ABACC's NUCLEAR MATERIAL ACCOUNTANCY

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ABSTRACT

In December 1991, the Agreement between Brazil and Argentina for the Exclusively Peaceful Uses of Nuclear Energy entered into force. The agreement, inter alia, determines the control on all nuclear materials in all nuclear activities in both countries. To verify this commitment, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) was created and the Common System of Accounting and Control of Nuclear Materials (SCCC) established.

The Secretariat of ABACC started its operations in July 1992 and, almost immediately, began to receive reports on the inventories of nuclear material present in all nuclear activities of each State Party.

The Quadripartite Agreement, signed among Argentina, Brazil, the International Atomic Energy Agency (IAEA) and ABACC, entered into force on 4 March 1994. It is essentially a comprehensive safeguards agreement, based on the INFCIRC/153 model with some modifications due to the existence of the SCCC and the role of ABACC as a binational organization.

On 30 April 1994, ABACC sent the Initial Report to the IAEA and began the routine submission of the accounting reports in the format foreseen in Code 10.

Early in the beginning of its operations, ABACC started to develop its automated accounting system for Personal Computers. For this purpose, the structure of the data base was established and the programs were implemented using, at first, DBase III Plus and changing progressively to the Fox Pro for Windows.

The programs implemented showed to be satisfactory to fulfill the task of ABACC related to nuclear material accountancy. The main functions of this program and the improvements that will be developed in the next future are described.

Some characteristic of the ABACC's safeguards system, from the point of view of nuclear material accountancy, are showed.

I. INTRODUCTION

ABACC's characteristics, legal basis and implementation are summarized in this section[1-8].

A. The Bilateral Agreement

The Agreement for the Exclusively Peaceful Uses of Nuclear Energy, by means of which a control of all nuclear materials in all nuclear activities in both countries is established, was signed by Brazil and Argentina in Guadalajara, Mexico, on 18 of July 1991, and entered into force on 12 of December of the same year.

To verify the commitments of the Agreement, the and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) was created to administer and apply the SCCC.

B. The Common System of Accounting and Control of Nuclear Material

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 are not diverted to uses not authorized by the agreement.

Besides the Bilateral Agreement, the main documents that define the SCCC are the General Procedures and the

Application Manuals. The General Procedures specifies the basic criteria and the requirements of the SCCC and consists of nine chapters and two annexes. The Application Manuals are similar to the IAEA's Facility Attachments.

C. The Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC)

ABACC headquarters are located in the City of Rio de Janeiro, Brazil, as established by the Bilateral Agreement. It started its work in July 1992 in the premises facilitated by the Brazilian Government. The Agreement endows ABACC characteristics of an international organization and its employees assume the status of international staff. Their privileges and immunities are established in an additional protocol to the Bilateral Agreement, in the corresponding Headquarters Agreement signed with the Government of Brazil, and in a special Agreement signed with the Government of Argentine.

The principal functions of ABACC are the following:

- to monitor the functioning of the SCCC;
- to prepare a list of duly qualified inspectors from among those proposed by the Parties to carry out the inspections tasks,
- to designate, from among those included in the list, the inspectors who will carry out the inspection tasks necessary for the implementation of the SCCC, taking into account that the inspectors who are nationals of one of the Parties should carry out inspections at the facilities of the other Party, and to instruct them in the performance of their duties;
- to approve the General Procedures and the Implementation Manuals, after their negotiation with de National Authorities',
- to perform the necessary activities for implementation and administration of the SCCC;
- to inform the Party concerned of any anomalies which may arise in the implementation of the SCCC; that Party shall then be obliged to take the necessary measures to rectify the situation;
- to inform the Parties of the non-compliance by one of the Parties of the commitments made under the Agreement.

The organs of the ABACC are the Commission, its governing body consisting of four members appointed by the Parties, and the Secretariat, its executive body.

The technical unit of the Secretariat is structured in four areas of responsibility, each one consists of two professionals. The Accounting area is responsible for accountancy, reporting, data processing and informatics; the Planning and Evaluation area is responsible for safeguards approaches, preparation and negotiation of Application Manuals, and data evaluation; the Operations area is responsible for planning and performance of the inspections, convocation and instruction of inspectors; and the Technical Support area is responsible for instruments, measurement methods and techniques, and containment and surveillance logistic.

The present team of inspectors adds up to around thirty five inspectors from each Party. They are professionals from the safeguards area, employees of the national safeguards authorities, or from other areas such as methods and techniques, design and operation of nuclear installations who work for other official organizations.

The present annual budget of ABACC amounts to US$ 2.8 million, equally provided by the Parties. This amount does not include the inspectors salaries which are paid directly by the countries.

D. The Quadripartite Agreement

The Argentina-Brazil-IAEA-ABACC (Quadripartite) Agreement was signed on 13 December 1991, and entered into force on 4 March of 1994. It is essentially a comprehensive safeguards agreement, based on the INFCIRC/153 model with some modifications due to the existence of the SCCC and the role of ABACC as a binational organization. Some of them are in the Agreement's text itself, but there is a Protocol to the Agreement that details the relationship IAEA-ABACC.

The General Part of the Subsidiary Arrangements was negotiated and approved by the parties and entered into force on the same date as the Agreement. It assigns ABACC an active role in the implementation of the Agreement.

II. NUCLEAR MATERIAL ACCOUNTANCY

A. Automated Accounting System

From the beginning of its operations, ABACC started the development and immediate implementation of its automated accounting system for Personal Computers, since accounting reports were received from the States almost simultaneously with the implementation of ABACC itself. Taking into account that during most of the implementation period (until June 1994) there was only one professional assigned for ABACC's accounting

unit, the development of the system was absolutely necessary to fulfill the objectives of the unit.

ABACC's data base must comply with the following requirements:

•be structured in accordance with the reporting system established in the Annex I of the SCCC's General Procedures, that is compatible with Code 10.

•be sufficiently flexible to allow the processing of data in other different formats (ABACC initially received reports in five different formats)

•be able to provide in an effective and fast manner the information requested by other units of ABACC

•be able to match shipments to and receipts from the MBAs

•be rapidly implemented since ABACC began to receive the accounting reports from the States almost simultaneously with its establishment.

With these premises, the first version of the nuclear material accounting program was written using DBase III Plus and then changing progressively to the Fox Pro for Windows.

Table 1 shows the main functions of this program and the improvements that will be developed in the near future.

The program developed has shown to be satisfactory to fulfill the objective of ABACC as far as nuclear material accountancy is concerned. At present, it needs to be operated by someone with a good knowledge on nuclear material accounting, but with the improvements to be implemented in the future no special skill in this subject will be needed.

B. Nuclear Material Accounting Activities

The first activities in nuclear material accounting began with the reception, in the beginning of September 1992, of the Initial Report on the inventories of nuclear material (as of 30 June 1992) present in all nuclear activities of each State Party.

Since then and until the entry into force of the Quadripartite Agreement (from September 1992 to March 1994), ABACC processed 3170 lines of records concerning inventory changes informed by Brazil and Argentina through its accounting reports. From this total, 1254 lines referred to nuclear material subject also to other Safeguards Agreements of the States with the IAEA. During this period, ABACC programmed a gradual transition (by groups of facilities) from the reporting formats in use until then in the countries, to that foreseen in the SCCC (used under INFCIRC/153). At the end of 1993, all material balance areas (MBAs) submitted only to SCCC were reporting according to the new system, the whole process being completed by March 1994. This proved to be of great importance, since as early as from the following month of the entry into force of the Quadripartite Agreement, the Agency could receive the accounting reports in the format foreseen in Code 10, in which no important mistakes have been observed (about 2% of the total entries sent to IAEA), notwithstanding the great difference in respect to the previous system used in both countries.

Once the Quadripartite Agreement entered into force, ABACC sent the Initial Report (as of 31 March 1994) to the IAEA on 30 April 1994.

From April 1994 to August 1995, ABACC received 728 reports from the States Parties relating to the months of April 1994 to July 1995 and processed 6862 lines of data, corresponding 2566 to inventories changes (around 160 inventory changes per month). It is interesting to point out that 70% of these inventory changes are domestic transfers of which almost 70% are transfers of less than 0.01 effective kilogram and only a 1.2% of more than 1 effective kilogram.

Table 2 presents the number of Facilities and Locations Outside Facilities (LOFs) grouped by type or area, that are under ABACC safeguards. Only 20% of these facilities/LOFs have a nuclear material inventory of more than 1 effective kilogram.

Table 3 shows, for each type of facilities or LOF, the percentage in relation to:

•the total number of facilities and LOFs,

•the total entries of accounting reports,

•the total of ABACC nuclear material inventory (calculated in effective kilograms).

From Tables 2 and 3 it is possible to make the following remarks:

•Although the nuclear power generation area have only about of 9 % of the number of facilities and accounting entries they have more than 99 % of the total nuclear material inventory of the ABACC's safeguards system,

• On the other hand, the LOFs , with less than 0.1 % of the inventory, are almost half of the total number of facilities and generate a quarter of the entries of the accounting records,

•The research reactor area has the higher number of accounting entries with only 0.5 % of the inventory,

•The enrichment area produce the higher number of accounting entries per facility.

III. CONCLUSIONS

The development of an automated accounting system of nuclear material for Personal Computers was made possible in a considerable short time. The program developed has shown to be satisfactory to fulfill the objective of ABACC as far as nuclear material accountancy is concerned.

The procedures followed by ABACC since it started its activities, in order to use accounting report formats compatible with Code 10, allowed that the reports sent to the IAEA after the Quadripartite Agreement entered into force, had no significant number of mistakes.

From nuclear material accounting point of view, it is possible to conclude that:

- the majority number of ICR entries refers to domestic transfers with no significant amount of nuclear material involved, and
- the area with the great majority of the nuclear material inventory (Nuclear Power Generation) generate a reduced number of accounting entries.

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TABLE 1: ABACC'S NUCLEAR MATERIAL ACCOUNTING PROGRAM

MENU ITEM	MAIN FUNCTION AT PRESENT	IMPROVEMENTS
INPUTS	-data input (manually or in magnetic media) -partial checking of the fields based on the code 10 provisions	-full checking of the fields based on Code 10 provisions -full checking of the fields based on the Design Information Questionnaires and Facilities Attachments' terms
MBA INVENTORIES	-calculating the nuclear material inventory for all categories for a selected MBA and date, based on the inventory change reports (ICRs) received by ABACC. It is possible to consider each country as an unique MBA.	
INVENTORY CHANGES	-listing all the inventory changes after a given day ordered by date and grouped by element category of nuclear material present at the selected MBA.	-listing and totaling the inventory changes for a given period, category of nuclear material and MBA -listing and totaling the inventory changes of a selected type for a given period, category of nuclear material and MBA
EDITION	-editing a previous data entry in order to revise, and to correct, if necessary, the inputs. It is not possible to delete an entry (this function is reserved to the administrator of the system)	
MATCHING	-matching between the shipments and receipts from the MBAs. This matching is made by the program but need to be confirmed by the operator of the system.	-requiring the confirmation of the matching only in case of doubt.
REPORTS ENTRIES	-giving the number and the period of the last report entered into the database for a selected MBA.	-giving a complete statistics of the accounting reports entered into the data base including the promptness from the point of view of SCCC and the INFCIRC/435 time limits. -generating ICRs, material balance reports (MBRs) and physical inventory listings (PILs) in the proper format for transmission to the IAEA by magnetic media.
MBR	-generating from the inventory changes reported, a Material Balance Report for a given period, element category and MBA. It is possible to consider each country as an unique MBA.	-generating a report with the discrepancies between the MBR and PIL reported -generating a report with the discrepancies between the MBR reported and the MBR generated by the system based on ICRs
EXIT	-asking to make a backup of the data base before exit the program.	

TABLE 2: NUMBER OF FACILITIES OR LOFs GROUPED BY TYPE OR AREA

TYPE/AREA	ARGENTINA	BRAZIL	ABACC
Nuclear Power Generation Area			
-Conversion Plants	1	0	
- Fuel Fabrication Plants	1	1	
-Power Reactors	2	1	
Total	4	2	6
Research Reactors Area			
-Conversion Plants	3	0	
-Fuel Fabrication Plants	2	1	
-Reactors/Critical/Sub critical	5	7	
-Storage	2	0	
Total	12	8	20
Enrichment Area			
-Conversion Plants	1	0	
-UF6 Production/Destilation	1	2	
-Enrichment Facilities	1	2	
-Storage	0	1	
Total	3	5	8
Others Research Facilities	1	2	3
Others Storage Facilities	1	1	2
Others LOFs	18	13	31
TOTAL	39	31	70

TABLE 3: ABACC'S NUCLEAR MATERIAL ACCOUNTANCY STATUS

AREA	% of Total Number of Facilities and LOFs	% of Total Entries of Accounting reports	% of Total Nuclear Material Inventory (in Effective kilograms)
Nuclear Power Generation	8.6	9.0	99.11
Research Reactors	27.1	32.0	0.55
Enrichment	11.4	23.1	0.21
Others Research Facilities	2.9	3.6	0.07
Others Storage Facilities	4.3	5.8	0.01
Others LOFs	45.7	26.5	0.05
TOTAL	100.0	100.0	100.00