

Designing and Implementing Bilateral Inspections in Argentina and Brazil

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1. Introduction

The Agreement between the Republic of Argentina and the Federative Republic of Brazil for the Exclusively Peaceful Use of Nuclear Energy¹ has been in force since December 1991. The basic undertakings of the bilateral agreement are:

- a) to use the nuclear material and facilities under their jurisdiction or control exclusively for peaceful purposes;
- b) To prohibit and prevent in their respective territories, and to abstain from carrying out, promoting or authorizing, directly or indirectly, or from participating in any way in:
 - The testing, use, manufacture, production or acquisition by any means of any nuclear weapon; and
 - The receipt, storage, installation, deployment or any other form of possession of any nuclear weapon.

This commitment is identical to that established in the Tlatelolco Treaty, but the Bilateral Agreement innovates when it establishes that: "Bearing in mind that at present no technical distinction can be made between nuclear explosive devices for peaceful purposes and those for military purposes, the Parties also undertake to prohibit and prevent in their respective territories (...) any nuclear explosive device while the above-mentioned technical limitation exists". So the "explosions for peaceful purposes", foreseen in the Tlatelolco Treaty, are not accepted in the scope of the Bilateral Agreement. With this additional statement the commitment of the Bilateral Agreement is equivalent to that of the Nuclear Non-Proliferation Treaty (NPT) for Non-Nuclear Weapon States (NNWS).

The Agreement also establishes that any serious non-compliance by either of the Parties enables the other party to abrogate the agreement, with the obligation to notify the Secretary General of the United Nations and the Secretary General of the Organization of American States of this fact.

To verify the control's commitment of the Bilateral Agreement the Brazilian-Argentine Agency of Accounting and Control of Nuclear Materials (ABACC) was created. The ABACC's objective is to administrate and apply the Common System of Accounting and Control of Nuclear Materials (SCCC), also established by the Agreement. The SCCC is a full scope safeguard's system that is being applied in both countries with the purpose of verifying that all nuclear materials in all nuclear activities

¹ "Agreement between the Republic of Argentina and the Federative Republic of Brazil for the Exclusively Peaceful Use of Nuclear Energy". INFCIRC/395. IAEA, Vienna, November 1991

are not diverted to the manufacture of nuclear weapons or other nuclear explosive devices.

Based on the Bilateral Agreement, a Quadripartite Safeguards Agreement among Argentina, Brazil, ABACC and the International Atomic Energy Agency (IAEA)² was signed in December 1991. This agreement is a full scope safeguards agreement, similar to INFCIRC/153 model agreements, and entered into force on March 1994 after its ratification by the Congresses of both countries.

The Quadripartite Agreement was considered by the IAEA and by the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL) as valid for complying with the requirements of the Treaty of Tlatelolco (Brazil and Argentina) and of the Non Proliferation Treaty. Figure 1 summarizes the relationship between the safeguards regime and the international commitments.

The basic undertakings of the Quadripartite Agreement are: The acceptance by the State Parties of safeguards on all nuclear materials in all nuclear activities within their territories, under their jurisdiction or carried out under their control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other explosive devices.

The IAEA, in its verification, shall take due account of the technical effectiveness of the SCCC. Furthermore,

- The State Parties, ABACC and the IAEA shall co-operate to facilitate the implementation of the safeguards provided for in the Agreement.
- ABACC and the IAEA shall avoid unnecessary duplication of safeguard's activities.

The implementation of such complex safeguards system with its several interfaces - IAEA, ABACC, National Authorities and Operators - requires a great effort and cooperation of all parties involved.

2. The Common System of Accounting and Control - SCCC

The Common System of Accounting and Control of Nuclear Material (SCCC) is a set of procedures established by the Parties to detect, with a reasonable degree of certainty, whether the nuclear materials in all their nuclear activities have been diverted to uses not authorized under the term of the Bilateral Agreement.

The SCCC was conceived as a full scope safeguards system to be implemented by a central executive body (the permanent staff of ABACC), which is technically and financially supported by the Parties to carry out its duties. This system requires the concurrence of efforts of Operators, National Authorities and ABACC. The National Authorities play a significant and special role in the implementation of the SCCC: besides the usual activities at state level, each of them is the natural channel through which ABACC requires the services needed to perform control activities in the other country. With this conception, the SCCC requires very well established National Authorities, not

² "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. INFCIRC/435. IAEA. Vienna, March 1994.

only able to fulfill its responsibilities at a national level but also to support ABACC's activities (for instance, they need to expand their inspection capabilities to be able to provide ABACC with the necessary support to carry out inspection in the other country). This double role of the National Authorities is new in the safeguard's field. The technical support available from the two Parties embraces inspectors; consultants; equipment maintenance and calibration; preparation of standards, laboratory services and any other safeguards related study or service.

The SCCC consists of the General Procedures and the Application Manuals for each installation. The Application Manuals shall be negotiated between ABACC and the respective Country for each facility. The General Procedures contain the directives of SCCC. The adequate level of accounting and control of nuclear material, at each facility and other locations, shall be specified in the corresponding Application Manual taking into account the following parameters:

- the nuclear material category, considering its relevant isotopic composition;
- the conversion time;
- The inventory or annual throughput of nuclear material production.

The nuclear material accountancy shall be based on measurement systems compatible with the latest international standards and conforming to the SCCC objective.

ABACC is applying the criteria and procedures as needed to define the specific technical safeguard measures to be applied to a particular facility. The safeguards basic criteria and procedures adopted by ABACC do not constitute a rigid set of rules. Each specific case is studied and control measures are established taking into account the facility and the characteristics of the nuclear installations in each country. This approach is possible because of the small number of facilities to be safeguarded in both countries and permits ABACC to introduce modifications easily whenever necessary and to incorporate new safeguard's technologies, at present in development, but that could produce a considerable impact by increasing the effectiveness of safeguards.

Table I describes the present situation of facilities and other locations in both countries.

3. The ABACC's Inspectorate

The inspections are performed in a cross national basis; Argentina inspectors carry out inspections in Brazil and vice-versa. The list of ABACC inspectors must be approved by its Board Directorate (Commission) among those suggested by the Governments of Argentina and Brazil. These inspectors do not work permanently for ABACC but are convoked by the Secretariat whenever necessary. The team of inspectors consists of 73 persons, 34 being Argentineans and 39 Brazilians. Part of the inspectors work for the State System and part of them are experts from the nuclear area which allows ABACC to count in its inspector's team with individual inspectors who have more experience in a particular type of facility, due to his/her routine job, and they are preferably selected for inspections in that kind of facilities.

Table I: Facilities and LOFs in Argentina and Brazil

Type	Argentina	Brazil	Total
Conversion facilities	7	1	8
Enrichment facilities	1	2	3
Fuel fabrication facilities	3	1	4
Power reactors	2	1	3
Research reactors	6	3	9
R&D facilities	1	3	4
Critical/sub critical units	-	3	3
Storage facilities	3	2	5
LOFs on fuel research	3	5	8
LOFs on reprocessing research	-	1	1
LOFs analytical lab.	3	2	5
Other LOFs	8	6	14
total	37	30	67

This is one of the main advantages of this system since the experts are familiarized with the type of facility to be inspected. The average level of relevant technical experience of the inspector's staff is around 8 years. Another advantage of this staff of inspectors is the great responsibility they accept and assume in performing inspections in the name of their country.

Each technical sector of ABACC takes care of training courses for the inspectors in a specific field. So training in measurement techniques and equipment operation, accountability activities, preparing inspection reports, data bank uses and workshops involving physical inventory verifications (PIV) for a particular type of facility are some of the formal training courses developed by ABACC.

From the practical experience obtained in implementing the SCCC and the ABACC, several singular aspects can be appointed out:

- As the inspection staff is formed not only by safeguards' experts but also by experts on design and on operation of installations, the Secretariat designs generally an inspection team formed by a safeguard expert and an expert on the type of facility to be inspected. As consequence, it is more effective the verification that the facility is operating as declared initially by the operator.
- A facility operator who performs an inspection in the other country will understand better the difficulties of the safeguard's implementation in this type of facility, and after the inspection will try to improve the safeguards' elements in its facility (record and report

systems, measurement systems, etc.). This feedback is significant to improve the application of the control system.

- The technical cooperation between the two countries encompasses several applications of nuclear energy. As consequence the people that are involved in the various applications are knowing by the other country. This fact is important to increase the confidence and the effectiveness of the control.
- As the inspectors do not work full time to the Secretariat of ABACC, the pre-inspection activities and the preparation of inspection reports are very important steps. The reports have to be detailed and completed in order to enable a follow-up of solution of discrepancies and anomalies and to guaranty the continuity of the knowledge of the situation. As consequence, a considerable fraction of the inspection effort is expended in the ABACC's Headquarters.

4. Inspection's Activities at fuel cycle facilities

Using the inspection effort defined for each facility and taking into account the facility operational program, an annual general inspection program is prepared by the Operations area of ABACC. According to the type of facility the following activities could be performed:

- Verification of physical inventory and of inventory changes through independent measurements;
- Reports and records examination;
- Confirmation of the absence of material borrowing;
- Application and use of containment and surveillance measures;
- Verification of operator's measurement system;
- Discrepancies and/or anomalies follow-up;
- Preliminary material balance evaluation;
- Verification of design information as necessary.

After the inspection, at ABACC Headquarters, the inspectors have to prepare the inspection report. While the inspection report is being prepared in a computer, the ABACC's inspection data bank is automatically up-dated.

The samples collected by the inspectors during the inspection are analyzed in a cross basis in laboratories in Argentina and Brazil. In order to constantly check the status of these laboratories, the ABACC Technical Support area keeps running an inter-comparison program.

The first evaluation of the inspection is made by the inspector at the field, and they try wherever possible to solve the pending problems at the moment. The Planning and Evaluation Officers are responsible for the final evaluation and for preparing the notification of the inspection results to the State.

Table II presents the number and type of inspections that were carried out by ABACC in the last three years, in compliance with their objectives.

Table II: ABACC's inspections

Inspections	1994	1995	1996
DIQ Verification	73	5	8
PIV and interim verifications	113	139	151
Total Inspection Number	186	144	159
Inspection Efforts (B) (PDI)	562	683	626
Inspectors Availability (C) (person-day)	1506	1489	1411
C/B	2.7	2.2	2.3

5. ABACC and the Quadripartite Agreement

The bilateral Agreement was supplemented by the Quadripartite Safeguard's Agreement, signed by the two governments, ABACC and the IAEA on 13 December 1991 in Vienna, Austria. Under this agreement the IAEA also takes the responsibility for applying full scope safeguards in Argentina and Brazil. The Quadripartite Agreement entered into force on 4 March 1994.

The agreement's basic undertakings are the acceptance by the State Parties of safeguards, in accordance with the terms of the agreement, on all nuclear materials in all nuclear activities within their territories, under their jurisdiction or carried out under their control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other explosive devices.

In addition, the agreement states that the IAEA shall have the right and the obligation to ensure that safeguards will be applied on all nuclear materials in all nuclear activities within the territories of the States Parties, under their jurisdiction or carried out under their control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other explosive device.

ABACC undertakes, in applying its safeguards on nuclear material in all nuclear activities within the territories of the States Parties, to co-operate with the Agency, in accordance with the terms of the Quadripartite Agreement, with a view to ascertaining that such nuclear material is not diverted to nuclear weapons or other explosive devices.

The Quadripartite Agreement further states that the IAEA shall apply its safeguards in such a manner as to enable it to verify, in ascertaining that there has been no diversion of nuclear material to any nuclear weapon or other nuclear explosive device the findings of the SCCC. The IAEA verification shall include, inter alia, independent measurements and observations conducted by the Agency, in accordance with the procedures specified in the Agreement. The IAEA, in its verification, shall take due account of the technical effectiveness of the SCCC. Moreover, the agreement states that the States Parties, ABACC and the IAEA shall co-operate to facilitate the implementation

of the safeguards provided for in the Agreement; and that ABACC and the IAEA shall avoid unnecessary duplication of safeguards activities.

The Quadripartite Agreement is similar to INFCIRC/153, with some particularities that were introduced mainly due to the existence of the SCCC and ABACC. The Quadripartite Agreement incorporates provision of information to the IAEA on the imports of any nuclear material that has not reached the starting point of safeguards. Nuclear material subject to the Quadripartite Agreement shall not be exported unless such material will be subject to safeguards in the recipient State and until the Agency has made appropriate arrangements to apply safeguards to such material.

The General Part of the Subsidiary Arrangements to the Quadripartite Agreement entered into force on the same date of the Agreement (4 of March 1994). Some particularities can also be found in this document, such as the provision for ABACC to send periodically to the Agency, information on the scope of its inspections, inspection reports, etc. The Subsidiary Arrangement incorporates the provision, on a co-operative basis, of information on preliminary construction plans for new facilities using design information questionnaire format as guidance.

There is an entire code dealing with arrangement between ABACC and the Agency for co-operation in the application of safeguards under the Agreement. In implementing these arrangements both Agencies shall be guided by the following principles:

- the need to reach its own independent conclusions
- the need to coordinate to the extend possible their activities for the optimum implementation of the Agreement and in particular to avoid unnecessary duplication of ABACC's safeguards. Also, when performing their activities, ABACC and the IAEA shall work jointly, whenever feasible, according to compatible safeguards criteria of the two Organizations.

The verification of the Initial Report by the IAEA started in June 1994 after several coordination meetings aimed at to establish some "ad hoc" rules to facilitate these activities. For most facilities previously under IAEA safeguard (INFCIRC/66), ABACC carried out the verification of the initial inventory simultaneously with the IAEA. This activity was performed mostly through several teams of inspectors working in both countries. By March 1995 practically all the initial inventory has been verified. The Agency's conclusion of verification's activities has not yet drawn and at present time Agency's teams are analyzing the consistency of the initial report information in both countries.

To the extend possible, the verification of DIQs was combined with the verification of the Initial Report. At present, conditions are such that drafting and negotiations of facility attachments can be speeded up. Three negotiation meetings have already occurred and nine facility attachments are expected to enter soon into force.

After the verification of the Initial Report, a regime of "ad hoc" inspections has been implemented. Almost all inspections are carried out on coordinated dates by both organizations and some practical arrangements on the field have been implemented.

Several levels of coordination are considered in the General Part of the Subsidiary Arrangements, that when fully implemented shall allow an effective application of safeguards by both Agencies avoiding the unnecessary duplication of efforts. ABACC and the Agency shall meet to discuss safeguard's implementation and co-ordination matters as necessary and normally once every two years. Several co-ordination's meeting were held in the last three years. As result, ABACC and the IAEA agreed on Guidelines for Coordination of Routine and Ad-hoc Inspections. This document deals mainly with the coordination of ABACC and Agency on nuclear material measurements and on containment and surveillance activities. It is expected further improvement in the relationship of the two agencies at operational level since many activities still at present being unnecessarily duplicated.

6. Conclusions

ABACC is applying its safeguard's system in a way to balance conveniently the safeguard's effort depending on the relevancy of the concerned nuclear activity.

In principle, the regional system may contribute in many ways to enhance the safeguards, which can be summarized, as follow:

- the model of regional organization can reduce strongly the costs involved in safeguards implementation; ABACC for instance has a permanent technical staff of only 10 people, that have a coordination function, and may use conveniently the technical and human resources of the countries;
- the regional organization controls a small universe of facilities and materials and is not constrained by requirements of universality of procedures, as required in multilateral systems. It is therefore in better condition to maximize the verification procedures on those stages in the nuclear fuel cycle involving the production, processing, use or storage of nuclear material from which nuclear weapons could readily be made.
- the safeguard's criteria and procedure can be applied to each specific facility, since the number of nuclear facilities is not too large, and allows to increase substantially the efficiency and effectiveness of safeguards. For instance, there is no basic constraint for the definition of significant quantities or detection time;
- the mutual inspection model, as implemented by ABACC, allows to use the best available expertise in both countries. This makes possible to perform in each inspection the re-verification of the technical characteristic of installations and therefore to improve the safeguard's effectiveness.
- the implementation of the Bilateral and Quadripartite Agreements represented a considerable impact on the work load of the National Authorities and operators. To optimize the implementation of safeguards a close coordination between ABACC and the IAEA is required. While avoiding unnecessary duplication of efforts, each organization should be allowed to reach independent conclusions. For this purpose, ABACC and the IAEA should work jointly, whenever feasible, according to compatible safeguards criteria of the two Organizations.
- Considering the short time of implementation of the Quadripartite Agreement (3 years) and the first results of the cooperation between ABACC and the IAEA, which

are reflected in the agreed “Guidelines for the Coordination of Routine and Ad-hoc Inspections” between the Agency and ABACC, further improvement in the relationship of the two agencies is expected in the future.