INDONESIA'S EXPERIENCE IN IMPLEMENTING THE AMENDMENT TO CPPNM FOR PHYSICAL PROTECTION OF NUCLEAR MATERIAL AND NUCLEAR FACILITIES

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Abstract

The paper gives a description of Indonesia's experience in implementing the Amendment to CPPNM for physical protection of nuclear material and nuclear facilities. Starting with a short description of the global nuclear security, the paper continues to discuss the situation that connected with the implementation of the Amendment to CPPNM for physical protection of nuclear material and nuclear facilities, such as prevention and detection measures for the security system of nuclear material in BATAN's facilities. Finally, some concluding remarks are presented.

1. INTRODUCTION

The research and development of nuclear technology in Indonesia has been operating since the late 1950s, and has contributed in various sectors of life. To date, the nuclear research and development is mainly carried out by the National Nuclear Energy Agency of Indonesia (BATAN), which was established in 1958.

According to Act No. 10/1997 on Nuclear Energy, two agencies responsible for nuclear activities in Indonesia are BATAN as promoting body and Nuclear Energy Regulatory Agency of Indonesia (BAPETEN) as regulatory body. BAPETEN is authorized to formulate the necessary rules and regulations and is responsible for the enforcement of these activities through licensing and inspection.

BATAN is authorized to conduct research and development, production of raw materials for the manufacture of nuclear fuel, radioisotope production for research and development purposes, and management of radioactive waste. Various research programs and activities are focused on several important areas: energy, food, health and medicine, natural resources and environment, industry, and advanced materials. All research and development activities are carried out professionally for peaceful purposes by taking into account the principles of safety, security, and environment protection.

Indonesia has three research reactors and several supporting nuclear facilities, including nuclear fuel and radioactive waste treatment facilities, which are operated by BATAN. The work at these facilities involves the use of nuclear materials.

To ensure the security of nuclear material and associated facilities from various threats, BATAN has implemented physical protection system of nuclear material and associated facilities according to existing standards developed by the IAEA, and maintained and strengthened the system through security systems measures.

As a party to the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment (CPPNM/A), Indonesia recognizes the importance of promoting the physical protection (or nuclear security) objectives, and affirms its international commitment to support the strengthening of global nuclear security by ratifying and implementing the CPPNM/A. Indonesia ratified the CPPNM in 1986 and its Amendment in 2009.

Indonesia (BATAN) has implemented physical protection of nuclear material and nuclear facilities based on such important instrument. This paper will give a description of such activities in more details.

2. ROAD TO STRENGTHEN THE GLOBAL NUCLEAR SECURITY

Nuclear terrorism has gained a global recognition as one of the most challenging threats to global security in the 21st century. Attempts by individuals and groups of persons are still made to acquire nuclear material for terrorist and other malicious purposes. The threat of nuclear terrorism remains real. More broadly, terrorist attacks continue across the globe and the threat is constantly evolving. As an important reminder that nuclear facilities and materials continue to be targets of interest to terrorists. These continuing threats and documented incidents show that nuclear terrorism is today's problem. Protecting nuclear materials and nuclear facilities from the threats posed by terrorists and other non-state actors is an urgent priority.

One of the most important tools in the fight against nuclear terrorism is the CPPNM/A. The CPPNM/A is the sole legally binding instrument for the security of nuclear materials in peaceful use in facilities, transport and storage.

The CPPNM has a threefold scope of application: the physical protection of nuclear material used for peaceful purposes during international transport; the criminalisation of offences; and international co-operation in the case of theft, robbery or any other unlawful taking of nuclear material or credible threat thereof.

Adopted under the auspices of the IAEA on 8 July 2005 and entered into force in 2016, the Amendment expands and deepens the effect of the CPPNM, and it was regarded as the single most important step which the world can take to strengthen nuclear security. Whereas the obligations for physical protection under the CPPNM cover nuclear material used for peaceful purposes during international transport, the Amendment extends this scope to also cover nuclear material in domestic use, storage and transport and nuclear facilities used for peaceful purposes.

In reflecting the importance of national responsibility for physical protection of nuclear material and nuclear facilities, the Amendment introduces a legal commitment to have and implement a physical protection regime covering the physical protection objectives as reflected therein. Through this, the aim of the national regime is: protecting against theft and other unlawful taking of nuclear material; ensuring the implementation of measures to locate and recovering missing or stolen nuclear material; protecting nuclear material and nuclear facilities against sabotage; and mitigating or minimising the radiological consequences of sabotage. Further, in implementing this undertaking, the states parties shall: establish and maintain an appropriate legislative and regulatory framework for physical protection; establish or designate a competent authority responsible for its implementation; and take other appropriate administrative measures necessary for the physical protection of such material and facilities.

3. IMPLEMENTATION OF THE CPPNM/A FOR STRENGTHENING NUCLEAR SECURITY IN INDONESIA

3.1 National Legislative and Regulatory Framework on Nuclear Security

As a party to the CPPNM/A, Indonesia recognizes its responsibility for establishing, implementing and maintaining a physical protection regime against theft and sabotage for all its nuclear facilities. Indonesia is also a party to some treaties and conventions on nuclear safety, security, and safeguards, such as Convention on Nuclear Safety, Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Convention on Early Notification of a Nuclear Accident, Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, International Convention for the Suppression of Acts of Nuclear Terrorism, and Treaty on the Non-Proliferation of Nuclear Weapons. Therefore, Indonesia has a strong commitment to fully support the IAEA efforts to continually improve security system, and has cooperated with other countries for such purpose.

Indonesia has established and maintained a national legislative framework to govern physical protection of nuclear material and the associated facilities. The framework for the regulation of nuclear security within Indonesia consists principally of Act No 10/1997 on Nuclear Energy, and Government Regulation (GR) No 54/2012 on the safety and security of nuclear installations. Other regulations relevant to nuclear security are GR

33/2007 on the safety of ionizing radiation and security of radioactive sources, GR 29/2008 on the licensing of ionizing radiation sources and nuclear materials utilization, GR 2/2014 on licensing of nuclear installations, and GR 58/2015 on radiation safety and security in transport of radioactive materials, and BAPETEN's Chairman Regulation (BCR) 1/2009 on the requirement of physical protection of nuclear materials and nuclear facilities, BCR 6/2015 on the security of radioactive sources, and BCR 1/2010 on emergency preparedness and response.

3.2 BATAN's Practices on Physical Protection System

The basis for the implementation of physical protection for a nuclear facility rests on the well-recognized basic principle of nuclear security, in which the responsibility for the establishment, implementation and maintenance of a physical protection regime within a State Party rests entirely with that State.

The CPPNM/A requires that each State Party shall establish, implement and maintain an appropriate physical protection regime applicable to nuclear material and nuclear facilities under its jurisdiction. It also establishes 12 Fundamental Principles to be applied in executing that requirement. These Fundamental Principles address: Responsibility of the State; Responsibilities During International Transport; Legislative and Regulatory Framework; Competent Authority; Responsibility of the License Holders; Security Culture; Threat; Graded Approach; Defence in Depth; Quality Assurance; Contingency Plans; and Confidentiality.

These 12 fundamental principles have been already applied by Indonesia, as summarized in Table 1, for strengthening its national nuclear security. The issue of nuclear security is a part of national security. Indonesia is committed to actively participate in maintaining and strengthening global nuclear security, one of which is to effectively implement national nuclear security. The threat of nuclear security is increasingly real. Many events that are related to national security threats have recently occurred at some public areas.

TABLE 1 INDONESIA'S IMPLEMENTATION OF 12 FUNDAMENTAL PRINCIPLES

Fundamental Principles	**Implementation**
Responsibility of the State	Establishing the physical protection regime
Responsibilities During International Transport	Indonesia has some experiences in nuclear material transport
Legislative and Regulatory Framework	Establishing some regulations: GR No 54/2012, GR No 2/2014, BCR No 1/2009
Competent Authority	Establishing BAPETEN as the Regulatory Body
Responsibility of the License Holders	Responsibilities for physical protection has been clearly identified.
Security Culture	Promoting and conducting self-assessment of security culture
Threat	Formulation of a national design basis threat (DBT)
Graded Approach	Designing physical protection system refer to the DBT
Defence in Depth	Applying defence-in-depth in BATAN's nuclear facilities
Quality Assurance	Implementing the nuclear security management system
Contingency Plans	Exercising regularly the contingency plans
Confidentiality	Establishing the requirements of information confidentiality

To implement the state responsibility, Indonesia has developed and established a physical protection regime for the security of nuclear materials and nuclear facilities. Implementation of the physical protection

regime is carried out with the establishment of legislative and regulatory framework, the establishment of competent authorities and design of physical protection system.

The establishment of legislative and regulatory framework is particularly in the form of the stipulation of GR 54/2012 on the safety and security of nuclear installations and BCR 1/2009 on the requirement of physical protection of nuclear materials and nuclear facilities.

GR 54/2012 requires the license holders to ensure the safety and the security of nuclear facilities. The security of nuclear facilities according to this regulation is to prevent, detect, assess, delay, and respond to unauthorized transfers of nuclear material and sabotage of nuclear facilities and nuclear materials. During design and construction activities, the license holders shall establish and implement a physical protection system that includes an assessment of the vulnerability of the facility; physical protection plan; physical protection system characteristics; control of communication lines; access controls; and testing of the function of physical protection systems. The license holders, in establishing and implementing the physical protection plan, shall classify nuclear materials that used, stored and transported; refers to the design basic threat in accordance with the classification and location of nuclear material; and applying the concept of defense-in-depth for prevention and protection. The license holders shall implement and maintain a physical protection system for nuclear facilities from the time of construction until their decommissioning. In implementing and maintaining a physical protection system, the license holders shall establish and implement procedures to ensure the security is controlled in all situations.

Meanwhile, BCR 1/2009 further regulates technically the physical protection system. According to this regulation, the license holders shall establish, implement and maintain a physical protection system of nuclear materials and nuclear facilities based on the design basic threat in order to prevent unauthorized transfer of nuclear material; recovering lost nuclear material; to prevent sabotage of nuclear installations and nuclear materials; and to mitigate the consequences of sabotage.

BATAN, as the license holder and the operator of the Indonesian nuclear facilities, has applied consistently the terms and requirements provided by these regulations.

In the transportation activities of nuclear materials, BATAN always coordinates with the related parties to ensure the security of transport. This coordination is to ensure the activity is secure from all threats. Security supports from the police and other parties are essential.

3.2.1 Security system

Strengthening the nuclear security implies the need to take the necessary measures to minimize the probability of, prevent the occurrence of, and carry out precautionary actions to mitigate the subsequent damage of, malicious acts involving attacks or sabotage to nuclear facilities or misuse of radioactive material. Such measures are directed to provide adequate physical protection from attacks and irresponsible hands by prevention and detection.

An effective nuclear security system must be capable of preventing, detecting and responding to a criminal or unauthorized act with nuclear security implications, involving nuclear material or other radioactive material. This goal can be reached, among others, through the establishment of the activities that integrates the following elements such as procedures, personnel, equipment and technology, security culture, and management systems as shown in Figure 1.

BATAN implements a security system to meet effective nuclear security objective as set out by BAPETEN as the regulatory body, to comply with regulations, standards, and procedures. Security requirements are based on a graded approach, taking into account the current evaluation of the threat, the relative attractiveness of nuclear material, the nature of material and potential consequences associated with its unauthorized removal or sabotage. A security system to protect nuclear material from an adversary intent on committing a malicious act is designed to perform basic security functions such as deterrence, detection, delay, response, and security management. A well-designed security system will integrate such measures to perform all five security functions so as to effectively secure the target from the various threats.

The comprehensive approach consists of implementing several layers of defence, including both administrative aspects and technical aspects that an adversary would have to overcome or circumvent in order to achieve his or her objective. Administrative aspects include procedures, instructions, administrative sanctions, access control rules, and confidentiality rules, while technical aspects include multiple protection layers fitted with detection and delay. It also important to apply a defense-in-depth principle to a security system by

incorporating trained security personnel, technology, and administrative procedures to ensure a complete functional system. Within this framework, BATAN develops its security and physical protection system.

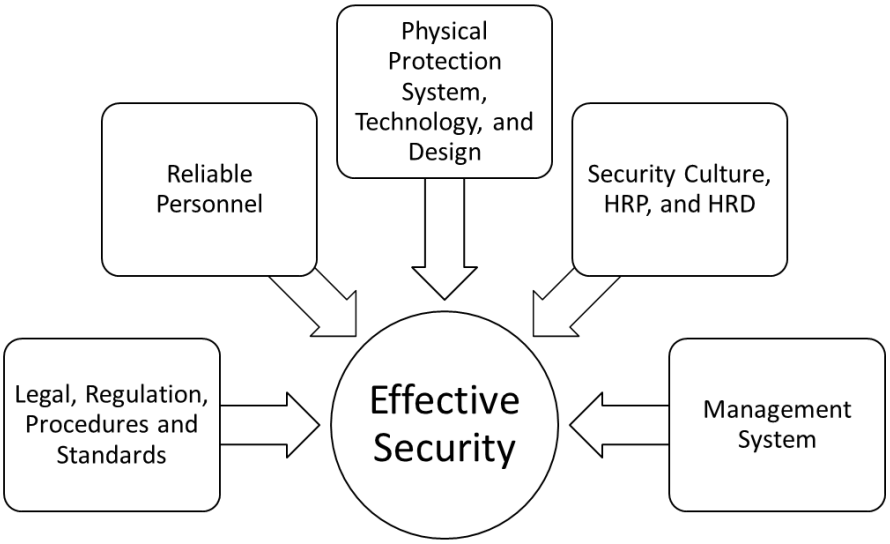

FIG. 1 The approach to promoting effective security in BATAN's nuclear facilities

3.2.2 Security management system

BATAN regards nuclear security as a main priority as shown in its nuclear security policy statement. BATAN's nuclear security policy states that BATAN is committed to ensure the security of its nuclear materials and installations, radioactive sources, facilities, employees, workers, visitors, activities and important information from any security threats through the implementation of an effective, integrated, and comprehensive nuclear security management system in accordance with the laws and regulations. Every BATAN's employee shall strive for the achievement of nuclear security objectives, and shall implement nuclear security culture according to his or her respective roles and responsibilities. BATAN also establishes standards on the nuclear security management system and on security risk assessment in order to be implemented in its nuclear facilities.

To manage the security of its nuclear material and nuclear facilities, BATAN begins with a step how to get the full understanding of what the process involves. By taking into account that the approach to a good management plan is to conduct a security assessment of the entire facility, focusing primarily on the nuclear material, and other radioactive material used in its research and development activities.

BATAN implements such security management measures by addressing access control, trustworthiness, information protection, preparation of a security plan, training and qualification, accounting, inventory and event reporting. It also includes developing procedures, policies, records, and plans for the security of nuclear material and for a more effective security culture.

BATAN has committed to develop, implement, test, periodically review, revise as necessary a security plan and comply with its provisions. The security plan describes the overall nuclear security system to protect the nuclear material and includes measures to address an increased threat level, response to nuclear security events and the protection of sensitive information. It also includes the administrative aspects, including defining the roles and responsibilities of individuals with security responsibilities, access authorization processes, trustworthiness determination processes, information protection processes, inventories and records, event reporting, and review and revision of the security plan, and how procedural and administrative security measures will be scaled to meet increased levels of threats, as well as the response actions including cooperation with relevant competent authorities in the location and recovery of radioactive material consistent with national practice.

3.3 Physical Protection for the security of nuclear material and nuclear facilities

3.3.1 Prevention measures

The purpose of prevention measures is to exclude potential adversaries and to minimize the likelihood of a malicious act on the radioactive material. Prevention measures include the establishment of the organization of nuclear security, training, background checks, information security system, and access control. For this purpose, BATAN has developed, updated and implemented the nuclear security plan; promoted security culture; ensured that security equipments are functioning properly; ensured the availability of security personnels, procedures, and equipments; and provided nuclear security training for personnel involved in the activities. Structurally, BATAN has determined the field of work within the organization that has the duties and functions of managing the radioactive material in its facilities.

BATAN always applies access control to all its nuclear facilities. Access control is used to allow only authorized entry or exit, and to prevent or detect unauthorized entry and exit. Access control is achieved by identifying individuals by means of an identifying device, an access code and/or a personal identifier. Further, the access system is periodically checked to ensure that it is effective.

Regarding information security, BATAN always applies methods and procedures to protect sensitive information, which will have the impacts on nuclear security. Information security is provided in a quality assurance guide, clearly identified information classification for documents related to nuclear material.

3.3.2 Detection measures

Using the national threat assessment, BATAN has established nuclear security systems for detection by instruments of nuclear and other radioactive materials. The detection systems are based on a defence in depth approach and on the premise that such material could originate from both within or outside the facilities, and provide the necessary detection capability and capacity.

Detection can be achieved by several means, including visual observation, video surveillance, electronic sensors, accountancy records, seals and other tamper indicating devices, process monitoring systems, and other means. Detection measures include providing detection equipments, and continuous monitoring by the security personnels. Detection equipments include, among others, handy talky, fixed telephone and mobile phone, alarm system, motion detectors, closed circuit televisions, infrared sensors, and balance magnetic switchs, and radiation portal monitors. BATAN's security personnels will monitor the situation at the central alarm station or patrol regularly and randomly at the location and surrounding area.

Detection of nuclear and other radioactive materials can be achieved through an instrument alarm or an information alert. BATAN has designed and implemented nuclear security systems based on such indicators, and ensure that the detection measures are supported by effective response measures.

BATAN also carried out methods of contraband detection including manual searches of personnel, packages and vehicles, the use of metal detectors, and radiation detectors. Manual searches are used for monitoring persons and material exiting from an area. Random searches are also used to deter the unauthorized removal of radioactive material.

To prevent the smuggling and theft of radioactive material out of facility, BATAN has also installed radiation portal monitors at the exit gates.

3.4 Reliable personnel, trustworthiness, and security culture

BATAN has to ensure that the trustworthiness and reliability of individuals with authorized access to radioactive material and/or security sensitive information are verified in accordance with the national regulations, as a key measure in mitigating the threat posed by insiders. The background check measure aims to assess the trustworthiness of the personel, establishing access authority to nuclear material, and identify undesirable behavior. Background checks to personnel who have access to radioactive material are carried out through the implementation of human reliability programs. The program aims to collect information related to personnel, especially those who are in critical positions, through their personal documents and interviews. Information obtained includes information on family background, criminal records, finance, and health.

To maintain the capability and competence of security personnels, BATAN has regularly carried out training exercises for physical fitness and shooting drills as well as other competencies.

As a way to improve the effectiveness of security system, BATAN has promoted and internalized the security culture since 2010, and conducted security culture self-assessment in 2012 and 2015 in its three nuclear facilities. The self-assessment methodology followed the guidelines set by the IAEA.

The purpose of the self-assessment is to provide a clear picture of the extent to which nuclear security is part of BATAN's culture. Self-assessment plays a key role in developing and maintaining an awareness of the strengths and weaknesses of BATAN's nuclear security culture. Self-assessment is to complement the currently used methods for evaluating vulnerabilities and nuclear security systems, to help management to refine BATAN's overall nuclear security arrangements.

Security culture self-assessment has provided some benefits in developing and maintaining security awareness in BATAN's nuclear facilities, especially at Serpong nuclear site.

3.5 International cooperation

The Amendment enhances the scope of the CPPNM's existing provisions on international co-operation, assistance, co-ordination and information exchange. In particular, it now enables direct co-operation and consultation between states parties or as now expressly stated, through the IAEA (and other relevant international organisations) with a view to obtaining guidance on the design, maintenance and improvement of physical protection systems for nuclear material in domestic use, storage and transport.

The role of international cooperation is well recognized for promoting worldwide the importance of nuclear security. In line with this, Indonesia has hosted three IAEA International Physical Protection Advisory Service (IPPAS) missions that were conducted in 2001, 2007, and 2014. The missions were to review legal and regulatory basis for the physical protection of nuclear activities, and the implementation of physical protection in three research reactors of BATAN. The missions gave some recommendations for developing the design basis threat and training in sabotage and vital area analysis, upgrading and improving physical protection of nuclear material and nuclear facilities.

Following the IPPAS missions, BATAN has undertaken various efforts to maintain and strengthen the physical protection systems and measures in order to fulfil national regulation and the IPPAS recommendations. BATAN has conducted physical protection upgrades mainly at the three research reactors in cooperation with U.S. Department of Energy (USDOE). Physical protection upgrades include heavily improvement to motion detector sensors and security cameras to detect unauthorized access, and fortified central alarm stations that allow on-site guards the ability to monitor alarms and security cameras and communicate with response forces.

International cooperation and expert supports are also essential for maintaining and strengthening nuclear security. To this end, BATAN has developed a broad network with the IAEA, USDOE, U.S. Department of States (USDOS), University of Georgia (UGA) of USA, King's College London (KCL) of UK, ANSTO of Australia, and JAEA of Japan for strengthening its nuclear security systems.

The cooperation area includes organizing workshops in the field of nuclear security and related topics. In the period of 2010-2019, BATAN has organized several activities related to capacity building for nuclear security.

4. CONCLUSION

To ensure the security of its nuclear material and nuclear facilities, Indonesia has developed, established and implemented a physical protection regime for the security of nuclear material and nuclear facilities by applying the twelve fundamental principles as required by the Amendment to the CPPNM.

The implementation of the physical protection regime is carried out with the establishment of legislative and regulatory framework, the establishment of competent authorities and design of physical protection system.

In the facility level, BATAN, as the operator of Indonesia's nuclear facilities, has applied the robust physical protection system by integrating the following key elements such as procedures, personnel, equipment and technology, security culture, and management systems in order to prevent unauthorized acquisition and malicious use of nuclear material and other radioactive material.

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