CARTA INTERNACIONAL
ASSOCIAÇÃO BRASILEIRA DE RELAÇÕES INTERNACIONAIS

ISSN 2526-9038

Brazil and the Refusal to the Additional Protocol: Is It Time to Review this Position?

O Brasil e a recusa ao Protocolo Adicional: chegou a hora de rever esta posição?

Brasil y la negativa al Protocolo Adicional: ¿Es hora de revisar esta posición?

DOI: 10.21530/ci.v16n1.2021.1108

Marcos Valle Machado da Silva[1]

Abstract

Despite its commitment to the non-proliferation of nuclear weapons, Brazil will not adhere to the Additional Protocol (AP) as long as the nuclear-weapon states (NWS) do not advance in their nuclear disarmament. In this context, the question arises: is this position an effective way to pressure the NWS to comply with Article VI of the Non-Proliferation Treaty (NPT)? This article argues that it is an ineffective position that weakens every year. Firstly, the article presents an overview of the purpose of the AP and highlights the number of states that have adhered to it. Secondly, it analyses the Brazilian official position concerning the AP. Thirdly, it identifies and analyses the states involved in the peaceful use of nuclear energy that has signed an AP with the IAEA and how this could affect the Brazilian position of refusing to sign an AP to pressure the NWS to comply with Article VI of the NPT.

Keywords: Additional Protocol; Nuclear Disarmament; Non-proliferation.

1 Doutor em Ciência Política (UFF). Professor da Escola de Guerra Naval (EGN), Rio de Janeiro, Brasil. (mbvalle2002@yahoo.com.br). **ORCID: https://orcid.org/0000-0003-0367-8899**.

Artigo submetido em 03/08/2020 e aprovado em 22/03/2021.

Resumo

Apesar do inegável compromisso com a não proliferação de armas nucleares, o estado brasileiro assumiu a posição de não aderir ao Protocolo Adicional (PA) de salvaguardas, enquanto os estados nuclearmente armados (NWS) não avançarem no seu desarmamento nuclear. Nesse contexto, cabe questionar: essa posição é uma maneira eficaz de pressionar os NWS a cumprirem o Artigo VI do Tratado sobre a Não Proliferação de Armas Nucleares (TNP)? Este artigo argumenta que a posição assumida pelo estado brasileiro é ineficaz e enfraquece a cada ano. Incialmente, o artigo apresenta uma visão geral do objetivo do PA e destaca o número de estados que aderiram a ele. Segundo, analisa a posição oficial brasileira em relação à essas salvaguardas adicionais. Terceiro, identifica e analisa os estados que assinaram um PA com a AIEA, evidenciando como esse contexto pode afetar a posição brasileira que usa a recusa ao PA como forma de pressionar os NWS a cumprirem o Artigo VI do TNP.

Palavras-chave: Desarmamento Nuclear; Não Proliferação; Protocolo Adicional.

Introduction[2]

The Brazilian nuclear programme has its origins in the 1950s when the National Nuclear Energy Commission (CNEN) was created to formulate Brazilian nuclear policy. Since then, Brazil has been developing a programme for the peaceful use of nuclear energy, with two nuclear power plants in operation and a third under construction. The country also has four working research reactors and a fifth research reactor is planned. Also, there is a programme for the construction of a conventional nuclear-powered submarine[3] (CNPS). It is worth noting that Brazil has large uranium[4] reserves and dominates the uranium enrichment cycle. This makes the peaceful use of nuclear energy one of the strategic objectives of the Brazilian State, which receives more or less priority depending on the

2 This work was supported by the Brazilian Coordination for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES), Project PROCAD-DEF20191325566P. The views and conclusions of this paper are those of the author only and should not be interpreted as representing sponsor or federal government policies or endorsements.

3 The National Defense Strategy sent to the national congress in July 2020, uses the term conventional nuclear-powered submarine to make it clear that this future Brazilian submarine will have conventional weapons and that nuclear energy will be used exclusively for its propulsion (Author's note).

4 Brazil has the seventh largest uranium reserves in the world, with around 276,800 tons of uranium concentrate (U_3O_8). (World Nuclear Association 2019).

elected government. Brazil is also an active member of the nuclear weapons non-proliferation regime, being a signatory to the major treaties that constitute it.

In this context, the Brazilian nuclear programme, and the Brazilian State's policy on the non-proliferation of nuclear weapons, has been the object of study by academics in Brazil (see Leonam dos Santos Guimarães 2005; Mônica Herz 2013; Matias Spektor 2016; Eugenio Diniz Costa 2017; and Matias Spektor, Togzhan Kassenova, and Lucas Perez Florentino 2019) and outside the country (see Togzhan Kassenova 2014 and 2016; Joseph Cirincione 2005; and Mark Hibbs 2009).

Despite the consensus on the Brazilian State's commitment to the non-proliferation of nuclear weapons, the refusal of successive Brazilian governments to sign the so-called Additional Protocol (AP) of Safeguards with the International Atomic Energy Agency (IAEA) has generated mistrust.

It should be remembered that the official Brazilian position presented by its political and diplomatic representatives, as well as expressed in two editions of its National Defence Strategy, is that Brazil will not adhere to the new incorporations to the NPT, to expand the safeguards against proliferation, while the nuclear-weapon states[5] (NWS) have not made significant progress in their nuclear disarmament (see Brazil 2008 and 2012).

In this context, the question arises: is this position an effective way to pressure the NWS to comply with Article VI of the Non-Proliferation Treaty (NPT)? Theories related to proliferation and non-proliferation are central to this article. There is comprehensive literature on the potential drivers for the country's decision to develop nuclear weapons (see Sagan 1996 and 2011, Waltz 1999 and Cirincione 2008), and on the dynamics of proliferation and non-proliferation (see Zanders 2013). However, this article focuses on the three approaches to nuclear non-proliferation: multilateral, plurilateral, and unilateral (see Abe 2007).

The multilateral approach focuses on the United Nations, primarily within the framework of the NPT and IAEA safeguards. The plurilateral focuses on like-minded states coming together to strengthen and complement national efforts on non-proliferation. The Nuclear Suppliers Group (NSG) is the quintessence of this kind of approach. The unilateral approach focuses on the use of force to prevent

5 According to Article IX, item 3 of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), 'a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967'. Therefore, USA, Soviet Union (now Russia), United Kingdom, France and China are *de jure* nuclear-weapon states (see UNODA. *NPT, Text of the Treaty*).

proliferation within the framework of the right of an individual and collective defence against the existence of a real or imminent threat of proliferation or a specific proliferator (See Abe 2007).

The focus of this article is on the multilateral approach since the research question addressed here is part of the debate that arises from interpreting Article II vis-a-vis Article VI of the NPT, that is: non-proliferation must be accompanied by disarmament or non-proliferation must precede nuclear disarmament. In other words: Non-nuclear-weapon states (NNWS) non-proliferation efforts must be accompanied by NWS disarmament outcomes, or NNWS non-proliferation is a precondition for NWS disarmament.

It can be argued that the NWS nuclear disarmament obligation is unconditional and therefore the NWS must constantly move towards meeting this obligation, even if there is no target date for its fulfilment. However, in the last decade, there has been no progress on the issue of nuclear disarmament. Contrarily, the NWS is renovating and modernising their nuclear arsenals. Also, arms control and disarmament treaties, such as the Intermediate-Range Nuclear Forces Treaty, have been abandoned and the New START expires in 2021, with no guarantee that it will be extended.

In this context, some critics argue that the NWS has not engaged in fulfilling their end of the bargain, that is, nuclear disarmament, so the NNWS must consider that they are the only side doing their part. On the other hand, one of the positions within this debate is one in which non-proliferation and nuclear disarmament are perceived as causally linked. Therefore, for nuclear disarmament to occur, non-proliferation must be ensured (Carlson 2019).

Also, there is the argument that non-proliferation is also a security interest for NNWS. In that sense, in his article "Is the NPT Still Relevant? How to Advance the Disarmament Provisions of the NPT", John Carlson presents the perspective that the NPT consists of a "three-way bargain":

> Some critics argue that nuclear-weapon states have not lived up to their end of the bargain, so non-nuclear-weapon states should consider that they are no longer bound. This overlooks the deeper nature of the NPT as a three-way bargain: the NPT is not just a bargain between nuclear-weapon states and non-nuclear-weapon states, it is just as important as a bargain between non-nuclear-weapon states themselves. [...] It is essential for the security of non-nuclear-weapon states that they are not facing nuclear threats from other non-nuclear-weapon states (Carlson 2019, 99).

However, Kassenova (2016) observes that some NNWS, as is the case in Brazil, pay special attention to states that are the major claimants of additional non-proliferation efforts, which are generally the NWS. So, if the major claims for additional non-proliferation efforts are the NWS, the NNWS are waiting to see what efforts and results are achieved in nuclear disarmament.

Summarily, the debate over whether non-proliferation efforts should be accompanied by more NWS disarmament outcomes, or whether non-proliferation is a precondition for NWS disarmament, continues to be a hot topic, both in academia as in the foreign ministries of several member states of the NPT. The commitment of an NNWS to additional non-proliferation efforts, such as the AP, is present in this debate. For states like Brazil, as shown in this article, additional non-proliferation commitments will only occur after the NWS shows evidence that nuclear disarmament is being effectively enforced.

However, this article argues that the refusal to sign the AP, as a method of additionally pressuring the NWS to comply with Article VI of the NPT, is an inefficient position that is weakened year after year, given the increasing number of signatories of the AP.

To seek answers to the proposed research question and to corroborate the assumption made, the article aims to show how adherence to the AP has been growing, including by states involved in the peaceful use of nuclear energy and, using the Brazilian position on the AP as a case study, highlights how the AP's refusal is an inefficient way to pressure the NWS to comply with Article VI of the NPT.

To achieve the proposed objectives, this article is developed in three steps. Firstly, it presents a brief description of the purpose of the AP and the evolution of the number of states that have adhered to it. Secondly, it analyses the Brazilian official position concerning the AP. Thirdly, it identifies and analyses the states involved in the peaceful use of nuclear energy that has signed an AP with the IAEA and how this could affect the Brazilian position of refusing to sign an AP as a way to pressure the NWS to comply with Article VI of the NPT.

The Additional Protocol: Purpose and Numbers

To understand the objectives and purposes of the AP, it is worth reviewing the commitments, in terms of safeguards, made by NPT signatories such as

NNWS, and the gaps in those commitments evidenced in cases involving Iraq and the Democratic People's Republic of Korea (DPRK).

Under Article III of the NPT, all parties to the NNWS must enter into a safeguards agreement with the IAEA. This safeguards agreement is known as the Comprehensive Safeguards Agreement (CSA) and is regulated by INFCIRC/153/Corr[6]. Given the near-universal membership of the NPT, CSAs are also virtually universal.

The purpose of the CSA is to ensure that NNWS have the right to use nuclear energy peacefully without concerns from other NPT signatories that nuclear activities will be used to develop nuclear weapons. However, these safeguards are verified solely based on the information provided by the signatory state, as established by INFCIRC/153. That is, the IAEA is expected to verify the data and facilities that a signatory state to the NPT has declared. According to former IAEA director (1997 to 2009) Mohamed ElBaradei (2011, 18): "The Agency was only expected to verify the data that a particular country had declared. Our authority and mechanisms to search for nuclear materials or facilities that had not been formally declared were restricted. That may sound a bit naive, and it actually was".

The IAEA's experiences in Iraq and the DPRK in the early 1990s highlighted weaknesses in detecting undeclared nuclear material and activities in states whose governments violated the terms of the NPT.

Regarding Iraq, the IAEA safeguards agreement allowed the Agency to inspect a limited number of sites at the Tuwaitha nuclear research centre. In 1991, following the defeat of Saddam Hussein in the First Gulf War, the IAEA discovered facilities undeclared by Iraq in Tuwaitha and other places that inspectors were not authorized to visit. At these facilities, Iraq secretly enriched uranium and carried out reprocessing experiments (Hibbs 2012).

In the DPRK, the case was much more complex. Although the DPRK signed the NPT in 1985, it did not ratify its safeguards agreement with the IAEA until April 1992. The DPRK operated a nuclear reactor in Yongbyon for the entire period in which no safeguards were applied and, according to Graham (2004), the reactor did not stop until the late 1980s, which allowed enough time to reprocess the spent fuel and obtain plutonium.

According to Sigal (1997), during the second ad hoc inspection in Yongbyon in July 1992, the DPRK stated that it had separated about 90 grams of plutonium

6 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 (see IAEA, INFCIRC/153/Corr).

in the early 1990s. However, the inspectors detected an 'anomaly' in the initial declaration of the DPRK to the IAEA and the analysis noted that the reprocessing had occurred on three occasions – in 1989, 1990, and 1991 – and involved different batches of irradiated material, suggesting that there were over 90 grams of plutonium declared by the DPRK. The question was: where was this plutonium and how much was there?

The United States later informed the IAEA that its satellites had found two waste storage facilities near the Yongbyon nuclear reactor. When the IAEA requested a special inspection of the sites, the DPRK rejected it as a violation of its sovereignty (see Graham 2004; Sigal 1997). This started the well-known series of crises with the DPRK, marked by apparent advances that were followed by recurring setbacks, culminating in the country's withdrawal from the NPT in January 2003 and the detonation of nuclear devices in 2006, 2009, 2013, 2016, and in 2017.

These two cases – the enrichment of uranium by Iraq and the reprocessing of uranium for plutonium by the DPRK – highlighted the weaknesses of the CSAs established under INFCIRC/153. In other words, the safeguards system, based only in the "good faith" of the states in the integrity of the declarations that describe the existing nuclear materials and facilities, proved incapable of preventing the illegal development of nuclear weapons. In the case of Iraq, which established a parallel programme, there was no deviation or failure in accounting for what was declared. The clandestine programme was limited to using undeclared facilities and material, escaping the scope of the procedures established by current regulations.

In this context, at the end of 1993, the IAEA initiated a broad programme to improve and strengthen the application of safeguards under the CSAs. This led to Program 93 + 2 and later to the Model Additional Protocol, designed for states that have a safeguards agreement with the IAEA.[7]

This model was established in May 1997 by INFCIRC/540 – *Additional Model Protocol to the Agreement(s) between States and the International Atomic Energy Agency for the Application of Safeguards*. In December 1998, the model presented in INFCIRC/540 was modified in articles 2.a. (ii), 2.a. (ix) (b), 4.a. (iii), 17 and 18.b, which give rise to the current INFCIRC/540 (Corrected) (see IAEA, INFCIRC/540/Corr).

The model consists of a preamble, 18 articles, and two annexes. Articles 2 to 10 focus on the main provisions relating to the application of safeguards.

7 The name 93 + 2 reflected that the program was drafted in 1993 with the intention of being implemented in two years (Arms Control Association 2019).

Article 2 lists the activities related to nuclear energy to be declared by the State Party. Annexes I and II are directly linked to this article. Annex I presents the list of activities referred to in article 2.a. (iv), and Annex II presents the list of equipment and non-nuclear materials specified for notification of exports and imports following Article 2.a. (ix).

Article 3 establishes the deadlines and frequency for updating the information established in Article 2. Articles 4 to 10 deal with complementary access, that is, the right of access for IAEA inspectors, as well as the requirements and rules of procedure for the State party and the IAEA. It is important to note that Article 7 establishes that, at the request of a state, the IAEA and the state 'will make arrangements for controlled access under this Protocol to prevent the dissemination of proliferation-sensitive information, to comply with the requirements of security or physical protection, or to protect confidential or commercially sensitive information'.

The point to be made here is that the model provides the means to address sensitive information and technology developed by a state party. This was necessary as it is difficult to believe that, for example, Germany, the Netherlands, and the United Kingdom, the owners of the Uranium Enrichment Company (URENCO) [8], would sign an agreement exposing the confidential and proprietary information related to their enrichment techniques and facilities.

Summarily, when analysing the content of the AP model presented in INFCIRC/540 (Corrected), it is possible to verify the substantial increase of the IAEA provisions that ensure the absence of material and activities not declared by all the states that are part of the NPT.

The strengthening measures include:

— More information provided by the state party, and IAEA access to all facilities related to the state's nuclear fuel cycle, from uranium mines to nuclear waste disposal.
— A broader IAEA right of access to these facilities to verify the information declared by the State Party.
— IAEA access on short notice to all nuclear fuel cycle-related facilities in the state.

8 URENCO is a uranium enrichment consortium, by centrifugation, which was founded following the signing of the Treaty of Almelo (1970) by the governments of Germany, the Netherlands, and the UK. URENCO is unique in the world enrichment market in having four enrichment facilities in four different countries: Gronau (Germany), Almelo (the Netherlands), Capenhurst (United Kingdom), and Eunice (New Mexico, USA). (URENCO 2018).

— More information provided by the state party on the manufacture, export, and import of sensitive equipment related to nuclear energy and the IAEA's access to these locations.
— The right of the IAEA to collect environmental samples in declared locations and in other places that the Agency considers necessary to verify the declared information.
— A simplified procedure for the designation of IAEA inspectors and the appropriate multiple entry/exit and/or transit visas to allow the inspector to enter and remain in the territory of the State party (see IAEA, Strengthening Measures).

The AP fills the gaps in INFCIRC/153 and provides the IAEA with an overview of all key points of a State party's nuclear programme and infrastructure. Summarily, the AP improves the quantity and quality of information that is made available for IAEA analysis, contributing to two of the pillars of the NPT: preventing the proliferation of nuclear weapons and ensuring the continued peaceful use of nuclear weapons energy by the NNWS.

Adherence to the AP did not get off to a promising start, as in 2000 an AP was "in force" in only 11 states. However, in the years that followed, the number of states with an "in force" AP increased substantially, as shown in Table 1.

Table 1 – Status of AP 'in force' – Evolution of the Number of States

Number of States with AP In Force				
31 Dec. 2000	**31 Dec. 2005**	**31 Dec. 2010**	**31 Dec. 2015**	**30 Sep. 2020**
11 States	60 States	103 States	127 States	136 States

Source: Prepared by the author based on data from the IAEA *Status List. Conclusion of Additional Protocols*.

As of September 2020, an AP was in force in 136 states. Another 14 states have signed an AP but have not yet put it into force,[9] and another two are in the process of signing.[10] Therefore, of the 193 member states of the UN, 149 have already signed an AP with the IAEA.

In this context, it is worth highlighting the Brazilian official position of refusing an AP with the IAEA, even though Brazil is an active defender of the non-proliferation of nuclear weapons and nuclear disarmament.

9 Algeria, Belarus, Bolivia, Cabo Verde, Guinea, Guinea-Bissau, Iran, Kiribati, Lao, Malaysia, Myanmar, Timor-Leste, Tunisia, and Zambia (see IAEA, *Status List. Conclusion of Additional Protocols*).

10 Sao Tome and Principe, and Sri Lanka (see IAEA, *Status List. Conclusion of Additional Protocols*).

Brazil and the Additional Protocol

The Federal Constitution of Brazil, in Title III, Chapter II, Article 21, paragraph XXIII, point a), determines that the use of nuclear energy is exclusively for peaceful purposes: All nuclear activity within the national territory will only be admitted with peaceful purposes and subject to the approval of the National Congress (Brazil 1988).

Since the democratisation of the country in the second half of the eighties, the Brazilian State has renounced nuclear weapons programmes and has opted for the peaceful use of nuclear energy, without renouncing the domain of the uranium enrichment cycle, nor the development of nuclear research, and its use for power generation and propulsion for ships.

At the end of the 1990s, Brazil has already inserted in the nuclear weapons non-proliferation regime, becoming a signatory of the following treaties: the Treaty of Tlatelolco, the Quadripartite Agreement (INFCIRC/435),[11] the NPT, the Complete Prohibition Nuclear Test Treaty (CTBT), the Antarctic Treaty, the Outer Space Treaty, and the Seabed Arms Control Treaty. Also, the country has been a member of the Nuclear Suppliers Group since April 1996.

Even before becoming a State Party to the NPT, Brazil had already signed a CSA with the IAEA. This agreement, known as the Quadripartite Agreement and referred to in the IAEA as INFCIRC/435, was signed in 1991 by Brazil, Argentina, the IAEA, and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC),[12] entering into force in 1994.

Through the Quadripartite Agreement, both Brazil and Argentina placed all nuclear material and all nuclear activities under IAEA safeguards. The agreement applies two sets of measures. The first set deals with the verification of reports on nuclear materials and activities declared by the two states parties (Argentina and Brazil). Some complementary measures are taken to ensure the accuracy

11 Agreement of 13 December 1991 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 (see IAEA, *INFCIRC/435*).

12 The Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials was created on July 18, 1991, with the signing of the Agreement between Argentina and Brazil for the Exclusively Peaceful Use of Nuclear Energy. After having been approved by the Congresses of the two countries, the Agreement entered into force in December 1991. The principal mission of ABACC is to guarantee Argentina, Brazil and the international community that all the existing nuclear materials and facilities in the two countries are being used for exclusively peaceful purposes (ABACC, *About*).

and reliability of the statements, among which are the application of security seals and the installation of surveillance cameras at key points within the nuclear facilities (Ximenes 2019).

The second set of measures comprises inspections similar to those provided for in INFICIRC/153, that is, ad hoc inspections, routine inspections, and special inspections. These inspections, as well as the notifications and previous deadlines for their performance, are specified in Article 81 of the Quadripartite Agreement. Notifications can be made within 24 hours and up to a week in advance. Article 82 of the Quadripartite Agreement establishes the possibility for the IAEA to carry out part of the routine inspections without prior notice. These inspections are called "random sampling" (see, IAEA, INFCIRC/435; and Ximenes 2019).

Brazil's adherence to the nuclear weapons non-proliferation regime is clear. However, the limits regarding the deepening of this participation are clearly marked, since successive Brazilian governments have indicated that Brazil is already inserted in the non-proliferation regime following the Brazilian Constitution and the NPT. Therefore, additional measures towards nuclear non-proliferation, by the Brazilian State, should be adopted only in exchange for great efforts on nuclear disarmament of the NWS.

This Brazilian position has been presented by its political and diplomatic representatives, as well as expressed in successive editions of the Brazilian National Defence Strategy (END):

> Brazil will ensure that access routes are kept open for the development of its nuclear technologies. It will not adhere to amendments to the Treaty on the Non-Proliferation of Nuclear Weapons that extend the restrictions of the Treaty until the nuclear-weapon States advance on the central premise of the Treaty: their nuclear disarmament.[13] (Brazil 2008, 34 and 2012, 96).

The 2016 National Defence Strategy, approved by the Brazilian Congress in 2018, addresses this issue more gently, but still emphasises the need for the disarmament of the NWS.

The 2020 edition of the National Defence Strategy, recently presented to the National Congress for its analysis and enactment, reaffirms the Brazilian State's

13 O Brasil zelará por manter abertas as vias de acesso ao desenvolvimento de suas tecnologias de energia nuclear. Não aderirá a acréscimos ao Tratado de Não Proliferação de Armas Nucleares destinados a ampliar as restrições do Tratado sem que as potências nucleares tenham avançado, de forma significativa, na premissa central do Tratado: seu próprio desarmamento nuclear. (Brazil 2008, 34 and 2012, 96).

commitment to non-proliferation and the total elimination of existing nuclear weapons. Likewise, this document clearly states that Brazil has not renounced the peaceful use of nuclear technology (Brazil, 2020, 34 and 58).

Summarily, Brazil expressed in successive editions of its National Defence Strategy (Brazil, 2008, 2012, 2016 and 2020), that it opted for peaceful use without renouncing the domain of nuclear technology. This position, embodied in the Federal Constitution of 1988 and attested by the active Brazilian participation in the regime of non-proliferation of nuclear weapons, has as its fundamental premise the progressive disarmament of armed nuclear states.

It is worth noting that the development of a conventional nuclear-powered submarine is one of the Brazilian strategic programmes highlighted in all editions of the National Defence Strategy (see Brazil 2008, 2012, 2016 and 2020). The suspicion that the signing of an AP may compromise this programme cannot be ruled out as one of the undeclared reasons that reinforce the current Brazilian position. Reactors used for the propulsion of submarines, ships, and other military platforms are not subject to a prohibition or restriction by the NPT or any other treaty. However, this opens the door to criticism derived from the perception that the use of nuclear energy for the propulsion of military ships is a breach in the non-proliferation regime (Thielmann & Hoffman 2012).

This issue has never been raised as a source of controversy, as only the five NWS recognised in the NPT and India, which is not a signatory to the NPT, use nuclear-powered submarines. However, with the steady advancement of the Brazilian conventional nuclear-powered submarine programme, this issue could become a hot spot on the non-proliferation agenda, as Brazil is the only NNWS with this type of programme.

It should also be noted that the CSA signed by the Brazilian State, that is, the Quadripartite Agreement provides, in its article 13, that the States Parties (Brazil and Argentina), if they wish to use nuclear material for the propulsion of vehicles, including submarines, must inform the IAEA of this intention, and "make an arrangement" with the IAEA containing special procedures for not applying safeguards while nuclear material is used for nuclear propulsion (see IAEA, INFCIRC/435). However, to date, the Brazilian State has not submitted to the IAEA any proposal for special procedures related to nuclear material that will be used to promote the CNPS.

Therefore, even with Brazil as an active member of the nuclear non-proliferation regime, the lack of additional safeguards can raise controversial issues.

Despite the possible problems related to the development of the conventional nuclear-powered submarine programme, the position of rejecting an AP is not exclusive to the Brazilian military. As already mentioned, it has been expressed during the last two decades by successive Brazilian diplomats and foreign ministers. A high-ranking Brazilian diplomat declared that the AP is only an instrument to slow down the technological development of countries where there is the capacity for such development, such as Brazil. 'Where this capacity does not exist, the Protocol is of no importance, neither for those who benefit from it (nuclear states) nor for those who are subject to their obligations (non-nuclear states that do not have uranium, technology or industrial capacity)'.[14] The same diplomat has even stated that: 'Accepting the Additional Protocol and the internationalisation of uranium enrichment would therefore be a crime against the country'[15] (see Guimarães 2010).

In a less ideological way and in line with the Brazilian diplomatic tradition, other diplomats emphasise that the regime structured around the NPT cannot focus solely on the non-proliferation of nuclear weapons. The speech by Ambassador Antonio de Aguiar Patriota, then Permanent Representative of Brazil to the United Nations, stated at the 2015 NPT Review Conference of the Parties:

> […] As long as nuclear weapons exist, there will be States and non-state actors tempted to acquire or develop them. Brazil is firmly committed to the goal of nuclear non-proliferation. […] Brazil cannot accept that the burden of the NPT regime continues to fall exclusively on non-nuclear-weapon States, with the increasing imposition of obligations that affect only those that already faithfully comply with the obligations of the Treaty (UN 2015, 8).

Regarding the position of the Brazilian State on non-proliferation commitments vis-a-vis the advancement of nuclear disarmament by the NWS, the page on Nuclear Disarmament and Non-Proliferation of Nuclear Weapons of the Ministry of Foreign Affairs of Brazil, consulted on July 14, 2020, files the following statement:

14 'Onde não há essa capacidade não tem o Protocolo qualquer importância, nem para os que dele se beneficiam (os Estados nucleares) nem para aqueles que a suas obrigações se submetem (os Estados não-nucleares que não detêm urânio, nem tecnologia, nem capacidade industrial e que são a maioria esmagadora dos países do mundo)'. (see Guimarães 2010).

15 'Aceitar o Protocolo Adicional e a internacionalização do enriquecimento de urânio seria, assim, um crime de lesa-pátria' (see Guimarães 2010).

> The promotion of nuclear disarmament must be high on the international community's agenda. Over forty years after it entered into force in 1970, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) has achieved great success in preventing the proliferation of nuclear weapons between countries other than those that already possessed them. However, there was little progress concerning eliminating the nuclear arsenals maintained by nuclear-weapon states. It is estimated that there are still over 17,000 nuclear warheads in the world today (of which over 4,000 are actively deployed) [...]. Brazil understands that there is a clear compliance gap concerning the implementation of the commitment of the nuclear-weapon States to nuclear disarmament (see Brazil, Ministry of Foreign Affairs, *Nuclear Disarmament and Non-Proliferation of Nuclear Weapons*).

The statement points to the Brazilian foreign policy understanding that nuclear disarmament cannot be dissociated from non-proliferation efforts and that there has been continuity in this position over the past two decades. The official position of the Brazilian State regarding AP is to refuse to sign until there is significant progress in nuclear disarmament by the NWS. It can be inferred that the position of the Brazilian State is associated with the perception that it is a form of pressure on the nuclear-weapon States to comply with their disarmament obligations under Article VI of the NPT.

However, considering the current number of adherents to the AP, it is worth returning to the research question for this article: is this position an effective way to pressure the NWS to comply with Article VI of the NPT?

The AP Signatories and Their Involvement in the Peaceful Use of Nuclear Energy

This section identifies and analyses the states involved in the peaceful use of nuclear energy, with and without a signed/effective AP, and how this participation could affect the Brazilian position of no additional non-proliferation commitments without nuclear disarmament by the NWS. For this, the use of nuclear power reactors for electricity generation and research reactors, mainly among NNWS, are considered analytical axes of participation in the peaceful use of nuclear energy.

Based on the analysis proposed by nuclear power reactors, Table 2 shows the states that have an AP signed/in force with the IAEA and their number of nuclear reactors (NPR), in operation or under construction.

Table 2 – States with a signed/effective AP (as of September 2020) and their NPR

	State	Number of NPR's		INFCIRC	Entry in Force
		Operational	Under Construction		
1	Armenia	1	-	455/Add.1-2	28 Jun. 2004
2	Bangladesh	-	2	301/Add.1	30 Mar. 2001
3	Belarus	-	2	AP Signature 15 Nov. 2005	
4	Belgium	7	-	193/Add.8	30 Apr. 2004
5	Bulgaria	2	-	193/Add.24	1 May 2009[1]
6	Canada	19	-	164/Add.1	8 Sep. 2000
7	**China (NWS)**	46	11	369/Add.1	28 Mar. 2002
8	Czech Rep.	6	-	193/Add.26	1 Oct. 2009
9	Finland	4	1	193/Add.8	30 Apr. 2004
10	**France (NWS)**	58	1	290/Add.1	30 Apr. 2004
11	Germany	7	-	193/Add.8	30 Apr. 2004
12	Hungary	4	-	193/Add.16	1 Jul. 2007
13	**India**	22	7	754/Add.6	25 Jul. 2014
14	Iran	1	-	AP Signature 18 Dec. 2003	
15	Japan	38	2	255/Add.1	16 Dec. 1999
16	Korea, Rep.	24	5	236/Add.1	19 Feb. 2004
17	Mexico	2	-	197/Add.1	4 Mar. 2011
18	Netherlands	1	-	193/Add.8	30 Apr. 2004
19	Romania	2	-	193/Add.28	1 May 2010
20	**Russia (NWS)**	36	6	327/Add.1	16 Oct. 2007
21	Slovakia	4	2	193/Add.10	1 Dec. 2005
22	Slovenia	1	-	193/Add.12	1 Sep. 2006
23	South Africa	2	-	394/Add.1	13 Sep. 2002
24	Spain	7	-	193/Add.8	30 Apr.2004
25	Sweden	8	-	193/Add.8	30 Apr. 2004
26	Switzerland	5	-	264/Add.1	1 Feb. 2005
27	Turkey	-	1	295/Add.1	17 Jul. 2001
28	U.A. Emirates	1	3	622/Add.1	20 Dec. 2010
29	Ukraine	15	2	550/Add.1	24 Jan. 2006
30	**UK (NWS)**	15	1	263/Add.1	30 Apr. 2004
31	**USA (NWS)**	98	2	288/Add.1	6 Jan. 2009

Source: Prepared by the author based on data from the IAEA, *Power Reactor Information System (PRIS)*, and IAEA, *Status List. Conclusion of Additional Protocols.*

Table 3 presents the states without an AP signed with the IAEA and their number of nuclear power reactors in operation or under construction.

Table 3 – States without an Additional Protocol Signed / In Force with IAEA (as of September 2020) and their Nuclear Power Reactors

	State	Number of Nuclear Power Reactors	
		Operational	Under Construction
1	Argentina (NNWS)	3	1
2	Brazil (NNWS)	2	1
3	**Pakistan (NPT Non-signatory)**	5	2

Source: Prepared by the author based on data from the IAEA, *Power Reactor Information System (PRIS)*.

Some facts and inferences related to states with nuclear reactors in operation or under construction taken from Tables 2 and 3:

— Of the 34 states with nuclear reactors, 31 have an AP signed or in force with the IAEA (91.2%). The exceptions are Argentina, Brazil and Pakistan.
— Of the 31 states with nuclear reactors and a signed AP, 29 AP are "in force" (93.5%). The exceptions are Iran and Belarus.
— Of the 34 states with nuclear reactors, 32 are signatories to the NPT (94.1%). The exceptions are India and Pakistan.
— Of the 31 states with nuclear power reactors and one signed AP, 25 are NNWS, five are NWS and one is a nuclear-armed state not recognised by the NPT (India).
— The five NWS (China, France, Russia, the United Kingdom, and the United States of America) are not required to have IAEA safeguards agreements under the NPT. However, these five states have signed voluntary offer safeguards covering civil nuclear facilities and have also concluded AP with the IAEA.
— India is not a signatory to the NPT. However, it has placed its civilian nuclear facilities under IAEA safeguards and has an AP in place.
— Of the 27 NNWS that have nuclear reactors, only two – Brazil and Argentina – do not have AP with the IAEA (7.4%). Therefore, Brazil and Argentina represent a small subset of the NNWS that are involved in the peaceful use of nuclear energy without an AP with the IAEA.

Continuing with the proposed analysis, Table 4 shows the states with an AP signed/in force with the IAEA and their number of research reactors.

Table 4 – States with an Additional Protocol Signed/In Force with the IAEA (September 2020) and their Research Reactors

	State	R.R Status					INFCIRC	Entry in Force
		Operational	Under Construction	Planned	Shutdown	Decommissioned or Under Decommissioning		
1	Algeria	1	-	-	1	-	Signature 16 Feb. 2018	
2	Australia	1	-	-	1	2	217/Add.1	12 Dec. 1997
3	Austria	1	-	-	-	2	193/Add.8	30 Apr. 2004
4	Bangladesh	1	-	-	-	-	301/Add.1	30 Mar. 2001
5	Belarus	3	-	-	1	1	Signature 15 Nov. 2005	
6	Belgium	3	-	1	-	3	193/Add.8	30 Apr. 2004
7	Bulgaria	-	-	-	1	-	193/Add.24	1 May 2009
8	Canada	5	-	-	5	8	164/Add.1	8 Sep. 2000
9	Chile	1	-	-	1	-	476/Add.1	3 Nov. 2003
10	**China (NWS)**	16	-	3	3	2	369/Add.1	28 Mar. 2002
11	Colombia	1	-	-	-	-	306/Add.1	5 Mar. 2009
12	Czech Rep.	3	-	1	-	2	193/Add.26	1 Oct. 2009
13	Congo	-	-	-	2	-	183/Add.1	9 Apr. 2003
14	Denmark	-	-	-	-	3	193/Add.8	30 Apr. 2004
15	Finland	-	-	-	1	1	193/Add.8	30 Apr. 2004
16	**France (NWS)**	3	1	-	6	29	290/Add.1	30 Apr. 2004
17	Georgia	-	-	-	-	1	617/Add.1	3 Jun. 2003
18	Germany	5	-	-	3	38	193/Add.8	30 Apr. 2004
19	Ghana	1	-	-	-	-	226/Add.1-2	11 Jun. 2004
20	Greece	1	-	-	2	-	193/Add.8	30 Apr. 2004
21	Hungary	2	-	-	-	2	193/Add.16	1 Jul. 2007
22	**India**	5	-	2	1	5	754/Add.6	25 Jul. 2014
23	Indonesia	3	-	-	-	-	283/Add.1	29 Sep. 1999
24	Iran, Isl. Rep.	4	-	-	-	1	Signature 18 Dec. 2003	
25	Iraq	-	-	-	2	-	172/Add.2-3	10 Oct. 2012
26	Italy	5	-	-	1	10	193/Add.8	30 Apr. 2004
27	Jamaica	1	-	-	-	-	265/Add.1	19 Mar. 2003
28	Japan	3	-	-	9	17	255/Add.1	16 Dec. 1999
29	Jordan	2	-	-	-	-	258/Add.1	28 Jul. 1998
30	Kazakhstan	4	-	-	1	-	504/Add.1	9 May 2007

continua...

continuação

State	R.R Status					INFCIRC	Entry in Force
	Operational	Under Construction	Planned	Shutdown	Decommissioned or Under Decommissioning		
31 Korea, Rep.	2	-	1	-	2	236/Add.1	19 Feb. 2004
32 Latvia	-	-	-	1	1	193/Add.22	1 Oct. 2008
33 Libya	1	-	-	1	-	282/Add.1	11 Aug. 2006
34 Malaysia	1	-	-	-	-	Signature 22 Nov. 2005	
35 Mexico	2	-	-	1	1	197/Add.1	4 Mar. 2011
36 Morocco	1	-	-	-	-	228/Add.1	21 Apr. 2011
37 Netherlands	2	-	1	1	5	193/Add.8	30 April 2004
38 Nigeria	1	-	1	-	-	358/Add.1	4 Apr. 2007
39 Norway	-	-	-	2	2	177/Add.1	16 May 2000
40 Peru	2	-	-	-	-	273/Add.1	23 Jul. 2001
41 Philippines	-	-	-	1	-	216/Add.1	26 Feb. 2010
42 Poland	1	-	--	-	5	193/Add.14	1 Mar. 2007
43 Portugal	-	-		1	-	193/Add.8	30 Apr. 2004
44 Romania	2	-	-	-	3	193/Add.28	1 May 2010
45 **Russia (NWS)**	52	3	-	17	52	327/Add.1	16 Oct. 2007
46 Serbia	-	-	-	1	1	204/Add.1	17 Sep. 2018
47 Slovenia	1	-	-	-	-	193/Add.12	1 Sep. 2006
48 South Africa	1	-	-	-	1	394/Add.1	13 Sep. 2002
49 Spain	-	-	-	-	4	193/Add.8	30 Apr. 2004
50 Sweden	-	-	-	-	5	193/Add.8	30 Apr. 2004
51 Switzerland	1	-	-	-	5	264/Add.1	1 Feb. 2005
52 Taiwan	1	-	-	1	4	See Note*	
53 Tajikistan	-	1	-	-	-	639/Add.1	14 Dec. 2004
54 Thailand	1	-	1	-	-	241/Add.1	17 Nov. 2017
55 Turkey	1	-	-	1	1	295/Add.1	17 Jul. 2001
56 Ukraine	3	1	1	-	-	550/Add.1	24 Jan. 2006
57 **UK (NWS)**	1	-	-	2	44	263/Add.1	30 Apr. 2004
58 **USA (NWS)**	50	-	-	14	243	288/Add.1	6 Jan. 2009
59 Uruguay	-	-	-	-	1	157/Add.1	30 Apr. 2004
60 Uzbekistan	1	-	-	-	1	508/Add.1-2	21 Dec. 1998
61 Vietnam	1	-	1	-	-	852/Add.1	21 May 2013

* The IAEA also applies the INFCIRC/540/Corr. for Taiwan. However, the relations between the IAEA and the authorities in Taiwan are non-governmental.

Source: Prepared by the author based on data from the *IAEA – Research Reactor Database*; and IAEA. *Status List. Conclusion of Additional Protocols*.

Table 5 presents the number of research reactors in states without an AP.

Table 5 – States without an Additional Protocol Signed / Into Force with the IAEA (September 2020) and their Research Reactors

	State	Research Reactors Status				
		Operational	Under Construction	Planned	Shutdown	Decommissioned or Under Decommissioning
1	Argentina	5	2	-	1	1
2	Brazil	4	-	1	-	-
3	**DPRK**	**1**	-	-	-	-
4	Egypt	1	-	-	1	-
5	**Israel**	**2**	-	-	-	-
6	**Pakistan**	**2**	-	--	-	--
7	Saudi Arabia	-	1	-	-	-
8	Syria	1	-	-	-	
9	Venezuela	-	-	-	1	-

Source: Prepared by the author based on data from the IAEA. *Research Reactor Database*; and IAEA. *Status List. Conclusion of Additional Protocols*.

Some facts and inferences are drawn from Tables 4 and 5:

— Of the 70 states that have research reactors, 61 are NNWS, five are NWS and four are nuclear-armed states not recognised by the NPT (the DPRK, India, Israel, and Pakistan).

— Of the 70 states that have research reactors, 61 have an AP with the IAEA (87.1%). The exceptions are Brazil, Argentina, the DPRK, Egypt, Israel, Pakistan, Saudi Arabia, Syria, and Venezuela.

— Of the 61 states with research reactors and a signed AP, 57 have the current status. The exceptions are Algeria, Belarus, Iran, and Malaysia.

— Of the NNWS that have research reactors, only six – Brazil, Argentina, Egypt, Saudi Arabia, Syria, and Venezuela – have not signed an AP.

— If only working research reactors are considered, there are 49 states with a signed AP.

— Of these 49 states with at least one working research reactor and a signed AP, 43 are NNWS, five are NWS and only one is a nuclear-armed state not recognised by the NPT (India).

— Of the nine states with research reactors that do not have an AP signed with the IAEA, seven have operating research reactors. The others are Saudi Arabia and Venezuela.

As already mentioned, as of September 2020, there were 150 signatory states of the AP, 136 of which have ratified it. Only six NNWS that use, or have used, nuclear energy for peaceful purposes have not signed an AP: Argentina, Brazil, Egypt, Saudi Arabia, Syria, and Venezuela (see Tables 3 and 5).

Summarily, Tables 2, 3, 4, and 5 show that most of the states that are involved with the peaceful use of nuclear energy, whether in research or the generation of electricity by nuclear power plants, are signatories to an AP with the IAEA. Of the 61 NNWS that have some involvement in nuclear research and/or power generation, 55 are AP signatories. That is, the non-nuclear weapons states signatories of the AP are active in the peaceful use of nuclear energy. This undermines the narrative that the signatories to an AP with the IAEA are states that cannot use, or have renounced the use of nuclear energy for peaceful purposes, following the NPT.

In this context, how does the current position of the Brazilian State concerning the AP contribute to the disarmament of the NWS? The position of refusing an AP to pressure the NWS to move forward with nuclear disarmament does not appear to affect a context in which most NNWS, including most of those using nuclear power, are already signatories to an AP with the IAEA.

It is worth mentioning that among the 24 NNWS that use nuclear energy both for the generation of energy for peaceful purposes and research purposes, only Brazil and Argentina do not have an AP signed with the IAEA. This position represents the almost complete isolation of Argentina and Brazil with the adherence to the additional safeguards that the AP made possible. This stance does not appear to promote an effective form of pressure aimed at the nuclear disarmament of the nuclear-weapon States. To date, there is no record of any NWS reducing its nuclear arsenal due to the Brazilian refusal to sign the AP.

Conclusions

The AP strengthens the IAEA's ability to ensure that the peaceful use of nuclear energy is not used as a cover for the development of nuclear weapons programmes. With the detail of the information that States parties must declare,

along with the greater number of sites to be inspected, the IAEA is better able to guarantee the exclusively peaceful use of nuclear energy by NNWS, without hindering or compromising sensitive technologies developed by the NNWS and its private companies. The AP model contained in INFCIRC/540/Corr provides for this and it is up to each state that signs an AP to guarantee this condition.

Some misunderstandings related to the AP are being undone and the number of states that have signed an AP and enforced it is growing to the point that it is becoming the norm. By the time of finalising this article, in October 2020, 150 states had signed an AP, including 55 of the 61 NNWS that have some form of nuclear activities. In other words, of the 193 member states of the UN, 149 have already signed an AP with the IAEA. Each year this number increases, weakening the position of states that advocate signing an AP only when the NWS advance their commitment to nuclear disarmament.

As of October 2020, only six NNWS with some type of nuclear activity have not signed an AP: Argentina, Brazil, Egypt, Saudi Arabia, Syria, and Venezuela. These states are, at this time, a minority among UN member states, and among the NPT states that, for different reasons, have refused to go ahead with strengthened commitments regarding the non-proliferation of nuclear weapons.

In this context, insisting on the non-commitment to an AP without progress in nuclear disarmament appears to be innocuous and ineffective. In this sense, the Brazilian position of no additional nuclear non-proliferation commitments, as a way of exerting some pressure on the NWS to comply with Article VI of the NPT, seems to be an inefficient position that weakens year after year given the growing number of signatories to the AP.

However, it is important to make a caveat in the research carried out given that an accurate and traceable empirical basis – relative to the refusal to sign the AP was an ineffective way to pressure the NWS to comply with Article VI of the NPT – was not found. There is not possible to claim that no progress has been made in disarming the NWS because of this refusal. However, it is possible to infer that this position is weakened year after year given that most states are already signatories to an AP and each year the number of non-signatory states decreases.

Once this caveat is made, it is worth noting that maintaining the current position of the Brazilian State to refuse any type of additional safeguards before the IAEA may generate opposition to the development of the Brazilian programme of conventional nuclear-powered submarines. Therefore, as the CNPS programme progresses successfully, pressure from the international community to increase

the gap in the nuclear non-proliferation regime may be eliminated by signing additional safeguards for naval propulsion reactors.

On the other hand, considering an AP, or additional safeguards in line with article 13 of INFCIRC/435, with the IAEA, without jeopardising the development and operation of the Brazilian conventional nuclear submarine, could leverage the Brazilian position as an active member of the nuclear non-proliferation regime and also be a model for this issue if, in the future, other states seek to develop nuclear-powered submarines.

All these factors will inevitably bring to discussion the inclusion of Brazil in the AP or the adoption of additional safeguards that involve arrangements with special procedures for the nuclear fuel used in the CNPS, as provided in article 13 of INFCIRC/435. In this discussion, the only position that the Brazilian State should not adopt would be not to question and evaluate whether it's a position to refuse an AP – or any other type of additional safeguards – will respond to its strategic interests. Failure to see this reality could lead to a situation of isolation that may be perceived too late.

Gone are the days when, in Brazil, considering signing an AP would be "a crime against the country." Today it is a necessity to guarantee Brazilian strategic interests, and to ensure Brazil's position as a state actively committed to the non-proliferation of nuclear weapons and capable of pressing for nuclear disarmament with its example and leadership.

References

Abe, Nobuyasu. 2007. Existing and Emerging Legal Approaches to Nuclear Counter-Proliferation in the Twenty-First Century. Journal of International Law & Politics Vol. 39, No. 4 (Summer 2007). Available at: <https://nyujilp.org/wp-content/uploads/2013/02/39.4-Abe.pdf>. Accessed 31 October 2020.

Arms Control Association. 2019. IAEA Safeguards Agreements at a Glance. Available at: <https://www.armscontrol.org/factsheets/IAEASafeguards>. Accessed 9 July 2020.

Brazil. 1988. Constituição da República Federativa do Brasil [Constitution of the Federative Republic of Brazil]. Brasília: Senado Federal, Centro Gráfico.

Brazil. 2008. Decreto nº 6.703, de 18 de dezembro de 2008. Aprova a Estratégia Nacional de Defesa [National Defence Strategy]. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2008/Decreto/D6703.htm>. Accessed 12 July 2020.

Brazil. 2012. Ministério da Defesa. Estratégia Nacional de Defesa (END) [National Defence Strategy *Optmized*]. Available at: < https://www.gov.br/defesa/pt-br/arquivos/estado_e_defesa/END-PNDa_Optimized.pdf > . Accessed 12 July 2020.

Brazil. 2016. Ministério da Defesa. Estratégia Nacional de Defesa (END) – Versão Aprovada por meio do Decreto Legislativo nº 179 de 14/12/2018 [National Defence Strategy].

Brazil. 2020. Ministério da Defesa. Política Nacional de Defesa e Estratégia Nacional de Defesa – Versão enviada ao congresso Nacional em 2020.

Brazil. Ministry of Foreign Affairs. Nuclear Disarmament and Non-Proliferation of Nuclear weapons. Available at: < http://www.itamaraty.gov.br/en/politica-externa/paz-e-seguranca-internacionais/6353-nuclear-disarmament-and-non-proliferation-of-nuclear-weapons > . Accessed 14 July 2020.

Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). About. Available at: < https://www.abacc.org.br/en/the-abacc/about > . Accessed 21 July 2020.

Carlson, John. 2019. Is the NPT Still Relevant? – How to Progress the NPT's Disarmament Provisions. Journal for Peace and Nuclear Disarmament, Volume 2, 2019, 97-113. doi: 10.1080/25751654.2019.1611187.

Cirincione, Joseph. 2008. Bomb Scare: The History and Future of Nuclear Weapons. New York: Columbia University Press.

Cirincione, Joseph; Rajkumar, Miriam; Wolfsthal Jon B. 2005. Deadly Arsenals: nuclear, biological and chemical threats. 2.ed. Washington, DC: Carnegie Endowment for International Peace.

Costa, Eugenio Pacelli Lazzarotti Diniz. 2017. Brazil's Nuclear Submarine: A Broader Approach to the Safeguards Issue. Revista Brasileira de Política Internacional [online]. 2017, vol. 60, n.2, e005. Epub Oct 19, 2017. doi: 10.1590/0034-7329201700205.

ElBaradei, Mohamed. 2011. A Era da Ilusão: a Diplomacia Nuclear em Tempos Traiçoeiros [The Age of Deception: Nuclear Diplomacy in Treacherous Times]. São Paulo: Leya.

Guimarães, Leonam dos Santos. 2005. Naval Nuclear Propulsion and the International Non-Proliferation Regime. Paper presented at the 2005 International Nuclear Atlantic Conference, Santos, August 28, 2005. Available at: < www.ipen.br/biblioteca/cd/inac/2005/full/1780.pdf > . Accessed 8 July 2020.

Guimarães, Samuel Pinheiro. 2010. A Energia Nuclear e a Soberania Nacional [Nuclear Energy and National Sovereignty]. Carta Maior (May 4, 2010). Avaliable at: < https://www.cartamaior.com.br/?/Editoria/Internacional/A-energia-nuclear-e-a-soberania-nacional/6/15520 > . Accessed 15 July 2020.

Graham, Thomas Jr. 2004. Commonsense on Weapons of Mass Destruction. Seattle: University of Washington.

Herz, Monica; Victor Coutinho Lage. 2013. A Atual Política Nuclear Brasileira [Current Brazilian Nuclear Policy]. Rio de Janeiro, BRICS Policy Center.

Hibbs, Mark. 2009. Brazil, Verification Agencies Aim for Naval Fuel Safeguards Negotiations. *Nuclear Fuel*, March 9, 2009.

Hibbs, Mark. 2012. The Unspectacular Future of the IAEA Additional Protocol. Proliferation Analysis. April 26, 2012. Available at: <https://carnegieendowment.org/2012/04/26/unspectacular-future-of-iaea-additional-protocol-pub-47964>. Accessed 9 July 2020.

International Atomic Energy Agency (IAEA). Additional Protocol. Available at: <https://www.iaea.org/topics/additional-protocol>. Accessed 12 July 2020.

International Atomic Energy Agency (IAEA). 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. Available at: <https://www.iaea.org/publications/documents/infcircs/structure-and-content-agreements-between-agency-and-states-required-connection-treaty-non-proliferation-nuclear-weapons>. Accessed 14 July 2020.

International Atomic Energy Agency (IAEA). INFCIRC/435 – Agreement of 13 December 1991 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. Available at: <https://www.iaea.org/sites/default/files/infcirc435.pdf>. Accessed 14 July 2020.

International Atomic Energy Agency (IAEA). *INFICIRC/540* (Corrected) – Model Protocol Additional To The Agreement(s) Between State(s) And The International Atomic Energy Agency For The Application Of Safeguards. Available at: <https://www.iaea.org/sites/default/files/infcirc540c.pdf>. Accessed 14 July 2020.

International Atomic Energy Agency (IAEA). Power Reactor Information System (PRIS) – The Database on Nuclear Power Reactors. Available at: <https://pris.iaea.org/PRIS/home.aspx>. Accessed 31 October 2020.

International Atomic Energy Agency (IAEA). Research Reactor Database. Available at: <https://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx>. Accessed 31 October 2020.

International Atomic Energy Agency (IAEA). Status List. Conclusion of Additional Protocols. Available at: <https://www.iaea.org/sites/default/files/20/01/sg-ap-status.pdf>. Accessed 31 October 2020.

International Atomic Energy Agency (IAEA). Strengthening measures. Available at: <https://www.iaea.org/topics/additional-protocol/strengthening-measures>. Accessed 15 July 2020.

Kassenova, Togzhan. 2014. Brazil's Nuclear Kaleidoscope. Carnegie Endowment for International Peace. Available at: <https://carnegieendowment.org/files/brazil_nuclear_kaleidoscope_lo_res.pdf>. Accessed 11 July 2020.

Kassenova Togzhan. 2016. Brazil, Argentina, and the Politics of Global Nonproliferation and Nuclear Safeguards. Carnegie Endowment for International Peace. Available at: < http://carnegieendowment.org/2016/11/29/brazil-argentina-and-politics-of-global-nonproliferation-and-nuclear-safeguards-pub-66286 > . Accessed 16 July 2020.

Sagan, Scott D. 1996. Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb. International Security 21(3): 54–86.

Sagan, Scott D. 2011. The Causes of Nuclear Weapons Proliferation. Annual Review of Political Science 14(1): 225–44.

Sigal, Leon V. 1997. The North Korean nuclear crisis: Understanding the failure of the 'crime-and-punishment' strategy. Arms Control Today; Washington Vol. 27, Ed. 3, (May 1997). Available at: < https://www.armscontrol.org/act/1997-05/features/north-korean-nuclear-crisis-understanding-failure-crime-punishment-strategy > . Accessed 17 July 2020.

Spektor, Matias. 2016. The Evolution of Brazil's Nuclear Intentions. The Nonproliferation Review, v. 23, n. 5-6, p. 635-652.

Spektor, Matias; Kassenova, Togzhan; and Florentino, Lucas Perez. 2019. Brazil's Nuclear Posture Under Bolsonaro. Arms Control today. Available at: < https://www.armscontrol.org/act/2019-09/features/brazil%E2%80%99s-nuclear-posture-under-bolsonaro > . Accessed 16 July 2020.

Thielmann, Greg and Hoffman, Wyatt. Submarine Nuclear Reactors: A Worsening Proliferation Challenge. In Arms Control Association Threat Assessment Brief, 2012. Available at: < https://www.armscontrol.org/sites/default/files/files/TABs/TAB_2012Jul_Submarine_Nuclear_Reactors.pdf > . Accessed 8 July 2020.

United Nations (UN). 2015. Statement by H.E. Antonio de Aguiar Patriota, Ambassador, Permanent Representative of Brazil to the United Nations: 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, 28 April 2015. Available at: < http://www.un.org/en/conf/npt/2015/statements/pdf/BR_en.pdf > . Accessed 14 July 2020

UNODA. Treaty on the Non-Proliferation of Nuclear Weapons – NPT, Text of the Treaty. Available at: < https://www.un.org/disarmament/wmd/nuclear/npt/text/ > . Accessed 25 June 2020.

Uranium Enrichment Company (URENCO). 2018. Annual Report and Accounts 2018. Available at: < https://www.urenco.com/cdn/uploads/supporting-files/Strategic-Report-Urenco_AR_2018_1.pdf > . Accessed 18 July 2020.

Ximenes, Marcio V. da Silva. 2019. "O Protocolo Adicional ao Acordo de Salvaguardas com a AIEA: os possíveis impactos na construção e operação do Laboratório de Geração de Energia Nucleoelétrica". Thesis. Escola de Guerra Naval.

Waltz, Kenneth. 1999. Peace, Stability, and Nuclear Weapons. In: *Art, R & Waltz, K. (ed)*. The Use of force – Military Power and International Politics. New York: Rowman & Littlefield Publishers, INC. 1999, p. 357-371.

World Nuclear Association. 2019. Supply of Uranium (Updated August 2019). Available at: < https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/uranium-resources/supply-of-uranium.aspx > . Accessed 22 June 2020.

Zanders, J. Pascal. 2013. Nonproliferation of 'Weapons of Mass Destruction': The Ultimate Challenge? European Institute of Public Administration. Seminar on Global Challenges – Security: Multiple Dimensions and Challenges (Brussels, 15-16 October 2013). Available at: < http://www.the-trench.org/wp-content/uploads/2018/07/20131016-WMD-proliferation-challenge.pdf > . Accessed 31 October 2020.