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# The Denuclearization of Brazil and Argentina

José Goldemberg <sup>a</sup>, Carlos Feu Alvim <sup>b</sup> and Olga Y. Mafra <sup>c</sup>

<sup>a</sup>IEE/USP – Instituto de Energia e Ambiente da Universidade de São Paulo, São Paulo, Brazil; <sup>b</sup>ECEN Consultoria, Rio de Janeiro, Brazil; <sup>c</sup>ECEN Consultoria, Rio de Janeiro, Brazil

## ABSTRACT

The article analyzes the Brazilian and Argentine experience in nuclear nonproliferation since the 1991 establishment of a regional binational safeguards agency, known as the Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). After these two countries signed their Bilateral Agreement, considerable positive change occurred in their nuclear-related activities so that there is presently no concern in the international community or in Brazil and Argentina about the possibility of non-peaceful use of nuclear energy in the region. The Bilateral Agreement establishing ABACC was also a milestone for the Mercosul Agreement and for South American economic integration. This paper describes the evolution of nuclear energy development in the two countries, highlighting the significance of the agreements signed, the barriers established to prevent proliferation, and the challenges faced by ABACC.

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## Introduction

The possibility of nuclear war has been a source of major concern since the beginning of the nuclear age. In 1946, there was hope that atomic energy could be placed under international control, but the failure of the Baruch Plan<sup>1</sup> clearly indicated that other industrial powers in addition to the United States, particularly the Soviet Union, would soon develop nuclear weapons. The Soviets succeeded in acquiring a nuclear weapon in 1949, followed by the United Kingdom in 1951. This first wave of nuclear proliferation arguably contributed toward lessening the risk of a nuclear war by establishing a ‘balance of terror’ that characterized the Cold War period. The danger of mutual annihilation most likely contributed to a reduction in armed conflict between the United States and Soviet blocs.

However, the subsequent acquisition of nuclear weapons by additional countries has increased the risk of their possible use. This second wave of nuclear proliferation has been driven more by regional conflicts than by global ones. The Middle East, India, Pakistan, the Korean Peninsula, Brazil, Argentina and South Africa have become areas of nuclear proliferation at various times since the 1960s.

By the early 1990s, these areas were viewed as posing serious potential threats to world peace. In two regions – southern Africa and South America (mainly Brazil and

**CONTACT** José Goldemberg  goldemb@iee.usp.br

<sup>1</sup>Baruch Plan, which was promoted by the United States, proposed the elimination of existing stockpiles of atomic bombs only after a system of international control was established, and it prohibited veto power in the Security Council on the commission’s decisions.

Argentina) – the issue of nuclear proliferation was successfully addressed as part of broader regional peace solutions.

The fall of military regimes in South America and the end of apartheid in South Africa contributed to this result. In the case of South Africa, proliferation had already occurred and the government's white leadership had no interest in passing nuclear weapons on to their black successors. South Africa's construction of a nuclear device without detection by the International Atomic Energy Agency (IAEA) inspectors present in that country was another factor that sparked calls for strengthening the international safeguards system.

The nuclear weapons solution that eliminated mutual mistrust between Brazil and Argentina was an international commitment that replaced the two countries' role as signatories of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), which both countries considered discriminatory. This step enabled the later signing of a comprehensive agreement with the IAEA. The Treaty of Tlatelolco (or Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean) was not in force at the time in the two countries, as Argentina had not ratified it and Brazil did not sign the waiver of Article 28.<sup>2</sup>

From the standpoint of the international community, Tlatelolco was not a satisfactory compromise ensuring nonproliferation because it still permitted explosions of nuclear devices for peaceful purposes, such as for nuclear tests. Nevertheless, Tlatelolco was important because it included guarantees that countries possessing nuclear weapons would not use them against nonnuclear-armed countries in the region. There were also problems with the method of verification by special inspections required by other members, which the two countries considered a possible generator of conflicts and which the amendments had placed under the responsibility of the IAEA alone.

As a boundary condition, Brazil and Argentina accepted a prohibition of nuclear tests for peaceful purposes but wanted to explicitly preserve the use of nuclear propulsion.

A strong diplomatic effort was made to solve these problems. It included the following steps:

- Implementation of the Treaty of Tlatelolco, which would later be amended by a proposal, presented by Brazil, Argentina and Chile.
- Signing of a Bilateral Agreement<sup>3</sup> that institutionalized Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) as the body for the mutual system of accounting and control of nuclear materials.
- Signing of a comprehensive agreement of safeguards between the two countries and the IAEA, which would become the Quadripartite Agreement (with ABACC as the fourth participating party).

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<sup>2</sup>Article 28 allows the suspension of the Treaty's entry into force for the signatory state, until the countries with territorial possessions in the area and nuclear weapons states sign the Tlatelolco Additional Protocols I and II. By those protocols, (I) the outside countries will apply the Treaty in territories for which, de jure or de facto, they are internationally responsible and the nuclear weapon states are committed on not to use or threaten to use nuclear weapons against Tlatelolco Contracting Parties.

<sup>3</sup>The Agreement signed between the Republic of Argentina and the Federative Republic of Brazil for the Exclusively Peaceful Use of Nuclear Energy.

In conjunction with this effort, the countries insisted on effective progress in worldwide nuclear disarmament. The Comprehensive Nuclear Test Ban Treaty (CTBT) is surely the most important nondiscriminatory treaty in nuclear nonproliferation history. The CTBT bans nuclear explosions by everyone, everywhere: on the earth's surface, in the atmosphere, underwater and underground. Thanks to a group of scientific experts, a nonintrusive system of verification was established and proved very useful in verifying the absence of nuclear explosions as well as in detecting tests by India, Pakistan and, more recently, North Korea.

Notably, the most successful agreements on disarmament have been negotiated first in the bilateral arena. That was the case with the CTBT as well as other initiatives such as the Strategic Arms Limitation Treaty between the United States and the Soviet Union during the Cold War. A similar bilateral approach was the key to avoiding nuclear proliferation in South America and is the main subject of this article.

On 7 July 2017, the UN General Assembly approved the Treaty on the Prohibition of Nuclear Weapons<sup>4</sup> as a legally binding instrument to prohibit nuclear weapons, leading toward their total elimination. The agreement was approved by 122 countries with only one abstention and one vote against it. However, a number of countries stayed out of the negotiations, including the United States, Russia and other states with nuclear weapons, along with many of their allies. The Democratic People's Republic of Korea did not join the talks either. In a joint press statement, the delegations of the United States, the United Kingdom and France said that they 'have not taken part in the negotiation of the treaty and do not intend to sign, ratify or ever become party to it' (US Missions to the UN 2017).

The treaty has the same general scope as the Treaty of Tlatelolco and similar commitments. The signatory countries not only renounce the direct possession of nuclear weapons but also commit not to accept the stationing, installation or deployment of any nuclear weapons or other nuclear explosive devices in their territory or in any location under their jurisdiction or control. Another provision commits the countries not to use, or threaten to use, nuclear weapons or other nuclear explosive devices.

Although there is no real expectation that this treaty will gain universal adoption in the near future, it carries moral significance as a document approved by the majority of UN members. The treaty also established procedures for any country that decides, in the future, to renounce the use of nuclear weapons.

This article focuses on the circumstances surrounding these initiatives and discusses the possible use of the ABACC model in other regions.

## **Difficulties in acceptance of the nonproliferation treaty**

On 1 July 1968, the NPT, which divided the world's countries into those that possessed nuclear weapons (the victorious powers in World War II) and nonnuclear weapon states (NNWSs), was opened for signature.

In retrospect, it is difficult to understand why the NPT was ever adopted, because it divided states into two categories: nuclear weapon 'haves' and 'have-nots'. This step was taken over the objections of nationalist groups in many developing countries, which argued that their countries were submitting to a 'new colonialism' and should not abandon aspirations of

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<sup>4</sup><https://undocs.org/A/CONF.229/2017/8>.

becoming nuclear weapon states. Critics also doubted that nuclear weapon states would indeed completely relinquish their stocks of nuclear weapons; indeed, no relinquishing of weapons has occurred, nearly 50 years after the NPT's adoption.

The five great nuclear powers acquired their weapons prior to 1968. They are also the permanent members of the UN Security Council, in which they have veto power. This situation is sometimes wrongly interpreted as meaning that the possession of nuclear weapons is a necessary condition for attaining that status. In fact, the present organization of the United Nations predated the countries' possession of such weapons and is the result of a geopolitical decision made after World War II ended in 1945, not of the five nations' possession of nuclear weapons. For the United States, the Soviet Union, the United Kingdom, France and China, national security was clearly the fundamental reason for nuclear development, which was the supreme element of a policy of mutual deterrence. In Israel, nuclear weapons were seen as a guarantee of survival for a nation surrounded by many hostile countries.

For India, Pakistan and North Korea, regional security and the desire to intimidate and coerce rivals were probably the determining factors. For South Africa, the main driver of nuclear development was the perception that such weapons were needed to prevent an onslaught against the apartheid regime by black Africa. For Sweden, it was a matter of status. In almost all these countries, the perceived bureaucratic self-aggrandizement by the original nuclear establishment also played an important role in motivating their efforts.

## Incentives and barriers to nonproliferation

A country can have global or regional motivations to proliferate. Global motivations presuppose an economic and territorial capacity that is compatible with the capacity to project power on a global scale.

Table 1 summarizes the status of nuclear weapon and fuel cycle development in the world's 10 largest economies (IMF 2015).

Table 1 shows that among the 10 largest world economies, Brazil is the only one with fuel cycle mastering that does not possess or depend on nuclear weapons for its protection (Alvim and Guimarães 2011). Indonesia also has no nuclear weapons and, like Brazil, has no special 'weapons-usable nuclear materials', defined as 1 kg or more of highly enriched uranium, separated plutonium (Pu) or Pu content in nonirradiated mixed oxide fuel (NTI, n.d.). This table may give the erroneous impression that Brazil could be motivated to develop nuclear weapons by the size of its economy. Among the countries listed in Table 1, probably only three countries (United States, Russia and China) actually have global motivation to maintain a nuclear arsenal. For the other cases, historical, including Cold War legacy or regional motivations can explain the existing nuclear weapons or protection. This is not the case for Brazil and Argentina or for any other South American country, since the continent countries have no global power pretension, regional menace and almost no Cold War historical tensions.

Argentina currently ranks 27th in economic activity and has no global ambitions that could motivate its development of nuclear weapons. Should Brazil venture into nuclear development or should the region be threatened by another possessor of nuclear weapons (as Argentina was opposed by the United Kingdom in the Malvinas/Falkland Islands conflict, for example), then Argentina or some other country in the region would certainly be motivated to participate in a nuclear arms race.

**Table 1.** Nuclear weapons and fuel cycle mastering in the world's 10 largest economies.

| Rank | GDP PPP | Country        | Nuclear weapons | Fuel cycle mastering | Weapons-usable nuclear material* |
|------|---------|----------------|-----------------|----------------------|----------------------------------|
| 1    |         | China          | Yes             | Yes                  | Yes                              |
| 2    |         | USA            | Yes             | Yes                  | Yes                              |
| 3    |         | India          | Yes             | Yes                  | Yes                              |
| 4    |         | Japan          | Umbrella        | Yes                  | Yes                              |
| 5    |         | Germany        | Shared          | Yes                  | Yes                              |
| 6    |         | Russia         | Yes             | Yes                  | Yes                              |
| 7    |         | Brazil         | No              | Yes                  | No                               |
| 8    |         | Indonesia      | No              | No                   | No                               |
| 9    |         | France         | Yes             | Yes                  | Yes                              |
| 10   |         | United Kingdom | Yes             | Yes                  | Yes                              |
| 27*  |         | Argentina      | No              | Yes                  | No                               |

\*Forecast for 2017 GDP.

The ABACC Agreement not only creates barriers to proliferation by using the safeguards procedures but also drastically reduces the motivation for having nuclear weapons by building trust among the regional countries.

Also, national discussions about the subject have considered that nuclear weapons would make the country a target without strengthening its defense capacity in any significant way. That is an additional reason for nonproliferation. The same reasoning applies to Argentina.

The Bilateral Agreement between Brazil and Argentina is an important barrier that helps to prevent an attitude of isolation on the part of institutions or groups who may attempt to engage in proliferation activities in a clandestine manner. Together with New Zealand and the Philippines, Brazil is one of just three countries whose national constitution has banned the non-peaceful use of nuclear energy.

Brazil's constitution was drafted in the framework of a democratic reestablishment after the end of its military regime. It represents the position of civil society that admits only the peaceful use of nuclear energy. At that time, Brazil had not yet made its commitments to the Bilateral Agreement and the NPT. Today, the constitution functions as an extra barrier mainly because it expresses a national consensus against nuclear weapons, not because of the difficulty of changing the Brazilian constitution (which has been amended 97 times since 1992).

The Treaty of Tlatelolco also serves as a barrier, but it also reduces national fears and the motivation for developing nuclear weapons, because countries with territorial possessions in the region, including those with nuclear weapon capability, are committed to refrain from receiving, storing, possessing or using any nuclear weapons in the region.

The NPT remains the primary overarching barrier against proliferation. However, a situation of inequality among countries generates tensions, as do the IAEA's verification authority and the possibility of punishment via the UN Security Council. Another negative point about the NPT that could motivate proliferation is that the treaty does not unambiguously prohibit NNWSs from sharing, receiving or storing nuclear weapons within their own territory.

Another barrier that should not be overlooked is the Nuclear Suppliers Group (1997a, 1997b). The NSG is a group of nuclear supplier countries that seeks to

contribute to the nonproliferation of nuclear weapons through the implementation of two sets of guidelines governing nuclear exports and nuclear-related exports.

Opposition to the NSG is not great because it allows major nuclear imports from non-nuclear states.

## **Evolution of the Tlatelolco agreement**

The Treaty of Tlatelolco is the conventional name given to the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean. It is embodied in the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL).

The parties to this treaty agree to prohibit and prevent the ‘testing, use, manufacture, production or acquisition by any means whatsoever of any nuclear weapons’ and the ‘receipt, storage, installation, deployment and any form of possession of any nuclear weapons’ in the region.

There are two additional protocols in the treaty. Protocol I binds overseas countries with territories in the region (the United States, the United Kingdom, France and the Netherlands) to the terms of the treaty. Protocol II requires all declared nuclear weapon states to refrain from undermining in any way the region’s nuclear-free status. The treaty has been signed and ratified by the United States, the United Kingdom, France, China and Russia.

As of the early 1990s, Brazil and Argentina had not yet agreed to abide by the treaty; Argentina had not ratified it and Brazil and Chile had not waived the relevant clause of Article 28.

As IAEA General Director Yukiya Amano remarked on the occasion of the conference marking 45th anniversary of the signing of the Treaty of Tlatelolco:

In establishing and implementing a nuclear-weapons-free zone in Latin America and the Caribbean, the countries concerned demonstrated the importance of dialog and persistence. Their success was such that Tlatelolco provided the inspiration for four similar treaties in Africa, Central Asia, Southeast Asia and the South Pacific. A total of 133 countries – nearly two-thirds of the countries of the world – now belong to nuclear-weapons-free zones. (Amano 2012)

Thus, the treaty can be considered a landmark in disarmament and in nonproliferation control.

## **Brazil and Argentina before the regional agreement**

Brazil’s interest in nuclear energy started with Admiral Alvaro Alberto (a military leader closely connected to high government circles), who established the National Council for Scientific and Technological Development (CNPq) in 1951. A subcommission on nuclear energy, the National Nuclear Energy Commission (CNEN), was set up within the Council and became an independent entity a few years later. Alvaro Alberto tried to initiate an autonomous nuclear program in Brazil as Homi Bhabha did in India, avoiding any close association with the United States. He approached West Germany – then still under Allied occupation and barred from nuclear activities – and obtained



some uranium enrichment centrifuges. The ultracentrifuges were taken to the Technological Research Institute in São Paulo, but after some time they were abandoned, placed behind closed doors and left there for years.

In 1956, under the 'Atoms for Peace' program, Brazil received from the United States a 5 MW 'swimming pool' research reactor fueled by 90% enriched uranium. The reactor was installed at the University of São Paulo, under the jurisdiction of the federal government. The burned-up fuel was stored in place for years but was more recently returned to the United States. All 90% enriched uranium was replaced by 20% enriched uranium (because the United States no longer supplied 90% enriched uranium) and the fuel plates (Material Testing Reactor (MTR) plates) were produced locally. Other small research reactors were installed elsewhere in Brazil and were useful in disseminating the use of radioisotopes in industry and medicine. However, the issue of nuclear power generation and the whole question of an independent nuclear program, as originally envisaged by the nationalistic elements in the military, became more or less dormant for several years.

Interestingly, as early as the 1950s, some leading Brazilian scientists (and some military leaders) criticized Atoms for Peace since it created a dependence on a foreign supply of enriched uranium and since enriching uranium seemed, at that time, a very distant target for Brazil. This concern was the origin of the idea of adopting a natural uranium reactor design. The so-called Thorium Group proposed use of a natural uranium reactor, moderated by heavy water, with a Th-232 blanket that would become U-233 and could be used afterwards as a replacement for U-235. In this way, Brazil could replace the use of enriched uranium with thorium, which is abundant in the country. However, this project did not win government support and was abandoned when Brazil instead decided, by political reasons, to adopt the pressurized water reactor (PWR) technology for power reactors.

In the late 1960s, a turnkey PWR 624 MW power reactor, which used low enriched uranium, was purchased from Westinghouse for installation at Angra dos Reis, on the Atlantic coast midway between Rio de Janeiro and São Paulo. The decision was presented as a way to familiarize Brazilian engineers with nuclear power, but the fact that it was a turnkey unit led to criticism from the military and many Brazilian scientists.

These groups pointed to the success of a more autonomous nuclear program in Argentina, based on Canadian Deuterium Uranium (CANDU) reactors (which use natural uranium and heavy water) and the Atucha I power reactor (built in cooperation with Germany). Atucha I initially used natural uranium fuel but was later changed to use slightly enriched uranium fuel (at the level of 0.85%). Many years later, the Atucha II nuclear power reactor was completed using the same model.

The prospect that Argentina could, over time, become self-sufficient in building its own reactors and develop nuclear reprocessing became a thorny issue between Brazil and Argentina, fueled by the fact that both countries, like India, had not adhered to the NPT.

In 1967, the Brazilian newspaper *Folha de São Paulo*<sup>5</sup> published an article stating that ever since 1960, Brazil has possessed the means to build an atomic bomb. The article

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<sup>5</sup>"Atraso nuclear será superado," *Folha de São Paulo*, 6 July 1967, p. 1.



also reported that Brazil's top military leaders had reaffirmed their interest in research on and use of nuclear energy for any purpose, as a reaction to Argentina's steady progress in the nuclear field with the help of German technicians who had left Europe after World War II.



'Folha de São Paulo,' 6 July 1967. The article's title stated, 'Since 1960, Brazil has had the means to build a nuclear weapon and now military officials are promising that the NUCLEAR DELAY WILL BE REMEDIED'.

Brazil's strongly nationalistic military government (under the presidency of General Geisel) responded to such criticism in 1975 by announcing an ambitious agreement with West Germany<sup>6</sup> to initiate a comprehensive nuclear industry in Brazil, including the complete fuel cycle. In what was branded the 'deal of the century', KWU (a subsidiary of Siemens) proposed setting up factories in Brazil to manufacture parts for the reactors, enrich uranium and reprocess plutonium for future use in 'breeders'. The goal of the agreement was to achieve the installation, by 1990, of eight 1300 MW power reactors, built in the country with progressive indexes of nationalization, at a total cost of \$10 billion. State enterprises and joint ventures with KWU were put in place to achieve that goal. The agreement encompassed technology transfer with regard to uranium enrichment and fuel reprocessing, and a very strong special safeguards regime was installed. Brazil agreed with Germany and the IAEA that all equipment, materials and information would be under safeguards. This type of very invasive safeguards agreement had never been adopted in any other country.

Such grandiose plans were obviously overstated and represented a distorted view of Brazilian reality. The rationale offered by the government to justify the agreement was that the nuclear program represented a response to the oil crisis of 1973, which at the time posed a serious threat to the country's trade balance. Actually, this was the wrong answer because

<sup>6</sup>Agreement between the Government of the Federal Republic of Germany and the Government of the Federative Republic of Brazil concerning Cooperation in the Field of Peaceful Uses of Nuclear Energy (signed in Bonn 27 June 1975 and entered into force 15 November 1975).

electricity in Brazil was produced mainly by hydroelectric plants and not by petroleum, so building nuclear reactors would not reduce the importing of oil, which was used by transportation and industry.

There were also loud complaints that the so-called German nuclear deal did not contemplate a fair contribution of inputs from local industry and technological institutions. Moreover, the Carter administration in the United States did not overlook the possibility that the Brazilian military government might have an ambition to develop nuclear weapons. President Geisel declared that the government wanted to import technology and equipment to install a nuclear industry in Brazil. According to Gaspari (2004), at a meeting of the National Security Council, the president said that ‘the government had no intention of building nuclear weapons, but we should leave the option open according to the circumstances’.

The perception in official circles was that, with the German deal, Brazil was entering the stage usually referred to in the literature as ‘latent proliferation’, under which a country moves closer to having nuclear weapons capability through civilian programs. It was also significant that the Brazilian government signed the German agreement without consulting the country’s scientific organizations.

The Brazil–Germany deal crumbled under US pressure due to its own weaknesses. Enrichment, which employed the untested ‘jet-nozzle’ process of uranium enrichment offered by the Germans after the United States vetoed the use of centrifuge enrichment, was abandoned and the Carter administration canceled existing guarantees to supply enriched uranium needed to refuel the Westinghouse Angra I nuclear power reactor.

This decision by the US government reignited pressures in some Brazilian civilian and military circles for the development of an independent program. As a consequence, the Army, Navy and Air Force commanders – realizing that the reactors built under the German deal, even if successful in producing electricity, would not lead to nuclear independence – began ‘autonomous’ programs, coordinated by the CNEN. The great degree of secrecy adopted, the way in which the program was conducted, and the military’s participation in it fueled further suspicion about Brazil’s intention to build nuclear weapons.

In 1979, General Figueiredo, then Brazil’s president, declared that it was imperative for the country to undertake nuclear energy development based on fuel available within its own national territory and using its own technology: ‘It was important to guarantee a sovereign future for the next generations’ (Leati and Maltchik 2014).

Three uncoordinated ‘parallel’ programs were then set in motion, within the Army, Navy and Air Force, respectively. The Air Force pursued laser enrichment, the Army pursued a natural uranium and graphite (plutonium generator) reactor and the Navy developed centrifuge enrichment. The Navy’s program, run by officers trained at the Massachusetts Institute of Technology, prospered most fully. The official reason given for this effort was to build a small power plant for submarine propulsion.

Information available on these programs suggests that by the end of the 1980s, the following results had been achieved (Vargas 2013):

- In 1979 or 1980, the Navy, initially at the Nuclear Research Institute at the University of São Paulo, and later at the Experimental Center of Aramar in Iperó (100 km away from São Paulo), achieved a uranium enrichment rate of 20% by ultracentrifugation. It also started planning the first light water power

reactor, RENAP-1, with 100 MW, designed to propel the first Brazilian nuclear submarine, which would be built at the Navy shipyards in Rio de Janeiro.

- The Army tried to install a subcritical assembly in Guaratiba, Rio de Janeiro, and planned to build an ‘irradiated experimental reactor’ (REI), moderated with graphite and natural metallic uranium as fuel. The graphite was produced by TECMAT, the first company in Latin America to engage in such production. This proved to be a more expensive reactor than the others and was economically unfeasible, but it could produce plutonium, the key element in building nuclear weapons, in a similar way to that used by France to build its first device.
- Laser development for uranium enrichment was attempted on a laboratory scale at the Air Force Technological Institute at São José dos Campos.

In May 1990, a group called GT-PRONEN was formed (Barbosa 2009, 31), under the government of President Collor de Mello, in order to evaluate the Brazilian nuclear activities. This was a clear demonstration that the model established by Decree-Law 2464<sup>7</sup> had not achieved its objectives, given the lack of a political decision to definitively organize the nuclear sector.

Almost all the projects developed in Brazil, according to the report that GT-PRONEN sent to the presidential cabinet, were abandoned along the way, except for the Navy’s plan to enrich uranium under the command of Admiral Othon Luiz Pinheiro da Silva, which was the one that ultimately succeeded in Brazil.

At that time, and during the years that followed, some important newspapers, such as *Folha de São Paulo*, *O Globo* and *O Estado de S. Paulo*, gradually gained access to and published confidential documents. According to Dimenstein (1995), a secret document prepared by the Brazilian National Security Council ‘justified the parallel nuclear program and defined the production of nuclear explosives as being one of its objectives’. It was noted that these explosives would have ‘peaceful purposes’.

This document, composed in November 1984, was signed by General Venturini, then Secretary of the National Security Council, which was overseeing the parallel nuclear program. The text further stated, ‘In order to achieve the assigned objective, it is necessary to develop autonomous technology, appropriate to national conditions, to allow control of the nuclear fuel cycle, including enrichment of uranium and reprocessing of irradiated material’.

On its second page, the document reported the ‘objective of [achieving] autonomous projects’, stating that nuclear power would allow naval propulsion and the production of explosives.

That was the principal publicly disclosed document in which the production of a nuclear explosive was explicitly mentioned and received formal presidential approval. Many other newspaper articles and even books have described nuclear bomb development plans in Brazil and Argentina, but without presenting a clear documentation as a basis.

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<sup>7</sup>Decree-Law Nº 31 August 2464, 1988. *Official Journal of the Union*, 1 September 1988, Section I, p. 16,793.

This law changed the name of the Brazilian Nuclear Enterprises SA to NUCLEBRÁS, transferred assets owned by it and took other measures about the nuclear structure adopted before.

In 1995, Venturini, then a retired Army General, told *Folha de São Paulo* that ‘the nuclear explosives would not mean building an atomic bomb. They could be used for engineering design that required an explosion, such as opening a channel as for example’ (Dimenstein 1995).

More recently, an article in *O Globo* (23 March 2014) reported:

The secret, ultra-secret and confidential archives of the military governments had revealed a project to produce the Brazilian atomic bomb in a dispute with Argentina to dominate the technology. If at the beginning of the military regime, fabrication of the nuclear device was only a plan to secure the war-like hegemony of the continent under the government of General Joao Figueiredo, then later it became an obsession.

According to a newspaper article published on 5 August 1981, a ‘short study’ produced by the General Secretariat of the National Security Council triggered an alert with an ultra-secret information stamp: ‘Argentina is able to manufacture a nuclear device in a shorter time frame than Brazil’. Carrying the title ‘Comparative Monitoring of Nuclear Development between Brazil and Argentina in Military Expression’, the document explains that the study was produced ‘to allow adequate advance notice of the development of nuclear explosives in Argentina, making possible a decision by the Brazilian government’.

The alleged Argentine supremacy in the sector echoed among the Brazilian generals. At the time, the Brazilian nuclear program was moving in several directions and suffered from a lack of planning and resources, after the extraordinary expenses incurred by the agreement that President Geisel had signed with the German government.

Brazil’s National Information Service (SNI) archives contain a series of documents about ‘the Argentine bomb’. In 1982, a report produced by SNI agents working at the Brazilian embassy in Buenos Aires was sent to a central agency in Brasilia. ‘As absolute leader in this [nuclear] field in Latin America, Argentina becomes, every day, the strongest candidate in the Third World to join the “Club of London” that brings together the nuclear powers’, the document stated, while also taking into account the financial difficulties that Argentina was facing. Despite this prediction, the agents concluded that Argentina was not building a bomb at that time.

To reverse this trend in the military regime after the democratization, Article 21, XXIII (a) of the 1988 new Constitution was introduced, establishing that ‘all nuclear activities within national territory shall be admitted only for peaceful purposes and upon approval by the National Congress’. Peaceful explosions were renounced only after the Argentina and Brazil signed the Agreement for the Exclusively Peaceful Use of Nuclear Energy in 1991.

There is no historical evidence, even after two decades of official and unofficial access to confidential documents, that either Brazil or Argentina was effectively engaged in a program to produce nuclear weapons, despite stating their right to peaceful explosions. Apparently, the effort was limited to secret activities aimed at developing dual-use technologies that could prepare the countries for subsequent production of a nuclear device. This activity, although secret, was neither illegal nor in violation of the international agreements applicable to both countries at the time.

However, the United States viewed such endeavors with great suspicion and placed Brazil on a surveillance list of countries suspected of conducting secret programs to produce nuclear weapons. By doing so, the United States made gaining access to some modern technologies and equipment that were unavailable in Brazil very difficult. The items that became inaccessible included high-speed computers needed by PETROBRAS (the state oil company), the National Space Research Institute and universities. These computers, purchased from US companies, were not delivered because the US Department of Commerce blocked their export.

Meanwhile, Argentina (also under a military regime at the time), through its National Atomic Energy Commission, was working (with German participation) on the construction of research and power reactors to be sold to other countries, developing an uranium enrichment plant using gaseous diffusion methodology, and building a reprocessing plant.

Argentina was also making progress in plutonium production (already achieved on a laboratory scale) and was building a reprocessing unit to support this production. Furthermore, the Argentines had achieved advancements in heavy water production with their own technology and had constructed a commercial factory with imported technology, under IAEA safeguards.

By the mid-1980s, the political situation in Argentina and Brazil had changed dramatically with the end of military regimes in both countries by the election of civilian Presidents Alfonsín (1983) in Argentina and Sarney (1985) in Brazil and a consultation process involving mutual visits to nuclear installations and public declarations. But no concrete steps had been taken. The political agreements occurred with the next pair of civilian presidents: Menem in Argentina and Collor de Mello in Brazil.

## **The case of Brazil and Argentina**

The end of military rule and the election of civilian presidents in 1990 led to a sweeping reexamination of nuclear programs in Brazil and Argentina. With their return to democracy, both countries realized that their dreams of grandeur – of becoming great powers – were not useful to national development. Accordingly, the idea of pursuing semi-clandestine nuclear activities was no longer a priority.

Democracy also brought greater transparency to government activities, resulting in oversight of what previously may have been secret programs. As Professor Goldemberg argued successfully in 1991, the path to entry into the First World required not possessing nuclear weapons but solving the problems of economic underdevelopment.

At the time, frequent press reports<sup>8</sup> (Marluce 2017) claimed that preparations were underway to test a nuclear explosive device near an air force base in Serra do Cachimbo in the state of Pará. But an investigation determined that no significant work on nuclear weapon production was occurring at any of the military laboratories. President Collor de Mello then staged a visit to the alleged test site in Pará and symbolically closed a well that had been dug for potential use in a nuclear test.

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<sup>8</sup>In August 8th, 1986, the Brazilian Newspaper Folha de São Paulo published an article entitled “Serra do Cachimbo pode ser local de provas nucleares”.

Prior to 1991, neither Brazil nor Argentina had adhered to an internationally recognized instrument designed to verify all uses of nuclear energy. There were concerns in the international community that these two countries might be engaged in developing a nuclear device. The uncertainty generated by the belief that Brazil and Argentina might still be nourishing a desire to possess nuclear weapons represented a threat to their peaceful relationship.

No full-scope safeguards agreement was in force in the two countries, aside from that related to international cooperation. The Treaty of Tlatelolco was not in force. There was no agreement on the meaning of 'peaceful explosions' that was considered as a valid instrument for some applications.

In this context of suspicion, building trust between Brazil and Argentina was a long process, requiring many years of negotiations performed in stages. Along the way, joint declarations, little by little, promoted openness and mutual knowledge of nuclear activities in the two countries. Visits by high-ranking authorities and national experts from the two countries were organized.<sup>9</sup>

In July 1986, the Agreement of Nuclear Cooperation between the Federative Republic of Brazil and Republic of Argentina for the Development of Peaceful Uses of Nuclear Energy was signed in Buenos Aires, affirming both countries' commitments to the exclusively peaceful application of their nuclear programs and their common interest in enhancing the autonomy of their respective nuclear programs. Many topics of common interest were covered in this agreement, which was important to both countries and was referred to as Protocol 17.

One very important commitment, the Joint Declaration on Brazilian–Argentine Nuclear Policy, was signed in 1990 and approved establishment of a Common System of Accounting and Control of Nuclear Materials<sup>10</sup> between the two countries.

The most important agreement took place in 1991 when Brazil and Argentina signed the Bilateral Agreement for the Exclusively Peaceful Use of Nuclear Energy in Guadalajara, Mexico. Among other actions, this pact established the ABACC, aimed at performing mutual inspections of the nuclear materials present in Brazil and Argentina.

After the establishment of ABACC<sup>11</sup> in December 1991, a four-way safeguards agreement was signed by Brazil, Argentina, ABACC and the IAEA to consolidate the system for application of safeguards, which remains in force today in both countries.

The Quadripartite Agreement entered into force in March 1994 after its ratification by the Brazilian Congress. Concurrently, side letters were signed by the IAEA and the

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<sup>9</sup>President of Federative Republic of Brazil, Jose Sarney and President of Argentine Republic, Raul Ricardo Alfonsín in Puerto Iguazú, Argentina, and Foz do Iguazu, Brazil, from 29 November to 30 November 1985.

On 8 April 1988, President of Argentine Republic Argentina, Raul Ricardo Alfonsín, visited Aramar Enrichment Experimental Center in Iperó, Brazil. President of Federative Republic of Brazil, Jose Sarney, visited nuclear installations in Centro Atomico Ezeiza. On 5 July and 6 July 1990, invited by the President of the Argentine Republic, Dr. Carlos Saúl Menem, the President of the Federative Republic of Brazil, Dr. Fernando Collor, paid a visit to Argentina.

On 28 November 1990, the President of the Argentine Republic, Carlos Saúl Menem, and the President of the Federative Republic of Brazil, Fernando Collor, met at Foz de Iguazú, Brazil, and made a declaration of common nuclear policy.

<sup>10</sup>Declaração sobre a Política Nuclear Comum Brasileiro Argentina SCCC, 28 November 1990.

<sup>11</sup>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 Quadripartite Agreement, INF/CIRC 435, 13 December 1991.



two countries for preserving enrichment plants and the nuclear submarine program. Future construction of nuclear submarines will require development of a methodology of nonintrusive safeguards to be applied to submarines in Brazil.

The Quadripartite Agreement (INFCIRC 435) is equivalent to INFCIRC 153<sup>12</sup> IAEA, which was the current model for full-scope safeguards at the time. However, the Quadripartite Agreement is stricter with regard to control of the nuclear material eventually used for nuclear propulsion. In fact, INFCIRC 153 contains a provision for 'non-application of safeguards to the nuclear material of nuclear submarines', whereas INFCIRC 435 states that 'the State Party and the Agency shall make an arrangement so that these special procedures shall apply only while the nuclear material is used for nuclear propulsion'. Therefore, safeguards under the Quadripartite Agreement are not suspended for submarine reactor nuclear fuel during the period of operation. Special procedures must be agreed with IAEA to assure that the fuel is still in use for propulsion and not diverted.

After the OPANAL Council accepted the amendments to the Treaty of Tlatelolco (weapons-free zone), the treaty entered into force for Argentina and Brazil in January and May 1994, respectively.

In February 1995, Argentine authorities presented the legal instruments for that country's adherence to the NPT, and Brazil took the same step in September 1998.

Although the controls and rules exercised by the current nonproliferation regime can help to delay the acquisition of nuclear capabilities, the most effective nuclear non-proliferation strategy is to reduce the underlying incentives for states to acquire such weapons. In such a strategy, the role of regional neighbors is usually crucial.

If countries are determined to acquire nuclear weapons, it seems nearly impossible for any other country's policy of denial to ultimately stop them. Similar efforts, after all, have failed in India, Pakistan, Israel and most recently North Korea.

Yet nonproliferation efforts can slow programs geared toward the production of nuclear weapons so that internal political change can catch up and stop them before it becomes too late. Such changes ultimately derailed the potential weapons programs in the Southern Cone.

The movement of commerce between two neighbors, as measured by Gross National Product (GNP) values, is an important indicator of the risk of regional motivation for proliferation. The total amount of trade between Brazil and Argentina is six times greater than that between India and Pakistan. This strong economic interdependence helps to restrain nuclear and other confrontations between the two countries.

On ABACC's 20th anniversary, the foreign ministers of both countries acknowledged that ABACC was the forerunner of Mercosul and of South American economic union. An analysis of the commercial exchange between Brazil and Argentina gives a good idea of the evolution that has occurred. The agreement that established ABACC was considered in the negotiations as a precondition for the Mercosul Agreement, the first version of which included Paraguay and Uruguay in addition to Brazil and Argentina. In the 5 years following the agreement, commercial trade between Argentina and Brazil increased sevenfold. Today, Argentina is Brazil's second largest trading partner, ahead of the

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<sup>12</sup>The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (Corrected), June 1st, 1972, INFCIRC 153.



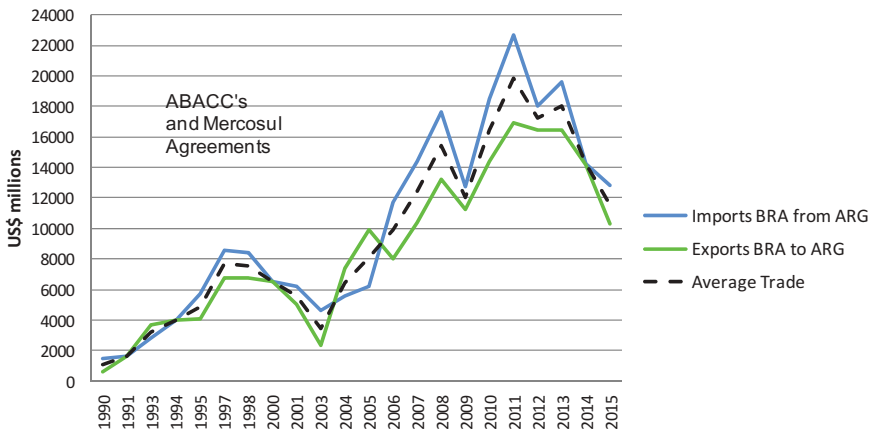


Figure 1. Evolution of trade between Brazil and Argentina from 1990 to 2015.<sup>13</sup>

United States. Trade fell from 2007 to 2009 due to the crisis that pushed Argentina into insolvency and the political and economic crisis in Brazil, but it recovered to reach a new plateau in 2010, when it was 15 times the amount of trade in 1990 (10 times greater in real value). The amount of trade has dropped again in recent years because of the economic problems experienced by the two countries (see Figure 1).

### Aspects of the Brazilian and Argentine experience that may be useful to other countries

ABACC is an international organization that consists of two organs, the Commission and the Secretariat, with headquarters in Rio de Janeiro, Brazil. Its mission, obligations and responsibilities are defined in the Bilateral Agreement that established ABACC as a neutral technical organization to administer inspections.

To comply with its mission of guaranteeing that all nuclear materials are used exclusively for peaceful purposes, ABACC has a team of 22 employees, with 2 secretaries (one for Brazil and one for Argentina), 10 officers of both nationalities, an administrative group of 9 in Rio de Janeiro, technical and administrative support in Buenos Aires and 102 Brazilian and Argentine inspectors (ABACC 2015).

Careful studies and the drafting of detailed procedures for all types of inspections, specifically for application to sensitive facilities, were developed.

According to the Quadripartite Agreement, inspections are performed jointly by ABACC and the IAEA, and it is important to maintain the initiative and precedence of the regional organization over the international one for addressing discrepancies, which in many cases is not an easy task.

Technical personnel from the safeguards area and the technical nuclear area were selected to constitute the inspectors group, but they also participate in providing

<sup>13</sup>ITC - International Trade Centre Trade Statistics. 2001 - 2017. [www.intracen.org/itc/market-info-tools/trade-statistics/](http://www.intracen.org/itc/market-info-tools/trade-statistics/).

solutions to technical problems in destructive and nondestructive measurements as well as in surveillance and in containment mechanisms and techniques.

Another activity adopted to enhance ABACC's technical development was to establish technical cooperation not only with laboratories in Argentina and Brazil but also with international organizations such as EURATOM, IAEA, DOE, Los Alamos, Oak Ridge and others. Experts from these laboratories were frequently invited to participate in ABACC training courses, and the Brazilian and Argentine inspectors and technicians were invited to participate in training courses and the development of special techniques at international laboratories. ABACC has also established cooperation with other countries such as Canada, Japan and South Korea.

A particularly thorny problem was the inspection of enrichment facilities. The technique developed to safeguard these installations had involved many years of work and numerous experiments in cooperation with other international laboratories. It was difficult to guarantee that inspectors would not have access to the technology used for enrichment while at the same time ensuring that no undeclared activity could take place. In addition, for the first time, safeguards were applied at military installations in Brazil and great care had to be taken to avoid disclosure of military-related activities.

Multinational organizations (including safeguards agencies) have less control over their personnel than most national organizations. It is also more difficult to control information about suppliers and important technical issues. Therefore, it is necessary to ensure that international and regional inspections do not become a cause of proliferation.

Brazil and Argentina's successful approach (Goldemberg 2006) to these issues exemplifies an effective regional solution to the problem of proliferation, like the South African solution.

Because nuclear proliferation issues are of intense interest to the great powers, they have received more attention than nuclear disarmament, but some success was achieved first with détente and also after the dissolution of the Soviet Union.

ABACC, the national authorities and the IAEA engage in ongoing collaboration for the purpose of applying the safeguards established in the Bilateral and Quadripartite Agreements. Technical and coordination meetings, such as those of the Liaison Committee and its subcommittee, are organized to analyze important topics related to the application of safeguards at Brazil and Argentina's nuclear facilities. Much of ABACC's success is due to the extensive debate that occurs and the positive contributions made by the parties during these meetings. Collaboration by national authorities and the IAEA in implementing the decisions adopted also plays an important role in the efficient application of safeguards. In 2015, six technical meetings took place between ABACC, the IAEA and the national authorities, along with one ABACC-IAEA coordinating meeting and one meeting of the Liaison Committee.

Safeguards inspectors in Argentina and Brazil are employees of ABACC during the completion of their compliance missions, and in undertaking their work they take only ABACC's interests into account. During the missions, they are fully subordinate to the Secretary's authority and do not request or accept instructions from any government or authority not associated with ABACC. This safeguards inspection process remains active at all times.

Very few inspectors from ABACC work permanently in the safeguards area. They are technicians with expertise in all nuclear related fields. They have expertise in areas such as nuclear fuel cycle, research and power reactors, production of radioisotopes, development of new projects, measurement techniques and so on.

On average, inspectors have between 20 and 30 years of experience in the area, 12% hold PhDs, and 39% have a master's degree. Impartiality in conducting the inspections, broad experience in the nuclear area and significant professional and academic training are fundamental factors that lend credibility to the results of the inspections and thus enhance ABACC's success in carrying out and winning broad compliance with its mission.

In 2015, ABACC performed 110 inspections at nuclear facilities in Argentina and Brazil, in coordination with the IAEA, with a total effort of 806 inspector days. During these inspections, 90 accounting audits of nuclear material were performed, and the data were used to verify Argentina and Brazil's official declarations and to update the two countries' accounting information database. This updating is of utmost importance in guaranteeing that all nuclear materials are under control and that the inventories of verified nuclear material are consistent with the information supplied by the countries. Brazil and Argentina have a significant level of nuclear activity (Mafra et al. 2009). Consequently, the activities and the quantities of nuclear material under safeguards will increase as new facilities start to operate. ABACC has been monitoring this growth and has developed, in cooperation with the IAEA and the national authorities, an effective and efficient safeguards approach based on the use of modern technology, seeking to minimize any intrusion into the routine activities performed at the nuclear facilities.

## **Challenges faced by ABACC**

Even though ABACC has had great success in applying safeguards during its 25 years of existence, it has had to face a number of challenges (some of which remain) and will likely face new ones in the future.

Credibility is ABACC's greatest asset. It took years for ABACC to gain the respect of international organizations and other countries, so the risk of losing this credibility is its greatest threat.

Technical credibility depends on the quality of the experts working for or assisting ABACC. There is no immediate danger of the ABACC losing its credibility because the technicians involved are a very well-prepared group.

The measurement equipment used during the inspections must be up to date and geared toward identifying future problems (there are immediate risks with regard to this item).

Autonomy is another very important subject. Even secretaries and employees must have well-defined mandates.

The lack of means to detect undeclared materials and activities, however, is a more serious problem. The unclear definition of ABACC's approach (relative to the IAEA's) concerning its search for information on undeclared activities and facilities is another possible threat. The IAEA uses all available types of information in addition to the inspections themselves to search for undeclared activities.

Yet another threat lies in the emerging imbalance between the nuclear programs of the two countries, which were reasonably comparable in scope during ABACC's first two decades.

The Additional Protocol to the Safeguards Agreement is perhaps the greatest threat to ABACC in the coming years. On one hand, ABACC's system cannot yet provide assurances about the existence of undeclared facilities and materials, and that weakness must be strengthened. On the other hand, the Protocol's system is clearly based on distrust and suggests that inspectors should act almost as intelligence agents. Under the Protocol, IAEA representatives can inspect nuclear and nonnuclear facilities; this will hamper the development of autonomous nonnuclear techniques that must be undertaken because the materials cannot be commercially acquired. A relevant concern is that this situation could undermine the activities of the nuclear submarine program, which is classified not as a nuclear weapon but as a non-proscribed military nuclear application.

One thing seems clear: the adoption of the Additional Protocol implies procedures that ABACC cannot accept because it may contribute to increasing mistrust. In this way, ABACC could lose its role because there would be safeguards activities in which ABACC would not be following the IAEA's guidelines. Such loss of ABACC's relevance and practical utility could lead to its actual or virtual extinction. Something similar has occurred with EURATOM's active role as a regional agency, although it continues to act in place of the national authority in some countries. The new safeguards resulting from the Additional Protocol, without effective ABACC action, would result in weaker safeguards in the region.

Starting to play the game of mistrust and searching for non-declared information in accordance with the Protocol's system would present enormous risks to the regional system. In this regard, ABACC needs to establish less intrusive mechanisms to ensure the nonexistence of possible undeclared materials – for example, using modern trace detection techniques in the environment.

Even though the two countries do not currently have any intention to follow the Additional Protocol relative to the Quadripartite Agreement, the possibility of unilateral action by one of the countries, through separately signing the Additional Protocol, is also a very important threat.

## **Opportunities for ABACC**

The original process of applying safeguards is based on verification of a country's declaration of its facilities and materials, conducted by inspectors who rely on measures of containment and surveillance. Initial confidence has already been expressed in the acceptance of the statement and a verification of its use. This is called 'trust and verify'.

Evidence of violation of the prohibition against using undeclared nuclear equipment and materials has posed a dilemma for agencies applying safeguards. The IAEA has opted for a scheme that fosters distrust in both inspectors and inspected countries.

ABACC has the opportunity to set an example of creating and maintaining credibility among nations by adhering to the principle of 'trust and verify', which should not be abandoned and replaced by procedures based on mistrust. The latter would be incompatible with ABACC's mission of building trust between the countries and with

the international community. If ABACC were to follow a strategy similar to the IAEA's, it would encourage a search for undeclared information about each country, thereby provoking institutional mistrust that would undermine its intention to build trust.

Obviously, the safeguards system must provide a solution to the problem of discovering non-declared nuclear facilities and materials. Since there can be no nuclear weapon without special nuclear materials, one way to prevent nuclear proliferation is to focus on detecting this type of materials. That approach could be very effective in situations such as Brazil and Argentina, where these materials are not currently used in any activity. Another alternative methodology would involve extending the use of making swipe sampling in any circulating areas. It has been demonstrated that existing swipe technologies can detect extremely low material concentrations. This type of verification could resolve virtually any suspicions that might arise. Both countries maintain complete lists of nuclear locations for verification purposes, although they do not report this information publicly.

The mutual inspection regime represents an additional security factor that must be considered in evaluating the system, as was recognized by the NSG. The intrinsic efficiency of inspectors who have a natural incentive to prevent proliferation in a neighboring country is another relevant factor.

The ABACC system has shown that it is possible, under a regime of trust, to achieve the same objectives achieved by a regime of challenge in which inspectors seek continuously to uncover undeclared information about the country, thereby generating distrust. To fully address the possible existence of undeclared facilities and materials, the ABACC would have to strengthen its verification system to cover the presumption of undeclared material.

## Conclusions

ABACC continues to attract international interest in its approach. For example, a Japanese organization known as the Research Center for Nuclear Weapons Abolition at Nagasaki University has recently requested a study of the ABACC system.

The present motivation for nuclear proliferation is primarily regional, and so it is natural that this threat can be more easily solved through a regional approach. The lack of trust among neighbors has been the major reason for nuclear weapons development attempts (and successes) throughout the world in recent years.

Regional arrangements can be a bridge to international compromise agreements between countries or regions, and in many cases they can function more effectively as trust-building instruments than international agreements do. Mutual concessions are also politically more acceptable. In the case of Brazil and Argentina, the Bilateral Agreement paved the way to later acceptance of international controls.

Regional or bilateral agreements can adopt less intrusive mechanisms than international agreements, since potential adversaries are involved in verification processes. For this reason, these agreements can reduce proliferation (while avoiding leakage of information) more smoothly than international agreements, since greater care is taken in dealing with sensitive information.

The Additional Protocol was harmful to the EURATOM regional safeguards organization. It reduced the role of the regional organization by reinforcing the power of national and international authorities.

In our view, ABACC and the reciprocal inspections in Brazil and Argentina offer an impressive example of what can be achieved in terms of transparency, as well as a fruitful path toward increasing cooperation to improve international safeguards. This case also provides a useful example of achieving shared multinational commitment to exclusively peaceful uses of nuclear energy.

The restrictions placed on dual-use technologies have increased the pressure on countries to acquire their own technology. Maintaining control of sensitive technology has become an important demonstration of a country's technological capability. There are technologies to which a country can gain access only by achieving the capacity to develop them internally.

The ABACC model has contributed to the successful process of building trust between Brazil and Argentina and with the international community. The depth of today's strategic partnership between the two countries, in which nuclear issues are just one of many fields of cooperation, and the absence of both countries from any list of concerns under international nonproliferation regimes show that this objective has been achieved. The routine follow-up on the two countries' nuclear projects also indicates that it is possible to preserve the respective governments' ability to protect strategic information about their activities.

The regional solution is the easiest option, but it is also important to include an external policy project (in the case of Brazil and Argentina, the Mercosul economic approach was very important). Mutual concessions must not be discriminatory or too intrusive.

Finally, it is important that the policy positions of armed countries do not include threats against disarmed countries, consistent with the Treaty of Tlatelolco. Even though verification processes are not stipulated under this treaty, it provides an important moral framework. It would be desirable for armed countries to accept full application of the IAEA safeguards within their territories located in the Tlatelolco region, in fact or by law.

## Notes on contributors

*José Goldemberg* (goldemb@iee.usp.br) earned his Ph.D. in Physical Sciences from the University de São Paulo in 1954. He was Rector of the University from 1986 to 1990. A Member of the Brazilian Academy of Sciences, he has served as the President of Brazilian Association for the Advancement of Science. He did research and taught at the University of Illinois, Stanford University, University of Paris (Orsay) and Princeton University. Between 1990 and 1992, he was Secretary of State for Science and Technology and Minister of State for Education of Brazil. Between 2002 and 2006, he was Secretary for the Environment of the State of São Paulo. In 2008, he was awarded the Blue Planet Prize 2008 of the Asahi Glass Foundation (Japan) and, in 2013, the 'Lifetime Achievement Award' from the Zayed Future Energy Prize.

*Carlos Feu Alvim* (carlos.feu@ecen.com), 'Docteur d'État' in Physics by University of Grenoble, France, Master of Science and Nuclear Techniques, Federal University of Minas Gerais (UFMG) Bachelor's degree in Physics, UFMG. Chief Editor of the Journal: Economy and Energy, Director of ECEN Consulting, He was: Secretary of ABACC, Assistant Professor of UFMG, Deputy Secretary of Industrial Technology in Trade and Commerce Ministry, General Coordinator for Planning in Technological Secretary of Republic Presidency (PR) of Brazil. Technical Advisor of National Energy Commission CNE/PR at of the Drafting Report of the 'Reference Report on Brazilian Emissions of Greenhouse Gas - GHG in Production, Processing and Use of Energy for the Second Brazilian Declaration'. (Agreement UNDP / MCT) Participation in coordination of projects related to the organization of the Brazilian Nuclear Area with SAE/PR. Coordinator in several projects with Eletronuclear such as 'Economical Indicators Which Permits to Preview the Operational Performance of the Energy Generation'.



*Olga Y. Mafra* (olga@ecen.com), earned her Doctor (1972) and Master (1969) Degrees in Science and Technology from the University of São Paulo. She worked as researcher at IPEN in São Paulo from 1962 to 1975. She was Assistant Doctor at Physics Institute from 1975 to 1979, and Professor and Researcher at Military Engineering Institute from 1977 to 1981. She was Researcher at Nuclear Energy National Commission from 1981 to 1992 and led a program of detectors development. She was nominated Officer for Operations and later Officer for Technical Support of Brazilian Argentina Agency of Accounting and Control of Nuclear Materials from 1992 to 2005. Since 2005, she has been an associate of ECEN Consultancy. Her last publications include: ‘The Brazilian Emissions Goals of Greenhouse Gases’ (2017), ‘Studies to Obtain a Set of Economic Indicators to Monitor an Enterprise Operational Performance in Energy Generation’ (2016), and ‘Strengthening of the Brazilian Nuclear Sector’ (2014).

## ORCID

José Goldemberg  <http://orcid.org/0000-0002-6604-532X>

Carlos Feu Alvim  <http://orcid.org/0000-0002-5457-5278>

Olga Y. Mafra  <http://orcid.org/0000-0002-8425-5160>

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