

# Current status of the implementation of SNRI regime in ABACC Regional System

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## ***Abstract:***

*During 2006, ABACC and IAEA have been discussing the conditions to initiate the application of a Short Notice Random Inspections (SNRI) regime, in January 2007, in Argentinean and Brazilian fuel fabrication and conversion facilities. The main objectives of this new safeguards regime is to achieve 100% coverage of the nuclear material transfers term of the mass balance equation during the material balance period, to confirm that the facilities are operating as declared and to make internal and external borrowing scenarios and abrupt diversion of nuclear material more susceptible to be detected through the introduction of randomized interim inspections and simultaneous physical inventory verifications. In addition, during these random interim inspections traditional activities required in the safeguards criteria, such as the verification of strategic points, the operator's measurement system assessment and records and reports auditing will take place.*

*The introduction of this new safeguards regime involves the implementation of some innovative elements such as the retention periods on nuclear material subject to be transferred, the operational mailbox declarations and fixed sampling plans. In this regard, the frequency and inspection effort and the required information on the advance notifications are the dominant concerns. All these changes imply arrangements and new procedures that have required consultations with the state parties/operators in order to establish the most adequate parameters. In addition, some particularities of the ABACC's Regional System were taken into account in order to avoid undue burden on the operators and to preserve the improvement in the effectiveness that implies the introduction of unpredictability in the planning and conducting interim inspections.*

*Taking into account that the characteristics and the operational schedules of the fuel fabrication and conversion facilities in Brazil and Argentina are quite different, the impact of the SNRI regime on each facility is analyzed in this paper and the coordination arrangements and parameters adopted on each case to meet the safeguards goals are presented. Finally, the current status of implementation is reported.*

**Keywords:** nuclear safeguards implementation; regional systems; experience in new domestic transfer verification methodology.

## **1.- Introduction**

Since 1994, ABACC Regional System applies full safeguards procedures on all the fuel fabrication facilities in Argentina and Brazil. Within this type of facilities the two commercial facilities handle more than 2 significant quantities of nuclear material in a year, then the SNRI criteria can be applicable. One of them is in Brazil; this plant produces all the nuclear fuel assemblies of low enriched uranium required to refuel the light water reactors Angra I and Angra II. The other one is in Argentina; this facility produces the nuclear fuel assemblies of natural and low enriched uranium required by the on load reactors of Embalse and Atucha I.

Until 2006, the Safeguards Criteria required the verification of the inventory of nuclear material once a year and at least 20% of the nuclear material, per category type, involved in domestic and international transfers. Other objectives like the verification of strategic points, operator's

measurement system, blending activities and other inventory changes, were normally addressed in connection with the PIV or interim inspections activities. In addition, provisions to cover the borrowing scenario have to be taken when applicable. Verification activities serving timely detection purposes are not foreseen in this type of facilities since none of these facilities operates with plutonium or high enriched uranium.

The operational characteristics of both fuel fabrication plants are quite different. The Brazilian facility is a conversion and fuel fabrication plant where all the production steps are integrated. The facility comprises two main process, one dedicated to produce UO<sub>2</sub> powder and pellets from low enriched UF<sub>6</sub> (up to 5% enrichment) and the other dedicated to fuel assembly production. The facility works by campaigns, normally two per year, with a maximum design capacity of approximately 170 tons of LEU. The major components of the flow term in the annual mass balance equation are the domestic shipments of fresh fuel to the nuclear power stations and the domestic receipts of UF<sub>6</sub> and rejected fuel elements. The major international transfers are the imports of low enriched uranium as UF<sub>6</sub> and U-Gd fuel rods and the exports of UO<sub>2</sub> powder and pellets.

The Argentine facility is a fuel fabrication plant that receives the UO<sub>2</sub> powder and produces pellets, fuel rods, LEU fuel assemblies and NU fuel bundles. At present, the design capacity is approximately 140 tons of natural uranium and 100 tons of LEU to produce 5000 CANDU type fuel bundles and 500 Atucha I type fuel assemblies in a year. To produce LEU of 0,85% enrichment required for fuelling the PHWR Atucha I, blending of LEU up to 5% is carried out with natural uranium at the facility. The major domestic receptions are natural UO<sub>2</sub> powder produced in a conversion facility and rejected LEU fuel assemblies. The major domestic shipments are the transfers of fuel assemblies and fuel bundles to the on load reactors and, occasionally, scrap material is shipped to the conversion facility to be recovered. The major international transfers are occasional imports of LEU powder. This plant works on a continuous basis. Up to two receipts per month of UO<sub>2</sub> powder and normally one shipment per month of Atucha I type fuel assemblies and CANDU type fuel bundles, are foreseen in this case.

In March 2006, during the IAEA-ABACC Coordination Meeting, the Agency informed that an approved SNRI regime had to be in place by the end of 2006 in order to be possible to start the evaluation of the fuel fabrication plants and conversion facilities applying these new criteria in 2007. Following this notification, ABACC coordinated consultations with the state parties in order to immediately initiate with discussions, considering that the new regime introduces additional burden on the operators and national authorities and requires special arrangements in order to adapt some particularities of the ABACC's Regional System, regarding channels of communications, coordination of joint inspections and triggering, verification of imported nuclear materials, etc.

Since May 2006, the main elements of the new regime were discussed among the parties. Comments, points of view and proposals were exchanged through e-mails and in September 2006, during a quadripartite meeting, the basis to implement the new regime were established. Following this meeting, progress in the discussion of the formal documents was met and tentative dates for field trials were proposed.

## 2.- Pro and cons of the new regime

The inspection activities and methodologies considered in this new regime are aimed at achieving the following objectives:

- a) To improve the safeguards effectiveness through the introduction of unpredictable interim inspections.
- b) To make possible 100% coverage of the flow term of the annual mass balance.
- c) To make the borrowing scenarios more susceptible to be detected.
- d) To make false reporting more difficult to be concealed.
- e) To improve the detection probability of abrupt diversion.
- f) To provide a better confirmation that the facility operates as declared.

Even though this new regime is more effective than the present verification strategy, from the facility operational point of view, its implementation reduces the flexibility in the operational program, introduces undesirable dead time in the availability of the feed material and final products and requires extensive and more frequent provision of data. Consequently, extra burden on the operators and national authorities is expected.

## 3.- Issues related to SNRI regime in the regional system.

The implementation of this new approach requires the introduction of changes in the current practices. In order to avoid duplication of efforts between ABACC and the IAEA, new arrangements regarding notifications, coordination of inspection activities and verification of international transfers have been discussed and agreed with the state parties.

- a) Provisions to avoid the duplication of efforts.

The Quadripartite Agreement requires that duplication of efforts should be avoided whenever possible. In this regard, a joint inspection program was adopted as the most efficient strategy.

- b) SNRI notifications arrangements

Under the traditional approach, the IAEA notifies in advance the regional system the inspection activities and the regional system is the responsible for the coordination with the state parties. In the new regime the triggering organization assumes the responsibility to notify the other organization and the state party its intention to carry out a SNRI. The notification of the triggering organization has to be sent to the state party 24h in advance. Provisions to ensure the participation of the non-triggering organization have been adopted in a specific coordination guideline. It was agreed that the triggering organization will coordinate the inspection.

The identification of the inspectors, their documentation, the selected facility and the inspection starting time must be included in the notification to the State Party.

This arrangement is valid only for SNRI notification. All the other inspections will follow the traditional practice, according to the Quadripartite Subsidiary Arrangements.

c) Verification of international transfers

The General Procedures of the Common Accounting and Control System of Nuclear Materials (SCCC) established under the Bilateral Agreement for Peaceful Uses of the Nuclear Energy - signed between Argentina and Brazil- requires the verification by ABACC of all the international transfers of more than one effective kilogram. As the IAEA has the possibility to verify such transfers of nuclear material in the supplier or receiver country, this requirement could imply an undue burden on the operators and interfere in the coordination of the inspection activities.

The Secretary of ABACC has adapted this procedure in order to improve the coordination of the inspection activities at fuel fabrication facilities. As a result of bilateral consultations, it was decided that in commercial fuel fabrication facilities the international transfers will be verified at the moment the SNRI takes place. Considering that the imported material is normally used as feed material in the fabrication process, the remainder material not yet processed, available at the facility at the moment the SNRI takes place, will be verified in order to confirm the international transfer. In addition, retention period will not be requested for imported materials at the fuel fabrication plants and conversion facilities under SNRI regime.

d) List of item subject to verification.

The SNRI inspections are aimed at verification of nuclear material involved in domestic and international transfers and to cover the internal borrowing scenario. The nuclear material subject to verification will be included in a List of Inventory Items (LII). This List will be provided to the inspectors upon arrival at the facility.

As the SNRI regime deals with the flow term of mass balance equation, nuclear material corresponding to intermediate compounds are not submitted to verification. Only the nuclear material received and not yet processed and the nuclear material ready to be shipped, available for verification at the facility, shall be included in the list.

Nuclear material involved in domestic and international transfers, previously verified and still available at the facility, shall also be included in the list and identified. This material will be verified differently following the borrowing scenario provisions.

e) Verification of nuclear material

All nuclear material involved in domestic transfers included in the list and not yet verified will be verified applying a fixed sampling plan.

All nuclear material involved in international transfers, if present at the facility, shall be verified with medium detection probability at the same level of the fixed sampling plan.

All nuclear material included in the list and identified as previously verified will be verified for gross defect with low detection probability.

Each facility has a fixed sampling plan approved based on the annual throughput. This plan defines for each stratum submitted to verification, the quantity of items to be verified and the level of verification (gross, partial and/or bias defect) independently of the total population of items available for verification at the moment the SNRI takes place.

Consequently, regarding sampling plans, different criteria are applied for domestic transfers, borrowing and international transfer.

#### f) Operator declarations to support SNRI

Requirements to provide the information indicating expected dates for international transfers of nuclear material and the annual operational programs are clearly established in the Subsidiary Arrangements of the Quadripartite Agreement.

In addition to these provisions, the new regime requires frequent SNRI declarations to support the verification activities. In the traditional practice, all the operational and accounting information from the states parties are sent to IAEA through ABACC. In order to support the new approach, ABACC and the states parties have accepted that the SNRI declaration will be provided simultaneously to ABACC and IAEA, via encrypted e-mail.

The frequency of the SNRI declaration was established on a case by case basis, taking into account some operational concerns.

As an example, we can mention that in the facility that works with a continuous regime, a weekly frequency of SNRI operational declarations was adopted for UO<sub>2</sub> powder received and fuel assemblies ready to be shipped.

#### g) Records and report auditing.

The joint auditing software agreed upon between IAEA and ABACC is applied to carry out joint book auditing activities. ABACC is responsible to provide updated accounting information. It was agreed that in case the non-triggering organization can not participate in the SNRI, the SNRI declarations will be checked for correctness and consistency against supporting documentation. A complete book auditing will be performed during the next joint inspection.

#### h) Retention periods

The retention period is the period of time while the nuclear material involved in domestic transfers can not be processed or shipped to be available for verification at the facility. As a general rule, 5 working days were adopted in the Brazilian facility and 6 working days in the Argentine facility, introducing special provisions regarding quality assurance of the fuel assemblies in the last case.

### 4.- Current status

At present, draft documents for both facilities have been discussed in detail with both States Parties. Last versions dated 29-03-2007, were received by ABACC on April 2007 and submitted to Argentina and Brazil for final revision and formal approval.

For the Brazilian facility, a clarification from the IAEA side on the practical implementation of the 24 h advance notification to the State Parties during a day off is still pending.

In the case of Argentina, the conversion facility is not integrated with the fuel fabrication plant. Consequently, the national authority has requested that the nuclear material involved in domestic transfers between both facilities should be verified with the same criteria. At present, the SNRI regime has been proposed only for the fuel fabrication plant, while alternatives to apply a SNRI for the conversion facilities are being explored.

After the formal approval of the documents, a field trial will start. ABACC expects that in July 2007 the field trial will be running at least in one of the facilities mentioned in this paper in order to adjust with the operators and both national authorities practical details of the implementation of the new regime.

Still there are some differences between the IAEA side and the State Parties, regarding the format and the data that should be included in the SNRI declarations. This declaration represents an additional burden that must be assumed by the operators. The national authorities would like a less rigid format for these declarations while the provision of the relevant data of each item for verification purpose is assured. In this regard, the provision of scanned copies of the packing lists is much easier for the facility operators than typing the same data in a rigid format like an ICR. In addition, the introduction of special codes, can be source of frequent mistakes until the operator gains experience in their application. ABACC supports the proposal of the national authorities.

## **5.- Conclusions**

From the overview presented in this paper, it can be observed that the introduction of this new methodology of verification of nuclear material involved in domestic and international transfer required from the national authorities and ABACC the modification of the methodology currently applied for international transfers verification and the introduction of relevant changes in the current practice, like channels of communications, coordination of inspections and the provision of safeguard information. Understanding that the new approach is more effective than the traditional one, the national authorities and ABACC have given support to this IAEA proposal. The discussions have been very fruitful and dynamic. As a result, the documents are almost ready for approval. It will take more effort and time consume to gain experience and to adjust some practical details at the field implementation. ABACC, IAEA and the national authorities should have an open mind and flexibility in order to successfully solve the pending issues and to speed up the practical implementation of the new regime in both countries, Brazil and Argentina.