



## **Nuclear security in the brazilian reality**

Rodrigo Carneiro Curzio, Joao Claudio Batista Fiel, Bruno Da Silva Moura,  
Walinton Evangelista De Sousa, Luan Jardim Bonfim

*Instituto Militar de Engenharia (IME) / Exército Brasileiro.*

*rodrigoc.curzio@gmail.com*

---

### **ABSTRACT**

**This paper presents an overview on the implementation of nuclear security's knowledge in the brazilian reality, sharing the promotion of nuclear security education, aligned to guidelines and orientations of the IAEA, and covering fields such as The Regulatory Area and The Non-Regulatory Area. The study takes into account the acts of terrorism that indicate the use or threat of use of radioactive material, radiological weapons or even nuclear weapons, including local attacks where such materials are present. The Nuclear Security planning in a country includes everything. From planning a safety project from a core of a nuclear reactor to planning a gym's safety. It also includes physical security plan, safeguards plan, information security, the society's alert about any risk and actions to prevent and detect the different types of threats, such as the risk of sabotage, illegal transfer of radioactive material, among others.**

***Keywords: Nuclear Security, Regulatory Area, Non-Regulatory Area, Terrorism***

---

## 1. INTRODUCTION

This study gives an overview of the structure of nuclear security adapted to the reality and necessity of the Brazilian Society and presents two main objectives. The first highlights knowledge about events involving nuclear safety and defines areas, possible risks and actions to prevent and detect different types of threats. The second emphasizes Global Nuclear Safety.

The Nuclear Security term consists of the ways of preventing, detecting and responding to sabotage, attack action, theft and unauthorized access or illegal transfer of nuclear or radioactive materials, as well as its facilities and associated practices [1].

The Nuclear Security is part of a complex structure, dynamic and broad, based on two main areas covering various fields: **Regulatory Area** (*Specific for Nuclear and Other Radioactive Material, Facilities and Activities*) and **Non-Regulatory Area** (*Specific for Nuclear and Other Radioactive Material, out of Regulatory Control*) [1]. Despite its complexity, constant updating is necessary for adaptation to global, local and current scenario. This involves people, standards and procedures, in addition to requiring study and preparation of plans and/or adaptation projects in the local community in order to better positioning of the security capabilities in response actions [2].

In Brazil, as in other countries, nuclear security has been implemented following the guidelines of the IAEA's standards, in accordance with the social reality of our country and in accordance with the criteria established by the CNEN's rules. IAEA's international technical advisory activities include, but are not limited to, major contemporary global events, with regard to the permanent theme of nuclear and radiological safety. Nuclear and radiological safety, in general, is part of the IAEA's mandate as a specialized International Organization [1,2].

In times of major events such as the Olympic Games and the Football World Cup, hosted in national territory in 2014 and 2016, respectively, a crisis management committee manages and structures all security procedures working cooperatively with professionals from other countries [2]. In this way, the IAEA's Office of Nuclear Security (ONS) routinely deals with UN countries in situations such as holding major global events. Materials developed by the IAEA in the area of international cooperation include studies, publication and distribution of manuals for guidance on nuclear safety issues [3].

Nowadays, around the world, a security structure never seen before has been implemented at airports and in various points of circulation of the general public. At the same direction, the use of metal detectors has become standard in sights, stadiums and sports arenas in various parts of the world. Monitoring by cameras has been enhanced with the installation of face recognition and various safety equipment was created. There was also a true revolution in the preparation, training and intelligence of the authorities responsible for sporting events [3].

Despite not having a history of terrorist attacks and not be a potential target of extremist terrorism, Brazil has been preparing itself and advancing in knowledge of prevention and response procedures against any kind of threats [1,2]. Our country has continental dimensions with extensive borders in forest regions and a vast wealth of fauna, flora and mineral, requiring much effort in relation to their safety. Due to the growing international prominence, especially to host major events, it becomes even more evident the importance of cooperative work with national and international agencies, confronting and adapting to the reality of the society that we live.

## **2. BRAZILIAN'S VIEW OF NUCLEAR SECURITY IN THE REGULATORY AREA**

Of all industrial activities, nuclear generation is one that offers less risk. In 30 years of operation of the Nuclear Power Plants in Brazil (Angra 1 e 2), no accident records or event that might endanger the plant workers, the public or the environment of the region. Security is a commitment that is crystallized in the Integrated Management Policy in Brazil. It is a priority and precedes productivity and economy and should never be compromised for any reason [3].

For dealing with a very powerful form of energy, safety of nuclear installations goes beyond the thick walls of steel and concrete that surround our reactors. Nuclear Security is an ongoing process that not only involves components and structures, but also people and organizations [4].

Nuclear power plants have passive safety systems, which automatically come into action to prevent accidents and also shut down and cool the reactor in emergencies. The plants still have two protective barriers that physically protect the reactor: an external, concrete, and other internal, steel.

These retaining walls protect plants against external factors such as earthquakes, tsunamis, floods and explosions, and the pressure increase inside the plant [2,4].

Brazil's Institutions see security as one of the most relevant points of its organizational planning, guiding all activities. One of the major concepts used is that of defense in depth, i.e. the application of barriers in series, as an obstacle [1,3].

### **3. BRAZILIAN'S VIEW OF NUCLEAR SECURITY IN THE NON-REGULATORY AREA**

In Brazil, after the announcement of the choice of country to host the World Cup and the Olympics Games, efforts and cooperative work arrangements have been proposed and structured in order to gather knowledge and experience to better compose the nuclear security framework.

The attacks on the Twin Towers in New York in the fateful September 11, changed the strategies, plans and security actions around the world, especially in major international events. As has been deployed at airports, the search and the use of metal detectors have become standard in sights, stadiums and sports arenas in various parts of the world. Monitoring by cameras has been enhanced with the installation of face recognition and various safety equipment were created. There was also a real revolution in the preparation, training and intelligence of sports authorities [2].

Although without a history of terrorist attacks and not being a potential target, Brazil was prepared and adapted to the current global scenario. The discussion regarding the drafting of laws aimed at terrorism in Brazil has been already studied since 2006, when military and professionals of the Institutional Security Cabinet developed a draft anti-terrorism [5,6].

In Brazil, intense preparatory activities for nuclear and radiological safety planning took place during these years, both for the 2014 Football World Cup as well as for the 2016 Rio de Janeiro Olympics. "Nuclear safety" activities, including the drawing up of contingency plans, training of personnel and simulations conducted under the auspices of the IAEA, were carried out outside the eyes of the media and the public with the objective of minimizing risks and strengthening the respective mechanisms of prevention [3,4].

In terms of major global events, the issue of nuclear and radiological safety involves months or even years of exhaustive and detailed preparation in planning, theoretical training and practical simulations for those directly involved in their tactical-operational activities. The IAEA, as usual, was an international technical protagonist of all this, interacting with its Brazilian counterpart and local organizations directly involved in the major events that took place.

Also interacted with IAEA were national technical-academic bodies, intelligence, as well as police forces and civil defense, both state and federal. Specifically, the IAEA bases the nuclear and radiological safety of large events on the possibility or risk of nuclear radioactive exposure of the multitudes of thousands of people attending these major global events or their locations [2]. Taking this into account, the corresponding risk factors in Brazil were studied, evaluated and monitored by the country's technical-scientific and intelligence community, under the technical assistance provided by the IAEA international cooperation.

### **3.1. Defense and prevention strategy**

The first step to be taken in order to prevent terrorist attacks in major events is to spread the knowledge to the people of what is terrorism, how can it occur and what measures should be taken to prevent a possible attack. Thus, the population itself could contribute to preventing or minimizing the effects of any terrorist attack [8]. The second step is the proper preparation of the multi-agency (Military Police, Civil Police, Firefighting Force, Navy, Air Force, Army and others) to operate safely or prevent a terrorist attack. Knowledge and practical measures to be taken to get the most alert and attention as the suspects is an example of part of that preparation [1,8].

The third step to take in order to minimize the damage of an attack is the preparation of the multi-agency to operate together with the organizers, volunteers, associations in question, since the isolated action of these parties do not would optimize the solution of the problem and even failures could occur, slowing the process [8].

Numerous events, such as sporting events that bring together delegations from various countries, are particularly sensitive targets for an attack of terrorist groups and such actions have occurred frequently in the past 42 years. About 200 attacks or attempted attacks related to the sport occurred in that period [2].

### 3.2. Defense in depth

After the bombing of the American Twin Towers, the world entered a state of alert of the danger of terrorist attacks, and so many countries have changed their defense and prevention strategies against terrorists in big events [1,2]. Brazil is an example of this. It is in evidence since it hosted the World Cup and the Olympic Games. The Brazilian government has invested around 1.16 billion reais in security for the World Cup and 2 billion in the Olympics [9].

The Brazilian defense strategy has included the interception of a possible attack by early detection. In the stadiums, many cameras have been installed, and several plainclothes police officers has been infiltrated. A central detection has been installed at any entrances of spectators having cars for a checking with X-ray and scanner [10].

The central World Cup control counted four security levels at: centrally at each stage with ten mobile stations around the stadium, a regional center in each host city and two national centers, one in Brasilia and another in Rio de Janeiro. Helicopters were flying over the sports arenas with cameras, sending images in real time to the control center [8].

A major concern for the 2016 Olympic Games was the marathon of 42 km, because could be very difficult to detect suspicious throughout this journey. To enhance security, beyond normal police, plainclothes police officers were infiltrated along the route and monitoring by air cameras were also executed. In addition to all this equipment, the Brazilian defense had gas detectors and bomb disposal equipment, which detect and deactivated explosives [10].

## 4. CONCLUSION

The importance and scope of nuclear safety have been disclosed in the international community as the future of the nuclear area. Throughout this study, it was possible to present a little about Nuclear Security in the Brazilian reality, presenting the main concerns and the risks eminent to the reality of Brazil, separately describing the Regulatory Area and the Non-Regulatory Area, emphasizing the different situations in which it operates and the inherent challenges.

## ACKNOWLEDGMENT

Thanks go firstly to Military Institute of Engineering to encouragement and all kind of support. Thanks, too, the Nuclear Security Division of the International Atomic Energy Agency, which has been provided informative support that has been made possible to guide students and professionals in the Brazilian nuclear industry within nuclear security field.

## REFERENCES

- [1] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), INFCIRC/225/Rev.1 **The Physical Protection of Nuclear Material** (1977).
- [2] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), **Nuclear Security System for Measures and Major Public Event** (ISSN 1816–9317), Nuclear Security Series No. 18 (2012).
- [3] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), INFCIRC/274/Rev.1/ Mod.1 **Amendment to the Convention on the Physical Protection of Nuclear Material** (2005).
- [4] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), **Implementing Guide on Security in the Transport of Radioactive Material**, Nuclear Security Series No. 9 (2008).
- [5] SOUZA, Delanne N. **Brazil's role in the fight against terrorism**. Revista Brasileira de Inteligência, v. 5, p. 29-38, 2009.
- [6] **United States Department of State, Country Reports on Terrorism 2016 - Brazil**, 19 July 2017, available at: <https://www.refworld.org/docid/5981e44e13.html> [accessed 24 August 2020].
- [7] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), **Implementing Guide on Security of Nuclear Material in Transport**, Nuclear Security Series No. 26G (2015).
- [8] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), **Nuclear Security Recommendations on Radioactive Material and Associated Facilities**, Nuclear Security Series No. 14 (2011).
- [9] JUNIOR, O. A. D. S. **Brasil: os impactos da Copa do Mundo 2014 e das Olimpíadas 2016**. Observatorio das Metrópoles, 2015.

- [10] INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), **Implementing Guide on Security of Radioactive Sources**, Nuclear Security Series No. 11 (2009).