BUILDING A SAFEGUARDS SYSTEM - ABACC'S EXPERIENCE

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Abstract

Since July 1992 the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) is applying a full scope safeguard's system in both countries - the Common System of Accounting and Control of Nuclear Materials (SCCC). A Quadripartite safeguard's agreement was signed between Argentina, Brazil, ABACC and the IAEA that entered into force in March 1994. After a brief description of the status of implementation of the SCCC and the type and quantity of facilities involved, an explanation of the procedures and basic principles used by ABACC for establishing safeguard's approaches and control measures is presented. Finally, the status of implementation of the Quadripartite agreement is summarized.

1. Introduction

The Bilateral Agreement between the Republic of Argentina and the Federative Republic of Brazil for the Exclusively Peaceful Use of Nuclear Energy /1/ is in force since December 1991. To verify the control's commitment of the Agreement the Brazilian-Argentine Agency of Accounting and Control of Nuclear Materials (ABACC) was created. The ABACC's objective is to apply a full scope safeguard's system in both countries, called the Common System of Accounting and Control of Nuclear Material (SCCC), with the purpose of verifying that all nuclear materials in all nuclear activities are not diverted to the manufacture of nuclear weapons or other nuclear explosive devices. The organization of ABACC and the characteristics of the safeguard's system have been described in previous papers /2,3/.

On March 1994 entered into force a Quadripartite Agreement among Argentina, Brazil, ABACC and the International Atomic Energy Agency. This Agreement, though similar to those based on the INFCIRC/153 model, takes into account the Bilateral Agreement and, therefore, the SCCC and ABACC. The Quadripartite Agreement called for a close coordination between the IAEA and ABACC that, while avoiding unnecessary duplication of efforts, shall allow each Agency to fulfill its responsibilities and to reach independent conclusions.

2. ABACC and the implementation of the SCCC

Table 1 describes the present situation of facilities and other locations in both countries.

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	5	3	8
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 reproc.research	-	1	1
LOFs analytical lab.	3	2	5
Other LOFs	11	7	18
TOTAL	39	31	70

Table 1: Facilities and LOFs in Argentina and Brazil

The Secretariat of ABACC started its operation in July 1992. The Initial Report on the inventories of nuclear material in all nuclear activities in each State Party was received on September 92. Considering that both countries had at that time nuclear material under IAEA safeguards (INFCIRC/66 type agreements), the Secretariat decided to concentrate the initial efforts on the nuclear material submitted only to the SCCC. A detailed description of the activities carried out during the second half of 1992 and 1993 has been presented in previous papers /2,5/.

The activities performed until March 1995 can be summarized as follow:

- Accounting: Initially, the records and reports system under use by the Parties was compatible with INFCIRC/66. The changing from the previous system to the new one foreseen in the SCCC (compatible with INFCIRC/153 type agreements) was made by steps and was fully implemented by March 1994.
- Design Information Verification: The examination and verification of almost all design information have been done and a process of updating and improving DIQs is under way.
- Inspections: Table 2 presents the number and type of inspections that were carried out by ABACC in compliance with their objectives.

Inspections	1992	1993	1994	1995*
DIQ Verification	6	11	73	3
Initial Inventory and interim verifications	5	24	113	21
Total number of inspections	11	35	186	24
Inspection efforts (persons-day)	114	373	1506	464

*up to April

Table 2: ABACC's inspections

A strong increase of the number of inspections took place during 1994 as compared with the previous year. This fact is due mainly to the Initial Report and DIQ verifications linked to the entered into force of the Quadripartite Agreement. It is foreseen a significant reduction of this figure for 1995.
- Technical Support: Portable equipment for inspection was procured by the end of 1992 and this initial inversion was expanded during 1993 and 1994, also a whole system for using metallic seals was implemented. Studies for the procurement of facility specific equipment started in early 1994, and in some cases a conceptual design was elaborated. The system for DA analysis was established based on a net of laboratories in both countries. In addition, reference material and standards both for DA and NDA were procured or developed. In order to verify the quality of the analysis of samples, a inter-comparison laboratory program was established.
- Training: A seminar for ABACC inspectors was carried out in each country in the second half of 1992, and in June 1993, a training course was organized by the Argentinean National Authority, supported by ABACC. Another training course supported by ABACC was organized in September 1994 by the Brazilian National Authority. These training activities were carried out mainly by experts from the National Authorities and ABACC with a significant support of lecturers from other countries (USA and France) and Safeguards Organizations (IAEA and EURATOM). In addition, a program of specific workshops started in 1994, the first one took place at a fuel fabrication plant in Argentina in February 1995. In this case under an action sheet of a cooperation agreement between the DOE (USA) and ABACC. Other training activities are planned for 1995 and 1996.
Planning and Evaluation: The evaluation of the results of inspection is continuously performed. The activities in this area were initially concentrated in the discussion of basic criteria and guidelines aimed at supporting design verification and inspections. During 1993 started the negotiations of Application Manuals (equivalent to the Facility Attachment), process that was interrupted in 1994 in order to accommodate the coordination with the IAEA. The drafting of 24 facility attachments, the initiation of discussion on the coordination of activities with the IAEA, and bilateral and trilateral discussions on "ad hoc" procedures for the enrichment facilities, were the main activities done in 1994. The coordination of activities, discussions on "ad hoc" safeguards procedures with the IAEA and the negotiations of facility attachments play at present a central role in this area.

3. ABACC's procedures and basic principles

The General Procedures of the SCCC are a set of criteria and procedures applicable to all nuclear materials in all nuclear activities aimed at the timeless detection, with a reasonably degree of certitude, of any diversion of significant quantities of nuclear materials to the manufacturing of nuclear weapons or nuclear explosive devices.

To be able to fulfill its responsibilities, and considering the basic concepts - significant quantities, timeliness detection and reasonable degree of certitude - ABACC is applying the criteria and procedures established in the SCCC as well as additional criteria and procedures as needed to define the specific technical criteria and safeguard measures to be applied for the control of a given nuclear material at a given facility.

The criteria adopted by any Organization are the natural consequence of its operational experience. Therefore, for the time being, and during this stage of implementation, ABACC also is using as references the criteria or guidelines of other organizations (IAEA and EURATOM).

In the context stated above, the safeguards' basic criteria and procedures that are employed by ABACC do not constitute a rigid set of rules. Each specific case is studied and a set of suitable specific technical criteria and control measures are established, taking into account also the characteristics of the nuclear activities in each country. This approach, although time consuming, shall allow ABACC to gain experience and to introduce modifications when necessary. In addition, this also allows the incorporation of new safeguard technologies, at present in development, that seems could have a considerable impact in increasing the effectiveness of safeguard.

Diversion strategies are formulated, considering inter alia the diversion of declared material, the use of diverted material in an eventual undeclared facility, the introduction or change in the composition of undeclared material and concealment methods. For each specific case goals are defined and an evaluation is made of diversion hypothesis, diversion paths (and countermeasures), and diversion rates (both abrupt and protracted diversions are considered). Additionally, the actual or potential relations of the facility under study with other facilities are taken into account.

As usual, the ABACC safeguard's approach is based, in general, on the verification of the operator's declarations, in particular on physical inventory and inventory changes during a material balance period, using containment and surveillance as supporting means.

The level of control for each facility, that includes the inspection frequency, is established considering the following variables: characteristics of the facility, category of the nuclear material (taking into account the relevance of the isotopic composition), conversion time, inventory and production time (linked to the facility throughput). In addition, the quality of the measurement system, the application of containment and surveillance and the material accessibility are factors that could affect the inspection frequency or the inspection's scope.

Inspection's goal quantities are usually established considering the type of facility (item or bulk) and the maximum inventory, or the throughput.

The intervals of time between inspections are established considering the nuclear material production time, the conversion time and the safeguards approach for each facility. In addition, ABACC systematically carries out re-verifications of the validity of the design information.

The first evaluation of the result of an inspection is performed by the inspector's themselves. The inspection's report shall contain their comments and conclusions about the verification activities, including judgments about the appropriateness of these activities and even on the safeguard approach as well as recommendations on resolved and unresolved discrepancies. The inspectors shall also recommend additional actions when necessary. For ABACC, this is a fundamental stage in the control system and requires tecnnical knowledge and judgment capacity of the inspectors. Since the beginning, ABACC has been fully aware of the key role played by well trained inspectors in the field. This non-quantifiable aspect of safeguards has been clearly pointed out by Kloeckner and Schenkel /7/.

A second level of evaluation is performed in ABACC's Headquarters, that includes the overall evaluation of the inspection report/results, and has basically two purposes:

(i) To evaluate the material balance for a given period, specially in case of relevant bulk facilities, through the known methods (MUF evaluation, MUF-D, etc.).

(ii) To analyze the conclusions about the verification activities for an individual MBA in the context of the conclusions obtained from other MBAs, specially in case of MBAs that have a close relationship, and globally for each country.

Following these evaluations the National Authority is notified about the conclusions of the verification activities.

When justified, for a given period of time, an in deep evaluation of consistency is made for a given facility, taking into account inspection reports and results, accounting reports, characteristics of the facility and the fuel cycle.

All discrepancies are followed up immediately, with an urgency that is a function of the type and quantity of the nuclear material involved and the strategic importance of the facility (or facilities) concerned. Unresolved discrepancies could constitute an anomaly and in such a case it is triggered a specific sequence of actions. An anomaly is reported to the ABACC's Commission.

4. The SCCC and the Quadripartite Agreement

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 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.

There is a 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: a) the need to reach its own independent conclusions, b) 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.

Considering the description made in this paper, it can be concluded that there are no basic incompatibilities between the criteria followed by both Agencies. Differences that could arise in some specific cases should not constitute difficulties either to fulfill their responsibilities or to coordinate their activities avoiding the unnecessary duplication of safeguards efforts.

5. Status of implementation of the Quadripartite Agreement

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 team of inspectors working in both countries. By March 1995 practically al the initial inventory has been verified.

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. Some drafts of facility attachments were already distributed by the IAEA to ABACC and the State Party concerned and the first negotiation meetings are scheduled for the second half of June this year. ABACC has already provided to the IAEA a proposal of draft of facility attachments for almost all facilities and LOFs not previously under IAEA safeguards.

After the verification of the Initial Report, a routine regime of "ad hoc" inspections is being 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 will allow an effective application of safeguards by both Agencies avoiding the unnecessary duplication of efforts. In this sense, in February 1995 was held in Vienna the first coordination meeting. As result, a draft of the first guidelines for the coordination of safeguards activities (non duplication of surveillance equipment, sealing on nuclear material, etc.) was discussed.

6. References

/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.

/2/ A. Biaggio, O. Mafra, M. Marzo and R. Nicolas, "A Good Nuclear Neighbors Relationship", Proceedings of the 15th ESARDA Annual Symposium, Rome, Italy, May 1993, EUR 15214, ESARDA 26, p.163-165.

/3/ M. Marzo, A. Biaggio and A. Raffo, "Nuclear Co-operation in South America: The Brazilian-Argentine Common System of Safeguards", IAEA Bulletin, 3/1994, p.30-35, Vienna, 1994.

/4/ 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.

/5/ J. Coll, "The Role of a Regional Organization in the Application of Safeguards - the Example of ABACC", Proceedings of International Nuclear Safeguards 1994: Vision for the Future, Vienna, 1994, IAEA-SM-333/204, vol. 1, p.71-79.

/6/ Procedimentos Gerais do Sistema Comum de Contabilidade e Controle de Materiais Nucleares (SCCC). ABACC, junho 1994. (available in Portuguese and in Spanish).

/7/ Schenkel, R. and Kloeckner, W., "The role of non-quantifiable aspects in nuclear safeguards", Proceedings of the 13th INMM Annual Meeting, Scottdale, Arizona, USA, July 18-21, 1993.