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## A Critical Assessment on Nuclear Security Measure in Indonesia

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### Abstract

Our overriding thesis is that nuclear security measures are required in Indonesia as a matter of urgency given Indonesia's current plans for the construction of nuclear power plants (NPP) and all the physical infrastructure and supply chains wherein nuclear materials is exposed to the general public and a target for terrorist attack. This work is divided into two parts: (1) an analysis and close reading of the existing nuclear regulatory regime of Indonesia, with the view of determining whether the existing regulations are sufficient to provide nuclear security measures that protect the general public, and (2) based on our analysis what kind of policies and legislative provisions should we have in order to better protect the public. The headline of our assessment is that there is a complete lack of legal basis for security measures and that it is recommended. From an international perspective the nuclear operating organization is within the penumbra of nuclear security standards established by the International Atomic Energy Agency (IAEA). However, while within the penumbra of the international standard for nuclear security, our assessment finds the Indonesian security measure is inadequate and potentially dangerously in effective and thus, in its current state behooves the Indonesian government to undertake a deep reformation of the legal framework of nuclear security in Indonesia.

**Keywords:** Nuclear Security; Indonesia; Policy; Regulation; Assessment.

### Introduction

In 2012, Indonesia had prepared a plan to construct four units of Nuclear Power Plant (NPP) in Jepara Central Java, Bangka Belitung, West Kalimantan and Nusa Tenggara Barat.<sup>1</sup> Unfortunately, on 27 February 2017, Indonesian militants were caught red-handed as they planned to detonate a radioactive "dirty bomb" in

<sup>1</sup> Ni Putu Eka Wiratmini, 'Empat Daerah Ini Berpotensi Dibangun Pembangkit Listrik Tenaga Nuklir' (*Bisnis.com*, 2019) <<https://ekonomi.bisnis.com/read/20190521/44/925457/empat-daerah-ini-berpotensi-dibangun-pembangkit-listrik-tenaga-nuklir>> accessed 1 November 2019.

Bandung, West Java. This incident comes from the fact that Indonesia grapples with an influx of militants deported from other countries and the fallout from the Islamic State-led siege in the southern Philippines city of Marawi where the militants had hoped to transform low-grade radioactive Thorium 232 (Th-232) into deadly Uranium 233 (U-233).<sup>2</sup>

Given the fact that nuclear terrorism has spread to Indonesia, the construction has been delayed. The worrisome problem of the construction of the NPP in Indonesia is the nuclear security issue, as many questions and issues about nuclear development in Indonesia are concerns about its economics, environmental impact and safety as well as security implications in terms of weapons proliferation and terrorism.<sup>3</sup> Besides nuclear terrorism threat, the delay is also due to the strong opposition from Non-Government Organization such as Greenpeace *Asia Tenggara's* Climate Change and Energy who express the rejection of the idea to plan an NPP. The resistance against the NPP is primarily driven by suspicious that the government does not possess the capacity to handle high-risk technology. Moreover, the argument against nuclear energy is that the development of NPP Program is not suitable for Indonesia because it will create governance and financial problem. Likewise, for the reasons of safety, security and potential pollution, Indonesia seems not ready to handle the totality of risks implied by an NPP.<sup>4</sup>

The plan to build NPP is delayed to 2027 due to ongoing opposition from some NGO's in Indonesia. The project envisages the start-up of conventional large light-water reactors on the populous islands of Bali, Java, Madura and Sumatra. Also, Indonesia plans to construct small reactors (up to 100 MWe) for deployment in Kalimantan, Sulawesi and other islands to supply power and heat for industrial

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<sup>2</sup> Tom Allard and Agustinus Beo Da Costa, 'Exclusive: Indonesian Militants Planned "dirty Bomb" Attack - Sources' (*Reuters*, 2017) <<https://www.reuters.com/article/us-indonesia-security/exclusive-indonesian-militants-planned-dirty-bomb-attack-sources-idUSKCN1B51FW>>.

<sup>3</sup> Andrew Symon, 'Nuclear Power in Southeast Asia: Implications for Australia and Non-Proliferation' (2008) <[https://www.lowyinstitute.org/sites/default/files/pubfiles/Symon%2C\\_Nuclear\\_power\\_in\\_Southeast\\_Asia\\_1.pdf](https://www.lowyinstitute.org/sites/default/files/pubfiles/Symon%2C_Nuclear_power_in_Southeast_Asia_1.pdf)>.

<sup>4</sup> M. Syahrani W. Lubis, 'PLTN Masih Hadapi Tantangan Besar Dari Masyarakat' (*Bisnis.com*, 2019) <<https://ekonomi.bisnis.com/read/20190430/44/917386/pltn-masih-hadapi-tantangan-besar-dari-masyarakat>> accessed 21 November 2019.

use.<sup>5</sup> Two national organs; the National Nuclear Agency of Indonesia (*Badan Tenaga Nuklir Nasional* – BATAN) and the Nuclear Energy Regulation Agency of Indonesia (*Badan Pengawas Tenaga Nuklir* – BAPETEN) are responsible for the development of the work of NPP and the preparations for nuclear energy in coordination with the IAEA.

Although the construction of the NPP has been delayed, this does not mean the country could disregard the demand for sound nuclear security infrastructure, including legal and policy framework. Therefore, the paper is aimed to accentuate the importance of national nuclear security measures. The first part of this paper is identifying nuclear security policies under the international nuclear regime and IAEA Guidance. In part two, the paper evaluates the existing legal framework of nuclear energy and whether it meets the minimum level of satisfying the fundamental principles of prevention and response to nuclear security threats. In section three, the paper reaches into determining whether the nuclear security measure can be implemented by operating organizations and specifically, whether said organizations have been able to satisfy the requirement for designing a defense based on threats, identifying the risks arising at the NPP, and ensuring compliance with regulatory requirements. The fourth part is a critical assessment and recommendation for the lacuna that exists in the Indonesian nuclear legal framework. The last section is the conclusion.

### **Methodology**

The method of the research is a literature review by identifying what has been written and defined as nuclear security and threat from both international legal frameworks and IAEA Guidance. The aim is to find the legal basis for Indonesia to provide a comprehensive nuclear security measure in its legal and policy framework. By analyzing and close reading of the existing nuclear

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<sup>5</sup> World Nuclear News ‘Batan to Cooperate with Indonesian Power Company’ (*World Nuclear News*, 2019) <<http://world-nuclear-news.org/Articles/Batan-to-cooperate-with-Indonesian-power-company>>.

regulatory regime, the paper finds a lacuna within its nuclear law. The paper also identifies and examines the practice of nuclear-operating organizations to meet the IAEA standard in the nuclear security system.

### **Literature Review Of Nuclear Security**

The literature is in agreement that the primary concern on nuclear security is nuclear theft where a person or persons illegally takes Plutonium or Highly Enrich Uranium (HEU) out of the facility where these materials are supposed to reside.<sup>6</sup> Nuclear theft has multiple facets, from smuggling, illicit trading and illegal transport. These acts are driven by the demand on the black market, which exists due to the sophisticated smuggling schemes employed by powerful players such as organized crime or terrorist groups.<sup>7</sup>

The risks of nuclear theft depend on three factors, firstly, the quantity and quality of the material available to be stolen since the terrorist usually intend to make a nuclear bomb or weapon which requires a minimum amount of nuclear material. Secondly, the security measures in place where insider and outsider thieves are most likely to operate. Thirdly, the security measure to protect the nuclear materials from any illegal attempt is insufficient.<sup>8</sup> The effort to steal or acquire nuclear materials by a terrorist group or criminal from nuclear facilities in any countries will increase especially where the country appears less committed to strengthening nuclear security.<sup>9</sup>

### **Nuclear and Radioactive Material Concern for Illicit Trafficking and Malicious Use**

Article XX of the Statute of the IAEA defines the term “special fissionable materials” is Plutonium -239; Uranium-233; Uranium enriched in the Isotopes 235

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<sup>6</sup> Mathew Bunn, ‘Reducing the Greatest Risks of Nuclear Theft & Terrorism on the Global Nuclear Future’ (2009) 1 *Daedalus Journal of the American Academy of Arts and Science* [112-123].

<sup>7</sup> Lyudmila Zaitseva and Kevin Hand, ‘Nuclear Smuggling Chains’ (2003) 46 *American Behavioral Scientist* [822-844].

<sup>8</sup> Mathew Bunn (n 7).

<sup>9</sup> Bryan R. Early, [*et.,al.*], ‘Atoms for Terror? Nuclear Programs and Non-Catastrophic Nuclear and Radiological Terrorism’ (2013) 43 *British Journal of Political Science* [915-936].

or 233. The term “Uranium enriched in Isotopes 235 or 233” is Uranium containing Isotopes 235 or 233 or both, in an amount that consists in the abundance ratio of the sum of these Isotopes. The term “source material” is Uranium containing the mixture of Isotopes occurring in nature; Uranium depleted in the Isotope 235; Thorium; and any other materials.<sup>10</sup> Before 9/11 the nuclear and radiological materials concern for illicit trafficking and malicious act were those that could most directly be used by a rogue state to produce nuclear weapons such as Uranium and Plutonium. However, with the increase of terrorism, the threat of illicit and malicious use against the nuclear material is not limited to the traditional nuclear materials but also other nuclear materials such as Americium, Neptunium and Thorium and other radioactive materials sources for various industrial and medical applications whether by-product materials or naturally occurring materials. These non-traditional nuclear materials can be used to make a “dirty bomb”.<sup>11</sup>

The activity regarding nuclear is divided into safe and dangerous nuclear activities. Safe activities include the use of tracer Isotopes and small quantities of nuclear materials. Meanwhile, hazardous activities are Uranium mining and refining; Uranium enrichment; the operation of Plutonium production reactors and associated reprocessing plants and nuclear explosive research and development.<sup>12</sup> The nuclear activities involve of small amount radioactive materials are commonly used in the nuclear industry, such as nuclear medicine, research, radiotherapy or others. It contains Nuclides which undergo spontaneous disintegration (a process accompanied by the emission of one or more types of ionizing radiation, such as Alpha-, Beta-, neutron particles and Gamma rays).<sup>13</sup> However, dispersion of radioactive material by an explosively driven device, even with small quantities of

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<sup>10</sup> The Statute of the IAEA, ‘The Statute of International Atomic Energy Agency’ (*International Atomic Energy Agency*, 1957) <<https://www.iaea.org/about/statute> >.

<sup>11</sup> Galya I. Balatsky, [et.,al.], *Illicit Trafficking of Nuclear and Radiological Materials*, in James E Doyle (Ed), *Nuclear Safeguards, Security, and Non-Proliferation: Achieving Security with Technology and Policy* (James E Doyle ed, Butterworth-Heinemann 2008).[415-416].

<sup>12</sup> The Acheson-Lilienthal, ‘A Report on the International Control of Atomic Energy’ (1946).

<sup>13</sup> Article 1 (1) of the International Convention for the Suppression of Acts of Nuclear Terrorism, (adopted April 13, 2005), *UNGA RES A/59/766*, (ICSANT).

nuclear materials such as Isotopes (e.g. Cesium 137 sources), will have a substantial social, environmental and economic impact.<sup>14</sup> If these materials are under the possession of the terrorist or criminal, the effect will be tremendous for people and the environment. The impact of unsafely managed and protected radioactive materials and sources would be likely to cause permanent injury to a person who handled it or were otherwise in contact with it, for more than a few minutes. It would be fatal to be close to this amount of unshielded material for a period of a few minutes to an hour. These materials and sources are typically used in practices such as Radio Thermal generations, Irradiators and radiation Tele Therapy.<sup>15</sup>

In 2019, the IAEA released the Incident and Trafficking Database (ITDB) where the number of the incident reported to the ITDB related to trafficking, or malicious use between 1993 and 2018 confirmed the use of enriched Uranium (12 times), Plutonium (2 times) and Plutonium Beryllium Neutron sources (4 times). A small number of these incidents involved seizures of kilogram qualities of potential weapon usable nuclear materials.<sup>16</sup>

### **Nuclear Security under the International Nuclear Regime and the IAEA Guidance**

Although a number of the global nuclear incident has occurred, there is no single international instrument that comprehensively addresses nuclear security. Until today, the global nuclear security legal frameworks are scattered into several international agreements, such as the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the Convention on Physical Protection of Nuclear Materials (CPPNM) and its amendment; Comprehensive Nuclear Test Ban Treaty (CTBT);

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<sup>14</sup> IAEA Report, 'Goiaia Brazil Incident, A Radiotherapy Unit, Containing a Cs-137 Source, 1,375 Ci, in Powder Form Was Abandoned by a Brazilian Clinic in Goiaia. The Encapsulated Source Was Subsequently Opened by U' (1988).

<sup>15</sup> IAEA Safety Standards, 'Categorization of Radioactive Sources' (2005).; Code of Conduct on the Safety and Security of Radioactive Sources Annex I; Guidance, Paragraph 3(a), Code of Conduct, Annex I, Table 1 and "Categorization of radioactive sources", (Vienna: IAEA-TECDOC-1344, 2003)

<sup>16</sup> IAEA, 'Incident And Trafficking Database (Itdb) Incidents Of Nuclear And Other Radioactive Material Out Of Regulatory Control' (2019).

International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT); The United Nations Security Council Resolution 1540 (Adopted in April 2004) and 1373 (adopted in September 2001); Code of Conduct on the Safety and Security of Radioactive Sources (Code of Conduct); Guidance on the Import and Export of Radioactive Sources (Guidance); the Convention on the Suppression of Unlawful Acts Relating to International Civil Aviation (Beijing Convention); the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation as amended by the Protocol of 2005 to the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (SUA 2005), and the Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the Continental Shelf as amended by the Protocol of 2005 to the Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the Continental Shelf (SUA PROT 2005). Also, the IAEA issued the guidance for the Member States to assist them in meeting their obligations under international legal instruments and in discharging their responsibility for nuclear security within the state.

Despite the lack of international harmonization, the IAEA Guidance on Nuclear Security Fundamental recommends the Member States to establish the nuclear security regime under their law. To strengthen nuclear security, the IAEA has urged its members to build security measures based on a legal and regulatory framework which defines the responsibility of the state, the regulatory authorities and operating organizations.<sup>17</sup> The Member States should regulate the security measure in term of preventing, detecting and responding to sabotage, theft and unauthorized access to or illegal transfer of nuclear material and other radioactive substance, and their associated facilities.<sup>18</sup> The IAEA defines the term of nuclear security as:

*“the prevention of, detection of and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities, sensitive information*

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<sup>17</sup> IAEA, ‘Annual Report 2008’ (2009). Vienna: IAEA.[71].

<sup>18</sup> International Atomic Energy Agency, ‘Nuclear Security Culture, Nuclear Security Series No. 7’ (2008) Vienna: IAEA.[3].

*and assets, other acts determined by the state to harm nuclear security”.*<sup>19</sup>

The objective of a state’s nuclear security regime is to protect persons, property, society, and the environment from the harmful consequences of a nuclear security event. The state should establish, implement, maintain and sustain an effective and appropriate nuclear security regulation to prevent, detect and respond to such nuclear security events to achieve the objective of nuclear security regime. The regime covers nuclear material and other radioactive material, whether it is under or out of regulatory control, and associated facilities and activities throughout their lifetimes, and it should reflect the risks of harm to the person, property and the environment.<sup>20</sup>

The main elements of the nuclear security regime are<sup>21</sup>:

- (1) The responsibility of competent authorities designated by the states including competent authority related to border control and law enforcement and responsibilities for all authorized person;
- (2) All legislative and regulatory framework and associate administration measure to govern the nuclear security regime;
- (3) State’s nuclear security regime must include a measure for defining offences or violation under domestic laws or regulations where those criminal or intentional unauthorized acts involving or directed at nuclear material and other radioactive material associates to nuclear facilities and activities. State also requires establishing appropriate penalties that are proportionate to the gravity of the harm that could be caused by the commission of the offences or violation. The state could establish jurisdiction over such offences or violation and provide for the prosecution or, as appropriate, extradition of alleged offenders;
- (4) A nuclear security regime ensures that nuclear security systems and nuclear security measures are in place at all appropriate organizational level to detect and assess nuclear security event, and to notify the relevant competent authorities so that necessary response actions can be initiated;
- (5) A nuclear security regime ensures that relevant competent authorities and authorized persons are prepared to respond appropriately at local, national and international levels to nuclear security event by periodically exercising, testing, and evaluating the plans for effectiveness by relevant competent authorities and authorized persons to (1) mitigate and minimize harmful consequences to persons, property, society and the environment from nuclear security events;

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<sup>19</sup> International Atomic Energy Agency, ‘Objective and Essential Elements of a State’s Nuclear Security Regime, Nuclear Security Series No. 20’ (2013) Vienna: IAEA.[1].

<sup>20</sup> *ibid.*[2].

<sup>21</sup> *ibid.*



(2) locate, recover and secure nuclear material and other radioactive material that is out of regulatory control; and (3) feedback into the preparedness process including plans, the result of exercise and the test of the plans and experience.

### Legal Basis on Nuclear Security Threats

The vital element of nuclear security is criminal proceedings of nuclear security threats and offences. Although nothing in the parlance of international law creates a single comprehensive nuclear security agreement, the legal basis of threats and offences on nuclear security is scattered among international nuclear conventions.

#### (a) Threat

Article 7(1) (g) and (2) of Amendment of CPPNM defines “threat” as any use of nuclear material that causes death or serious injury to any person or substantial damage to property or environment. “Threat” also defines as “to commit an offence that compels a natural or legal person, international organization or state to do or to refrain from doing any act”.<sup>22</sup>

#### (b) Offences involving nuclear materials

Article 4 of the Beijing Convention,<sup>23</sup> Article 5bis of SUA 2005<sup>24</sup>, and Article 1 (1) of SUA PROT 2005 refers the offence which is conducted by “any person” who is defined or understood under national law to include natural persons and legal entities.<sup>25</sup> The Amendment of CPPNM provides the type of offences that are subject to punishment. The offence is an act without lawful authority constitutes the receipt; possession; use; transfer; alteration; disposal or dispersal of nuclear material. It is likely to cause death or serious injury to any person or substantial damage to property or the environment.<sup>26</sup> The intentionally commits of theft or robbery,<sup>27</sup> embezzles or fraudulently obtains nuclear material shall be punished.<sup>28</sup> The offence also includes the act of carrying, sending or moving

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<sup>22</sup> International Atomic Energy Agency, ‘Amendment to the Convention on the Physical Protection of Nuclear Material’ (2016) <<https://www.iaea.org/sites/default/files/infocirc274r1m1.pdf>>.

<sup>23</sup> International Civil Aviation Organization, ‘Convention for the Suppression of Unlawful Acts Against the Safety of Civil Aviation, (Beijing Convention)’ (1971).

<sup>24</sup> International Maritime Organization, ‘Protocol of 2005 to the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation’ (2005) <MO Doc. LEG/CONF.15/21 (SUA 2005)>.

<sup>25</sup> International Maritime Organization, ‘Protocol of 2005 to the Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the Continental Shelf’ (2005).

<sup>26</sup> Article 7 (1) (a) and (2).

<sup>27</sup> Article 7(1) (c) and (2).

<sup>28</sup> *ibid.*

material into or out of state without approval from the competent authority.<sup>29</sup>

(c) Offences involving nuclear facilities

The Amendment of CPPNM provides the clause regarding an act directed against a nuclear facility, or an act interfering with the operation on a nuclear facility. The offender intentionally causes, or he knows that the action is likely to cause, death or severe injury to any person or substantial damage to property or the environment by exposure to radiation or release of radioactive substances.<sup>30</sup> Meanwhile, ICSANT provides a specific clause regarding unlawful acts to use in any way radioactive material or device. The use or damage a nuclear facility in a manner to release or risks the release of radioactive material, with the intent to cause death or serious bodily injury, substantial damage to property or the environment, compel a natural or legal person, an organization or a state refrain from doing an act.<sup>31</sup>

(d) Offences specific to aircraft

Beijing Convention provides the provisions regarding the unlawful release or discharges from an aircraft in service or on-board an aircraft in service, intentionally transports or causes to be transported, or facilitates the transport of, on-board an aircraft any nuclear weapon or other nuclear explosive devices, or radioactive.<sup>32</sup>

(e) Offences specific to the vessel

SUA 2005 regulates the offence for unlawfully and intentionally uses against any explosive, radioactive material or nuclear weapon or other nuclear explosive devices, any source materials, special fissionable materials on a ship or discharges from a vessel or transports on-board a ship. Likewise, any equipment materials especially designed or prepared for the processing, use or production of special fissionable materials, knowing that it is intended to be used in a nuclear explosive activity or any other nuclear activity not under safeguards according to a comprehensive safeguard's agreement with the IAEA.

## Result and Discussion

Assuming Indonesia builds a Nuclear Power Plant by the mid-twenty-first century and as a form of critical risk assessment to it, we pose questions about the soundness and completeness of the current nuclear security measures. This assessment is divided into two parts. The first part focuses on the legal framework for the prevention and response to nuclear security threats in Indonesia, whether

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<sup>29</sup> Article 7(1) (d) and (2).

<sup>30</sup> Article 7(1) (e) and (2).

<sup>31</sup> ICSANT Art. 2(1)(b) and 5.

<sup>32</sup> Beijing Convention Art. 1(1)(g) (h) and 3.

there is coherency with the guidance of IAEA. The second part delves into the nuclear security measures as they may be performed by an operating organization to seek whether the organization has followed the IAEA guidance as well.

### **Assessing National Legal and Policy Framework for Prevention and Response to Nuclear Security Threat**

Indonesia is placing most of its attention on nuclear security due to concerns about terrorism and illegal nuclear trafficking by ratifying almost all international agreements related to nuclear security such as the NPT, CPPNM, CTBT, SUA 2005, SUA PROT 2005 and ICSANT. Despite becoming a party to a number of key international legal instruments relating to nuclear security, Indonesia does not have a specific law covering nuclear security. Although this country promulgates the Law No. 10 the year 1997 on Nuclear Energy, the term of nuclear security stipulates only in Article 16 paragraphs (1) that notes:

*“Any activity related to the utilization of nuclear energy shall maintain safety, security and peace, the health of workers and the public, as well as the environment protection.”*

This provision is not sufficient to form a legal basis for nuclear security. The law itself does not address the nuclear security threat since it is focusing merely on the utilization of nuclear energy in Indonesia. This lacuna creates concern about the ability of the Indonesia government to fully ensure the safety and security of its nuclear materials, particularly against threats from non-state actors such as terrorist groups. Moreover, nothing in this law mentions about measures to prevent and response nuclear security threat neither penalizing of perpetrators. The absence of criminalizing malicious nuclear under this law constitutes a lacuna to mitigate the threat of nuclear security sufficiently. Be that as it may, Indonesia has promulgated several government policies and regulations to support the establishment of NPP under Law No 10 the year 1997. The purpose of these regulations is to reach the readiness in operating the NPP by regulating necessary infrastructure related to nuclear installations' permit systems, arrangement and operation of nuclear facilities. The regulations also provide rules and obligations for competence organization and

institution to responsible for the development, operation and regulation of all nuclear activities. There are four regulations which underline nuclear security measures.

### **The License of Nuclear Installation and the Utilization of Nuclear Materials (Government Regulation (GR) No.2 the year 2014)**

Article 17 of Law No 10 the year 1997 on Nuclear Energy regulates any use of nuclear energy such as the construction and the operation of nuclear reactors and other nuclear installations as well as decommissioning of the nuclear reactor subject to licensing according to government regulation. The government then stipulates Government Regulation (GR) No 2 the Year 2014. This GR defines the term nuclear reactor into a power reactor and non-power reactor. A power reactor is a nuclear reactor that is using thermal energy for generating power, and it includes the NPPs. Meanwhile, a non-power reactor is a nuclear reactor that uses neutrons producing radiation resulting from the nuclear fission reaction.<sup>33</sup>

There are two licensing conditions according to this GR. First, licensing for nuclear power reactor is divided into Commercial Power Reactors (NPP) and Non-Commercial Power Reactor such as reactor for research (BATAN operates non-commercial reactor). Second, the licensing for the Nuclear Non-Power Reactor is divided into the commercial non-power reactor and the non-power reactor for non-commercial use (BATAN operates the non-power reactor for non-commercial use). The license is divided into three types: (1) Nuclear Reactor Constructing License includes site and construction; (2) Nuclear Reactor Operating License includes commissioning and operation; and (3) Decommissioning License. GR No 2 the year 2014 requires documentation of Physical Protection of Nuclear Material (NM) and Nuclear Installation (NI) from a security threat. The document of NM and NI requires the establishment of a basic design against the threat from a malicious act, as well as a specific requirement for protection of facilities, equipment, and procedures from security risk.<sup>34</sup>

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<sup>33</sup> 'Regarding The License of Nuclear Installation and the Utilization of Nuclear Materials' (2014),( GR No.2).

<sup>34</sup> Dahlia C. Sinaga, 'Legal and Regulatory Framework of Nuclear Security in Indonesia' (2016) 1 International Journal of Nuclear Security.[1-6].

### **The Safety and Security of Nuclear Installations (GR No 54 the year 2012)**

In term of nuclear security, this regulation stipulates the technical prevention of transgression acts on the utilization of nuclear materials. Article 2 Paragraph (1) underlines “*to realize the safety and security of the installation nuclear, any legal entities that will carry out construction, operation and decommission are obliged to have a license from the Head of BAPETEN*” (this refers to GR no 2 the year 2014). Article 2 paragraph 4 (a) and (b) notes that: “*security of nuclear installations is intended to: 1) prevent deviation from the use of nuclear material from peaceful purpose; 2) prevent, detect, evaluate, delay and response to the transfer of nuclear material illegally as well as sabotage installations and nuclear materials.*” This provision obliges all license holders, including nuclear operators, to apply a significant technical measure to prevent, detect, evaluate, postpone, and respond to the illegal transport of nuclear materials. They should also take necessary precautions to prevent and respond to any act of sabotage at a nuclear installation that involves any nuclear materials. Article 43 of GR 54 the year 2012 also obliges the nuclear operator to be responsible for accomplishing the purpose of nuclear security which is to prevent any acts of transgression on nuclear material during its utilization on the NPP. Furthermore, the license holders are obliged to evaluate basic design threat and physical protection.

### **The Safety of Ionizing Radiation and Security of Radiation Sources (GR No 33 the year 2007)**

According to GR No 33 the year 2007, the security of the radioactive source is an action that is aimed at preventing the illegal access, destruction of the radioactive sources, loss, theft and unlawful evacuation of radioactive sources. However, this regulation does not elaborate on the mechanisms that would prevent illicit acts or acts of transgression relating to the access, destruction, theft and illegal possession of radioactive sources. Nothing in this rule provides for a definition of what specific security measures must be undertaken by the license holders to prevent malicious acts against the radioactive sources. This is a serious lacuna in the regulatory

regime since the NPPs should receive enough guidance from the government and the regulations so that they know what mechanisms should be in place to avoid harm and liability.

**Radiation Safety and Transportation Security on Radioactive Substance (GR No. 58 the year 2015)**

The IAEA has published the guidance to secure transportation of nuclear material in 2015. The objective is to provide the Member States with guidance in implementing, maintaining or enhancing the nuclear security regime. This includes explicit recognition of the need to protect radioactive and nuclear materials while being transported against theft, sabotage or other malicious acts that could have unacceptable consequences.<sup>35</sup> Securing nuclear materials during the carriage, especially during international transport possess heightened concern since these materials are vulnerable to a security breach at any point in transit. The IAEA requirements for nuclear security during transport could be accomplished to a reasonable extent by a combination of measures including deterring, detecting, delaying and responding to such malicious acts.

In 2015, Indonesia promulgated Government Regulations on Radiation Safety and Transportation Security on Radioactive Substance to implement the IAEA guidance regarding nuclear security transport. Article 1 paragraph (2) provides that security in radioactive transport is an action to prevent theft, sabotage, illegal trafficking and unlawful conduct against radioactive substance during transportation. Article 13 provides for a particular vehicle to transport nuclear material. The vehicle must be equipped with a barrier that impedes unauthorized access. The level of the underlying security for nuclear transport takes account of vehicles, the transit point and identification of carrier, control vehicle, utilization of key and seal, security countermeasures in the transportation of special form of Radioactive Substances and reporting both on a routine basis and in emergency conditions.

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<sup>35</sup> International Atomic Energy Agency, 'Security of Nuclear Material in Transport, IAEA Nuclear Security Series No. 26-G' (2015) Vienna: IAEA.

The regulations above are prominently providing technical control for nuclear operators and agents to protect nuclear materials and installations. The responsibility for the physical protection of nuclear materials, including security systems and response personnel is under the authority of the national atomic agency (BATAN). The agency, likewise, is responsible for improving and evaluating the nuclear security system.

### **The Indonesian Nuclear Agencies: The Measure to Prevent and Response Nuclear Security Threat**

BATAN is an organization that carries out government duties involving research, development, and utilization of nuclear science and technology in Indonesia. Regarding the nuclear security measures, BATAN conducts two activities: first, it follows the International Physical Protection Advisory Service of the IAEA (IPPAS) by upgrading the nuclear security system, and second, it has established the Centre for Security Culture and Assessment (CSCA).

#### **Upgrading the Nuclear Security System**

BATAN has implemented the IPPAS recommendation to create a Design Basis Threat (DBT) collaborating with BAPETEN (Nuclear Regulatory Agency) and the Indonesian State Intelligence Agency. The DBT is localized for each nuclear site in Indonesia. As of December 2019, BATAN operates the following research reactors and nuclear facilities (non-NPP):

1. 2 MW TRIGA Mark II Reactor in Bandung, West Java
2. Pasar Jumat Irradiation facility in Jakarta
3. 100 kW Reactor (Reactor Kartini) in Yogyakarta, Central java
4. 30 MW Reactor GA Siwabessy in Serpong, Tangerang
5. Secondary Standard Dosimetry Laboratory, BATAN HQ Jakarta

The IAEA Guidance on Development, Use and Maintenance of the Design Basis Threat defines “*a DBT is the attributes and characteristics of potential insider and outsider adversaries who might attempt a malicious act, such as unauthorized removal or sabotage against which a physical protection system for nuclear or*

*other radioactive material or associated facilities are designated and evaluated”*.<sup>36</sup>

A DBT is an essential part of the nuclear security evaluation process that considers intelligence data related to terrorist and non-state actors activities. To enhance nuclear security measures, BATAN is implementing the physical protection of nuclear facilities and the security of radioactive sources. It includes an access control system and video security, which involves triple security control during the transport of nuclear fuel with the involvement of related government agencies such as the police and the special squad of the military.

In 2010, BATAN also collaborated with BAPETEN to increase their commitments on nuclear security by hosting a self-assessment “Table-top Exercise” to improve the effectiveness and sustainability of nuclear security and physical protection system. The goal of the “Table-top Exercise” is to evaluate the integrated security system during the adversarial attack. This exercise is divided into two components. The first component is the evaluation of the effectiveness of physical protection, and the second component is the evaluation of the self-assessment of security response.<sup>37</sup>

### **The Evaluation of the Effectiveness of Physical Protection**

BATAN implements physical security designs in its reactors facilities to prevent nuclear materials from adversarial attempts of theft and sabotage following the IAEA standards and national regulations.<sup>38</sup> However, the main concern is the effectiveness of the physical protection since the physical security is difficult to attain due to circumstances and factors beyond the operator’s control resulting in delays and response. It thus needs to evaluate the effectiveness of each physical protection system, using site-specific performance-based evaluation of the response force and the security

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<sup>36</sup> International Atomic Energy Agency, ‘Development, Use and Maintenance of the Design Basis Threat, IAEA Nuclear Security Series No. 10’ (2009). Vienna: IAEA.

<sup>37</sup> Christopher Hobbs, [*et., al.*], ‘The Utility of Table-Top Exercises in Teaching Nuclear Security’ (2016) 2 International Journal of Nuclear Security.[1-11].

<sup>38</sup> International Atomic Energy Agency, ‘Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities’ (2010). Vienna: IAEA.



systems. Therefore, BATAN used “Table-top Exercise” to assess the effectiveness of a physical protection system in 2010. It used a scenario-based exercise model that facilitated assessments of the nuclear site by conducting multiple high-level evaluations of physical protection. The “Table-top Exercise” provides an analytic tool that offered a reasonable measure and scalable approach to the development, enhancement, test, evaluation, and optimization of many aspects of physical protection.<sup>39</sup>

### **The Evaluation of Self-Assessment of Security Response**

The objective of the self-assessment of security response by using “Table-top self-assessment exercise” is to demonstrate the performance of various response elements as part of a physical security system. The response elements included security guards, police and military personnel who are trained to respond to a security attack. The “table-top exercise” participants are divided into three teams that have different roles. The role is protection force, simulation advisories, and referees. The simulation is formed to tackle the security event, and it is completed when the objective of the simulation is reached. The mission of this simulation is to obtain knowledge regarding the success of the protection force and to discuss potential improvements to the current system.<sup>40</sup>

The goal of this evaluation is to acknowledge the need to improve several features including response personnel capabilities, detection and delay system and communication between relevant agencies such as regulatory bodies, police, military and nuclear operators.<sup>41</sup> However, the finding of the self-assessment in 2010 showed that the speed of coordination in responding to security incidents is still necessary improved.<sup>42</sup>

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<sup>39</sup> Khairul,[*et.al.*], ‘Indonesian Experience Self-Assessment Evaluation Tabletop Exercise of Physical Protection’, *Proceeding of 52nd Annual Meeting Institute of Nuclear Materials Management (INMM)* (2011).

<sup>40</sup> *ibid.*

<sup>41</sup> *ibid.*

<sup>42</sup> Badan Pengawas Tenaga Nuklir, ‘Report on Nuclear Security 2010: Information of Nuclear Security in Indonesia’ (2011).[52].; . On 20-24 September 2010, table top exercise involving Nuclear Security Personnel of Batan Serpong, Cisauk Sector Police, South Tangerang District Police, Military (TNI and TNI AD). The purpose of organizing is to test security and response procedures. This table top-exercise is using the RSG reactor theft and sabotage scenario by 5 (five) terrorists.

### Centre for Security Culture and Assessment (CSCA)

According to Security-Culture Implementing Guide, the essential elements of a security system are:<sup>43</sup>

- (1) Deterrence system is a robust defense system of defense and prevents attack;
- (2) The detection system is the security system that alerts the facility of covert or overt attack;
- (3) Delay system is the security system that prevents the progress of adversary threat toward the intended target where the successful delay will provide ample time to respond;
- (4) The response system is the action taken by security personnel to block the adversarial threat and attack;
- (5) The recovery system is the ability to resume regular operation after an incident or attempted incident.

The main factor of nuclear security is the human-to-human interface where incidents are related to the interactivities of human behavior. When a nuclear operating organization intends to develop a security culture; it should encourage the staff to respect common values and standard toward security in every aspect of the operations. For this reason, in 2014, BATAN established CSCA to implement the IAEA Guidance on Nuclear Security Culture. The purpose of this center is to promote and foster nuclear security culture in BATAN, conduct self-assessment, develop the security culture model, self-assessment methodology, and increase collaboration with other institutions dealing with security culture. BATAN established this center following the first nuclear security evaluation assisted by the IAEA and the Centre for International Trade and Security (CITS) of the University of Georgia.<sup>44</sup>

The first assessment consisted of a survey and interviews with approximately seven hundred respondents who involved in three research reactors in Indonesia from August 2012 to March 2013. The result of this self-assessment became the basis for establishing the CSCA. Following the establishment of the CSCA, BATAN conducted the second self-assessment in 2015. The second self-assessment

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<sup>43</sup> International Atomic Energy Agency, *Supra* Note 36.

<sup>44</sup> Anhar R Antariksawan, 'Nuclear Security Culture and BATAN's Assessment: BATAN's Experience, *International Journal of Nuclear Security*' (2016) 2 *International Journal of Nuclear Security* [1-7].

used four tools for the evaluation of progress, namely: interview, survey, document review, and observation. The assessment differs from the previous evaluation since it includes survey statement validation and target respondents from various scientific backgrounds who are involved in multi-purpose reactors, nuclear fuel cycle technology and radioactive waste center.<sup>45</sup>

The establishment of CSCA is crucial for BATAN because it will gain the confidence to implement nuclear security measure. All personnel of BATAN obtain more knowledge and information about the facilities, and the progress is achieved by conducting self-assessment. The result of the exercise is to gain a deeper understanding of nuclear security and improving security.

The nuclear operating organization has shown the achievement of the required standard for nuclear security. The measure implicates the standard required by the IAEA and the readiness to penetrate the NPP system and implementing a nuclear security culture system, due to the fact that Indonesia has acknowledged the nuclear security concern and has been strengthening its management and human resources capabilities in preparation for the NPP. However, it is imperative to address the nuclear security issue through a legal framework, taking into account the possible threat of nuclear security in Indonesia. The paper, therefore, continues to provide a critical assessment to reform nuclear law to tackle nuclear security issue.

### **Reforming Nuclear Law in Indonesia to Tackle Nuclear Security Issue: A Critical Assessment**

Taken as a whole Indonesia's nuclear regulation described above are insufficient to alleviate or mitigate the threat of nuclear security, since they lack specific measures for responding to malicious acts on all types of nuclear materials and facilities, and have no provision for penalizing perpetrators. Meanwhile, we may presume the world's rational ambition is to secure nuclear materials and facilities in every nation by providing at the very minimum legal threshold. The

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<sup>45</sup> *ibid.*

legal framework and policy are necessary to provide adequate measures to interdict nuclear smuggling, secure all nuclear facilities and materials from both inside and outside sabotage and attack, as well as penalize the perpetrators. Every state should move urgently to put in place effective national security standard including precise regulation to deal with the problem of theft and illicit trafficking in nuclear materials, strong and independent regulators, appropriate inspection programs and efficient enforcement. The national standard and regulations should also include regular, realistic, independent testing of the performance of the security system to defeat both insider and outsider attacks on nuclear facilities.<sup>46</sup>

The plan to build the NPP has been long discussed among experts and become a constant debate among regulators in Indonesia. The prominent debate is nuclear security issue since the Law No 10 the year 1997 neither mentions any measures to prevent and respond to the nuclear security threat nor provides any penalties to perpetrators. Given our analysis of the current nuclear regulatory regime and its apparent lacuna, we recommend that the lacuna be filled by tackling the nuclear security issue head-on. Briefly, we recommend Indonesia employ a comprehensive approach to prevent nuclear misuse and threat by reforming its laws and regulations taking account of the lacuna we have identified.

To fill gaps, the regulatory authorities should ensure the prevention, detection and response to crimes against nuclear security. This would be improving nuclear legal framework in Indonesia by providing a more complete and comprehensive set of regulations. Our main finding which should be a concern to all is that nuclear security measure in Indonesia lacks penal provisions. The rapid development of nuclear technology has made governments around the world aware of this problem, that is, the lack of specific criminal judicial proceedings, enforcement and criminal penalties for crimes relating to nuclear materials. Penal provision constitutes an essential component in the whole system of nuclear law. It affords confidence and trust that the nuclear law has been designed as a whole with effective positive and

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<sup>46</sup> Mathew Bunn and George Bunn, 'Strengthening Nuclear Security Against Post-September 11 Threats of Theft and Sabotage' (2002) 30 *Journal of Nuclear Materials and Management*. [48-60].

negative incentives and explicit recognition that society will not tolerate behaviours which are injurious to the populace. The provisions also create a firm legal basis to penalize bad actors or perpetrators of crimes that are a misuse of nuclear materials to the harm or detriment of the people and property. It is no doubt evident that nuclear material is a vital benefit to society in providing a source of energy and certain types of medicine and treatments. Still, at the same time, if it is in the wrong hands and used with an intention to do violence and cause bodily harm, then the population runs the risk of being exposed to one of the most poisonous substances known to science.

The current Nuclear Energy Law has a serious shortcoming in that it imposes only administrative sanctions to nuclear crime perpetrators. In this regard, to be credible, the criminal provisions should be designed in exacting detail and provide for rather Draconian remedies where the perpetrator is found guilty and leaves no doubt that the remedy provides the minimal possibility of evading personal penalties. Hence this paper provides a formulation of a criminal provision for the future nuclear law based on the general principles of Indonesian Penal Code.

According to Article 103 of the Indonesian Penal Code<sup>47</sup>, the principles set out in Book One (chapter I-VIII) can be applied to the criminal provisions under the nuclear law. The principles refer to:

- (1) Article 1 (1) states that “*no action shall be punished unless by virtue of a prior statutory of criminal provision.*”<sup>48</sup> It refers to the principle of legality; *nullum delictum nulla poena sine praevia legi poenali*.<sup>49</sup> This principle also contains the principle of *lex temporis delictie* that every crime committed by a person must be tried according to the criminal provisions in force at that time. The primary obligation set out in this principle is to provide nuclear crime provision under Indonesia’s nuclear law.
- (2) Article 2 states that “*the Indonesian Statutory Criminal Provisions apply to*

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<sup>47</sup> Unodc ‘Indonesian Penal Code’ <[https://www.unodc.org/res/cld/document/idn/indonesian\\_penal\\_code\\_html/I.1\\_Criminal\\_Code.pdf](https://www.unodc.org/res/cld/document/idn/indonesian_penal_code_html/I.1_Criminal_Code.pdf)>.

<sup>48</sup> *ibid.*

<sup>49</sup> Shahram Dana, ‘Beyond Retroactivity to Realizing Justice: A Theory on the Principle of Legality in International Criminal Law Sentencing’ (2009) 99 *Journal of Criminal Law and Criminology* 857.

*any person who is guilty of a punishable act within Indonesia*".<sup>50</sup> According to this Article, a nuclear law should consist a definition of "punishable act" that could refer to the description of "threat" or "offence" of nuclear material and facilities under Article 7(1) (g) and (2) of Amendment of the CPPNM, Article 4 of the Beijing Convention, Article 5bis of the SUA 2005, Article 1 (1) of the SUA PROT 2005, and Article 2(1)(b) and 5 of the ICSANT

- (3) An independent and sovereign State must have territorial boundaries within the country which include land, sea and air above it. Therefore, Article 3 states that "*Indonesian criminal provisions apply to any person outside the territory of Indonesia who is committing a crime on-board of Indonesia vessel or aircraft*".<sup>51</sup> This article provides a legal basis for the threat and offences against nuclear security which occurs on-board of vessel and aircraft according to Article 1(1)(g) (h) and 3 of the Beijing Convention as well as Article 3bis(1) (a)(i) and 5 of the SUA 2005.
- (4) Base on the principle of protection, Indonesian criminal provisions apply to any crimes that attack the security interests of Indonesia, whether the crime is carried out abroad by Indonesian citizens or foreigners. It means that "any person" who is defined or understood under national law to include natural persons and legal entities according to Beijing Convention Article 4.
- (5) The criminal sanctions under nuclear law should derive from the sanction system stipulated in Article 10 of the Penal Code regarding punishment. The type of punishment is divided into primary punishment and additional punishment. The first degree of primary punishment is capital punishment or the death penalty, the second degree is imprisonment, the third degree is light imprisonment, and the fourth degree is pecuniary compensation or fine. Meanwhile, additional sanctions are revocation of certain rights, forfeiture of a specific property, and publication of judicial verdict. The character of primary punishment is imperative; meanwhile, the additional sentence is facultative. Therefore, the primary punishment can be imposed without another penalty, and however, the additional punishment cannot be imposed without a basic penalty. The primary punishment should be executed after the verdict has permanent legal force.<sup>52</sup>

According to the principle of legality, an act is prohibited and subject to the criminal penalty if it is regulated under the law. Meanwhile, to determine someone is guilty under criminal law, the principle of error should be fulfilled. Indonesia has adopted the principle of "*Geen straf Zonder wet; Nulla poena-beginsel*"<sup>53</sup> which

<sup>50</sup> Art. 2 the Indonesian Penal Code.

<sup>51</sup> *ibid.* Art. 3

<sup>52</sup> *ibid.* Art. 10

<sup>53</sup> Robert Strang, 'Indonesia's Legal System Is Based on Dutch Colonial Law, See Robert Strang, (2008), More Adversarial, but Not Completely Adversarial: Reforms of the Indonesian Criminal Procedure Code' (2008) 32 Fordham International Law Journal [188-231].

means “*No offence is punishable unless it was an offence under the law at the time it was committed*”. Therefore, to determine illegal acts or offences related to nuclear security, the nuclear regulator can refer to the international nuclear regime that provides the legal basis of crimes against nuclear security. The formulation of a criminal provision under nuclear law should explicitly state the prohibitive acts or offences within its articles.

### **Conclusion**

Until the date of this writing, the ongoing impasse of construction of NPP revolves in a nuclear security issue. The governments’ debate regarding the issue took a lengthy period. In 2012 BAPETEN has initiated to draft a nuclear security law complements the existing nuclear energy law. However, the idea to have separate nuclear security law encounters a procedural hurdle; thus far, the process is still limited to planning in administrative matters.<sup>54</sup> In 2018, BAPETEN initiated to draft a new bill on nuclear energy complete with nuclear security measure to replace the existing nuclear law; thereof the paper is aimed to provide an insight into a comprehensive nuclear law.

Significantly, Indonesia is supposed to be more vigilant to a number of malicious nuclear acts occurred within its jurisdiction and neighboring countries, for example, the missing radioactive material in Malaysia<sup>55</sup> and industrial equipment containing radioactive materials in the Philippines occurred in 2018.<sup>56</sup> The incident of “dirty bomb” in Bandung West Java was a signal that Indonesia should be more focusing on nuclear security in its nuclear legal framework. Even though the country does not possess NPP, there is a

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<sup>54</sup> Mohamad Mamat and Angga Kautsar, ‘Komitmen Pemerintah Indonesia Dalam Memperkuat Keamanan Nuklir, (Commitment of Indonesia to Strengthen Nuclear Security)’, *roceeding of Nuclear Safety Conference* (Bapeten 2016).

<sup>55</sup> Tasnim Lokmaan, ‘Exclusive: Radioactive Device Missing’ (*New Straits Times*, 2018) <<https://www.nst.com.my/news/nation/2018/08/403235/exclusive-radioactive-device-missing>> accessed 21 July 2020.

<sup>56</sup> Kromek, ‘Radioactive Material Missing in the Philippines’ (*www.kromek.com*, 2018) <<https://www.kromek.com/blog/radioactive-material-missing-in-the-philippines/>> accessed 21 July 2020.

broad range of legitimate uses of radioactive materials, especially in industrial facilities, hospitals, research reactors, and scientific laboratories. The success of the nuclear operating organization to improve nuclear security system based on standards established by the IAEA is not a panacea for the nuclear security problem in Indonesia. Indonesia needs a set of overarching regulation, including criminal provision specifying for the nuclear crime. The incomplete nuclear security regime in Indonesia will unexpectedly create a safe-haven for the nuclear malicious perpetrator.

Needless to say, Indonesia has solid technical cooperation with IAEA such as cooperation in nuclear safety and safeguard control. As a non-nuclear-weapon country, Indonesia is bound by NPT and the Southeast Asian Nuclear Weapons Free Zone (SEANWFZ) and one of the signature countries of the Treaty on the Prohibition of Nuclear Weapons (TPNW). In 2003, the country began to implement the IAEA Integrated safeguards, including the additional protocol. Indonesia also continued to advocate the protection of the rights of non-nuclear-weapon countries to peaceful uses of nuclear technology.

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