REGIONAL SAFEGUARDS ARRANGEMENTS: THE ARGENTINA-BRAZIL EXPERIENCE

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Abstract

A Common System of Accounting and Control of Nuclear Material (SCCC) was established by Argentina and Brazil in July 1992. It is a full scope safeguard's system in both countries. The Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) was created to apply the SCCC. The main elements of the SCCC are presented. The main safeguards' procedures are described. A brief discussion of the inspection methodology and its impact for facility operators is performed. The safeguard's implementation from the operator's point of view is commented, taking as example a fuel fabrication plant in Argentina and a uranium enrichment plant in Brazil.

1. INTRODUCTION

The Agreement between the Republic of Argentina and the Federative Republic of Brazil for the Exclusively Peaceful Use of Nuclear Energy [1] 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.

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 safeguards system that is being applied in both countries 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.

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 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 a complex safeguards system with its several interfaces - IAEA, ABACC, National Authorities and Operators - requires a great effort and cooperation of all parties involved. This paper describes the status of this implementation, emphasizing its relevant aspects for nuclear fuel cycle facilities.

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 only able to fulfill their 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.

As the Quadripartite Agreement demands a close coordination between the IAEA and ABACC, which, while avoiding unnecessary duplication of efforts, shall allow each Agency to fulfill its responsibilities and to reach independent conclusions, coordination meetings have been made between the two Agencies at the planning level. With this objective the "Guidelines for the Coordination of Inspection Activities between the Agency and ABACC" were agreed and are being applied. For example some equipment, either for being already installed at the facilities or rarely used or very expensive, must be shared between the two Agencies.

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

3. THE ABACC INSPECTORATE

The inspections are performed on a cross national basis; Argentine 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 on 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.

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 aspects can be highlighted:

- 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 a consequence, the verification that the facility is operating as declared initially by the operator is more effective.

- A facility operator who performs an inspection in the other country will understand better the difficulties of the safeguards 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 a consequence, the people involved in the various applications are known 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 for 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 a consequence, a considerable fraction of the inspection effort is expended at the ABACC Headquarters.

4. INSPECTION 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 the operator's measurement system;

- Discrepancies and/or anomalies follow-up;

- Preliminary material balance evaluation;

- Verification of design information as necessary.

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

The samples collected by the inspectors during the inspection are analyzed on 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 in the field, and they try wherever possible to solve the pending problems immediately. 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. In order to study the impact of the safeguards activities on the facility operation, it is important to observe the inspection effort for some relevant installations. As examples considered in this paper, one considers the fuel fabrication plant in Argentina (CONUAR) and the centrifuge enrichment plant in Brazil (LEI). In CONUAR, ABACC normally performs one PIV and 3 interim inspections per year with a total inspection effort of 21 PDI.

LEI is a small centrifuge enrichment plant, whose safeguards approach is complex, essentially due to the verification that the facility is operating as declared. In order to verify the inventory and internal and external flow of material, ABACC is performing one PIV and 5 interim inspections per year. Additionally, ABACC performs 3 unannounced inspection per year. The total inspection effort amounts to approximately 30 PDI.

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

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

The main direct inspection costs are: travel (air fare, per diem, and associated expenses); salaries of inspectors while on duty travel and for performing inspection-related duties at ABACC Headquarters (This cost is covered directly by the Countries); destructive analysis of samples taken during the inspections, including the transport costs; NDA equipment, including maintenance and spare parts; Containment and surveillance equipment, including spare parts and maintenance, production and verification of seals, associated duty travel and staff salaries. In addition, one shall consider all costs connected with the inspection efforts, i.e. management, negotiations, data processing, evaluations, etc. Currently, ABACC has 10 staff members in the professional category, 2 administrative officers and 7 staff members in the service category.

5. IMPACT OF THE CURRENT SAFEGUARDS ACTIVITIES ON THE FACILITY OPERATION

5.1. The Brazilian point of view

Before the SCCC implementation, Brazil had 2 safeguards agreements: INFCIRC/110 (Brazil-IAEA-USA) and INFCIRC/237 (Brazil-IAEA-Germany). Both follow the guidelines of the old safeguards system (INFCIRC/66.Rev2). Nuclear material should be submitted to safeguards, if it is being or has been: supplied under the agreement(s), produced, processed or used in a facility that has been supplied under the agreement(s), or produced in or by use of safeguarded nuclear material.

When the SCCC began to be implemented, several changes occurred. All the nuclear material in the country came under the control of this system, provided it had the composition and purity suitable for fuel fabrication or for isotopic enrichment. Consequently, there was an increase in the work demand. All the facilities submitted the Design Information Questionnaire (DIQ) to ABACC. The facilities already under safeguards of the old agreement reviewed and updated the information adapting to the new DIQ format, and the other facilities had to prepare a new document.

A new reporting system was adapted using the documents Inventory Change Report (ICR), Material Balance Report (MBR) and Physical Inventory Listing (PIL). The accounting records had to be modified to comply with the new rules and conventions of completing the updated reports. As a result, it was necessary for the National Authority to develop a standard General Ledger for all nuclear facilities, to comply with the reporting system, in addition to allowing to sent the reports to ABACC through information technology.

Significant efforts were made in order to optimize, standardize and automate the accounting systems, of Brazilian nuclear facilities. The nuclear facility operator training, has successfully been aimed at implementing a unified system. This made it possible for the National Authority to have efficient control and fulfill deadlines agreed upon by ABACC and the Agency regarding the presentation of accounting reports.

The Initial Physical Inventory Taking (PIT) of all nuclear facilities was established. Subsequently, inspections of Physical Inventory Verification were carried out by ABACC. There was a need for the facilities to establish or to improve a system of measurements to determine the quantities in the inventory of nuclear material and the variations for each material balance area.

Regarding the notifications of exports, imports and transfers between Argentina and Brazil, new rules have been established in the SCCC and in the Quadripartite Agreement, obliging the facilities to send Annual Operational Programs to both agencies. The date that the physical inventory is to take place must be stipulated and communicated. Because of all the new measures of the SCCC, both the Brazilian National Authority and the facility operator have had to increase man power in order to carry out all the commitments.

A Case Example: The Uranium Enrichment Plant in Brazil

In the development of the nuclear fuel cycle, Brazil has opted for the uranium enrichment centrifugation method. The process of research and development has been carried out by the Brazilian Nuclear Energy Commission (CNEN) and the Brazilian Navy since the early 80's. The Isotopic Enrichment Laboratory - LEI, began to operate in 1987 for testing centrifuges in cascade mode. The laboratory has three small cascades operating independently with a reduced inventory of about 0.2 significant quantity. In 1989 the enrichment laboratories came under the National Safeguards control. The national inspections are carried out by the Safeguards Division of CNEN.

Before the creation of ABACC, a group of Argentinean and Brazilian experts from the enrichment and safeguards areas, was created to develop a safeguards approach for enrichment facilities in both countries. A preliminary project of nuclear material control for LEI was prepared taking into account the technological and commercial secrets involved. The separative work capacity of each centrifuge and its physical and structural aspects are considered to be secret. Consequently, the cascades are surrounded by panels to avoid the machines being observed. In addition to this, inspectors are not permitted to identify the cylinders connected to the feed and withdraw stations, as this data would allow to determine the centrifuge separative work capacity. When ABACC started its operation, the group of experts was designated group of consultants of ABACC.

LEI constitutes one Material Balance Area (MBA); during the PIT the process operation is interrupted and all nuclear material transferred to the storage area. The feed cylinders cannot be connected to the process before they are made available for verification; the product and tails cylinders cannot be shipped out or blended before they are made available for verification. ABACC verifies the operator total uranium and U-235 mass balance. As the operator considers the individual cascade capacity a sensitive information, the mass balance is evaluated for the whole laboratory. ABACC performs 4 to 6 interim inspection per year. During the interim inspections, ABACC will verify the flow of nuclear material. The operator undertakes to present during the interim inspection for ABACC verification (i) the UF_6 that will feed the facility during the time until the next inspection, and the UF_6 product and tail produced since the last inspection. So the operator prepares a kind of buffer, i. e. a temporary UF_6 storage of all material processed or to be processed in the facility in the period between two inspections (in general two or three months). These activities will be supported by a C/S System, that confirms that only verified feed cylinders are connected to the F/W stations. Further, ABACC considers a frequency of three non-announced inspections (LFUA type) per year to the cascade's area to verify that there are no additional feed or takeoff points inside the cascade area, no UF_6 containers are present and no connections between the cascades. The inspector's access may be delayed not more than 2 hours after official request for it. When the Quadripartite Agreement (INFCIRC/435) entered into force, the IAEA adopted the same methodology as ad-hoc procedures. Currently a safeguards approach for LEI is being negotiated between ABACC, the IAEA and Brazil, the main difficulty being the scenario of accumulation of nuclear material behind the panels. Alternatives of control are being studied such as a perimeter control approach and the development of non-destructive measurement for detecting nuclear material behind the panels. In the framework of Program 93+2, Part 1, the Agency performs periodically environmental sampling at LEI.

5.2. The Argentinean point of view

A case example: The Fuel Fabrication Plant

The fuel cycle in Argentina has been designed to cover the requirements of the On-Load Nuclear Power Plants using natural or 0.85% enriched uranium fuel elements. The CONUAR S.A. Fuel Element Fabrication Plant with its three fabrication lines (Atucha type natural and enriched uranium fuel elements, and natural uranium Candu type), is where the whole line of fuel elements

required by Atucha and Embalse Nuclear Power Plants is fabricated, using as raw material the uranium oxide produced at Cordoba's Conversion Plant.

CONUAR is located at the Ezeiza Atomic Centre, in the outskirts of Buenos Aires; the Atucha-I Nuclear Power Plant (NPP) is located in Lima about 100 km from Buenos Aires; the Embalse NPP and Córdoba Conversion Plant are located in different points of the Córdoba Province, at a distance of 800 km from CONUAR. From a point of view of safeguard's application, these installations are very narrowly related. In the Candu Reactor, fuel elements imported by CONUAR are also being used.

In the Southern part of the country, at a distance of 2000 km from Buenos Aires, the Uranium Hexafluoride Conversion Plant is located, that uses as raw material UO_2 natural powder. For this reason it is entailed to CONUAR.

In CONUAR all metallurgical processes required for obtaining the oxide uranium sintered pellets and the fuel elements assembling are performed. In the particular case of Atucha's fabrication line, as long as the new Atucha type fuel fabrication with enriched uranium is not completed, it is working alternatively with natural and enriched uranium at 0,85%, depending on the requirements.

Safeguards approach and implementation experience

For the nuclear material control, CONUAR works as one material balance area, in which an annual Physical Inventory Verification (PIV) inspection is performed. Interim inspections for the verification of inventory changes are also performed. The pellet loading station is controlled to detect the diversion of nuclear materials into the MUF through the evaluation of the material balance equation.

Likewise, to cover the scenario of material borrowing, simultaneous random inspections to the UO_2 powder storage in the fuel element fabrication plant are performed, due to the PIV in the Cordoba Conversion Plant or in the UF_6 Conversion Plant at the Pilcaniyeu Complex, or to the fuel elements storage, due to the PIV in the NPP's. During the PIV in CONUAR, simultaneous inspections in some of the above mentioned facilities are foreseen.

From the operator's and National Authority's point of view, the safeguards application implies to take the necessary and appropriated control measures to minimize the impact in the facility's normal operation. Particularly in relation with the PIV inspections, the following has been observed:

a) The need to interrupt production;

b) Some materials are not fully accessible for verification;

c) Lost of Quality Assurance of items selected for verification (fuel elements already assembled); and

d) Large number of national inspectors is necessary for the simultaneous inspection of the Fuel Fabrication Plant and others in order to satisfy the borrowing criteria.

The interim inspections for the verification of national and international transfers, of other inventory changes and of other strategic points have also an impact on the facility's operation and appropriated actions are required to minimize it. In general, the following must be considered:

a) The need of advanced notification;

b) The eventual lost of Quality Assurance of the fuel elements;

c) Compatible criteria of the international control organizations (ABACC, IAEA) to perform the verifications; and

d) Difficulties on the verification of the pellet loading station for operative reasons.

To minimize the impact of the facility shutdown and the partially accessible material, the physical inventory taking (PIT) is performed together with the National Authority, starting with the homogenization, pressing and sintering sectors. These are under normal operational conditions, since previously the UO_2 amounts required to keep them functioning are reserved and the rest of the installation is shutdown. The activity starts with the records audit and goes on with the inventory taking of the UO_2 powder, of fuel elements ready for transfer, of fuel rods, and of pellets at loading stations. The PIT ends in the press, homogenization and sintered zones, whose operation is finally interrupted until the verification by the IAEA and ABACC are performed. The inventory so established and the information from the homogenization operational records allow to estimate the amount of material partially accessible and the Material Unaccounted For (MUF) of the facility. If the values result unusually high and exceed the acceptable limits for a PIV, the National Authority requires the homogenization's total discharge, although such operation will considerably delay the Plant re-start. The ABACC's and IAEA's verifications start in this area and follow an inverse course in order to liberate the plant as soon as possible.

The verification of fuel elements contained in shipping containers requires the opening of some boxes and the handling of fuels for identification and measurements. In this occasion the quality assurance granted by the manufacturer could be lost. This is especially conflictive in the case of imported fuel. In this case, the nuclear material verification (with the present methods) could produce a prejudice to the fuel fabrication plant in case of an eventual posterior rejection by the installation.

The simultaneous inspections to cover the scenario of the nuclear material borrowing result practically in short-notice inspections, with approximately 12-hours notice for distant facilities. This requires a fast logistic co-ordination and the availability of national inspectors.

In relation with the verification of domestic transfers, the methodology applied by the IAEA requires the presentation of a detailed operational program with the dates on shippings and receipts to allow the planning of such inspections. Usually, such a program is not available within the previously required time and, besides that, for contractual reasons, last time changes are very frequent. This forces a permanent program updating, but under some circumstances it is not possible to notify in advance as required (~4 days).

To validate the verification of the shipment at the conversion plant as well as the receipt at the fuel fabrication plant, the IAEA seals the containers at the shipping facility and verifies the seals at the receiver facility. If a container seal is broken during the transport, the IAEA verifies 100% of the material contained in this container and verifies the rest of the population with an average detection probability for gross and partial defect for natural uranium, or with an average detection probability for gross, partial and bias defect for enriched uranium.

In the case of fuel element transfers, due to the Quality Assurance reasons before mentioned, the shipping cask is sealed at the shipping facility and the fuel elements are verified at the NPP with an average detection probability for gross defect for natural uranium, and with an average probability for gross and partial defect for low enriched uranium. Since the IAEA current criteria do not require the verification of fuel element receipts at OLRs, this practice normally generates an additional safeguards activity in the NPPs.

The nuclear material involved in domestic transfers is verified with another methodology by ABACC. During the PIV and interim inspections, ABACC verifies the material received since the previous inspection and the material expected to be transferred until the next inspection. Although this methodology is appropriate for the stratum of UO_2 powder and fuel elements of the Atucha type, the Candu fabrication line works with a very small accessible stock material. For this reason, to verify the stock could be necessary to open the boxes with the consequent eventual loss of Quality Assurance and the generation of additional costs. A similar problem occurs with imported materials.

The differences between the two organizations in the verification of transfers introduce problems in the co-ordination of inspections and, in some cases, two different inspections are performed simultaneously in the same facility.

In some interim inspections pellet sampling is performed at the pellet loading station. As the Atucha line alternates campaigns of natural and enriched uranium, the verification of this strategic point requires an appropriate planning from the control organizations and a periodic updating of the operative program.

Proposed Solutions

To decrease the impact of inspections due to the borrowing scenario, the National Authority has recommended the simultaneous PIT in all conversion and fabrication facilities. Simultaneous inspections to the NPPs are also foreseen, when the fresh fuel inventory is higher than a significant quantity. This procedure has been applied for the second consecutive year and it diminished the interference with the plant's operation, has improved the co-ordination between control organizations and has allowed to rationalize costs for the National System of Accounting for and Control of Nuclear Materials.

The problems related to quality assurance of national or imported packaged fuel that has to be verified have been temporarily solved by the application of seal in CONUAR and the posterior verification at the NPP. A final solution to this problem that should contemplate the operational constraints of the facility and the PIV's requirements, needs the implementation of non-destructive methods for the verification of material contained in a transport container and the modification of the present safeguards criteria.

The problems related to the verification of domestic transfers and the possible solutions are still being studied. The goal is to minimize the need of advance notifications, to optimize the inspection's effort associated with these verifications, to improve the co-ordination between ABACC and the IAEA and, fundamentally, to minimize intrusive practices in the facility operation.

It shall be mentioned that the inspection effort to the initial part of the nuclear fuel cycle in Argentina is significant. The new safeguards measures should allow more efficiency in safeguards application without decreasing, rather incrementing, its effectiveness. For this objective it seems to be important to revise the safeguards approaches and criteria for the facilities involved, as well as strengthening measures, including other measurement methods.

6. CONCLUSIONS

ABACC is applying its safeguards system in a way to balance conveniently the safeguards 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 safeguards criteria and procedure can be applied to each specific facility, since the number of nuclear facilities is not too large and allows for a substantial increase of 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 it possible to perform in each inspection the re-verification of the technical characteristic of installations and therefore to improve the effectiveness of safeguards.

From the Brazilian and Argentinean points of view expressed in this paper it may be concluded that 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.

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