Materials Management, July 16–20*. Nashville, Tennesse.

Clinton, H., 2009. *Speech at United States Institute of Peace.* 21 October. [Online] Available at: http://abcnews.go.com/WN/clinton-relations-stabalize-north-korea-nuclear-threat/story?id=8881433 [Accessed 13 July 2017].

CTBTO, n.d. *The Soviet Union's Nuclear Testing Programme.* [Online] Available at: https://www.ctbto.org/nuclear-testing/the-effects-of-nuclear-testing/the-soviet-unionsnuclear-testing-programme/. [Accessed 14 July 2017].

Dahlman, O., Mykkeltveit, S. & Haak, H., 2009. *Nuclear Test Ban: Converting Political Visions to Reality*. s.l.:Springer Science & Business Media.

Davenport, K. e. a., 2015. *Understanding Iran Deal.* [Online] Available at: http://www.armscontrol.org/files/ACA_Iran-BB_2015%20Aug6_FINAL.pdf [Accessed 14 December 2015].

Davenport, K., Kimball, D. G. & Thiel, G., 2015. *Solving the Iranian Nuclear Puzzle. The Joint Comprehensive Plan of Action.* [Online] Available at: https://www.armscontrol.org/files/ACA_Iran-BB_2015%20Aug6_FINAL.pdf [Accessed 13 December 2015].

De Luce, D., 2003. *Europeans fail to end Iranian nuclear crisis.* The Guardian, 20 September. [Online] Available at: https://www.theguardian.com/world/2003/sep/20/iran.politics. [Accessed 10 November 2015].

Dias, F. et al., 2011. Twenty Years of Regional Safeguards: the ABACC System and the Synergy with the National Nuclear Material Control Systems. *Palm Desert, INMM 52nd Annual Meeting*.

ECJ (1993) Judgment of 21 January, Advanced Nuclear Fuels GmbH v Commission of the European Communities, C-308/90, ECLI:EU:C:1993:23.

ECJ (2005) Judgment of 12 April, Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland, Case C-61/03, ECLI:EU:C:2005:210.

Eisenhower, D., 1953. *Address by Mr. Dwight D. Eisenhower, President of the United States of America, to the 470th Plenary Meeting of the United Nations General Assembly.* [Online]
Available at: www.iaea.org/about/history/atoms-for-peace-speech
[Accessed 14 December 2015].

ElBaradei, M., 2011. *The Age of Deception: Nuclear Diplomacy in Treacherous Times.* New York: Metropolitan Books.

EU, 1957. *Treaty Establishing the European Atomic Energy Community (Euratom).* 298 UNTS 259. Opened for signature 25 March 1957, entered into force 1 January 1958.

EU, 1958a. *Agreement (Euratom - USA).* OJ L17, 19 March 1959, p. 309 et seq. Signed on 29 May 1958, entered into force 27 August 1958.

EU, 1958b. EAEC Council. *Regulation No 3 implementing Article 24 of the Treaty establishing the European Atomic Energy Community.* OJ 017, 6 October 1958. p. 406-416.

EU, 1959. *Agreement on the peaceful uses of atomic energy (Euratom - Atomic Energy of Canada Limited).* OJ B60, 24 November 1959. p. 1177 et seq.

EU, 1976. *Commission Regulation (Euratom) No 3227/76 of 19 October 1976 concerning the application of the provisions on Euratom safeguards.* OJ L 363, 31 December 1976, p. 1–57.

EU, 1978. *Amendment to the Agreement for cooperation in the peaceful uses of atomic energy (Euratom - Canada), in the form of an exchange of letters.* L65. 8 March 1978. p. 16 et seq.

EU, 1982. *Agreement concerning transfers of nuclear material from Australia to the European Atomic Energy Community(Australia - Euratom).* 82/672/Euratom. OJ L281, 4 October 1982. p. 8 et seq. Signed 21 September 1982, entered into force 15 January 1982.

EU, 1990a. *Commission Decision 90/413/Euratom of 1 August relating to a procedure in application of Article 83 of the Euratom Treaty.* OJ 1990 L 209. p. 27.

EU, 1990b. *Commission Decision 90/465/Euratom of 20 August relating to the appointment of a board responsible for implementing Decision 90/413 of 1 August 1990*. OJ 1990 L 241. p. 14.

EU, 1995. *Agreement for cooperation in the peaceful uses of nuclear energy (Euratom - USA). 96/314/Euratom.* OJ L120, 20 May 1996. p. 1 et seq. Signed 7 November 1995, entered into force 29 March 1996.

EU, 2001a. *EU Relations with the Islamic Republic of Iran. Communication from the Commission to the European Parliament and the Council.* COM/2001/0071 final, 7 February.

EU, 2001b. *Rresolution on the communication from the Commission to the European Parliament and the Council on EU relations with the Islamic Republic of Iran.* European Parliament. COM(2001) 71 - C5-0338/2001 - 2001/2138(COS), INFCIRC/26/Add. 1 November.

EU, 2002a. *EU Council Conclusions.* 9717/02 (Presse 178), 17 June. [Online] Available at: https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/gena/71044.pdf [Accessed 12 December 2015].

EU, 2002b. *Proposal for a Council Decision approving a Commission Regulation on the application of Euratom safeguards (presented by the Commission).* COM(2002) 99 final. 22 March. [Online] Available at: http://ec.europa.eu/transparency/regdoc/rep/1/2002/EN/1-2002-99-EN-F1-1.Pdf
[Accessed 14 July 2017].

EU, 2003. *Agreement for cooperation in the peaceful uses of nuclear energy (Euratom - Uzbekistan).* OJ L269, 21 October 2003. p. 9 et seq. Signed and entered into force 6 October 2003.

EU, 2004a. *Council Conclusions,* 13 December.

EU, 2004b. *Nuclear safeguards: the Commission imposes binding measures to put an end to an infringement at the Sellafield site in the United Kingdom* European Commission. Press Release No. IP/04/419. 30 March. [Online] Available at: http://europa.eu/rapid/press-release_IP-04-419_en.htm?locale=en [Accessed 1 July 2017].

EU, 2004c. *Presidency Conclusions,* 15-16 December.

EU, 2004d. *Answer given by Mrs de Palacio on behalf of the Commission to written parliamentary question P-1038/2004.* 30 April. [Online]

http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=P-2004-1038&language=EN [Accessed 1 July 2017].
EU, 2005a. *Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards.* OJ L 54. 28 February 2005, p. 1–71.

EU, 2005b. *Resolution on Iran.* European Parliament. P6_TA(2005)0382,13 October.

EU, 2005c. *Commission Recommendation of 15 December 2005 on guidelines for the application of Regulation (Euratom) No 302/2005 on the application of Euratom safeguards.* OJ L 28. 1 February 2006. p. 1–85.

EU, 2005d. *Agreement for co-operation in the peaceful uses of nuclear energy (Euratom – Ukraine).* OJ L 261 22 September 2006. p. 27 et seq. Signed 28 April 2005, entered into force 1 September 2006.

EU, 2006a. *Agreement for co-operation in the peaceful uses of nuclear energy (Japan – Euratom).* OJ L32, 6 February 2007. p. 65 et seq. Signed 24 August 2006, entered into force 20 December 2006.

EU, 2006b. *Resolution on the confrontation between Iran and the international community.* European Parliament. P6_TA(2006)0060, 15 February.

EU, 2006c. *Agreement for co-operation in the peaceful uses of nuclear energy (Euratom – Kazakhstan).* OJ L10 15 January 2009. p. 16 et seq. Signed 5 December 2006, entered into force 1 September 2008.

EU, 2006d. *Elements of a proposal to Iran as approved on 1 June 2006 at the meeting in Vienna of China, France, Germany, the Russian Federation, the United Kingdom, the Untied States of America and the European Union.* S202/06. [Online] Available at: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/en/reports/90569.pdf [Accessed 8 March 2017].

EU, 2006e. *European Commission issues nuclear safeguard obligations warning to British Nuclear Group Sellafield. European Commission.* Press Release No. IP/06/171. 15 February. [Online] Available at: http://europa.eu/rapid/press-release_IP-06-171_en.htm [Accessed 1 July 2017].

EU, 2007a. *Consolidated version of the Treaty on the Functioning of the European Union.* 13 December 2007. 2008/C 115/01. OJ C 115/47 9 May 2008.

EU, 2007b. *Council Common Position 2007/140/CFSP.* OJ L 61, 28 February 2007. [Online]
Available at: http://eur-

lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:061:0049:0055:EN:PDF [Accessed 1 March 2017].

EU, 2007c. *Council Conclusions.* 18 June. [Online] Available at: https://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/gena/94804.pdf [Accessed 1 May 2017].

EU, 2007d. *Council of the European Union, Presidency conclusions of the Brussels European Council.* 16616/1/07 REV 1 CONCL 3, 14 December. [Online] Available at: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/97669.pdf [Accessed 1 May 2017].

EU, 2007e. *Council Regulation (EC) No 423/2007 concerning restrictive measures against Iran.* OJ 20.4.2007 L103, 19 April.

EU, 2008a. *Council Decision of 23 June 2008 implementing Article 7(2) of Regulation (EC) No 423/2007 concerning restrictive measures against Iran. 2008/475/EC.* OJ L 163, pp. 29-33, 23 June.

EU, 2008b. *Resolution of on Iran. European Parliament.* P6_TA(2008)0031, 31 January.

EU, 2009. *Commission Recommendation of 11 February 2009 on the implementation of a nuclear material accountancy and control system by operators of nuclear installations.* OJ L 41, 12.2.2009. p. 17–23.

EU, 2010. *Council Decision of 26 July 2010 concerning restrictive measures against Iran and repealing Common Position 2007/140/CFSP. 2010/413/CFSP.* OJ L 195, 27.7.2010, pp. 39–73. 26 July.

EU, 2011a. *Agreement for cooperation in the peaceful uses of nuclear energy (Australia - Euratom).* OJ L 029. 1 February 2012. p. 2 et seq. Signed on 5 September 2011, entered into force 1 February 2012.

EU, 2011b. *Council Implementing Regulation (EU) No 503/2011 of 23 May 2011 implementing Regulation (EU) No 961/2010 on restrictive measures against Iran.* OJ L 136, 24.5.2011, p. 26–44.

EU, 2012a. *Council Decision 2012/635/CFSP of 15 October 2012 amending Decision 2010/413/CFSP concerning restrictive measures against Iran.* OJ L 282, 16.10.2012, p. 58–69.

EU, 2012b. *Council Implementing Regulation (EU) No 1264/2012 of 21 December 2012 implementing Regulation (EU) No 267/2012 concerning restrictive measures against Iran.* OJ L 356, 22.12.2012, p. 55–60.

EU, 2012c. *Council Regulation (EU) No 267/2012 of 23 March 2012 concerning restrictive measures against Iran and repealing Regulation (EU) No 961/2010.* OJ L 88, 24.3.2012, p. 1–112.

EU, 2013. *Agreement for cooperation in the peaceful uses of nuclear energy (Euratom - South Africa).* L204 31 July 2013, p. 3 et seq. Signed on 18 July 2013.

EU-Iran, 2015. *Joint Statement by EU High Representative Federica Mogherini and Iranian Foreign Minister Javad Zarif.* [Online] Available at: http://eeas.europa.eu/statements-eeas/2015/151018_01_en.htm [Accessed 14 December 2015].

Evstafiev, D., 1998. *Russian-Iranian Nuclear Cooperation and Export Control.* Press conference, Centre for Policy Studies in Russia [PIR Centre], National Press Institute, 25 November. Moscow.

FAS, 2002. *Nuclear Weapons.* India. 8 November. [Online] Available at: https://fas.org/nuke/guide/india/nuke/ [Accessed 13 July 2017].

FAS, n.d. *Factsheet. Indian Nuclear Explosions.* [Online] Available at: https://fas.org/nuke/guide/pakistan/doctrine/000513-factsheetindian_nuclear_explosio.htm [Accessed 13 July 2017].

Fathi, N., 2006. *Iran to "Revise Any Relations with Monitors in Nuclear Area.* New York Times, 28 December. [Online] Available at: http://www.iranfocus.com/en/index.php?option=com_content&view=article&id=9662:iran-to-revise-any-relations-with-monitors-in-nuclear-area&catid=8:nuclear&Itemid=113 [Accessed 8 March 2017].

Findlay, T., 2007. *Looking Back: The Additional Protocol.* [Online] Available at: https://www.armscontrol.org/act/2007_11/Lookingback [Accessed 14 December 2015].

Findlay, T., 2012. *Unleashing the Nuclear Watchdog: Strengthening and Reform of the IAEA.* Waterloo: CIGI.

Findlay, T., 2015. *Proliferation Alert! The IAEA and Non-Compliance Reporting. Project on Managing the Atom, Report #2015-04.* Belfer Centre for Science and International Affairs, Harvard Kennedy School.

Fischer, D., 1997. *History of the International Atomic Energy Agency: The First Forty Years.* Vienna: IAEA.

Ford, C. A., 2006. Compliance Assessment And Compliance Enforcement: The Challenge Of Nuclear Noncompliance. *ILSA Journal of International & Comparative Law,* Volume 12:583, pp. 583-591.

G8, 1998. *Conclusions of G8 Foreign Ministers*. G8 Summit 1998 in Birmingham. 9 May. [Online] Available at: http://www.g8.utoronto.ca/foreign/fm980509.htm [Accessed 13 March 2017].

G8, 2000. *Conclusions of the G8 Foreign Ministers' Meeting, Miyazaki, Japan.* G8 Summit 2000 in Okinawa, 13 July. [Online] Available at: http://www.mofa.go.jp/policy/economy/summit/2000/documents/conclusion.html [Accessed 13 March 2017].

G8, 2007. *Chair's Summary*. Summit 2007 in Heiligendamm. 8 June. [Online] Available at: http://www.g-8.de/Content/EN/Artikel/__g8-summit/anlagen/chairs-summary,templateId=raw,property=publicationFile.pdf/chairs-summary.pdf [Accessed 2 May 2017].

Gaietta, M., 2015. *The trajectory of Iran's nuclear programme.* New York: Palgrave Macmillan.

Goldschmidt, B., 1980. The Negotiation of the Non-Proliferation Treaty (NPT), (extract from Dr. Goldschmidt's book "Le complexeatomique", published in 1980. Paris: Editions Fayard). *IAEA Bulletin,* 22(3/4).

Goldschmidt, P., 2010. *Safeguards Noncompliance: A Challenge for the IAEA and the UN Security Council.* The Arms Control Association. [Online] Available at: http://www.armscontrol.org/act/2010_01-02/Goldschmidt [Accessed 2 May 2016].

Haghighatnejad, R., 2015. *Hardliners Push for New Law as Nuclear Talks Reach Deadline.* Iran Wire, 24 June. [Online] Available at: https://iranwire.com/en/features/1156 [Accessed 1 March 2017].

Heinonen, O., 2014. Verifying the Dismantlement of South Africa's Nuclear Weapons Program. In: *Nuclear Weapons Materials Gone Missing.*Belfer Center for Science and International Affairs, pp. 88-99.

Heinonen, O., 2015. *Testimony on 'The Iran Nuclear Deal and Its Impact on Terrorism Financing' before the Committee on Financial Services Task Force to Investigate Terrorism Financing.* U.S. House of Representatives.

Hibbs, M., 2012. *Russia's Safeguards Problem. Carnegie Endowment for International Peace.* 3 December. [Online]
Available at: http://carnegieendowment.org/2012/12/03/russia-s-safeguards-problem-pub-50219
[Accessed 6 June 2017].

Hibbs, M., 2015. *Iran and the Evolution of Safeguards.* 16 December. [Online]
Available at: http://carnegieendowment.org/2015/12/16/iran-and-evolution-of-safeguards-pub-6233
[Accessed 14 July 2017].

IAEA, 1957. *The Statute of the IAEA.* [Online]
Available at: https://www.iaea.org/about/statute
[Accessed 1 July 2016].

IAEA, 1959a. *Agreement between the International Atomic Energy Agency and the Government of Canada for the supply by Canada of uranium to the Agency",* INFCIRC/3. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1959/infcirc3.pdf
[Accessed 13 July 2017].

IAEA, 1959b. Board of Governors. *Item 14 of the provisional agenda (GOV/332), "The Agency's Safeguards. Memorandum by the Director General*. GOV/332. 28 April.

IAEA, 1959c. Board of Governors. *Record of GOV/OR Meeting 152.* GOV/OR.152, 27 June.

IAEA, 1959d. Board of Governors. *Item E(a) of the provisional agenda (GOV/452/Add.1), "The Agency's functions under Articles III.a.5 and 6 and XII of the Statute. (a) Safeguards against diversion. Annex.* GOV/463. 24 November.

IAEA, 1959e. *Agreement on the Privileges and Immunities of the International Atomic Energy Agency.* IAEA Doc. INFCIRC/9/Rev. 1 (1959), 374 U.N.T.S. 148 (1960).

IAEA, 1960. *General Conference. Item 18 of the provisional agenda (GC(IV)/109) "Agency Safeguards".* GC(IV)/108/Rev. 1[1]. [Online]

Available at: https://www.iaea.org/About/Policy/GC/GC04/GC04Documents/English/gc04-108-rev1_en.pdf
[Accessed 13 May 2017].

IAEA, 1961a. *The Agency's Safeguards.* INFCIRC/26. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1961/infcirc26.pdf
[Accessed 13 July 2017].

IAEA, 1961b. *The texts of the Supply Agreement between the Agency, the Government of Finland and the Government of the USA, and of the Project Agreement between the Agency and the Government of Finland, in connection with the Agency's assistance to the Government of Finland in establishing a research reactor project,"* INFCIRC/24 et al. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1961/infcirc24.pdf
[Accessed 13 July 2017].

IAEA, 1961c. *The texts of the instruments relating to a project for a joint Agency-Norwegian program of research with the zero power reactor "NORA".* INFCIRC/29. 22 June. [Online] Available at: https://www.iaea.org/publications/documents/infcircs/texts-instruments-relating-project-joint-agency-norwegian-program-research-zero-power-reactor-nora
[Accessed 13 July 2017].

IAEA, 1961d. *The Agency's Inspectorate.* Memorandum by the Director General, GC(V)/INF/39, Annex. 28 August.

IAEA, 1961e. *Annual Report of the Board of Governors to the General Conference 1 July 1960–30 June 1961.* GC(V)/154, July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC05/GC05Documents/English/gc05-154_en.pdf
[Accessed 12 July 2017].

IAEA, 1962a. *Annual Report of the Board of Governors to the General Conference 1 July 1961–30 June 1962.* GC(VI)/195. July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC06/GC06Documents/English/gc06-195_en.pdf
[Accessed 13 July 2017].

IAEA, 1962b. *The text of the Agreement between the Agency and the United States of America for the application of Agency safeguards to four United States reactor facilities.* INFCIRC/36. 24 May. [Online] Available at: https://www.iaea.org/publications/documents/infcircs/text-agreement-application-agency-safeguards-four-united-states-reactor-facilities
[Accessed 1 June 2017].

IAEA, 1962c. *The Agency's Safeguards. Memorandum by the Board of Governors.* GC(VI)/INF/48. 20 July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC06/GC06InfDocuments/English/gc06inf-48_en.pdf
[Accessed 13 July 2017].

IAEA, 1963a. *Annual Report of the Board of Governors to the General Conference 1 July 1962–30 June 1963.* GC(VII)/228. July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC07/GC07Documents/English/gc07-228_en.pdf
[Accessed 13 July 2017].

IAEA, 1963b. *Extension Of The Agency's Safeguards System. Resolution adopted by the Board of Governors.* GC(VII)/235. 26 July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC07/GC07Documents/English/gc07-235_en.pdf
[Accessed 13 July 2017].

IAEA, 1964a. *Annual Report of the Board of Governors to the General Conference 1 July 1963–30 June 1964.* GC(VIII)/270. July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC08/GC08Documents/English/gc08-270_en.pdf
[Accessed 13 July 2017].

IAEA, 1964b. *The Agency's Safeguards.* INFCIRC/26/Add.1. 9 April. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1961/inf26a1.shtml
[Accessed 13 July 2017].

IAEA, 1965a. *Safeguards. Resolution adopted during the 98th plenary meeting on 27 September 1965. Revision Of The Agency's Safeguards System.* GC(IX)/RES/186. [Online]

Available at: https://www.iaea.org/About/Policy/GC/GC09/GC09Resolutions/English/gc09res-186_en.pdf
[Accessed 13 July 2017].

IAEA, 1965b. *Annual Report of the Board of Governors to the General Conference 1 July 1964–30 June 1965.* GC(IX)/299. July [Online] Available at: https://www.iaea.org/About/Policy/GC/GC09/GC09Documents/English/gc09-299_en.pdf
[Accessed 20 December 2016].

IAEA, 1965c. *The Agency's Safeguards System (1965). INFCIRC/66. 5 December.* [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1965/infcirc66.pdf
[Accessed 13 July 2017].

IAEA, 1966a. *Annual Report of the Board of Governors to the General Conference 1 July 1965–30 June 1966.* GC(X)/330. July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC10/GC10Documents/English/gc10-330_en.pdf
[Accessed 11 July 2017].

IAEA, 1966b. *The text of the safeguards transfer agreement relating to the bilateral agreement between Canada and Japan.* INFCIRC/85. 14 July. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1966/infcirc85.pdf
[Accessed 13 July 2017].

IAEA, 1967a. *Agreement on the Privileges and Immunities of the International Atomic Energy Agency.* INFCIRC/9/Rev.2. 26 July. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc9r2.pdf
[Accessed 14 July 2017].

IAEA, 1967b. *The Agency's Safeguards System (1965, as provisionally extended in 1966).* INFCIRC/66/Rev.1. 12 September. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1965/infcirc66r1.pdf
[Accessed 13 July 2017].

IAEA, 1967c. *The text of the safeguards transfer agreement relating to the bilateral agreement between South Africa and the United States of America.* INFCIRC/98. 22 September. [Online]
Available at: https://www.iaea.org/sites/default/files/infcirc98.pdf
[Accessed 13 July 2017].

IAEA, 1967d. *The text of the safeguards transfer agreement relating to the bilateral agreement between South Africa and the United States of America.* INFCIRC/98. 22 September. [Online]
Available at: https://www.iaea.org/sites/default/files/infcirc98.pdf
[Accessed 13 July 2017].

IAEA, 1967e. *Annual Report of the Board of Governors to the General Conference 1 July 1966–30 June 1967.* GC(XI)/355. July. [Online]
Available at: https://www.iaea.org/About/Policy/GC/GC11/GC11Documents/English/gc11-355_en.pdf
[Accessed 12 January 2017].

IAEA, 1968a. *Annual Report of the Board of Governors to the General Conference 1 July 1967–30 June 1968.* GC(XII)/380. July. [Online]
Available at: https://www.iaea.org/About/Policy/GC/GC12/GC12Documents/English/gc12-380_en.pdf
[Accessed 12 January 2017].

IAEA, 1968b. *The Text of the Agreement Between the International Atomic Energy Agency and Mexico for the Application of Safeguards Under the Treaty for the Prohibition of Nuclear Weapons in Latin America.* INFCIRC/118. 23 September. [Online]
Available at: https://www.iaea.org/publications/documents/infcircs/text-agreement-between-international-atomic-energy-agency-and-mexico-application-safeguards-under-treaty-prohibition-nuclear-weapons-latin-america
[Accessed 14 July 2017].

IAEA, 1968c. *INFCIRC/66/Rev.2 (16 September 1968)The Agency's Safeguards System (1965, as provisionally extended in 1966 and 1968).* INFCIRC/66/Rev.2. 16 September. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1965/infcirc66r2.pdf
[Accessed 13 July 2017].

IAEA, 1968d. *The text of the safeguards transfer agreement relating to the bilateral agreement between Japan and the United States of America*. INFCIRC/119. 31 October. [Online]
Available at: https://www.iaea.org/sites/default/files/infcirc119.pdf
[Accessed 13 July 2017].

IAEA, 1969. *Annual Report of the Board of Governors to the General Conference 1 July 1968–30 June 1969.* GC(XIII)/404. July. [Online]
Available at: https://www.iaea.org/About/Policy/GC/GC13/GC13Documents/English/gc13-404_en.pdf
[Accessed 2012 January 2017].

IAEA, 1970a. *Annual Report of the Board of Governors to the General Conference 1 July 1969–30 June 1970. GC(XIV)/430.* [Online]
Available at: https://www.iaea.org/About/Policy/GC/GC14/GC14Documents/English/gc14-430_en.pdf
[Accessed 12 January 2017].

IAEA, 1970b. *Treaty on the Non-Proliferation of Nuclear Weapons. Notification of the entry into force.* INFCIRC/140. 22 April. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1970/infcirc140.pdf
[Accessed 13 July 2017].

IAEA, 1970c. *Board of Governors. Safeguards Agreements in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.* GOV/COM.22/3. 29 May.

IAEA, 1970d. *The texts of the instruments concerning the Agency's assistance to Chile for the establishment of a research reactor project.* INFCIRC/137. 9 February. [Online]
Available at: https://www.iaea.org/publications/documents/infcircs/texts-instruments-concerning-agencys-assistance-chile-establishment-research-reactor-project
[Accessed 13 July 2017].

IAEA, 1971a. *Board of Governors. Record of Meeting.* GOV/OR.436. 20 April.

IAEA, 1971b. *Scale of Assessment of Members' Contributions for 1972.* General Conference Resolution GC(XV)/RES/284. 8 October.

IAEA, 1971c. *General Conference. Annual Report. 1 July 1970 - 30 June 1971.* GC(15)/455. July. [Online]
Available at: https://www.iaea.org/About/Policy/GC/GC15/GC15Documents/English/gc15-

455_en.pdf
[Accessed 14 July 2017].

IAEA, 1971d. *Further Principles for the Assessment of Members' Contributions towards the Agency's Administrative Expenses.* General Conference Resolution GC (XV)/RES/283. 8 October.

IAEA, 1972a. *General Conference. Annual report. 1 July 1971 - 30 June 1972.* GC(XVI)/480. July. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC16/GC16Documents/English/gc16-480_en.pdf
[Accessed 14 July 2017].

IAEA, 1972b. *The text of the Agreement between the Government of Canada and the IAEA for the Application of Safeguards in Connection with the NPT.* INFCIRC/164. 2 June. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc164.pdf
[Accessed 14 July 2017].

IAEA, 1972c. *The Structure and Content of Agreements between the IAEA and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.* INFCIRC/153/ (Corr.). 1 June. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1972/infcirc153.pdf
[Accessed 13 July 2017].

IAEA, 1972d. *Board of Governors. Statement of the Governor of Japan.* Record of Meeting GOV/OR.451. 22 September.

IAEA, 1973a. *Safeguards. The formulation of certain provisions in agreements under the Agency's safeguards system (1965, as provisionally extended in 1966 and 1968).* GOV/1621. Board of Governors. 20 August. [Online] Available at: https://www.armscontrol.org/system/files/GOV1621.pdf
[Accessed 13 July 2017].

IAEA, 1973b. *The text of the Agreement between the Agency and Mexico for the application of safeguards in connection with the Treaty for the Prohibition of Nuclear Weapons in Latin America and the NPT.* INFCIRC/197. 13 December. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc197.pdf
[Accessed 1 June 2017].

IAEA, 1973c. *The text of the Agreement between the Agency and Mexico for the Application of Safeguards under the Treaty for the Prohibition of Nuclear Weapons in Latin America. Suspension of the application of safeguards.* INFCIRC/118 /Mod.1. 29 November. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc118m1.pdf [Accessed 14 July 2017].

IAEA, 1973d. *The text of the Agreement, and of the Protocol thereto, between Norway and the Agency for the application of safeguards in connection with the NPT.* INFCIRC/177, 11 April. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc177.pdf [Accessed 14 July 2017].

IAEA, 1973e. *The text of the Agreement, and of the Protocol thereto, between Denmark and the Agency for the application of safeguards in connection with the NPT.* INFCIRC/176, 9 April. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc176.pdf [Accessed 14 July 2017].

IAEA, 1973f. *The text of the Agreement, and of the Protocol thereto, between Belgium, Denmark, the Federal Republic of Germany, Ireland, Italy, Luxembourg, the Netherlands, the Euratom and the Agency in implementation of Article III (1) and (4) of the NPT.* INFCIRC/193. 14 September. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc193.pdf [Accessed 12 January 2017].

IAEA, 1973g. *The text of the Agreement and the two Protocols thereto, between Ireland and the Agency for the application of safeguards in connection with the NPT.* INFCIRC/184, 1 June. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc184.pdf [Accessed 14 July 2017].

IAEA, 1974a. *Standard Text of a Protocol to an Agreement.* GOV/INF/276, Annex B, 22 August. [Online] Available at: https://ola.iaea.org/ola/documents/GINF276.pdf [Accessed 14 July 2017].

IAEA, 1974b. *The Text of the Agreement between Iran and the Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.* INFCIRC/214, 13 December. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1974/infcirc214.pdf
[Accessed 15 December 2015].

IAEA, 1975a. *The text of the Agreement between the Agency and Spain relating to the application of safeguards to a quantity of enriched uranium.* INFCIRC/221. 23 July. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1975/infcirc221.pdf
[Accessed 13 July 2017].

IAEA, 1975b. *The Text of the Agreement Between the Agency and Argentina for the Application of Safeguards to the Embalse Power Reactor Facility.* INFCIRC/224. 8 August. [Online]
Available at: https://www.iaea.org/sites/default/files/infcirc224.pdf
[Accessed 13 July 2017].

IAEA, 1976a. *The text of the Safeguards Agreement of 22 September between the Agency, France and the Republic of Korea.* INFCIRC/233. 19 January. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1976/infcirc233.pdf
[Accessed 13 July 2017].

IAEA, 1976b. *The Text of the Safeguards Agreement of 26 February 1976 Between the Agency, Brazil and the Federal Republic of Germany.* INFCIRC/237. 6 May. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc237.pdf
[Accessed 1 February 2017].

IAEA, 1977a. *The Text of the Agreement of 17 November 1977 Between the Agency and India for the Application of Safeguards in Connection with the Supply of Heavy Water from the Soviet Union.* INFCIRC/260. 1 July. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc260.pdf
[Accessed 13 July 2017].

IAEA, 1977b. *The text of the Safeguards Agreement of 1 February 1977 between the Agency, Canada and Spain.* INFCIRC/247. 5 May. [Online]

Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1977/infcirc247.pdf
[Accessed 13 July 2017].

IAEA, 1977c. *The text of the Agreement of 22 July 1977 between Argentina and the Agency for the application of safeguards in connection with a co-operation agreement between Argentina and Canada.* INFCIRC/251. 28 November. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1977/infcirc251.pdf
[Accessed 13 July 2017].

IAEA, 1978a. *Communication Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment or Technology.* INFCIRC/254. February. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc254.pdf
[Accessed 13 July 2017].

IAEA, 1978b. *The text of the Agreement of 4 March 1977, and of the Protocol which is an integral part thereof, between Japan and the Agency in implementation of Article III.1 and 4 of the NPT.* INFCIRC/255. 1 March. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc255.pdf
[Accessed 18 June 2017].

IAEA, 1978c. *The text of the Agreement, and of the Protocol which is an integral part thereof, between the United Kingdom of Great Britain and Northern Ireland, the European Atomic Energy Community and the Agency for the application of safeguards in the United Kingdom in connection with the Treaty on the Non-Proliferation of Nuclear Weapons.* INFCIRC/263. 1 October 1978. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc263.pdf [Accessed 18 June 2017].

IAEA, 1980. *The Text of the Agreement of 8 July 1980 Between the Libyan Arab Jamahiriya and the Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.* INFCIRC/282. 1 October. [Online]
Available at: https://www.iaea.org/sites/default/files/infcirc282.pdf
[Accessed 14 July 2017].

IAEA, 1981a. *The text of the Agreement of 18 November 1977 and of the Protocol thereto between the USA and the Agency for the application of safeguards in the USA.* INFCIRC/288. 1 December. [Online]

Available at: https://www.iaea.org/sites/default/files/infcirc288.pdf [Accessed 14 July 2017].

IAEA, 1981b. *The text of the Agreement of 27 July 1978, and of the Protocol which is an integral part thereof, between France, the European Atomic Energy Community and the Agency for the application of safeguards in France.* INFCIRC/290. 1 December. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1981/infcirc290.pdf
[Accessed 14 July 2017].

IAEA, 1985a. *The text of the Agreement of 21 February 1985 between the Union of Soviet Socialist Republics and the Agency for the application of safeguards in the Union of Soviet Socialist Republics.* INFCIRC/327. 1 July. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc327.pdf [Accessed 14 July 2017].

IAEA, 1985b. *General conference. Annual Report for 1984. GC(XXIX)/748.* July. [Online]
Available at:
https://www.iaea.org/About/Policy/GC/GC29/GC29Documents/English/gc29-748_en.pdf
[Accessed 14 July 2017].

IAEA, 1988. *The text of the Agreement of 1 July 1986 between the People\'s Socialist Republic of Albania and the Agency for the application of safeguards to all nuclear activities of Albania.* INFCIRC/329. 1 October. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1988/infcirc359.pdf
[Accessed 14 July 2017].

IAEA, 1989. *Agreement of 20 September 1988 Between the People's Republic of China and the International Atomic Energy Agency For the Application of Safeguards in China.* INFCIRC/369. 1 October. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc369.pdf [Accessed 14 July 2017].

IAEA, 1990. *The text of the Argentine-Brazilian Declaration on Common Nuclear Policy, signed by the Presidents of Argentina and Brazil at Foz do Iguaçu, Brazil, on 28 November.* INFCIRC/388, 3 December 1990. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc388.pdf [Accessed 20 December 2016].

IAEA, 1991a. *A Report by the Director General on Non-Compliance by Iraq with its obligations under the Safeguards Agreement with the Agency.* GOV/2530. 18 July.

IAEA, 1991b. *Record of Meeting Board of Governors.* GOV/OR.758. 18 July.

IAEA, 1991c. *General Conference Resolution "South Africa's nuclear capabilities".* GC(XXXV)/RES/567, 20 September. [Online] Available at: https://www.iaea.org/About/Policy/GC/GC35/GC35Resolutions/English/gc35res-567_en.pdf
[Accessed 20 December 2016].

IAEA, 1992a. *Genral Conference. Annual Report for 1991.* GC (XXXVI)/1004. July. [Online]
Available at: https://www.iaea.org/About/Policy/GC/GC36/GC36Documents/English/gc36-1004_en.pdf
[Accessed 14 December 2015].

IAEA, 1992b. *Text of IAEA Press Release 92/11 of 14 February 1992.* INFCIRC/406, Annex II. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1992/infcirc406.pdf
[Accessed 14 December 2015].

IAEA, 1992c. *Sub-item 5 (a) of the provisional agenda (GOV/2586).* Board of Governors. 18 May.

IAEA, 1992d. *Strengthening of Agency Safeguards: The Provision and Use of Design Information.* Board of Governors. GOV/2554/Att.2/Rev.2. 1 April.

IAEA, 1992e. *Record of GOV/OR Meeting 776. Board of Governors.* GOV/OR.776, 25 February.

IAEA, 1992f. *Effective and Efficient Implementation of Safeguards by the Agency and Euratom under the Agreement (INFCIRC/193).* Board of Governors. Annex to GOV/INF/654. 13 May.

IAEA, 1992g. *Oral report on the case and the result of the special inspection by Director General Blix to the Board of Governors.* Record of GOV/OR Meeting 780. 16 June.

IAEA, 1993a. *Item 7 of the provisional agenda (GOV/2655).* Board of Governors. GOV/2657. 14 May.

IAEA, 1993b. *Sub-item 2 (a) of the provisional agenda (GOV/2628) "Universal reporting system on nuclear material and specified equipment and non-nuclear material".* Board of Governors. GOV/2629. 22 January.

IAEA, 1993c. *Record of 354th Plenary Meeting.* GC(XXXVII)/OR.354. General Conference, Thirty-Seventh Regular Session 27 September.

IAEA, 1994. *The Text of the Agreement (and the Protocol thereto) between Argentina, Brazil, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials and the IAEA for the Applicaiton of Safeguards.* INFCIRC/435, 1 March 1994. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc435.pdf [Accessed 20 December 2016].

IAEA, 1995a. *Item 5(b) of the provisional agenda (GOV/2799), "Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System: Proposals for a Strengthened and More Efficient Safeguards System.* Report by the Director General. GOV/2807. 12 May.

IAEA, 1995b. *Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System.* Report by the Director General to the General Conference. GC(39)/17. 22 August.

IAEA, 1995c. *Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System.* Report by the Director General. GOV/2784. 21 February.

IAEA, 1996a. *Implementation of the New Partnership Approach (NPA) between the IAEA and Euratom for the application of safeguards pursuant to INFCIRC/193.* Board of Governors. GOV/INF/793. 5 June.

IAEA, 1996b. *Strengthening the effectiveness and improving the efficiency of the safeguards system. Report by the Director General to the General Conference. GC(40)/17, 23 August,* .

IAEA, 1997a. *The Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards.* IAEA Doc. INFCIRC/540 (corr.), 15 May. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc540.pdf [Accessed 8 March 2016].

IAEA, 1997b. *Strengthening the effectiveness and improving the efficiency of the safeguards system.* Report by the Director General to the General Conference. GC(41)/22. 17 September.

IAEA, 1997c. *An agreement by exchange of letters with the Argentine Republic in connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Treaty*

for the Prohibition of Nuclear Weapons in Latin America and the Caribbean. INFCIRC/435/Mod.1, 1 August. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc435m1.pdf [Accessed 14 July 2017].

IAEA, 1998a. *An Agreement by exchange of letters with the Federative Republic of Brazil in connection with the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean.* INFCIRC/435/Mod. 2. 15 May. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc435m2.pdf [Accessed 14 July 2017].

IAEA, 1998b. *The Evolution of IAEA Safeguards.* International Nuclear Verification Series No. 2 ed. Vienna: IAEA.

IAEA, 2000a. *An agreement by exchange of letters with the Federative Republic of Brazil in connection with the NPT and the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean.* INFCIRC/435/Mod. 2 March. [Online] Available at: https://www.iaea.org/sites/default/files/infcirc435m3.pdf [Accessed 14 July 2017].

IAEA, 2000b. *Report on "Strengthening the effectiveness and improving the efficiency of the safeguards system and application of the Model Additional Protocol" to the 44th regular session.* IAEA General Conference. GC (44)/12. 16 August.

IAEA, 2001. *Safeguards Glossary. International Nuclear Verification Series No. 3,* Vienna: IAEA.

IAEA, 2002a. *Reinforcing the World's Regime Against Nuclear Weapons.* 14 November. [Online] Available at: www.iaea.org/NewsCenter/News/2002/11-13-903199.shtml [Accessed 15 December 2016].

IAEA, 2002b. *Record of the First Plenary Meeting.* General Conference, Forty-Sixth Regular Session. GC(46)/OR.1. 16 September.

IAEA, 2003a. Consideration of GOV/2003/63. Board of Governors. 9 September.

IAEA, 2003b. *Implementation of the NPT Safeguards Agreement between the Agency and the Democratic People's Republic of Korea.* Report by the Director General. GOV/2003/14. 12 February.

IAEA, 2003c. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2003/81. 26 November.

IAEA, 2003d. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2003/69. 12 September.

IAEA, 2003e. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2003/63. 26 August.

IAEA, 2003f. *Implementation of the NPT safeguards agreement in the Islamic Republic of Iran. Report by the Director General.* GOV/2003/40. 6 June.

IAEA, 2003g. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2003/75. 10 November.

IAEA, 2003h. *Consideration of GOV/2003/40 (continued).* Board of Governors. 19 June.

IAEA, 2003i. *Consideration of GOV/2003/75 (continued).* Board of Governors. 21 November.

IAEA, 2004a. *Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya.* Resolution adopted by the Board.GOV/2004/18. 10 March.

IAEA, 2004b. *Report of the International Atomic Energy Agency.* UN General Assembly. 47th plenary meeting. A/59/PV.47. 1 November.

IAEA, 2004c. *"Implementation of the NPT Safeguards Agreement in the Republic of Korea:* Report by the Director General. GOV/2004/84. 11 November.

IAEA, 2004d. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2004/90. 29 November.

IAEA, 2004e. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2004/79. 18 September.

IAEA, 2004f. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2004/49. 18 June.

IAEA, 2004g. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2004/21. 13 March.

IAEA, 2004h. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2004/60. 1 September.

IAEA, 2004i. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2004/34. 1 June.

IAEA, 2004j. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2004/11. 24 February.

IAEA, 2004k. *Consideration of GOV/2004/83 and 89.* Board of Governors. 29 November.

IAEA, 2004l. *Consideration of GOV/2004/60, GOV/2004/76/Rev.1, GOV/2004/77, and GOV/2004/78.* Board of Governors. 18 September.

IAEA, 2004m. *Consideration of GOV/2004/34 and Corr. 1, GOV/2004/449.* Board of Governors, 18 June.

IAEA, 2004n. *Communication dated 26 November 2004 received from the Permanent Representatives of France, Germany, the Islamic Republic of Iran and the United Kingdom concerning the agreement signed in Paris on 15 November 2004.* INFCIRC/637. 26 November. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2004/infcirc637.pdf
[Accessed 12 December 2015].

IAEA, 2005a. *Nuclear Verification. Strengthening Safeguards Implementation in States with Small Quantities Protocols.* Report by the Director General. GOV/2005/33. 13 May.

IAEA, 2005b. *The Safeguards Implementation Report for 2004.* Report by the Director General. GOV/2005/32. 13 May.

IAEA, 2005c. *Record of the 1130th Meeting.* Board of Governors. GOV/OR.1130. 16 June.

IAEA, 2005d. *Protocol Additional to the Agreement between the Republic of Austria, the Kingdom of Belgium, the Kingdom of Denmark, the Republic of Finland, the Federal Republic of Germany, the Hellenic Republic, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the Portuguese Republic, the Kingdom of Spain, the Kingdom of Sweden, the European Atomic Energy Community and the International Atomic Energy Agency in implementation of Article III, (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons.* INFCIRC/193/Add.8. 12 January. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1973/infcirc193a8.pdf
[Accessed 10 January 2017].

IAEA, 2005e. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2005/67. 2 September.

IAEA, 2005f. *Implementation of the NPT Safeguards Agreement in the Arab Republic of Egypt:* Report by the Director General. GOV/2005/9. 14 February.

IAEA, 2005g. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran and related Board resolutions.* Resolution of the Board. GOV/2005/77. 24 September.

IAEA, 2005i. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran and related Board resolutions.* Resolution of the Board. GOV/2005/64. 11 August.

IAEA, 2005j. *Consideration of GOV/2005/60, 61, 62, 63 and Rev.1; INFCIRC/648, 649 and 651.* Board of Governors. 11 August.

IAEA, 2005k. *Communication dated 2 August 2005 received from the Permanent Missions of France, Germany and the United Kingdom to the Agency.* INFCIRC/649. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2005/infcirc649.pdf
[Accessed 12 December 2015].

IAEA, 2005l. *Communication dated 1 August 2005 received from the Permanent Mission of the Islamic Republic of Iran to the Agency.* INFCIRC/648. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2005/infcirc648.pdf
[Accessed 12 December 2015].

IAEA, 2005m. *Chair's Conclusion on Sub-item 6(a): Strengthening safeguards implementation in States with Small Quantities Protocols.* Board of Governors. 20 September.

IAEA, 2006a. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board . GOV/2006/14. 4 February.

IAEA, 2006b. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Resolution of the Board. GOV/2006/14. 4 February.

IAEA, 2006c. *The Standard Text of Safeguards Agreements in connection with the NPT. Revision of the Standardized Text of the "Small Quantities Protocol".* GOV/INF/276/Mod.1, 21 February; and GOV/INF/276/Mod.1/Corr.1. 28 February.

IAEA, 2006d. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2006/64. 14 November.

IAEA, 2006e. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2006/15. 27 February.

IAEA, 2006f. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2006/27. 28 April.

IAEA, 2006g. *Communication dated 3 January 2006 received from the Permanent Mission of the Islamic Republic of Iran to the Agency.* Report by the Director General. GOV/INF/2006/1. 3 January.

IAEA, 2006h. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2006/53. 31 August.

IAEA, 2007a. *Board of Governors Considers Safeguards Implementation in Iran.* IAEA News. 12 September. [Online]
Available at: https://www.iaea.org/newscenter/news/board-governors-considers-safeguards-implementation-iran
[Accessed 1 May 2017].

IAEA, 2007b. *Communication dated 27 August 2007 from the Permanent Mission of Iran to the Agency concerning the text of the "Understandings of Iran and the IAEA on the Modalities of Resolution of the Outstanding Issues".* INFCIRC/711. 27 August. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2007/infcirc711.pdf
[Accessed 1 May 2017].

IAEA, 2007c. *Communication Received from the Permanent Mission of Brazil regarding Certain Member States' Guidelines for the Export of Nuclear Material, Equipment and Technology.* INFCIRC/254/Rev.9/Part 1. 7 November. [Online]
Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc254r9p1.pdf
[Accessed 14 May 2017].

IAEA, 2007d. *Dr. ElBaradei Calls for "Timeout" on Iran Nuclear Issue.* IAEA News. 29 January. [Online]
Available at: https://www.iaea.org/newscenter/news/dr-elbaradei-calls-timeout-iran-nuclear-issue
[Accessed 6 March 2017].

IAEA, 2007e. *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolution 1737 (2006) in the Islamic Republic of Iran.* Report by the Director General. GOV/2007/8, 22 February.

IAEA, 2007f. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747(2007) in the Islamic Republic of Iran.* Report by the Director General. GOV/2007/58. 15 November.

IAEA, 2007g. *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions in the Islamic Republic of Iran.* Report by the Director General. GOV/2007/22. 23 May.

IAEA, 2007h. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2007/48. 30 August.

IAEA, 2008a. *Communication dated 25 June 2008 received from the Resident Representative of the United Kingdom to the Agency concerning a letter and offer of 12 June 2008 delivered to the Islamic Republic of Iran.* INFCIRC/730. 1 July. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2008/infcirc730.pdf
[Accessed 1 May 2017].

IAEA, 2008b. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006) and 1747 (2007) in the Islamic Republic of Iran.* Report by the Director General. GOV/2008/4. 22 February.

IAEA, 2008c. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007) and 1803 (2008) in the Islamic Republic of Iran.* Report by the Director General. GOV/2008/15. 26 May.

IAEA, 2009a. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran.* Report by the Director General. GOV/2009/35. 5 June.

IAEA, 2009b. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran.* Report by the Director General. GOV/2009/74. 16 November.

IAEA, 2011. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran.* Report by the Director General. GOV/2011/65. 8 November.

IAEA, 2012a. *Committee of the Whole Record of the Fourth Meeting, 18 September 2012.* IAEA General Conference. GC(56)/COM.5/OR.4.

IAEA, 2012b. *Committee of the Whole. Record of the Second Meeting, 18 September 2012.* IAEA General Conference. GC(56)/COM.5/OR.2.

IAEA, 2012c. *Establishment of the Iran Task Force.* SEC/DIR/158. 29 August.

IAEA, 2012d. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran.* Report by the Director General. GOV/2012/9. 24 February.

IAEA, 2012e. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran.* Report by the Director General. GOV/2012/37, 30 August.

IAEA, 2013a. *Communication Received from the Permanent Mission of the Czech Republic to the IAEA regarding Certain Member States' Guidelines for Transfers of Nuclear-related Dual-use Equipment, Materials, Software and Related Technology.* INFCIRC/254/Rev.9/Part 2. 13 November. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc254r9p2.pdf
[Accessed 19 March 2017].

IAEA, 2013b. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran.* Report by the Director Genera. GOV/2013/56. 14 November.

IAEA, 2013c. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran.* Report by the Director General. GOV/2013/27. 22 May.

IAEA, 2013d. *Iran Sign Joint Statement on Framework for Cooperation.* 2013/21. 11 November. [Online] Available at: https://www.iaea.org/newscenter/pressreleases/iaea-iran-sign-joint-statement-framework-cooperation
[Accessed 15 July 2017].

IAEA, 2013e. *Safeguards Implementation Guide for States with Small Quantities Protocols.* IAEA Services Series No. 22 ed. Vienna: IAEA.

IAEA, 2014a. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran.* Report by the Director General. GOV/2014/43. 5 September.

IAEA, 2014b. *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran.* Report by the Director General. GOV/2004/83. 15 November.

IAEA, 2014c. *Monitoring and Verification in Iran in relation to the extension of the Joint Plan of Action," GOV/INF/2014/1, Annex "Joint Press Statement by EU High*

Representative Catherine Ashton Iranian Foreign Minister Mohammad Javad Zarif. Vienna. 19 July 2014.

IAEA, 2014d. *Monitoring and Verification in Iran in relation to the extension of the Joint Plan of Action," GOV/INF/2014/28, Annex "Joint Statement by Catherine Ashton and Iranian Foreign Minister Mohammad Javad Zarif following the talks in Vienna.* 24 November.

IAEA, 2014e. *Status of Iran's Nuclear Programme in relation to the Joint Plan of Action.* Report by the Director General. GOV/INF/2014/1. 20 January.

IAEA, 2014f. *Supplementary Document to the Report on the Conceptualization and Development of Safeguards Implementation at the State Level (GOV/2013/38).* Report by the Director General. GOV/2014/41. 13 August.

IAEA, 2015a. *Director General's Statement and Road-map for the Clarification of Past and Present Outstanding Issues regarding Iran's Nuclear Program.* 14 July. [Online] Available at: https://www.iaea.org/newscenter/statements/iaea-director-generals-statement-and-road-map-for-the-clarification-of-past-present-outstanding-issues-regarding-irans-nuclear-programme
[Accessed 26 February 2017].

IAEA, 2015b. *Joint Statement by the IAEA Director General Yukiya Amano and the Vice-President of the Islamic Republic of Iran, President of the Atomic Energy Organization of Iran, Ali Akbar Salehi.* 14 July. [Online] Available at: https://www.iaea.org/newscenter/statements/iaea-director-generals-statement-and-road-map-for-the-clarification-of-past-present-outstanding-issues-regarding-irans-nuclear-programme
[Accessed 16 June 2017].

IAEA, 2015c. *Final Assessment on Past and Present Outstanding Issues regarding Iran's Nuclear Programme.* Report by the Director General. GOV/2015/68. 2 December.

IAEA, 2015d. *Keynote address of Director General Yukiya Amano at the 4th European Union Non-Proliferation and Disarmament Conference organized by the International Institute for Strategic Studies (IISS).* 11 November. [Online] Available at: https://www.iaea.org/newscenter/news/sticking-to-its-technical-mandate-iaea-retains-confidence-on-iran-nuclear-issue-director-general-amano
[Accessed 1 July 2017].

IAEA, 2015e. *Monitoring and Verification in the Islamic Republic of Iran in relation to the Joint Plan of Action.* GOV/INF/2015/11, Attachment "Letter of the EU3+3 and Iran of 30 June 2015". 30 June.

IAEA, 2015f. *Road-map for the Clarification of Past and Present Outstanding Issues regarding Iran's Nuclear Program.* GOV/INF/2015/14, 14 July.

IAEA, 2015h. *Safeguards Statement for 2014. IAEA Doc. GOV/2015/30.*

IAEA, 2015i. *Status of Iran's Nuclear Programme in relation to the Joint Plan of Action.* Report by the Director General. GOV/INF/2015/8, 20 April.

IAEA, 2015j. *The Safeguards Implementation Report for 2014.* GOV/2015/30. 6 May. [Online]
Available at: https://armscontrollaw.files.wordpress.com/2015/07/sir-2014.pdf
[Accessed 13 July 2017].

IAEA, 2016a. *Annual Report 2015.* General Conference. Additional Annex Information, Supplement. GC(60)/9/Annex.

IAEA, 2016b. *Communication dated 21 December 2016 to the Agency sent on behalf of High Representative Mogherini in her capacity as Coordinator of the Joint Commission established under the Joint Comprehensive Plan of Action.* INFCIRC/907, Attachment, 23 December. [Online]
Available at:
https://www.iaea.org/sites/default/files/publications/documents/infcircs/2016/infcirc907.pdf
[Accessed 6 June 2017].

IAEA, 2016c. *IAEA Annual Report 2015.* GC(60)/9 (Corrected). [Online]
Available at:
https://www.iaea.org/About/Policy/GC/GC60/GC60Documents/English/gc60-9_en.pdf
[Accessed 13 July 2017].

IAEA, 2016d. *Introductory Statement to the Board of Governors of the Director General of the IAEA.* 19 January. [Online]
Available at: https://www.iaea.org/newscenter/statements/introductory-statement-board-governors-68
[Accessed 14 May 2017].

IAEA, 2016e. Iran and the IAEA: verification and monitoring under the JCPOA. *IAEA Bulletin,* June. [Online]
Available at: https://www.iaea.org/sites/default/files/bull572-june2016_0.pdf
[Accessed 15 July 2017].

IAEA, 2016f. *Islamic Republic of Iran. Country Nuclear Power Profiles.* [Online]
Available at:
https://cnpp.iaea.org/countryprofiles/IranIslamicRepublicof/IranIslamicRepublicof.htm
[Accessed 13 July 2017].

IAEA, 2016g. *New IAEA Uranium Enrichment Monitor to Verify Iran's Commitments under JCPOA*. 16 January. [Online] Available at: https://www.iaea.org/newscenter/news/new-iaea-uranium-enrichment-monitor-verify-iran%E2%80%99s-commitments-under-jcpoa
[Accessed 15 July 2017].

IAEA, 2016h. *Organizational Structure of the Department of Safeguards.* SEC/DIR/241. 25 May.

IAEA, 2016i. *Status of the Additional Protocol as of 7 October.* [Online] Available at: https://www.iaea.org/safeguards/safeguards-legal-framework/additional-protocol/status-of-additional-protocol
[Accessed 14 July 2017].

IAEA, 2016j. *The Safeguards Implementation Report for 2015.* Report by the Director General. GOV/2016/22/Rev.1. 3 May .

IAEA, 2016k. *Verification and Monitoring in the Islamic Republic of Iran in light of United Nations Security Council Resolution 2231 (2015).* Report by the Director General. GOV/2016/8. 26 February.

IAEA, 2016l. *Verification and Monitoring in the Islamic Republic of Iran in light of United Nations Security Council Resolution 2231 (2015).* Report by the Director General. GOV/INF/2016/1. 16 January.

IAEA, 2017a. *Communication dated 11 January 2017 to the Agency sent on behalf of High Representative Mogherini in her capacity as Coordinator of the Joint Commission established under the Joint Comprehensive Plan of Action.* INFCIRC/907/Add.1, Attachment. 12 January. [Online] Available at: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2016/infcirc907a1.pdf
[Accessed 16 June 2017].

IAEA, 2017b. *Status list: Conclusion of safeguards agreements, additional protocols and small quantities protocols.* 19 May. [Online] Available at: https://www.iaea.org/sites/default/files/status-sg-agreements-comprehensive.pdf
[Accessed 13 July 2017].

IAEA, 2017c. *Status of Small Quantities Protocols. Status as of 19 May 2017.* [Online] Available at: https://www.iaea.org/topics/safeguards-legal-framework/status-small-quantities-protocols
[Accessed 14 July 2017].

IAEA, 2017d. *Status of the Additional Protocol.* 19 May. [Online] Available at: https://www.iaea.org/topics/additional-protocol/status [Accessed 18 June 2017].

IAEA, 2017e. *The Safeguards Implementation Report for 2016.* Report by the Director General. GOV/2017/23, 12 May.

IAEA, 2017f. *Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015).* Report by the Director General. GOV/2017/10, 24 February.

IAEA, n.d. *Fact Sheet on DPRK Nuclear Safeguards.* [Online] Available at: https://www.iaea.org/newscenter/focus/dprk/fact-sheet-on-dprk-nuclear-safeguards
[Accessed 14 December 2015].

IAEA, n.d. *Systems of Accounting for and Control of Nuclear Material.* [Online] Available at: https://www.iaea.org/sites/default/files/17204801824.pdf [Accessed 14 July 2017].

Iran Watch, 2012. *A History of Iran's Nuclear Program.* [Online] Available at: http://www.iranwatch.org/our-publications/weapon-program-background-report/history-irans-nuclear-program
[Accessed 14 December 2015].

Iran Watch, 2005. *Summary of the Latest Round of Nuclear Talks Between Iran and the European Union.* 26 January. [Online] Available at: http://www.iranwatch.org/library/international-organization/european-union-eu/summary-latest-round-nuclear-talks-between-iran-and-european-union
[Accessed 1 March 2017].

Iran Watch, n.d. *Protocol of Negotiations Between Iran and Russia, Signed by Mikhailov and Amrollakhi.* 1 January 1995. [Online] Available at: http://www.iranwatch.org/library/government/russia/russia-protocol-negotiation-between-iran-and-russia
[Accessed 14 December 2015].

Iran, 2005a. *Proposal by Iran. Presented to Political and Security Working Group, Geneva, 17 January.* [Online] Available at: http://www.isisnucleariran.org/assets/pdf/Iran_Proposal_Jan172005.pdf [Accessed 1 June 2017].

Iran, 2005b. *Framework for a Long-Term Agreement between the Islamic republic of Iran and France, Germany and the United Kingdom, with the Support of the High Representative of the European Union.* 5 August. [Online]

Available at: http://www.pircenter.org/media/content/files/10/1356177810.pdf [Accessed 12 December 2015].

Iran, 2005c. *Response of the Islamic Republic of Iran to the Framework Agreement proposed by EU3/EU.* [Online] Available at: http://www.bits.de/public/documents/iran/IranonEU3-0805.pdf [Accessed 20 March 2017].

Iran, 2006. *Islamic Republic of Iran's Response to the Package Presented on 6 June.* [Online] Available at: http://www.isis-online.org/publications/iran/iranresponse.pdf [Accessed 6 February 2017].

IRNA, 2003. *Iranian President Mohammad Khatami on the Right of all Nations to Nuclear Energy.* 9 February. [Online] Available at: http://www.iranwatch.org/government/Iran/iran-irna-khatami-yazd-isfahan-kashan-020903.htm [Accessed 12 December 2015].

ISIS, 2015. *Verification of the Joint Comprehensive Plan of Action.* 28 July. [Online] Available at: http://isis-online.org/uploads/isis-reports/documents/Verification_of_Iran_JCPOA_Final.pdf [Accessed 14 December 2015].

ISIS, n.d. *Tehran Research Reactor (TRR).* [Online] Available at: http://www.isisnucleariran.org/sites/facilities/tehran-research-reactor-trr/ [Accessed 14 December 2015].

Islamic Republic News Agency, 2004. *Bushehr Nuclear Power Plant Delayed by Another Year.* [Online] Available at: www.iranwatch.org/library/government/iran/iran-irna-bushehr-nuclear-power-plant-delayed-another-year-8-22-04 [Accessed 14 December 2015].

Jafarzadeh, A., 2002. *New Information on Top Secret Projects of the Iranian Regime's Nuclear Program.* National Council of Resistance of Iran. 14 August. [Online] Available at: http://www.iranwatch.org/library/ncri-new-information-top-secret-nuclear-projects-8-14-02 [Accessed 14 December 2015].

JCPOA, 2015. *Joint Comprehensive Plan of Action.* Vienna, 14 July 2015.

Joyner, D. H., 2016. *Iran's Nuclear Program and International Law. From Confrontation to Accord.* 1 ed. New York: Oxford University press.

Joyner, D. H., 2016. *Iran's Nuclear Program and International Law. From Confrontation to Accord.* New York: Oxford University press.

Katzman, K., 2017. *Iran Sanctions.* Congressional Research Service Report, 14 April.

Kerry, J., 2015. *Adoption of the Joint Comprehensive Plan of Action.* U.S.Department of State. [Online] Available at: http://www.state.gov/secretary/remarks/2015/10/248311.htm [Accessed 14 December 2015].

Kilb, W., 2014. *The Nuclear Safeguards System of the European Atomic Energy Community (Euratom)* in: Christian Raetzke (Hrsg.), Nuclear Law in the EU and Beyond, Proceedings of the AIDN / INLA Regional Conference 2013 in Leipzig. Baden-Baden : Nomos Verlagsgesellschaft.

Martin, M., 2010. *Address by Micheal T.D., Minister for Foreign Affairs of Ireland, Eighth Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons.* New York. 3 May. [Online] Available at: http://www.un.org/en/conf/npt/2010/statements/pdf/ireland_en.pdf [Accessed 13 July 2017].

Lyman, E. S. 2008. *Can Nuclear Fuel Production in Iran and Elsewhere Be Safeguarded Against Diversion?* In: Sokolski, H. *Falling Behind: International Scrutiny of the Peaceful Atom*, Carlysle, PA: Strategic Studies Institute.

Manully, T. 2008. U.S.-India Nuclear Cooperation and Non-Proliferation, *Nuclear Law Bulletin*, 82 (2008/2), pp. 9-26

McKnight, A., 1971. *Atomic Safeguards: A Study in International Verification.* New York : UNITAR.

Medeiros, E. S., 2009. *Reluctant restraint: the evolution of China's non-proliferation policies and practices, 1980-2004.* Singapore: NUS Press.

Michel, Q., 2007. Critical Reflections on the Treaty on the Non-Proliferation of Nuclear Weapons. *Nuclear Law Bulletin*, 80 (2007/2), pp. 21-26.

Nobel Peace Prize, 2005. *Nobel Peace Prize Official Website.* [Online] Available at: http://nobelpeaceprize.org/en_GB/laureates/laureates-2005/announce-2005/ [Accessed 14 December 2015].

NPR, 2001. *Nuclear Threats. National Public Radio, interview with Mohammed ElBaradei.* 3 July. [Online] Available at: http://www.npr.org/templates/story/story.php?storyId=1125297 [Accessed 14 December 2015].

NSG, 2005. *Plenary Meeting. NSG_OSL/PRESS/FINAL.* Oslo, Norway, 23-24 June. [Online]
Available at: http://www.nuclearsuppliersgroup.org/images/Files/Documents-page/Public_Statements/2005-06-oslo.pdf
[Accessed 8 March 2017].

NSG, n.d. *The Nuclear Suppliers Group. About the NSG.* [Online]
Available at: http://www.nuclearsuppliersgroup.org/en/about-us
[Accessed 1 May 2017].

NTI, 2011 . *Iran Nuclear Chronology.* May 2011 (last update). [Online]
Available at: http://www.nti.org/media/pdfs/iran_nuclear.pdf?_=1316542527
[Accessed 2 May 2017].

OPANAL, 2016. *Additional Protocols.* [Online]
Available at: http://www.opanal.org/en/additional-protocols/
[Accessed 14 July 2017].

Patrikarakos, D., 2012. *Nuclear Iran: The Birth of an Atomic State.* London: I. B. Tauris & Co Ltd..

Pellaud, B. & Hooper, R., 1995. IAEA Safeguards in the 1990s: Building from Experience. *IAEA Bulletin,* 37(1), pp. 14-20.

Pickett, S. E., 2008. *Case Study: Safeguards Implementation at the Rokkasho Reprocessing Plant*". In: Doyle, J. E. (ed.). *Nuclear Safeguards, Security, and Non-proliferation: Achieving Security with Technology and Policy*. Burlington, MA: Butterworth-Heinemann.

Rainer, R. H. & Szasz, P. C., 1993. *The law and practices of the International Atomic Energy Agency 1970-1980. Supplement 1 to the 1970 edition of Legal Series No. 7.* Vienna: IAEA.

Redick, J.R., 1998. *Factors in the decisions by Argentina and Brazil to accept the non-proliferation regime*. In: Schneider, B. R. and Dowdy, W. L. *Pulling Back from the Nuclear Brink*. London : Frank Cass Publishers.

Reuters, 2012. *Iran, North Korea agree to cooperate in science, technology.* Reporting by Yeganeh Torbati. 1 September. [Online]
Available at: http://www.reuters.com/article/us-korea-north-iran-idUSBRE88005H20120901
[Accessed 1 May 2017].

Ripol Carulla, S. 1996. Principios y normas internacionales sobre seguridad de las instalaciones nucleares. *Cursos de derecho internacional de Vitoria/Gasteiz 1996*, pp. 175-232.

Rockwood, L., 2010. The IAEA Safeguards System. In: *International Nuclear Law: History, Evolution and Outlook.* s.l.:OECD, pp. 255-6.

Rockwood, L., 2013. *Legal framework for IAEA safeguard.* Vienna: IAEA.

Rockwood, L., 2014. *The IAEA's State-Level Concept and the Law of Unintended Consequences. Arms Control Today.* Arms Control Association website. 28 August. [Online]
Available at: https://www.armscontrol.org/act/2014_09/Features/The-IAEAs-State-Level-Concept-and-the-Law-of-Unintended-Consequences
[Accessed 30 April 2017].

Rockwood, L., 2017. Ex-section head for non-proliferation and policymaking in the Office of Legal Affairs of the IAEA, Executive Director of the Vienna Centre for Disarmament and Non-Proliferation [Interview] (4 July 2017).

Ronen, Y., 2010. *The Iran Nuclear Issue.* Bloomsbury Publishing.

Rowberry, A., 2013. *Sixty Years of "Atoms for Peace" and Iran's Nuclear Program.* 18 December. [Online]
Available at: https://www.brookings.edu/blog/up-front/2013/12/18/sixty-years-of-atoms-for-peace-and-irans-nuclear-program/
[Accessed 12 January 2017].

RT, 2010. *U.S. slaps new sanctions on Iran, Iran targets Coca-Cola.* 2 July. [Online]
Available at: https://www.rt.com/politics/iran-us-sanctions-coca/
[Accessed 14 May 2017].

Russia, 2008a. *Interview of Russian Minister of OFreign Affairs Sergey Lavrov.* Al-Hayat, 25 August. [Online]
Available at: http://russiaun.ru/en/news/200808256345
[Accessed 2 May 2017].

Russia, 2008b. *Transcript of Remarks and Replies to Media Questions by Russian Minister of Foreign Affairs Sergey Lavrov at Joint Press Conference with Israeli Minister of Foreign Affairs Tzipi Livni.* Tel Aviv, 20 March. [Online]
Available at: http://www.mid.ru/en/press_service/minister_speeches/-/asset_publisher/7OvQR5KJWVmR/content/id/344806
[Accessed 1 May 2017].

Samore, G., 2015. *The Iran Nuclear Deal. A Definitive Guide.* Belfer Center for Science and International Affairs [Online]
http://www.belfercenter.org/sites/default/files/legacy/files/IranDealDefinitiveGuide.pdf
[Accessed 13 December 2015].

Schleicher, H. W., 1980. Nuclear Safeguards in the European Community – A Regional Approach. *IAEA Bulletin,* 22(3/4), pp. 45-50.

Sciolino, E., 1991. *Report Says Iran Seeks Atomic Arms.* 30 October. [Online] Available at: http://www.nytimes.com/1991/10/31/world/report-says-iran-seeks-atomic-arms.html
[Accessed 14 December 2015].

Shea, T., 2015. *Assuring Effective IAEA Verification of the Iran-P5+1 Agreement.* July. [Online]
Available at: https://www.sfcg.org/wp-content/uploads/2015/07/Shea_Paper_Final-3.pdf
[Accessed 13 July 2017].

Skootsky, M. D., 1995. *U.S.Nuclear Policy toward Iran.* Non-Proliferation Analysis. No. 1, 1 June. [Online]
Available at: http://people.csail.mit.edu/boris/iran-nuke.text
[Accessed 10 December 2015].

Solomon, J., 2016. *U.S.to Buy Material Used in Iran Nuclear Program.* The Wall Street Journal, 22 April. [Online]
Available at: https://www.wsj.com/articles/u-s-to-buy-material-used-in-iran-nuclear-program-1461319381
[Accessed 14 May 2017].

Sonnier, C. D. D. G. D., n.d. *Containment and Surveillance - Past, Present and Future.* IAEA-SM-351/49. [Online]
Available at: http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/30/014/30014772.pdf
[Accessed 30 December 2016].

Stein, R., 1973. *IAEA Safeguards in connection with NPT and the IAEA-Euratom Safeguards Agreement.* International Nuclear Law Association.

Stockman, F., 2007. *U.S. issues new sanctions on Iran's state banks. Seeks to push regime to halt nuclear efforts.* The Boston Globe, 26 October. [Online]
Available at: http://archive.boston.com/news/nation/washington/articles/2007/10/26/us_issues_new_sanctions_on_irans_state_banks/
[Accessed 1 May 2017].

Straw, J., 2006. *Statement Following Iran Meeting.* London, 30 January. [Online]
Available at: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/declarations/88207.pdf

Strohecker, K., 2008. *Iran says work plan closed, U.S. intelligence fake.* Reuters, 24 February. [Online]
Available at: http://www.reuters.com/article/us-iran-nuclear-iaea-idUSL2453975720080224?rpc=64
[Accessed 1 May 2017].

SWIFT, 2012. *SWIFT instructed to disconnect sanctioned Iranian banks following EU Council decision.* SWIFT. 15 March. [Online]
Available at: https://www.swift.com/insights/press-releases/swift-instructed-to-disconnect-sanctioned-iranian-banks-following-eu-council-decision
[Accessed 14 May 2017].

Szasz, P. C., 1970. *The Law and Practices of the International Atomic Energy Agency.* Vienna: IAEA.

The Economic Times, 2008. *Iranian shipping line dismisses U.S.sanctions.* The Economic Times, 15 September. [Online]
Available at: http://economictimes.indiatimes.com/news/news-by-industry/transportation/shipping-/-transport/iranian-shipping-line-dismisses-us-sanctions/articleshow/3483123.cms
[Accessed 18 June 2017].

The Guardian, 2008. *Iran: Nuclear centrifuge total has doubled.* 27 July. [Online]
Available at: https://www.theguardian.com/world/2008/jul/27/3
[Accessed 1 May 2017].

The Guardian, 2013. *Joint Plan of Action*. Geneva. 24 November 2013. [Online]
Available at: https://www.theguardian.com/world/interactive/2013/nov/24/iran-nuclear-deal-joint-plan-action
[Accessed 15 July 2017].

The Telegraph, 2005. *Iran will block nuclear checks if referred to UN.* The Telegraph, 20 November. [Online]
Available at: http://www.telegraph.co.uk/news/1503463/Iran-will-block-nuclear-checks-if-referred-to-UN.html

Thorstensen, S. & Chitumbo, K., 1995. Safeguards in the European Union: The New Partnership Approach. *IAEA Bulletin,* 37(1), pp. 25-28.

UK Parliament, 2008. *Foreign Affairs Committee, Global security : Iran : fifth report of session 2007-08. Annex II "Joint Statement at the End of a Visit to the Islamic Republic of Iran by the Foreign Ministers of Britain, France and Germany, 21 October 2003,* London: Stationery Office.

UK, 1967. *Statement of Minister of State for Foreign Affairs of the United Kingdom (Mr. Frederick Mulley) in the House of Commons on 4 December.* [Online] Available at: http://hansard.millbanksystems.com/commons/1967/dec/04/nuclear-weapons-non-proliferation
[Accessed 30 March 2017].

UK, 2005. *Remarks with British Foreign Secretary Jack Straw After Meeting, Secretary Condoleezza Rice.* Foreign and Commonwealth Office, London, UK. 4 February.

UN Security Council, 1992. *Note by the President of the Security Council.* S/23500.

UN, 1945. *Charter of the United Nations.* 1 UNTS XVI. 24 October.

UN, 1946. *Statute of the International Court of Justice.* 18 April.

UN, 1957. *Agreement for co-operation concerning civil uses of atomic energy (USA – Iran).* 342 UNTS 29. Signed 5 March 1957, entered into force 27 April 1959.

UN, 1961. General Asembly Resolution 1665 (XVI). *Prevention of the wider dissemination of nuclear weapons.* 4 December. [Online] Available at: https://documents-dds-ny.un.org/doc/RESOLUTION/GEN/NR0/167/18/IMG/NR016718.pdf?OpenElement
[Accessed 12 July 2017].

UN, 1967a. *Contract for the transfer of enriched uranium and plutonium for a research reactor in Iran (IAEA – Iran – USA).* 614 UNTS 110. Signed 10 March, 10 May, and 7 June 1967, entered into force 7 June 1967.

UN, 1967b. *Treaty for the Prohibition of Nuclear Weapons in Latin America.* 634 UNTS 281. Opened for signature 14 February 1967, entered into force 25 April 1969.

UN, 1968. *Treaty for the Prohibition of Nuclear Weapons in Latin America (with annexed Additional Protocols I and II).* 9068 UNTS 326. Opened for signature 14 February 1967, Entered into force 25 April 1969.

UN, 1969. *Vienna Convention on the Law of Treaties.* 23 May 1969. 1155 UNTS 331. [Online]
Available at: https://treaties.un.org/doc/publication/unts/volume%201155/volume-1155-i-18232-english.pdf

UN, 1977. *Panama Canal Treaty (USA-Panama).* 7 September. 21086 UNTS 4.

UN, 1980. *Agreement on co-operation for the development and application of peaceful uses of nuclear energy (Brazil – Argentina).* 1339 UNTS 306. Signed 17 May 1980, entered into force 20 October 1983.

UN, 1985a. *South Pacific Nuclear Free Zone Treaty.* 1445 UNTS 178. Open for signature 6 August 1985, entered into force 11 December 1986.

UN, 1985b. *Third Review Conference of the NPT. Final Declaration.* [Online] Available at: http://www.nti.org/media/pdfs/NPTRevCon85.pdf?_=1316545527 [Accessed 14 July 2017].

UN, 1986. *Protocol 1, Protocol 2 and Protocol 3 to the South Pacific Nuclear Free Zone Treaty.* 1971 UNTS 470. Opened for signature 8 August 1986.

UN, 1991. *Agreement for the exclusively peaceful use of nuclear energy (Argentina – Brazil).* 1664 UNTS 215. Signed 18 July 1991, entered into force 12 December 1991.

UN, 1992. *Note by the President of the Security Council.* S/23500, 31 January.

UN, 1995a. *Background Paper Prepared by the Secretariat of the IAEA*. 1995 NPT Review and Extension Conference. NPT/CONF.1995/7/Part I. New York. 1 February.

UN, 1995b. *Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons. Decision 3.*

UN, 1995c. *Review and Extension Conference of the Parties to the NPT. Summary Record of the 3rd Meeting.* NPT/Conf.1995/SR.3, 18 April.

UN, 1995d. *Treaty on the Southeast Asia Nuclear Weapon-Free Zone.* 1981 UNTS 129. Opened for signature 15 December 1995, entered into force 27 March 1997.

UN, 1995e. *Protocol to The Treaty on Southeast Asia Nuclear Weapon-Free Zone.* 15 December.

UN, 1996. *African Nuclear-Weapon-Free Zone Treaty.* Opened for signature 11 April 1996, entered into force 15 July 2009. [Online] Available at: http://disarmament.un.org/treaties/t/pelindaba [Accessed 14 July 2017].

UN, 2002. *Letter dated 4 February 2002 from the Permanent Representative of the Islamic Republic of Iran to the United Nations Addressed to the Secretary General.* A/56/806–S/2002/140, 4 February. [Online] Available at: http://www.un.org/documents/ga/docs/56/a56806.pdf [Accessed 12 December 2015].

UN, 2003a. *General Debate, Statement of Iran.* General Assembly. 25 September. [Online]
Available at: http://www.un.org/webcast/ga/58/statements/iraneng030925.htm [Accessed 13 May 2017].

UN, 2003b. *Report of the International Atomic Energy Agency. Statement by Iran.* A/58/PV.533, 3 November.

UN, 2003c. *Statement by the Russian Federation.* UN General Assembly. Report of the IAEA. 3 November.

UN, 2005a. *Statement by the Russian Federation.* UN General Assembly, Report of the International Atomic Energy Agency. A/60/PV.41. 31 October.

UN, 2005b. *Address by Iran's President.* UN General Assembly. 17 September.

UN, 2006a. *Security Council Resolution 1696(2006), S/RES/1696 (2006).* 31 July. [Online]
Available at: https://www.iaea.org/sites/default/files/unsc_res1696-2006.pdf
[Accessed 16 June 2017].

UN, 2006b. *Security Council Resolution 1737 (2006). S/RES/1737 (2006).* 27 December. [Online]
Available at:
http://www.un.org/ga/search/view_doc.asp?symbol=S/RES/1737%282006%29
[Accessed 6 June 2017].

UN, 2006c. *Treaty on a Nuclear-Weapon-Free Zone in Central Asia.* No. 51633. Opened for signature 8 September 2006, entered into force 21 March 2009.

UN, 2006d. *Statement by the President of the Security Council.* 29 March. [Online]
Available at: https://www.iaea.org/sites/default/files/unsc_sprst2006-15.pdf
[Accessed 8 March 2017].

UN, 2006e. *Statement by Iran.* IAEA 50th General Conference, Fiftieth (2006) Regular Session. GC(50)/OR.1. 18 September. [Online]
Available at:
https://www.iaea.org/About/Policy/GC/GC50/GC50Records/English/gc50or-1_en.pdf
[Accessed 6 February 2017].

UN, 2006f. *Letter dated 31 July 2006 from the Permanent Representative of the Islamic Republic of Iran to the United Nations addressed to the President of the Security Council.* S/2006/603. 2 August. [Online]
Available at: http://repository.un.org/bitstream/handle/11176/19111/S_2006_603-EN.pdf?sequence=3&isAllowed=y
[Accessed 18 June 2017].

UN, 2006g. *61st session, 11th plenary meeting, A/61/PV.1.* General Assembly. 19 September.

UN, 2007a. *Security Council Resolution 1747(2007)*. S/RES/1747 (2007). 24 March. [Online]
Available at: http://www.un.org/ga/search/view_doc.asp?symbol=S/RES/1747%282007%29
[Accessed 1 May 2017].

UN, 2007b. *Security Council Toughens Sanctions against Iran, Adds Arms Embargo, with Unanimous Adoption of Resolution 1747 (2007)*. Press Release. SC/8980, 24 March. [Online]
Available at: https://www.un.org/press/en/2007/sc8980.doc.htm.
[Accessed 1 March 2017].

UN, 2007c. *Statement by Iran.* First Session of the Preparatory Committee for the 2010 NPT Review Conference. 1 May. [Online]
Available at: http://www.un.org/en/conf/npt/2007/statements/Iran_01_05_pm_final_version.pdf

UN, 2008a. *Letter dated 24 March 2008 from the Permanent Representative of the Islamic Republic of Iran to the United Nations addressed to the Secretary-General.* UN General Assembly / Security Council. A/62/767–S/2008/203. [Online]
Available at: https://disarmament-library.un.org/UNODA/Library.nsf/fe62e8425506649a852572ac00529ed3/c81735c8f5fc4e3d852574030057cde5/$FILE/a-62-767-s-2008-203.pdf
[Accessed 1 May 2017].

UN, 2008b. *Security Council Resolution 1803(2008)*. S/RES/1803 (2008). 3 March. [Online]
Available at: http://www.un.org/ga/search/view_doc.asp?symbol=S/RES/1803(2008)&referer=/english/&Lang=E

UN, 2008c. *Security Council Resolution 1835(2008)*. *S*/RES/1835 (2008). 27 September. [Online]
Available at: https://www.iaea.org/sites/default/files/unsc_res1835-2008.pdf
[Accessed 15 March 2017].

UN, 2009. *Security Council Resolution 1887(2009)*. S/RES/1887. 24 September. [Online]
Available at: www.un.org/News/Press/docs/2009/sc9746.doc.htm
[Accessed 15 May 2017].

UN, 2010. *Security Council Resolution 1929(2010)*. S/RES/1929 (2010), 9 June. [Online]

Available at: https://www.iaea.org/sites/default/files/unsc_res1929-2010.pdf. [Accessed 15 May 2017].

UN, 2014. *Protocol to the Treaty on a Nuclear-Weapon-Free Zone in Central Asia.* Opened for signature 6 May 2014.

UN, 2015a. *Third report on the provisional application of treaties, by Juan Manuel Gómez Robledo, Special Rapporteur.* International Law Commission. UN GA Document A/CN.4/687. 5 June. [Online] Available at: http://legal.un.org/docs/?symbol=A/CN.4/687 [Accessed 12 July 2017].

UN, 2015b. *Security Council Resolution 2231 (2015).* S/RES/2231 (2015). 20 July. [Online] Available at: http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/2231(2015) [Accessed 15 July 2017].

UN, 2017a. *South Pacific Nuclear Free Zone Treaty.* [Online] Available at: http://disarmament.un.org/treaties/t/rarotonga [Accessed 14 July 2017].

UN, 2017b. *Status of Protocol to The Treaty on Southeast Asia Nuclear Weapon-Free Zone.* [Online] Available at: http://disarmament.un.org/treaties/t/bangkok_protocol [Accessed 14 July 2017].

UN, 2017c. *Brazil: Accession to Treaty on the Non-Proliferation of Nuclear Weapons (NPT).* [Online] Available at: http://disarmament.un.org/treaties/a/npt/brazil/acc/london [Accessed 14 July 2017].

UN, 2017d. *Summaries of the Work of the International Law Commission: Provisional application of treaties.* International Law Commission. 16 February 2017 (last update). [Online] Available at: http://legal.un.org/ilc/summaries/1_12.shtml [Accessed 14 May 2017].

USA, 1960. *Review of the International Atomic Policies and Programs of the United States.* Report to the joint Committee on Atomic Energy. U.S. Congress. [Online] Available at: https://babel.hathitrust.org/cgi/pt?id=mdp.39015001304685;view=1up;seq=278 [Accessed 13 July 2017].

USA, 1987. *Executive Order 12613 – Prohibiting imports from Iran.* 29 October 1987. 52 FR 41940, 3 CFR, 1987 Comp., p. 256.

USA, 1992. *Iran-Iraq Arms Non-Proliferation Act.* H.R.5434.

USA, 1996. *Iran and Libya Sanctions Act.* H.R. 3107.

USA, 2002a. *Daily Press Briefing. Richard Boucher, Spokesman, Washington, DC.* 13 December. [Online] Available at: https://2001-2009.state.gov/r/pa/prs/dpb/2002/15976.htm [Accessed 20 November 2016].

USA, 2002b. *The President's State of the Union Address.* 29 January. [Online] Available at: https://georgewbush-whitehouse.archives.gov/news/releases/2002/01/20020129-11.html [Accessed 14 December 2015].

USA, 2005a. *U.S. Support for the EU3.* Statement by Secretary of State Condoleezza Rice. 11 March. [Online] Available at: https://2001-2009.state.gov/secretary/rm/2005/41834.htm [Accessed 2 March 2017].

USA, 2005b. *Executive Order 13382.*U.S. Department of State, 29 June. [Online] Available at: https://www.state.gov/t/isn/c22080.htm [Accessed 1 May 2017].

USA, 2006. *Iran, North Korea, and Syria Non-proliferation Act Sanctions (INKSNA*). U.S. Department of State, 13 October. [Online] Available at: https://www.state.gov/t/isn/inksna/ [Accessed 1 May 2017].

USA, 2008a. *Export Development Bank of Iran Designated as a Proliferator.* HP-1231. The U.S. Department of Treasury, 22 October. [Online] Available at: https://www.treasury.gov/press-center/press-releases/Pages/hp1231.aspx [Accessed 1 May 2017].

USA, 2008b. *Treasury Designates Iranian Proliferation Individuals and Entities.* Press Release. The U.S. Department of the Treasury. 8 July. [Online] Available at: http://www.iranwatch.org/library/government/united-states/executive-branch/department-treasury/press-release-treasury-designates-iranian-proliferation-individuals-and-entities [Accessed 1 May 2017].

USA, 2017. *U.S. Relations With Iran: Factsheet. U.S. Department of State.* [Online] Available at: http://www.state.gov/r/pa/ei/bgn/5314.htm [Accessed 14 March 2017].

Venter, A. J., 2005. *Iran's nuclear option. Tehran's quest for the atom bomb.* Philadelphia: Casemate.

Vick, K., 2006. *Iran Rejects Russia's Proposal on Uranium.* Washington Post Foreign Service. 13 March. [Online]
Available at: http://www.washingtonpost.com/wp-dyn/content/article/2006/03/12/AR2006031200275.html
[Accessed 8 March 2017].

Von Baeckmann, A., 1988. IAEA safeguards in nuclear-weapon States. A review of objectives, purposes, and achievements. *IAEA Bulletin,* 30(1), pp. 22-25.

WAS, 2017. *Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies.* WA-DOC (17) PUB 001. Compiled by the Wassenaar Arrangement Secretariat. February. [Online]
Available at: http://www.wassenaar.org/wp-content/uploads/2015/06/WA-DOC-17-PUB-001-Public-Docs-Vol-I-Founding-Documents.pdf
[Accessed 12 March 2017].

WNA, 2017a. *Nuclear Power in Iran.* April (updated). [Online]
Available at: http://www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Iran/
[Accessed 14 May 2017].

WNA, 2017. *The Nuclear Fuel Cycle.* [Online]
Available at: http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/introduction/nuclear-fuel-cycle-overview.aspx
[Accessed 1 April 2017].

WP, 2006. *President Bush Holds a White House Press Conference.* 26 January. [Online]
Available at: http://www.washingtonpost.com/wp-dyn/content/article/2006/01/26/AR2006012600853.html
[Accessed 8 March 2017].

WSJ, 2005. *Iran's Nuclear Policy Requires a Collective Response.* EU3 Foreign Ministers. The Wall Street Journal. 22 September. [Online]
[Accessed 8 March 2017].

Zak, C., 2002. *Iran's nuclear policy and the IAEA: an evaluation of Program 93+2.* Military research papers no. 3 ed. Washington: The Washington Institute for Near East Policy.