

## SECURITY OF RADIOACTIVE SOURCES AND MATERIALS

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### Abstract

*The activities involving the use of radiation sources and radioactive materials are subject to the control of the national bodies dedicated to the nuclear regulation. The main objective of this control is to assure an appropriate level of radiological protection and nuclear safety.<sup>1</sup>*

*In Argentina, this function is carried out by the 'Nuclear Regulatory Authority' (ARN) whose regulatory system for radiation sources and radioactive materials comprises a registration, licensing and inspection scheme. The system is designed to keep track of such materials and to allow taking immediate corrective actions in case some incident occurs.*

*Due to the appearance of a considerable number of illicit traffic events involving radiation sources and radioactive materials, the specialized national and international community has begun to evaluate the adoption of supplementary measures to those of "safety" guided to its prevention and detection (i.e. 'security measures').*

*This paper presents a view on when the adoption of complementary 'security' measures to those of "safety" would be advisable and which they would be. This will be done through the analysis of two hypothesis of illicit traffic, the first one with sources and radioactive materials considered as "registered" and the second, with the same materials designated as "not registered." It will also describe succinctly the measures adopted by the ARN or under its analysis regarding the 'security' measures to sources and radioactive materials.*

### 1. Introduction

To the aim of this work, the term "radiation sources and radioactive materials" does not refer to nuclear materials. 'Registered' radiation sources and radioactive materials are those subject to the control of the nuclear regulatory bodies. Those "not registered" are the ones involved in movements across the borders or inside them that can happen without the knowledge and control of the competent authorities of the relevant States.

The present study will consider for illicit traffic of radioactive materials: 'The unauthorized receipt, provision, use, transfer or disposal of radioactive materials, whether intentional or unintentional and with or without crossing of international borders.'<sup>2</sup>

The illicit traffic of 'not registered' sources and radioactive materials constitutes the area of more concern, since it involves radioactive materials that would not be known by the relevant control bodies. Therefore, the adoption of 'security' measures (i.e. extrapolated from the physical protection system) that allow preventing and detecting such illicit traffic and thus mitigating its potential radiological consequences will be considered.

### 2. The Argentinean regulatory system for sources and radioactive materials

There are about 1500 facilities that use radiation sources and radioactive materials in Argentina. These facilities use such materials with different purposes, such as radioisotopes production, basic and applied research and medical or industrial applications. The complexity

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<sup>1</sup> Nuclear material is also subject to control by the ARN in connection with the 'Guarantees of Non Proliferation' and Physical Protection.

<sup>2</sup> This definition is included in the 'IAEA Safety Standard Series – Draft Safety Guide: Preventing, Detecting and Responding to Illicit Trafficking in Radioactive Materials'

of the facilities as well as the radioactive inventory in the country embraces a wide range and geographical distribution, counting in the order of 5500 registered sources.

The ARN grants authorizations and licenses and enforces regulatory requirements, as applicable, to any practice involving radiation sources and radioactive materials. After granting such licenses the ARN verifies that each practice is performed in compliance with all national standards and international commitments adopted by the Country through the conduct of inspections and audits.

Concerning the 'safety' of radiation sources and radioactive materials, the ARN has issued the Basic Standard on Radiological Safety (Standard AR 10.1.1), that besides fixing rules, recommendations and requirements for the users of such materials, it has incorporated the recommendations issued by the International Commission on Radiological Protection ("ICRP"). In connection with their transport, Argentina has adopted the recommendations of the Safety Series. 6 of the IAEA on "Safe Transport of Radioactive Materials."

### **3. 'Registered' and 'not registered' radiation sources and radioactive materials - Illicit traffic**

The adoption of complementary 'security' measures would have for objective to enhance the capability of preventing and detecting the illicit traffic of radioactive materials. These measures would assist in preventing the commission of intentional or unintentional acts that can lead to severe radiological consequences. Therefore, the measures of 'security' are clearly subordinate to those of 'safety'.

A first analysis of the known illicit traffic events shows that their probability of occurrence in Argentina and in Latin America region is relatively low. However, considering the cases registered in other regions of the world, the ARN has included this issue some time ago in its medium and long-term assessments.

#### **3.1. Hypothesis of illicit traffic of 'registered' radiation sources and radioactive materials**

As it was mentioned, the main purpose of the registration and inspection system is to maintain the knowledge of the sources and radioactive materials and to assure a prompt detection and the application of immediate corrective actions in case some incident occurs.

The above mentioned system has been deemed satisfactory to assure an appropriate level of people's protection against the noxious effects of ionization radiation and to achieve and maintain a reasonable degree of radiological and nuclear safety. However, having in mind the appearance of events linked with the "nuclear crime" (i.e. theft, terrorism or sabotage) with sources or radioactive materials, the query of whether it is necessary to adopt complementary 'security' measures needs to be answered in the near future.

In Argentina, "registered" sources and radioactive materials are subject to the regulatory system briefly described in point 2, so the commission of an illicit act with them would be prevented by this system. In the event of not being prevented, the system would allow its detection and the implementation of immediate corrective actions. Therefore, it would not be necessary to adopt 'security' measures in addition to those of radiological protection in place.

Nevertheless, events like theft or sabotage against facilities with high radioactive inventories [e.g., of the order of 37 PBq ( $10^6$  Ci) of  $^{60}\text{Co}$ ] might be considered as special cases. Similar consideration would be applicable to such actions directed to the transport of radioactive materials with a significant activity within a State. This would indicate the convenience of adopting some measures of 'security' supplementary to those of 'safety'. These measures would be defined through the evaluation of the possible radiological consequences that such intentional acts could cause.

Therefore, in installations with a high radioactive inventory, it would be advisable to consider the implementation of some measures of the System of Physical Protection (PPS); similar to those applied in facilities with nuclear material.<sup>3</sup>

Similarly, for the transport of sources and radioactive materials, the convenience of applying some 'security' measures in addition to those of "safety" for preventing or detecting such illicit acts should also be examined. In particular, when this transport involves sources and radioactive materials of a given activity. A case under study of the ARN refers to the transport of <sup>60</sup>Co, since Argentina is one of the main producer of <sup>60</sup>Co and it regularly carries out transports of such material, each involving of the order of 55 TBq (1.5 x 10<sup>6</sup> Ci) of <sup>60</sup>Co.

In conclusion, the analysis of possible criminal events (e.g., sabotage) against 'registered' radiation sources and radioactive materials, shows that the adoption of some "security" measures, would be advisable in very specific cases. The measures to be implemented will correspond to the evaluation of the possible radiological consequences that such intentional acts could cause.

### **3.2. Hypothesis of illicit traffic of 'not registered' radiation sources and radioactive materials**

The "not registered" radiation sources and radioactive materials constitute the biggest challenge to be considered, because they refer to those for which there is not knowledge and thus they would be out of the control system. Therefore, the existence of additional "security" measures would allow enhancing the capability of prevention and detection of such materials. That will increase the possibility of taking actions to mitigate the potential radiological consequences derived from an illicit act (theft, sabotage or terrorism).

Those measures would consist primarily on the adoption of a system which permits taking timely knowledge, through normative and operative procedures and especially, through the exchange of information with other national and international control bodies properly coordinated with the nuclear regulatory authority.

Despite the low probability of illicit trafficking in the region, it is not possible to exclude the entrance of radiation sources and radioactive materials to the national territory, either intentional or not, out of the control of the relevant authorities. No Country is completely exempted of being used as a transit place to illicit trafficking radiation sources or radioactive materials toward or from other Countries. Neither the possible entrance of radioactive sources as if they were conventional goods nor the simply loss of knowledge due to an administrative failure can be underestimated (e.g. steel, metal scrap, etc.).

Consequently, the ARN in coordination with the Customs Authority and security bodies, has foreseen the adoption of 'security' measures, to assuring the prevention and early detection of this events, in order to place those sources or radioactive materials under its regulatory control ('safety').

As a result of the analysis of possible illicit events that involve 'not registered' radiation sources and radioactive materials, it is advisable to adopt some extrapolated practices of those of physical protection for nuclear materials. Basically, measures related with i) prevention, ii) legislation and regulation, iii) training, iv) response, and v) exchange and coordination of the information.

## **4. Measures to cope with the illicit traffic of nuclear materials - Possible application to the illicit traffic of sources and radioactive materials**

In the last years, some incidents derived from movements of nuclear material and other radioactive sources among States have happened, without the intervention and control of the

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<sup>3</sup> The Argentine requirements of the Physical Protection System are specified in the Standard AR.10.13.1 (Basic Standard of Physical Protection of Nuclear Materials and Installations).

competent bodies. In several cases, that was due to the absence of appropriate nuclear regulatory infrastructures or insufficient mechanisms of control.

The international community is carrying out an intensive program to prevent situations that involve the illicit traffic of nuclear materials in order to minimize the risk of proliferation of nuclear weapons. Nevertheless, no significant events with these materials had happened. Most of the known illicit traffic cases involved radiation sources and radioactive materials. Radioactive materials such as the  $^{60}\text{Co}$  or the  $^{137}\text{Cs}$  have been offered to sale out of the control system. Some radiation sources have been confiscated from individuals not authorized for their possession.

Therefore, the ARN is executing different activities in the fields of prevention, legislation, response, training and exchange of information. In addition, being ahead to the emergent spirit of the underway revision of the INFCIRC 225/Rev. 3, the ARN is studying the consequences of acts of sabotage involving radioactive materials.

#### **4.1. Prevention**

The ARN has established a system of physical protection for nuclear materials to prevent the commission of intentional acts that can lead to severe radiological consequences. Recently, the ARN have adopted additional measures to strengthen the current system to prevent and detect the illicit handling or use of such materials. On the other hand, although with a different objective, the ARN has put in place a system of accounting and control of nuclear materials (safeguards). Both regulatory branches are supplemented for the execution of their objectives.

Besides the existing notification, registration, licensing and inspection infrastructure, the ARN is studying to adapt some measures of the physical protection system of nuclear materials to the radiation sources and radioactive materials. The routine exchange of information with the Customs Authority and Security bodies takes place regularly. In addition, it is under the ARN's study the installation of radiation detectors (mobile and fixed) to be located for instance at border control stations, airports, ports of entry, etc.

#### **4.2. Legislation and regulation**

Recently, the National Congress has approved the 'National Law of Nuclear Activity' (Law Nro.24804), which provides that the regulatory and control functions of the ARN to all nuclear activities in the areas of radiological and nuclear safety, physical protection and guarantees of non proliferation are aimed to:

- Protect people against the noxious effects of ionization radiation,
- Look after the radiological and nuclear safety in the activities carried out in the country,
- Assure that nuclear activities are performed in compliance with the Law, the regulatory standards and requirements and all the international commitments and non proliferation policies assumed by the country, and
- Prevent the commission of intentional acts that can lead to severe radiological consequences.

The Law foresees among the functions and obligations of the ARN:

- To establish procedures for the application of sanctions for the violation of the standards issued by the ARN to fulfil its responsibilities, assuring the principle of due process.
- To confiscate nuclear and radioactive materials and to close preventively any installation that carries out a practice with these materials without the due license, permission or authorization or in the presence of serious violations to the radiological and nuclear safety standards.

### **4.3. Training**

One of the objectives of the ARN is the continuous improvement of its control system, being the training an important tool to achieving it. Thus, the ARN carries out specific courses for the users of radioactive materials and for the personnel of the organisms involved in the control of the entrance or exit of radioactive materials (e.g. Customs Authority, Security forces, etc.). Among them:

- The Physical Protection and Prevention of Illicit Traffic course for the National Custom staff (more than 200 officials). It included topics as the interaction of the radiation with the substance, radiological protection, transport of radioactive materials, physical protection, prevention of the illicit traffic of materials, response before emergencies and detection of radioactive materials.
- Similar training courses directed to the security forces, such as the Air Force Police (PAN), the Naval Prefecture (PNA) and the National Gendarmerie (GNA), those that will continue being offered in next years.
- Under the auspices of ICPO-INTERPOL and the Federal Police of Argentina (PFA), a Seminar on the Investigation of the Nuclear Crime, Physical Protection of Nuclear Materials and Prevention of its Illicit Traffic”, was dictated by the ARN. The Seminar was dedicated to training the superior personnel's of the PFA, the Custom Administration (ANA) and the national Intelligence Services. Conferences about nuclear crime organizations, INTERPOL communications, nuclear weapons, non-proliferation guarantees, export and import controls were also included.
- Through the Program of Technical Cooperation of ARCAL, a Regional Course for Latin America and the Caribbean on Physical Protection of Nuclear Materials and Facilities will take place between 1999/2000.

### **4.4. Response**

The responsibility of implementing an appropriate system of physical protection concerns to each State and under it, to detect and to investigate any incident of illicit traffic that involves nuclear materials. The response of the system should be such that permits to react timely to the illicit act or to mitigate its consequences. It should also be noticed that the adequacy of a System of Physical Protection regarding the illicit traffic of nuclear materials also is of concern to the international community. The ‘security’ measures of this system adapted for the sources and radioactive materials should be equally capable to prevent their illicit traffic.

In this context, the ARN has begun to elaborate a guide directed to national authorities and specifically to border officials, on the procedures to be used for the detection of illicit movements of radioactive materials and the corresponding response after such detection.

### **4.5. Exchange of information**

The exchange of information and frequent contact among relevant organizations, directly or indirectly related with this matter, is fundamental for the prevention and detection of the illicit traffic of radioactive materials. Hence, the ARN maintains a permanent contact with the National Customs Authority, the security forces, ICPO-INTERPOL, the World Organization of Customs (WOC) and the IAEA.

In the international context, several technical meetings related to the illicit trafficking of radioactive materials have taken place under the auspices of the IAEA. Many Member States, EUROPOL (European Police) and the World Customs Organization have participated.

The IAEA has established a database to record any illicit traffic involving radiation sources and radioactive materials. At the same time, the IAEA invited the Governments to indicate its interest of to participate in this program and to identify a contact point. Argentina has actively participated in such initiatives.

## 5. Conclusions

- The "security" measures that can supplement those of 'safety' have for foundation to strengthen the objectives of the radiological protection. Therefore, the 'security' measures in themselves are not relevant but for reason of assuring such objectives.

- It is considered appropriate that the 'security' measures to be established should be proportional to the radiological consequences that an illicit act with sources and radioactive materials could cause. The extrapolation of the measures of physical protection to radiation sources and radioactive materials should be adapted then to this approach.

- For the 'registered' sources and radioactive materials, it would be advisable to consider some complementary measures of "security" (similar to those of physical protection for nuclear materials) for the facilities and transports that involve radioactive materials above a given threshold.

- As for the illicit traffic of 'not registered' radiation sources and radioactive materials, the exchange of information and the permanent coordination of the nuclear regulatory body with all other related organizations are essential. The training is also important for the prevention, detection and response of possible illicit traffic events.

- In both hypotheses ('registered' and 'not registered' radiation sources and radioactive materials), it is very important to count with a solid nuclear regulatory infrastructure and with appropriate and consistent legislation to assure an effective control of such materials. Equally important is the international cooperation among the organizations related with the control of radiation sources and radioactive materials.