

THE SECURITIES OF RADIOACTIVE WASTE MANAGEMENT

BY

PANTHA CHANACHU

AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF LAWS IN BUSINESS LAWS (ENGLISH PROGRAM)

FACULTY OF LAW

THAMMASAT UNIVERSITY

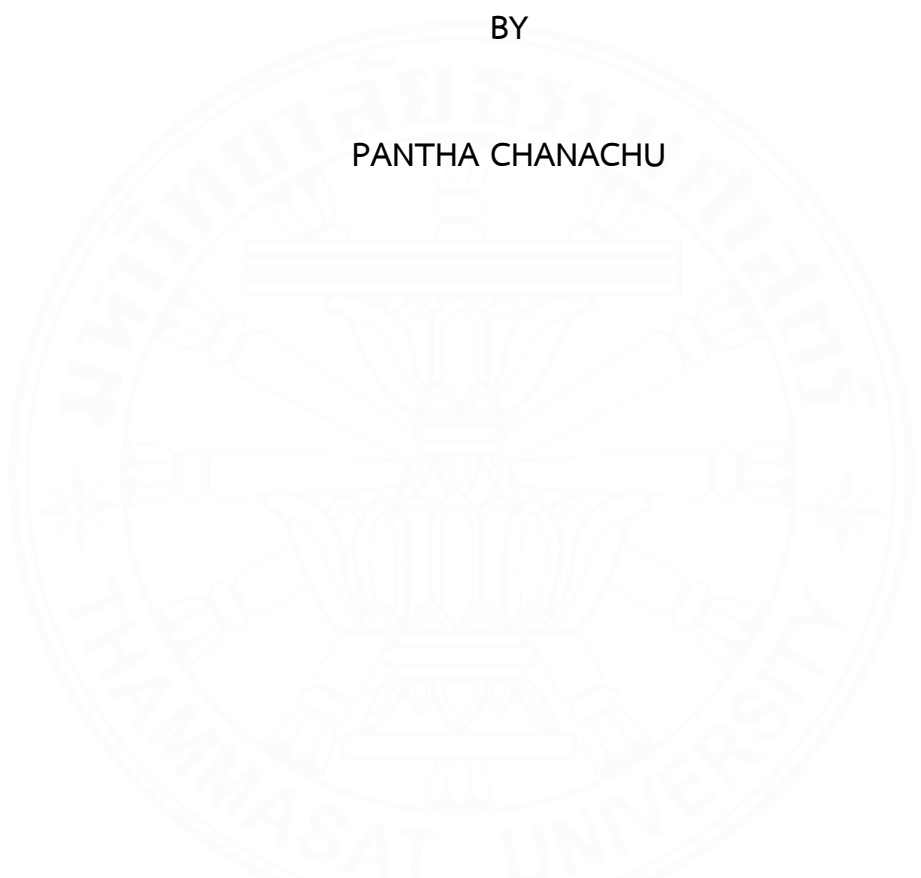
ACADEMIC YEAR 2022

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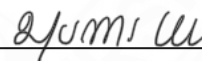
ENTITLED

THE SECURITIES OF RADIOACTIVE WASTE MANAGMENT

was approved as partial fulfillment of the requirements for
the degree of Master of Laws in Business Laws (English Program)

on December 26th, 2022

Chairman



(Associate Professor Munin Pongsapan, Ph.D.)

Member and Advisor



(Professor Amnat Wongbandit, D.Jur.)

Dean



(Associate Professor Pokpong Srisanit, Ph.D.)

Independent Study Title	THE SECURITIES OF RADIOACTIVE WASTE MANAGEMENT
Author	Miss Pantha Chanachu
Degree	Master of Laws
Major Field/Faculty/University	Business Laws (English Program) Faculty of Law Thammasat University
Independent Study Advisor	Professor Amnat Wongbandit, D.Jur.
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ABSTRACT

As the application of nuclear technology plays an important role in our daily life. Thailand tends to develop the use of nuclear and radiation significantly every year. By definition, radioactive waste is the by-product of medical, research, and industrial applications using radiation. Despite being deemed unusable; it is still regarded as a safety risk due to its radioactivity and volume. Thus, radioactive waste requires careful management to protect both people and the environment.

Additionally, reducing the burden on the future generation is another primary reason to require proper management. Therefore, providing the securities of radioactive waste management is one of the most effective measures to ensure the proper and careful management. Currently, the existing laws governing the use of nuclear and radiation in Thailand is the Nuclear Energy for Peace Act B.E. 2559 (2016) and The Nuclear Energy for Peace Act B.E. 2562 (2019). Presently, the ministerial regulation detailing the securities of radioactive waste management in Thailand is undergoing the process of drafting which is still ineffective and ambiguous. As consequence, this independent study aims to examine and suggest the securities of radioactive waste management in Thailand, especially the type of instruments that can be used as the securities and its assessment system. Furthermore, for Thai law analysis, there will be the comparative study of foreign laws, namely Austria, Canada, including

the guidance from international organizations. In order to determine the most effective mean to guarantee the responsibility of radioactive waste safe in Thailand, it is necessary to identify the appropriate securities for Thailand's circumstances and international standards.

Keywords: Nuclear law, Radioactive Waste Management, Securities, Financial Guarantee



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Pantha Chanachu

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LIST OF ABBREVIATIONS

Symbols/Abbreviations	Terms
AECL	Atomic Energy of Canada Limited
BMK	Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology
CNSC	Canadian Nuclear Safety Commission Federal
EEC	European Economic Community
EURATOM	European Atomic Energy Community
IAEA	International Atomic Energy Agency
ILW	Intermediate Level Waste
GNSCR	General Nuclear Safety and Control Regulations
HLW	High Level Waste
LLW	Low Level Waste
NDT	Non-Destructive Testing
NES	Nuclear Engineering Seibersdorf GmbH
NEA	Nuclear Energy Agency
NFWA	Nuclear Fuel and Waste Act
NSCA	Nuclear Safety and Control Act
NWMO	Nuclear Waste Management Organization
OAEP	Office of Atomic Energy for Peace
OAP	Office of Atoms for Peace
OECD	Organization for Economic Co-operation and Development
SBAC	Systems Variability Analysis Code

TINT	Thailand Institute of Nuclear Technology
VLLW	Very Low-Level Waste
VSLW	Very Short-Lived Waste



CHAPTER 1

INTRODUCTION

1.1 Background and Problems

Nowadays, the peaceful use of nuclear technology tends to develop more significantly, since the benefits of radioactive material are widely utilized in many different fields, especially medicine, agriculture, and industry. To govern the peaceful use of nuclear technology, nuclear law is a vital instrument to control and regulate nuclear technology for the safety of people and the environment. Nuclear law includes three primary areas including safety, security, and safeguard. Also, nuclear law covers civil liability arising from nuclear damage.¹ In this regard, nuclear law is recognized as the guardian in order to ensure the safety of using nuclear technology for peaceful purposes. Nuclear Energy for Peace Act B.E. 2559 (2016) and Nuclear Energy for Peace Act B.E. 2562 (2019) are two current specific laws governing nuclear and radiation utilization in Thailand. Radioactive waste management is a part of safety concerns for nuclear law, since radioactive waste generally refers to those radioactive materials that are no longer used but still contain radioactivity.² Therefore, radioactive waste requires careful management from the scientific experts with physical and chemical knowledge. In this sense, the licensee who possesses or uses the radioactive material is responsible for managing the radioactive waste prescribed by the law. Therefore, the most effective measure or strategy to guarantee the responsibility of radioactive waste management is to require “securities”.

In terms of radioactive waste management, securities refer to the financial guarantee involving having adequate finance requirement that aims to be used as operating expenses in the case when the licensee does not comply with the prescribed regulation or rule regarding radioactive waste management. Even the securities are

¹ International Atomic Energy Agency, Nuclear Law the Global Debate (Vienna: International Atomic Energy Agency, 2022), p.2.

² IAEA video, Radioactive Waste (5 July 2019) <www.youtube.com/watch?v=3SOqz1Yu8tY> accessed 1 January 2022

mentioned in draft ministerial regulation stipulating in section 31 of the Nuclear Energy for Peace Act, however the law is still considered ineffective, as the law only allows limited types of securities, including cash, government bonds, bank guarantee contract, assurance contract, revocable letters of credit, and promissory notes. Furthermore, the assessment system is ineffective and insufficient due to the review and revision issues.

As a result, despite the securities of radioactive waste management under Thai law is recognized, it still cannot be employed effectively due to the limited types of securities and the assessment system, including review and revision procedures.

1.2 Hypothesis

The current legislations dealing with the securities of radioactive waste management in Thailand is ineffective and insufficient; even though the securities are recognized, the type of securities is limited. Furthermore, they also experience the problem of review and revision issues. The law should be amended by adopting the Canadian model because Canadian nuclear law covers the broad legislation governing alternative securities and the effective assessment system. Furthermore, the concept of fund, widely used in many countries, is another option for Thai legislations to adopt due to its reliable and stable characteristics to guarantee that there will be radioactive waste management in the future.

1.3 Objective of Study

1. To study the concept of radioactive waste management and its importance, which emerges the idea of securities.
2. To study and analyze foreign laws and their practices on the securities of radioactive waste management, as well as to observe the guidance from the international organizations.
3. To study and analyze the existing Thai law and the draft regulation regarding radioactive waste management.

4. To propose the appropriate measure or regulation for the securities of radioactive waste management under Thai law.

1.4 Scope of Study

This Independent Study will mainly focus only on the securities of the radioactive waste management especially the type of assets that can be used as the financial guarantee or securities. Moreover, it will be discussed on the relevant Thai law which is Nuclear Energy for Peace Act and their ministerial regulations. Also, this study will further compare and analyze selected jurisdictions and international organization's guideline. Consequently, this paper will propose the proper regulation for Thai law on the securities of the radioactive waste management.

1.5 Methodology

This Independent study mainly uses documentary method, which gathers the research from the various sources including texts, reliable website, books, articles, government publications, domestic law, foreign law and the international law in order to analyze and decipher the solution of the securities of the radioactive waste management for Thai law.

1.6 Expected Result

1. To understand the concept of the radioactive waste management and its importance which recapitulate the concept of the securities.
2. To Understand foreign laws and their methods for managing radioactive waste, as the international organization's guidelines will be taken into consideration.
3. To Understand Thai law and its regulation regarding the radioactive waste management in business, which requires to place the securities according to the law.

4. To propose the appropriate measure or regulation for the securities of radioactive waste management under Thai law.



CHAPTER 2

BACKGROUND AND NATURE OF RADIOACTIVE WASTE MANAGEMENT AND THE SECURITIES

2.1 Introduction

This chapter will begin with the background of nuclear law, including the history and general knowledge. Due to the complications of nuclear law, the explanation of the basic principle of nuclear technology is included in this chapter. In particular, the topic of this Independent Study (IS) focuses on the securities of radioactive waste management. Thus, to understand why radioactive waste management is important, which ultimately leads to the necessity of the securities, the basic concept of radioactive waste will be introduced in this chapter, including the benefits of radioactive material, which will eventually turn into radioactive waste afterwards. On the other hand, this chapter will elaborate on the toxicity of the radioactive waste, along with a case that had ever encountered in Thailand. In addition, the guidance of the radioactive waste launched by the IAEA, the general concept, and the necessity of the securities will also be discussed in the chapter.

2.2 Background of Radioactive Waste

Nuclear law has been divided into four pillars; safety, security, safeguards, and liability for nuclear damage³, which covers the advantages of the technology's safe, secure, and peaceful use as well as its uses in daily life. Safety and security are always the deep concern for the use of nuclear technology. As a result, the four pillars of nuclear law provide protection for the advantages of peaceful use of nuclear technology and its uses in the present.⁴ Nuclear law works effectively to dual focus

³ International Atomic Energy Agency, *supra* note1.

⁴ *Ibid.*

on risks and benefits including responsibility, continuous control compliance, independence with international cooperation as another primary principle. Nuclear safety refers to impose of the legally binding of safety standards worldwide. Meanwhile, nuclear security is actively involved in the most recent progressive efforts to the sensitive area of nuclear security. In order to guarantee those nuclear and other radioactive materials, along with accompanying facilities, it requires adequately protected.⁵

Radiation has been acknowledged by humanity for over a century, as Willhelm Conrad Roentgen accidentally discovered radioactivity in November 1895.⁶ Since then, Roentgen had conducted a large number of experiments with radiation. One of his experimental masterpieces was a photograph of his wife's hand taken in 1895 using X-ray technology, which led to further development. Because of his monumental achievement, he received the very first Nobel Prize in Physics in 1901. After that, Rutherford committed his life to the theory of Alpha, Gamma, and Beta rays that he had gained from J. Elster and H. Gertel's earlier research. Along with this discovery, the harm and effect of radioactivity were divulged simultaneously by Danuel in April 1896. His experiment led to the skin burns and sensitive skin reaction arising from the rays. E. Grubbé, a physician who studied the radioactivity, later died of cancer, in which radiation was assumed to be the primary cause of his death. After that, people have utilized radiation for a variety of beneficial uses for peaceful purposes, including energy production, medicine, manufacturing, and cultivation.

Contradictorily, the USA was the first country to successfully develop nuclear power as military tools in July 1945. During World War II, nuclear power was first employed to destroy the opposing parties. Due to the power of nuclear weapons,

⁵ Peri Lynne Johnson, Nuclear Law in Practice- The IAEA Perspective (OLA webinar on Nuclear Law in Practice, 15 December 2020.)

⁶ F. N. Flakus, Detecting and measuring ionizing radiation- a short history, IAEA bulletin <<https://www.iaea.org/sites/default/files/publications/magazines/bulletin/bull23-4/23405043136.pdf>>, accessed 1 January 2022

World War II resulted in more than 100,000 deaths⁷ and a massive loss of economy and resources. As a result, the entire world, particularly the powerful countries declaring a war, acknowledged the detrimental impact of nuclear power. Later, the new notion of nuclear power usage was limited to 'peaceful use'. Consequently, nuclear power and radiation are now solely used for peaceful purposes.

At present, nuclear energy and ionizing radiation play an important role in our daily life. To govern and regulate the safety is the key of nuclear law ensuing from the previous nuclear and radiation of harmful events in the past. The advantage of the radiation from the radioactive material benefits in various fields for human beings. On the other hand, radiation can pose a great risk to the safety of human and the environment. These risks should be analyzed, handled, and regulated without excessively restricting the nuclear industry's contribution to human welfare and economic growth. Nuclear technology, therefore, requires a particular legal norm. Nuclear law deals with the significance of balance between risks and benefits. Radioactive waste is the result from the radioactive material, which still generates the radiation causing hazardous effects to humans and environment. Differing from other type of waste, radioactive waste cannot be eliminated ordinarily, but has to be managed and handled technically by the scientific procedures in order to avoid the hazardous forms the active radiation.

Radioactive waste management was firstly introduced since 1955 in the first conference on the Peaceful Use of Atomic Energy, hosted by Geneva.⁸ Resulting from the conference, the radioactive waste management gradually became more concerning for humanity and environment. In the present, the laws governing the nuclear and radiation power in Thailand are Nuclear for Peace Act B.E. 2559 (2016) and Nuclear Energy for Peace No. 2, B.E. 2562 (2019). The law controls from “cradle to grave”; for example, the law governs the process of import, production, and, foremost,

⁷ History.com editor, Atomic Bomb History, <<https://www.history.com/topics/world-war-ii/atomic-bomb-history>>, accessed 1 January 2022

⁸ Risoluti, P, The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, <<https://www.osti.gov/servlets/purl/841407>>, accessed 1 January 2021.

decommissioning and radioactive waste management provided in this act. Nevertheless, the details provided in the subsidiary law by the ministerial regulation is currently in the draft. Still, it remains unclear and ineffective.

2.2.1 Definition of Radioactive Waste

According to Glossary published by the IAEA, Radioactive waste refers to “waste that contains or is contaminated with radionuclides at concentrations or activities greater than clearance levels as established by the regulatory body.”⁹ This definition should be acknowledged that it is purely for regulatory purposes and that material with activity concentrations is equal to or less than clearance levels is radioactive from a physical viewpoint, although the associated radiological hazards are considered negligible.”¹⁰

Radioactive waste simply refers to any material that contains radioactive nuclear material that may appear in liquid, gas, or solid form, and is purposefully considered unused, even in possession. The half-lives radionuclides are consisted in the radioactive waste. The appropriate measure to manage radioactive waste depends on the type which generates the different hazards from its radiation.¹¹

2.2.2 The Concept of Radioactive Waste

Radioactive waste can exist in a wide variety of radionuclide concentrations in various physical and chemical forms, which can be produced by a variety of different sorts of facilities. As a result of these distinctions, waste management alternatives are similarly diverse. There are numerous options for waste processing and short-term or long-term storage prior to disposal.¹²

⁹ International Atomic Energy Agency, Radioactive Waste Management Glossary, (International Atomic Energy Agency, 2003), p.33.

¹⁰ Ibid.

¹¹ Ibid.

¹² International Atomic Energy Agency, Classification of Radioactive Waste, (International Atomic Energy Agency, 2009), p.1.

2.2.3 The Source of Radioactive Waste

As mentioned earlier, the radioactive material is widely used for medicine, research and industrial purposes. Because of this, according to the records, the radioactive waste can be divided into different types as follows:

2.2.3.1 The Radioactive Waste in Medicine

In 1898, the first x-ray machine was imported to diagnose pulmonary tuberculosis for inmates, which was the first use of radiation invented by Doctor Hans Adamsen, who initiated and introduced the use of radiation with the X-Ray machine for medicine purpose in Thailand¹³. Later on, other hospitals started to employ to use of the X-Ray including Vajira Hospital in 1912, Thai Red Cross Society in 1914, etc. In 1938, Siriraj hospital initially used Radium with 330 milligrams for a cancer treatment. Currently, there are approximately 1374 radioactive materials used in this field, covering 135 organizations in Thailand.¹⁴

2.2.3.2 The Radioactive Waste in Research

The radioactive waste in research mostly is resulted from the use in school or university. The fundamental research involves different field of science including chemical, biology and physics.¹⁵ Moreover, the waste is frequently discovered from research reactors that produce less energy than nuclear reactors. Consequently, it generates less radioactive waste than other sources including nuclear reactor.¹⁶ Additionally, the research resulting from nuclear technology produces enormous benefits for other fields, such as agriculture, evidenced by pesticide and

¹³Naruepol Pensiri, Utilization of Nuclear Energy and Radiation (2020), Atom for Peace Journal <https://www.oap.go.th/images/documents/resources/media-library/newsletters/oap_-_newsletter_vol.33_no.1.pdf>, accessed 12 January 2022.

¹⁴ Ibid.

¹⁵ International Atomic Energy Agency, Management of Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education, < https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1217_web.pdf>, accessed 12 January 2022.

¹⁶ Amnat Wongbandit, Kodmai Palang-gnan Nuclear Lae Rangsi [Nuclear and Radiation Law] (1st edn, Faculty of Law Thammasat University 2021) 277 (อำนาจ วงศ์บัณฑิต, กฎหมายพลังงานนิวเคลียร์และรังสี (พิมพ์ครั้งที่ 1, คณะนิติศาสตร์ มหาวิทยาลัยธรรมศาสตร์ 2564) 277)).

fertilizer research. Recently, there are approximately 222 institutes with 8437 radioactive materials being used in Thailand.¹⁷

2.2.3.3 The Radioactive Waste in Industry

The radioactive waste arising from industry is regarded as one of the most popular sources. Mostly found in the form of sealed-radiation used for the Non-Destructive Testing (NDT) for finding the defect of goods or measuring the quality of goods in the industry. Moreover, it has been used for the food's sterilization and other products, as well as the examination of critical parts in plant and machinery concerning deterioration and corrosion, such as engine components, furnace linings, and metallic surfaces, is an example of unsealed sources in industrial use.¹⁸

The waste mostly consists of medical radium which is the isotope Ra-226 with a nuclear charge of 88, a mass of 226 units, and Ra-228. There are 12 other radium with masses ranging from 213 to 230. Typically, disintegration involves the release of energy as a component of particles (alpha or beta rays) or gamma rays. The residual nucleus may be stable or unstable. Ra-226 disintegrates by the discharge of an alpha particle, leaving residual nucleus of radon-222, which is the radioactive with a half-life of 3.8 days.¹⁹ Hydrogen-3 or tritium (half-life 13 years) disintegrates with the emission of a negative beta particle, resulting in the stable nucleus helium-3, in its place. There is no essential difference between the natural and synthetic radioactive materials. The alpha, beta and gamma rays are called ionizing radiations. They convey energy in concentrated form, away from their source. Thus, the energy is dissipated more or less gradually in its passage through matter. Various interactions with matter are how the waste is employed in industrial and other applications. The term nuclear reaction applies to any processes in which the internal energy of a nucleus changes,

¹⁷ Naruepol Pensiri, *Supra note 13*.

¹⁸ Leppard, L. B., *Uses of Radioactive Materials in Industry*, Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique, <http://www.jstor.org/stable/41982804>. Accessed 16 Jul. 2022.

¹⁹ *Ibid.*

and therefore includes disintegration as a special case. Such reactions can be induced by a wide variety of collision processes.²⁰

The most typical industrial applications for radioisotopes are the use of accompanying radiations as a probe or a signal, such as in metering, sensing, or reporting. Due to the fact that sufficient detection sensitivity is accessible at low power levels, such applications do not require significant amounts of source material; nonetheless, biological dangers exist at vanishingly low radiation power levels. Thus, health and safety considerations are prioritized in the program. An extended type of radioisotope with a variety of related radiation energies is available for use.²¹

2.2.4 Type of Radioactive Waste

The factors were classified as per their physical, chemical, and radiological qualifications.²² Moreover, the remaining radiation hazard is the primary criterion for classifying radioactive waste into the following categories:

2.2.4.1 Very Short-Lived Waste (VSLW)

Waste that can be stored for a few years for decomposition and subsequently discharged from regulatory control in accordance with regulatory body-approved procedures for uncontrolled disposal, usage, or discharge. VSLW is mostly composed of radionuclides with very short half-lives, which are frequently used in medicine and research.²³

2.2.4.2 Very Low-Level Waste (VLLW)

Waste that does not require a high level of confinement and isolation may be disposed of at landfills close to the surface without regulatory control. These landfills may also contain other sorts of hazardous waste. Low-activity

²⁰ Ibid.

²¹ Ibid.

²² International Atomic Energy Agency, Disposal of Radioactive Waste Specific Safety Requirements, (International Atomic Energy Agency, 2011), p.1-p.2.

²³ Ibid.

soil and detritus are typical examples of waste in this class. Radionuclide concentrations with longer half-lives are typically low in VLLW.²⁴

2.2.4.3 Low Level Waste (LLW)

Waste that specifies the conditions for clearance, yet contains only a small number of long-lived radionuclides. Such waste necessitates isolation and concentration for up to a few hundred years and can be disposed of in near-surface facilities with specialized design. This category includes a wide range of garbage. LLW may contain both short-lived radionuclides with higher activity concentrations and long-lived radionuclides with lower activity concentrations.²⁵

2.2.4.4 Intermediate Level Waste (ILW)

Waste with contents, notably long-lived radionuclides, necessitate greater confinement and isolation than that provided by near-surface disposal. ILW, on the other hand, requires no or very moderate heat dissipation during storage and disposal. Long-lived radionuclides, particularly alpha emitting radionuclides, may be found in ILW and may not decay to a level of activity concentration appropriate for near-surface disposal over the period of time covered by institutional regulations. In conclusion, waste in this class is suggested to be disposed of at greater depths, ranging from tens of meters to a few hundred meters.²⁶

2.2.4.5 High Level Waste (HLW)

When ²³⁵uranium fuel has been converted into high level waste, it is predominantly liquid or solid in a reactor.²⁷ This is the most hazardous waste due to its caused the highest fatal radiation. When constructing a disposal site for such waste, sufficiently high levels of activity to produce significant amounts of heat from radioactive decay, or waste containing large amounts of long-lived radionuclides, must be taken into account. The most widely acknowledged approach

²⁴ Ibid.

²⁵ Ibid.

²⁶ Ibid.

²⁷ Thanin Bunyarat, Measure Control and Laws Enforcement related to the Radioactive Waste Management in Thailand, (Thesis Thammasat University 2006)

for disposing of HLW is to place it into the deep, stable geological formations that are typically at least a few hundred meters below the surface.²⁸

2.3 The Toxicity and Hazard of Radioactive Waste

As mentioned earlier, the radiation energy benefits human in various aspects. On the other hand, the misuse of radiation or the accident arising from the radiation might severely affect human health. Ionizing radiation's health effects are usually divided into two categories.²⁹ Since radiation is not visible to naked eye, cannot be smelled, and has no physical form or heat, there is no way to warn humans of its risk by its physical form. The severity of symptom arising from doses of radiation depends on three factors; time, distance and shielding. Because of this, radiation safety is one of the most important issues to be concerned about as it is the key to the peaceful use of radiation for all countries throughout the world. This concept of safety also applies to radioactive waste, which continues to emit radiation, unless properly managed by radioactive waste management. In Thailand, the case of COBALT-60, which occurred in Samutprakarn province in February 2000, was the case study for the failure of radioactive waste management responsibility.³⁰

In this case, the waste which was the medical radiation instrument teletherapy Gammatron-3 COBALT-60, firstly owed by Ramathipbodi hospital and later sold to KSE company without informing Office of Atomic Energy for Peace (OAEP), the regulation organization at that time. Unfortunately, that medical radiation instrument was stolen by the scrap dealer. In this case, it was discovered that around 10 people were impacted by the accident, with three of them regrettably died. The patients in

²⁸ International Atomic Energy Agency, *supra* note 22 at 36-38.

²⁹ Elena Buglova, Radiation Health Effects, < <https://www-pub.iaea.org/mtcd/meetings/PDFplus/2009/36489/p36489/Top%201.1%20E.%20Buglova.pdf>>, accessed 8 January 2022.

³⁰ *Ibid.*

this case experienced debility, headaches, nausea, and vomiting as early symptoms.³¹ The victims having the direct contact with the material, experienced irritation and burned sensations. Ultimately, it is revealed that the majority of the victims had suffered from leukopenia as a result of excessive radiation exposure.³²

This case was reported to the IAEA, which led to investigation process. The report concluded that there are many factors that caused this accident. As a result, the importance of the regulations regarding the radioactive waste management has been highlighted, as the cause of this tragedy was mainly resulted from the negligence of the proper management of the disused sources. Moreover, the dangers of radiation do not only lead to hazardous effects to environment, but also to human's health, in which other cases from overseas can be found in Japan and Brazil. Pertaining to the radiation effects, according to the IAEA study, they can be separated into two stages: deterministic and stochastic effects.

2.3.1 Deterministic Effect

The deterministic effect can directly impact cells and DNA, which in eventually can be cancerous, if being exposed to in a long period of time. At all dose levels, stochastic effects are present due to DNA damage. A change of cell that is still capable of mitosis can produce a clone of cells, causing cancer in the person who is exposed to the waste. Furthermore, the study also found that the change of genetic is also affected.³³

2.3.2 Stochastic Effects

After the appearance of deterministic consequences, organ functions might result in failure, when substantial amount of cells in organs or tissues are destroyed and they are ceased to grow. At a certain level, the effects can be medically

³¹ International Atomic Energy Agency, The Radiological Accident In Samut Prakarn, (Vienna: International Atomic Energy Agency, 2002) p.40-42.

³² Ibid.

³³ Versant Physics, Deterministic Vs. Stochastic Effects: What Are the Differences?, <<https://versantphysics.com/2021/04/21/deterministic-vs-stochastic-effects/>>, accessed 25 January 2022

detected on an organ or biological system. The initial symptoms can be typically shortened (from weeks to hours), and their intensity rises with an increasing equivalent dose. Regarding these effects, the symptoms might be found in radiologist and side effects of radiotherapy.³⁴ The stochastic effects accumulated and developed into the disease in the latter years, resulting in cancer, which is heritable causing genetic changes, which are mostly found in this stage.³⁵

2.4 The Guidance on Radioactive Waste Management

The International Atomic Energy Institution (IAEA), an international agency, is in charge of monitoring nuclear and radiation safety as well as regulating the member states to keep people and the environment safe from radioactive hazards. For this reason, the IAEA established guidance on numerous concerns regarding nuclear and radiation safety. The institution established the fundamental safety standards, which offer an objective foundation for choices about safety. Despite of this fact, those in charge of making decisions must conduct thorough analysis and decide how to achieve the best possible equilibrium between the advantages of a certain action or activity and the hazards posed by radiation and other undesirable outcomes. Based on the site-specific safety assessment findings, the state should set constraints for the disposal of long-lived radionuclides.³⁶

Another crucial factor to take into consideration are both people and the environment. As previously stated, radiation has detrimental effects on people, which can be both short-term and long-term. After the exposure to such hazardous ionizing radiation, human beings may experience immediate effects, or the radiation may gradually permeate into cells, leading to genetic changes and severe cancer in the

³⁴ Ibid.

³⁵ Ibid.

³⁶ International Atomic Energy Agency, *supra* note 22 at 31.

future. For the environment, the radiation can affect natural resources inevitably including, surface water, marine resources and groundwater.³⁷

The IAEA has ruled the guidelines on radioactive waste management into two sessions: nuclear power plants and other radioactive material. All safety principles are set to encourage safety as well as to indicated a joint convention, which are Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management. The objective of the advice on safety requirements is to specify the safety objectives and requirements for all types of radioactive waste disposal. This safety requirements publication is designed for use by anybody who is accountable for radioactive waste management and making decision on the development, operation, and closure of disposal facilities, particularly those who are concerned with regulatory issues. The International Atomic Energy Agency (IAEA) suggested to the members that they build a disposal facility in order to separate the waste from the accessible biosphere and considerably reduce the possibility of accidental human contamination of the waste and its consequences to ensure that the waste is disposed of safely. Even though the waste can be in different forms, such as liquid, gas, and solid, for the convenience of volume and immobilization to facilitate storage, transport, and disposal activities.³⁸

As mentioned above, the radioactive waste is divided according to its doses and levels. To protect people and the environment, it is therefore necessary to manage radioactive waste within its classifications. As per the guidance's recommendations; (i) Specific Landfill disposal is suggested for a very low-level radioactive waste (VLLW). The Specific Landfill disposal designated for low concentration or levels.³⁹ (ii.) Near Surface disposal is for intermediate level radioactive waste (ILW), due to the fact that the level of this waste is high enough to harm the public, it is necessary to build on the ground surface or up to a few tens of meters

³⁷ Ibid.

³⁸ Ibid.

³⁹ International Atomic Energy Agency, *supra* note 22 at 5.

below ground level for disposal.⁴⁰ (iii) Disposal for intermediate level waste, this kind of disposal is appropriate for Intermediate level waste (ILW), due to its radiation, it requires caverns, vaults or silos with qualifications of at least a few tens of meters below ground level and up to a few hundred meters below ground level.⁴¹ (iv) Geological disposal, this facility designs for high level radioactive waste (HWW) which are tunnels, silos and especially geological formation. (v) Borehole disposal, this is suggested for limited quantities of waste such as disused sealed radioactive sources.⁴² Regarding the disposal of solid high-level waste and spent fuel, one option can be boreholes with several kilometers deep; however, no state has chosen this option as a disposal site.

Conclusively, the preservation of the environment and the protection of the common public from the harmful effects of radiation are the two primary focuses of the safety requirements, which are relatable with the advice for the management of radioactive waste, which are relatable with the advice for the management of radioactive waste, which requires the effective waste management during both operational phase and after the closure of the facility. The application of legal and regulatory requirements in the pre-operational, operational, and, in some situations, post-closure phases will provide assurance of this protection.

2.5 The General Concept of the Securities

2.5.1 The Necessity of the Securities

The secured transaction designated for personal property adhere in order to protect and ensure for the debtor or security receiver. The objective of security comes from these following reasons;

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Ibid.

Firstly, the concept is to be used as operating expenses, proceeding when required and prescribed by law if the securities provider does not comply with the prescribed rules and regulations.⁴³

Under Thai jurisdiction, there are many relevant laws, aiming to enforce the security as the operating expenses in such of events.⁴⁴ For example, section 80/1 and section 80/2 of Petroleum Act B. E. 2514, these provisions require the concessionaire to deposit the security for the demolition of the building or any other materials. The objective of this provision is environmental protection, which is necessary for the concessionaire to provide the securities. In contrast, if the concessionaire fails to fulfill those responsibilities or does so with a delay, the harms might ensue. In that case, the law empowers the Director-General of the Department of Mineral Fuels to assign other individuals to operate the demolition on behalf of or jointly with the concessionaire, with the costs incurred being reimbursed from the securities.

Another example can be found in relevant Labour law, including Employment Arrangement and Jobseeker Protection Act B.E.2528 and Maritime Labour Act B.E. 2558. Under Employment Arrangement and Jobseeker Protection Act B.E. 2528, the security required to provide is for the domestic arrangement to comply with all rules under this act, in which the security cannot be less than 100,000 baht. The financial security under this act can be enforced when the employment arrangement's licensee does not repatriate the workers in the case of overseas employment or does so with the delay of more than fifteen days.

Next, this concept has been applied in some regulations in Maritime Labour Act B.E. 2558. Section 28 of this act states that the licensed recruiting agent shall provide the securities in the case where recruiting agent fails to perform those required terms and conditions under this act, in the case of the recruiting agent's failures to arrange for expenses such as transportation, accommodation, food, and other

⁴³ Waranya Ngamsiriudom, Legal Status of the Monetary Deposit as Security under Regulations of the Office of the Prime Minister on Procurement B.E. 2535, (Thesis Thammasat University 2016)

⁴⁴ Ibid.

necessities when the job applicant returns to domicile. In that case, the securities can be taken to cover such costs.

Secondly, the goal of securities is designed to be the compensation for the damage caused by the securities provider.⁴⁵

The conspicuous example can be found in Employment arrangement and Jobseeker Protection Act B.E. 2528 and Tourism Business and Guide Act B.E. 2551.⁴⁶ Regarding Employment Arrangement and Jobseeker Protection Act B.E. 2528, it is stated in section 16 and section 27, regarding the securities in the sense that the security provider shall be responsible for the damage. Section 16 requires an employment arrangement licensee to provide the securities with the amount not less than 50,000 baht for each employment agent as the compensation for a job seeker. In addition, the Tourism Business and Guide Act B.E. 2551 is another example. Section 18 of this act mandates tourism business licensees to provide one or more securities, such as cash, bank guarantee, Thai government bond, or state-owned enterprise bond, for any damage caused to tourists, as the protection when a tourism business licensee fails to make a payment to the fund that was set up to compensate the tourists who were harmed. In such a circumstance, the registrar of tourism businesses and guide centers can deduct a repayment amount from a given securities to the fund under section 41.

Lastly, the concept of securities is to be utilized as a debt payment. This goal of the securities appears in Life Insurance Act B.E. 2535 and Non-life Insurance Act B.E. 2535, in which both of them have mentioned that the securities shall include cash or bank guarantee to pay the creditor when the company is dissolved.

Conclusively, the securities of radioactive waste management are a type of security that aims to be used as operating expenses in the case where the licensee does not comply with the prescribed regulation or rule, similar to the securities concept in section 80/2 of the Petroleum Act B.E. 2514 and section 28 of the Maritime Labour Act B.E. 2558. The securities of radioactive waste management need to be sufficient to guarantee the licensee in possession of radioactive materials is held

⁴⁵ Ibid.

⁴⁶ Ibid.

2.5.2.1 Cash

2.5.2.2 Government bond

2.5.2.3 Bank guarantee

⁴⁷ Ibid.

⁴⁸ Marcia Wendorf, What Are Government Bonds & How Do They Work, <https://seekingalpha.com/article/4487106-government-bonds?external=true&gclid=EAlalQobChMIwwLp9p6g9gIVU5lmAh2A1goiEAAAYASAAEgJpk_D_BwE&utm_campaign=14926960698&utm_medium=cpc&utm_source=google&utm_term=127894704186%5Edsa-1427141793820%5E%5E552341146735%5E%5E%5Eg>, accessed 20 February 2022.

defaults, the bank agrees to pay a specified amount of money to the recipient.⁴⁹ It is essentially paid as the beneficiary in the event that the applicant cannot make a payment. The fees are charged to the applicant by the bank for providing such a guarantee. The role of bank guarantee as a guarantee for the securities receiver is crucial. Nevertheless, it might not be appropriate for every business, particularly small one, because small businesses may have insufficient credibility or margin profit to have a bank issuing a guarantee due to the rigorous and stringent screening process.⁵⁰

Apart from that, the UNCITRAL Model Law on Secured Transactions as the model law recommends these types of security as the securities for business.

2.5.2.4 Intellectual Property

Patents, copyright, and trademarks are examples of intellectual property that can be used as a security. This sort of security has the benefit of supporting and promoting intellectual property in the corporate world. Furthermore, it is advantageous to the business owner in the sense that it will not affect any other asset in terms of capital in the company. On the other hand, the disadvantage of intellectual property as a security is the difficulty on the assessment, which may provide a risk and burden to the security receiver.⁵¹

2.5.2.5 Receivable

Receivable is a new concept for security but it is also suggested by UNCITRAL MODEL LAW on secured transaction. A receivable refers to any rights for payment of a monetary obligation, excluding rights for payment shown by a negotiable instrument, cash credited to a bank account, and non-intermediated securities.⁵² The

⁴⁹ Advantages and Disadvantages of Bank Guarantee, <<https://efinancemanagement.com/working-capital-financing/advantages-and-disadvantages-of-bank-guarantee/>>, accessed 28 February 2022

⁵⁰ Ibid.

⁵¹ Itsarat Thamrongmast, Enforcement Methods of Intellectual Property Rights as Business Security According to the Business Collateral Act 2015, (Thesis Bangkok University 2015)

⁵² United Nations Commission On International Trade Law, 'UNCITRAL Practice Guide to the Model Law on Secured Transactions', (Vienna: UNCITRAL, 2020), p.21

downside of this concept is the variety of assets even though receivable can be transferred conveniently, there is a limitation on the types of debt that can be used.

2.5.2.6 Fund

Fund is regarded as one of the most popular concepts regarding the financial securities especially for the environment and healthcare issue, appearing in various environmental fund. The fund is collected from the polluter according to the Polluter Pay Principles (PPP)⁵³ which aims to control and treat waste disposal. The fund can be used accordance with its establishment.

The goal of the fund is to repair, treat, and protect the environment, particularly concerning the environmental issue of radioactive waste management, which can be considered an environmental law. As mentioned earlier, a fund is considered one of the most effective tools because of its dependability. The Environmental Damage Remediation Fund provides a model of action. It serves as a guarantee to protect people who have been affected by the damages resulting from polluter's actions.⁵⁴

2.6 Conclusion

Nuclear technology has been a part of daily life inevitably in various areas, especially in medicine, research, and industry. To consummate the purpose of nuclear for peace, nuclear law aims to promote the use for peace instead of military service. Apart from that, nuclear law seeks to be aware of the safety, security, safeguard, and liability key to nuclear law. Safety is one of the most important factors to consider for nuclear law. Radioactive waste management is regarded as one of the safety concerns for people and the environment. Radioactive waste management is considered a

⁵³ Kamolnut Noigraiprai, Concept of Establishing the Damage Remedy Fund for the Health and Life of People from Industrial Plant Pollution by Means of Earmarked Taxation, < <https://so03.tci-thaijo.org/index.php/JMND/article/view/252241/168969>>, accessed 25 February 2022.

⁵⁴ Wiyada Kanyalang, Legal Measures to Compensate and Remedy Environmental Damage by Environment Funds, (Thesis Thammasat University 2018)

crucial topic, as evidenced by its hazard and previous cases. As a result, effective radioactive waste management is essential under IAEA guidelines. In this way, providing the securities is considered as the most effective way to ensure radioactive waste management.



CHAPTER 3

INTERNATIONAL LAWS AND FOREIGN LAWS ON THE SECURITIES OF RADIOACTIVE WASTE MANAGEMENT

3.1 Introduction

This chapter will highlight the study of relevant principles of international law concerning the securities of radioactive waste management, the history and background of relevant international principles. Applying the law on nuclear energy for peace in Thailand also entails studying the pertinent international organizations to comprehend an overview and the significance of the principle of securities of radioactive waste management afterward. This chapter will also provide an in-depth analysis of the international legislation governing nuclear energy and radiation, focusing on the convention governing the securities of radioactive waste management. Furthermore, this section will discuss the two selected countries, Austria and Canada, that require the securities of radioactive waste in different circumstances. For Austria, even without nuclear power plants, nuclear technology is available. Meanwhile, in Canada, both nuclear power plants and other radiation usage are present

3.2 International Legal Framework on the Securities of Radioactive Waste Management

The international organization for nuclear cooperation is regarded as the world's "Atoms for Peace and Development" institution under the United Nations organization. To promote the safe, secure, and peaceful use of nuclear technologies, the agency collaborates with its member states and diverse partners throughout the world, which is the International Atomic Energy (IAEA). Also, the OECD is one of another international organization, regulating the use, control as well as providing advice pertaining to nuclear and radiation for the member countries including developed countries.

3.2.1 The Relevant International Organizations

(1) International Atomic Energy (IAEA)

The International Atomic Energy Agency (IAEA) was established on July 29, 1957, shortly after President Eisenhower delivered a speech to the United Nations General Assembly on the further intention of nuclear technology, which was to be used solely for the sake of peace in the future. The International Atomic Energy Agency's headquarters is located in Vienna, Austria. The International Atomic Energy Agency (IAEA) is the international agency considered as the nuclear guardian of the world. In addition, it aims to offer and advance the aid of nuclear and radiation use to achieve world peace.⁵⁵

The IAEA has specific responsibility for the application of international nuclear law, comprising of 172 member states.⁵⁶ The headquarter is in Vienna, Austria. Since 1979 and 1984, respectively, there have been two regional offices situated in Toronto, Canada. Additionally, there are two other contact offices located in New York City and Switzerland. The IAEA has been originally established in response to the deep fears and expectations generated by the discoveries and diverse uses of nuclear technology. Since the establishment, the IAEA has been given the mandate to engage with its member states and other partners throughout the world to promote safe, secure, and peaceful nuclear technologies. Pertaining to the IAEA Statute, the definition of the dual mission of the IAEA is to promote and govern the atom.⁵⁷

The IAEA has established guidelines addressing the safety of radioactive waste management. This guideline introduces the concept of the securities of radioactive waste management subsequently. Furthermore, the IAEA constantly

⁵⁵ International Atomic Energy Agency, History, <<https://www.iaea.org/about/overview/history>> accessed 6 March 2022

⁵⁶ International Atomic Energy Agency, History of the International Atomic Energy Agency, (Vienna: International Atomic Energy Agency, 1997),

⁵⁷ Ibid.

encourages the member states to protect the safety of nuclear technology for the public and the environment.

(2) European Economic Cooperation (OECD)

European Economic Cooperation or the OEEC was later developed to Organization for Economic Cooperation and Development (OECD) in 1960. Regarding Nuclear and Radiation, the Nuclear Energy Agency (NEA) under the OECD was established in February 1958.⁵⁸ Its purpose was to create a framework for peaceful nuclear cooperation. The agency's three primary goals were to organize cooperative research initiatives; resolve particular legal issues pertaining to nuclear energy through the harmonization of national legislation or the creation of regional conventions, and promote international cooperation, and provide a forum for its member countries to discuss and coordinate national nuclear energy programs.⁵⁹ First and foremost, the principal goal of the NEA is to help its members maintaining and advancing their development through global collaboration based on science, technology, the law, as well as to administer the government policy and decision on energy and global concern regarding the carbon issue.⁶⁰

The NEA has established its guideline based on the financial instrument for the decommission, spent fuel, and radioactive waste management. Regarding this perspective, the securities is the financial tool necessary for the members to guarantee the safety of the decommissioning, spent fuel, and radioactive waste management.

(3) European Atomic Energy Community (EURATOM)

The European Atomic Energy Community, known as EURATOM is the international organization developed from the EURATOM treaty established on 25

⁵⁸ Nuclear Energy Agency, Ensuring the Adequacy of Funding for Decommissioning and Radioactive Waste Management, (OECD Publishing Paris, 2021) p.2.

⁵⁹ Nuclear Energy Agency, A Critical Review of the System of Radiation Protection, (OECD Publishing, Paris), p.86

⁶⁰ Nuclear Energy Agency, *Supra* note 58, p.4

March 1957⁶¹ and was signed simultaneously by another international organization, the European Economic Community (EEC).⁶² This organization has set the goals of expanding the scope to embrace a diverse variety of subject areas that are connected to ionizing radiation and nuclear power, such as nuclear material safeguarding, radiation shielding, and the development of the International Fusion Reactor. One of the most significant legal frameworks on the safety of radioactive waste and spent fuel launched by EURATOM is THE COUNCIL DIRECTIVE 2011/70/EURATOM.⁶³ The goal is to ensure that European Union Member States are maintaining safety in radioactive waste management and continually improving their management regime. Another purpose is to guarantee the effectiveness of accessing useful information among members.

(4) ASEANTOM

The Association of the ASEAN countries attempts to duplicate and strengthen the international cooperation and development of the legal instrument for the utilization of nuclear and radiation among ASEAN members. Thus, the ASEANTOM was established in 2011 for this reason. The purpose of ASEANTOM is to encourage global cooperation on radiation and nuclear use safety, security, and protection. The annual meeting is held once a year, with different host from the member states every year.⁶⁴ The meeting primarily focuses on enhancing each country's technological and legal grounds on nuclear technology. The securities of the radioactive waste management are a part of the safety concern.

⁶¹ Britannica, The Editors of Encyclopaedia. European Atomic Energy Community, Encyclopedia Britannica, 21 Dec. 2011, < <https://www.britannica.com/topic/European-Atomic-Energy-Community>>. Accessed 3 June 2022.

⁶² European Parliament, Euratom Treaty, <<https://www.europarl.europa.eu/about-parliament/en/in-the-past/the-parliament-and-the-treaties/euratom-treaty>>, Accessed 3 June 2022.

⁶³ Haydon Etherington, Euratom, < <https://www.instituteforgovernment.org.uk/explainers/euratom>> Accessed on 3 June 2022.

⁶⁴ Raksina Rakwongsa, Background Information of Aseantom, <<https://www.oap.go.th/en/component/content/article/194-information/7987-background-information?Itemid=527>>, Accessed 4 June 2022

3.2.2 The International Agreements and Conventions under the IAEA

International convention and agreement are the important international legal instruments to assure the safety of nuclear energy and radiation, which comprise of requirements to make contracting parties binding on these following conventions and treaties. They are examples of the important international agreements concerning safety, security and nuclear safeguards.

(1) The Convention on Early Notification of a Nuclear Accident, adopted in 1968. This convention arises from one of the biggest nuclear accidents in Ukraine, which was the prominent Chernobyl nuclear plant accident.⁶⁵ The Convention stipulated that the states must report the complete information in order to facilitate further investigation.⁶⁶

(2) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. It was adopted in 1986 in response to the nuclear and radiological emergencies at Chernobyl. States shall publicly inform the IAEA any individuals, professionals, equipments, or materials available for support. In the event of a request, each state party determines whether it can provide the requested help, as well as the extent and circumstances of that support.⁶⁷

(3) Convention on Nuclear Safety: The nuclear safety convention is concerned with the safety of contracting parties and advises members to maintain the highest degree of nuclear safety possible, detailing the regulation of operating a nuclear facility.⁶⁸

(4) Joint Convention on the Spent Fuel Management and on the Safety of Radioactive Waste Management 1997: As mentioned in the first article, this convention is designed to maintain and improve the safety of the spent fuel and any

⁶⁵ Moser B, The IAEA Conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency (44 Nuclear L Bull 10, 1989)

⁶⁶ Ibid.

⁶⁷ Ibid.

⁶⁸ Kamminga, M. T., The IAEA Convention on Nuclear Safety, International and Comparative Law Quarterly, (Vol. 44, No. 4, pp. 872-882.)

waste occurring from radioactive material.⁶⁹ Thus, the joint convention on the Spent Fuel Management and of the Safety of Radioactive Waste Management aims to protect the safety of fuel and waste particularly.

(5) Agreement on the Privileges and Immunities of the IAEA: As mentioned earlier, the IAEA, as an international organization and a juristic person, is entitled to immunity when conducting related activities in any member state.⁷⁰ This convention provides IAEA with asset, income, and property immunity.⁷¹

(6) The Treaty on the Non-Proliferation of nuclear weapons: The purpose of this treaty is to promote the peaceful application of nuclear technology. The possession of nuclear weapons is actively discouraged through the promotion of this convention. Additionally, the treaty's main objective is the prohibition to provide assistance to other countries for the production of nuclear weapons or the possession of nuclear weapons with the inclusion of 191 states parties.⁷² While nuclear-weapons testing is ongoing, parties to the state have committed neither to produce nor to possess nuclear weapons. Additionally, they have agreed not to support, encourage, or induce the development of non-nuclear weapons.

(7) Additional Protocol to the Agreement between the Government of the Kingdom of Thailand and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons (AP): This convention is intended to safeguard nuclear weapons in order to ensure the safeguard in this matter with the condition in which nuclear material is not

⁶⁹ International Atomic Energy Agency, The joint convention on the Spent Fuel Management and on the Safety of Radioactive Waste Management, < <https://www.iaea.org/topics/nuclear-safety-conventions/joint-convention-safety-spent-fuel-management-and-safety-radioactive-waste> >, Accessed 30 June 2022.

⁷⁰ Legal Affairs of Office of Atoms for Peace, Convention and Treaties, < <https://www.oap.go.th/about-us/treaties> >, Accessed 30 June 2022.

⁷¹ Ibid.

⁷² United Nations, The Treaty on the Non-Proliferation of nuclear weapons, <<https://www.un.org/disarmament/wmd/nuclear/npt/#:~:text=The%20NPT%20is%20a%20landmark,and%20general%20and%20complete%20disarmament.>>, Accessed 12 June 2022

generated for weapon reasons. Furthermore, it is the responsibility of the member state to report radioactive material as well as the nuclear fuel cycle to the IAEA.⁷³

(8) Convention on the Physical Protection of Nuclear Material (CPPNM): It is a legal instrument to address the physical protection of nuclear material utilized for peaceful purposes in various scenarios. In addition, it focuses on international collaboration in the case of the criminalization of nuclear materials.⁷⁴

(9) Comprehensive Nuclear-Test-Ban Treaty: Initially, this convention aims to be an effort to limit the testing of nuclear weapons. This basically supports the idea of nuclear energy for peace. Furthermore, the goal of this treaty is to urge the complete prohibition on nuclear weapons and testing.⁷⁵

(10) International Convention for the Suppression of Nuclear Terrorism: It is an international legal issue regarding anti-terrorist activities and nuclear weapons.⁷⁶ Nuclear terrorism, by definition, is the use or threat to use nuclear material, nuclear fuel, radioactive products or waste, or any other radioactive substances having harmful, explosive, or other hazardous properties, including the use or threat of nuclear to compel individuals, states, or international organizations against their rights and discretion.⁷⁷

(11) The Vienna Convention on Civil Liability for Nuclear Damage: Its purpose is to determine the liability arising from nuclear damage. Furthermore, liability for nuclear incidents, transportation, and transfer of nuclear material shall be liable

⁷³ Office of Atoms for Peace, *supra* note 70.

⁷⁴ International Atomic Energy Agency, Convention on the Physical Protection of Nuclear Material (CPPNM), <<https://www.iaea.org/publications/documents/conventions/convention-physical-protection-nuclear-material-and-its-amendment#:~:text=The%20CPPNM%20establishes%20legal%20obligations,theft%2C%20robbery%20or%20any%20other>>, accessed 6 June 2022.

⁷⁵ United Nations, Comprehensive Nuclear-Test-Ban Treaty, <<https://www.un.org/disarmament/wmd/nuclear/ctbt/>>, accessed 6 June 2022.

⁷⁶ NTI, International Convention on the Suppression of Acts of Nuclear Terrorism, <<https://www.nti.org/education-center/treaties-and-regimes/international-convention-suppression-acts-nuclear-terrorism/>>, Accessed 6 June 2022

⁷⁷ Ibid.

under this convention. According to this convention, a person is liable for the damage that results in death, physical injury, damage to property, or economic loss, as well as any steps taken to restore or prevent environmental damage.

3.2.3 The Relevant International Agreement on the Securities of Radioactive Waste Management

Referring to aforementioned international instruments, the related convention on the securities of the radioactive waste management is the Joint Convention on the Spent Fuel Management and on the Safety of Radioactive Waste Management 1997.

(1) The background of the Joint convention on the spent fuel management and on the safety of radioactive waste management 1997.

The meeting on the drafting convention was initially held in Vienna, the IAEA's head office including with the legal and technician experts from 53 countries. This convention mainly focused on two subjects according to its name, which is the safety of spent fuel and the safety of radioactive waste management.⁷⁸ Through the adoption of legislation and the promotion of universal cooperation on the subject of safety procedures, the major purpose of this convention was to develop and maintain a high degree of safety in the worldwide management of spent fuel and radioactive waste. Moreover, it was significant to be concerned of and acknowledge that adequate safety measures would be applied in each step. Another purpose was to avoid accidents with radiological implications and to reduce the impact of such incidents in the event that such accidents occur during any step of the management of spent fuel or radioactive waste management. The scope of this convention focuses on radioactive waste management concerning the waste from civilians. Under this convention, the waste is not encompassed, since such waste does not derive from the nuclear fuel cycle, and is generated by military use. The waste is composed entirely of naturally

⁷⁸ Tonhauser, W., & Jankowitsch, The Joint Convention on the Safety of Spent Fuel Management and in the Safety of Radioactive Waste Management, (*Nuclear L Bull.*, 1997) p.9

generating radioactive elements.⁷⁹ On June 18, 2001, the International Atomic Energy Agency supervised the signing of the Joint convention. Even today, only internationally binding legal instrument has addressed this issue on a worldwide scale. The authority and scope of influence have progressed throughout the time with a number of 84 contracting parties.

(2) The scope of the Joint convention on the spent fuel management and on the safety of radioactive waste management 1997

There are 7 chapters as followings; Chapter 1 focused on the objective, definition and scope as the introduction of this convention. Chapter 2 and Chapter 3 emphasize the safety of spent fuel management and safety of radioactive waste management respectively. The fourth chapter discusses the safety requirements. Chapter 5 discusses on the movement of the waste. The meeting of the member states is mentioned in the Chapter 6. Lastly, chapter 7 pertains to, the final clauses and other related provisions. The convention is relevant to any country using radioactive sources for example in a research, industry, agriculture, medicine, and education. The convention fosters transparency and public conference.⁸⁰ Therefore, it is the regarded as the most powerful international legal instrument on waste management.

Regarding to safety management, these requirements are necessary under this convention. Firstly, under this Joint convention, the operator must assure that in each step of the process, the protection of people and the surroundings must be prioritized, due to the fact that safety is the overarching criterion. This convention

⁷⁹ Nuclear and Radiological Licensing Affair (Nirawan) and Legal Affair of the Office of Atoms for Peace, Comparison of the Joint Convention with the Safety of Handling Spent Nuclear Fuel and Safety of Radioactive Waste Management', <<https://www.oap.go.th/attachments/article/562/JC-ComparisonTable.pdf>>, Accessed 10 June 2022

⁸⁰ International Atomic Energy Agency, Promoting Safety of Spent Fuel and Radioactive Waste Management: 20 Years of the Joint Convention, <<https://www.iaea.org/newscenter/multimedia/videos/promoting-safety-of-spent-fuel-and-radioactive-waste-management-20-years-of-the-joint-convention>>, Accessed 10 June 2022

specifically applies to only civilian use, in which the military use is not included. This study accentuates mostly on the topic of radioactive waste management safety in Chapter 3. In this aspect, the radioactive waste management under this convention refers to all activities including decommissioning activities, relating to the handling, pretreatment, treatment, conditioning storage, or disposal of radioactive waste, excluding off-site transportation. The contracting parties require to take into account on the measure regarding the safety of those waste. Furthermore, The Joint convention on radioactive waste management and the Convention on nuclear safety indeed overlaps one another. The primary objective of the Convention on Nuclear Safety is the safety of nuclear installations and nuclear materials. In addition, the agreement discusses the consequences of the decommissioning of nuclear power plants. In this sense, the Joint convention focuses primarily on the management of fuel waste.

(3) The securities of the radioactive waste management under the Joint convention on the spent fuel management and on the safety of radioactive waste management 1997

As mentioned earlier, Chapter 3 of the convention highlights on the radioactive waste management. The relevant provision on the safety of radioactive waste management in the Joint convention covers Article 11 to Article 17, discussing the general safety requirement of radioactive waste management. Each contractual party must take the necessary procedures to guarantee that people, the public, and the environment will be the primary concern, regarding the risks resulting from radioactivity and its overall management.⁸¹ Under these general safety provisions, specifically outlining in article 21 stipulates the license holder's responsibilities, in which the license holder is primarily responsible for radioactive waste management. Furthermore, in the case where that waste cannot be identified, responsibility is assumed by the contracting party with authority over spent fuel or radioactive waste.⁸² In the light of the article 21, it implies that the contracting parties are required to design a regulatory framework concerning the duty of the license holder, which has to manage

⁸¹ Ibid.

⁸² Article 21 Responsibility of the license holder.

the radioactive waste. For this reason, to follow that responsibility, the financial security must be acquired to ensure that the license holder shall take the required measures for radioactive waste management. Regarding financial requirement under this convention, article 22 recognizes the availability of necessary financial resources to support the safety of facilities for the management of spent fuel and radioactive waste during both the operational and decommissioning stages of these facilities. In addition, after a facility is shut down, financial resources are gathered in order to ensure that effective institutional controls and monitoring procedures can continue uninterrupted for the amount of time that has been determined to be required.⁸³

The national report is a required examination for contracting parties in order to reflect their safety measures. Through the utilization of this framework, not only the commitment to implementing restrictive safety measures and the achievement of safety are demonstrated, but also it is an extraordinary chance to share their experiences and engage in collective learning.⁸⁴

3.2.4 The Guidance from the International Organizations on the Securities of Radioactive Waste Management

(1) IAEA: Cost Considerations and Financing Mechanism for the Disposal of Low and Intermediate level radioactive waste

Apart from that, The International Atomic Energy Agency (IAEA) has published a guideline on the technical and legal basis for the management of radioactive waste. This guideline focuses on providing advice on the financial regime regarding the management of radioactive waste that is of low and intermediate level. The guideline is titled "Cost Considerations and Financing Mechanisms for the Disposal of Low and Intermediate Level Radioactive Waste". This publication aims to focus on the primary cost aspects, cost assessment methodologies, and various financing sources for low and intermediate level radioactive waste disposal. According to the publication, it states that the purpose of the financial security on the radioactive waste

⁸³ Article 22 of the Joint convention on the Spent Fuel Management and on the Safety of Radioactive Waste Management 1997

⁸⁴ International Atomic Energy Agency, *supra note 1*.

is to ensure that sufficient finances are available for the proper and timely completion of all activities.⁸⁵ The primary premise of this guideline is similar to the Joint convention, which aims to ensure that dangerous waste will not be a burden to future generations⁸⁶ in accordance with the principle of “radioactive waste minimization” to prevent the waste creation and keep waste as low as possible. A variety of factors are considered in the approach for management of radioactive wastes in a way that preserves the environment and humanity such as the financial stuffs and funding.

According to financial mechanism under this guideline, it can be divided into 7 types: State Budgets and State Guarantee, Endowments, Waste Management Fund, Waste Management Organization Resources, Bank Loan, Advanced Payment, Income from Charging for Disposal service.⁸⁷

1. ***State Budgets and State Guarantee***: This type of financial mechanism can take account of two scenarios: a country with nuclear power plants and a country without nuclear power plants. For those member states having no nuclear power plants, the state budget may be the only option for the initial stage of waste management system development.⁸⁸ In particular, in the event that a member state does not have the necessary requirements, the state budget must be allocated in order for a waste management program to be implemented. As a result, these wastes will be covered by the state budget. In contrast, when a nuclear power plant is present, the state budget is regarded as a major issue. Nuclear power facilities generate more waste, which can pose a significant expense problem for the producers, who may not be able to cover the total cost. As a result, the state budget will contribute to the expense. Regarding state guarantee, it mostly appears in the form of loan or lending by financial instrument, which considers as one of the most efficient

⁸⁵ International Atomic Energy Agency, Cost Considerations and Financing Mechanism for the Disposal of Low and Intermediate level radioactive waste (Vienna: International Atomic Energy Agency, 2007), p.1-2.

⁸⁶ Ibid.

⁸⁷ Ibid.

⁸⁸ Ibid.

mechanisms because state guarantee provides help to waste management organizations in managing waste when the costs from waste producers are insufficiently met.⁸⁹

2. **Endowment:** In the case of starting waste management project, the endowments are given by a state in the form of the lump-sum in order to establish the waste management infrastructure. Foremost, in case of country with nuclear power plant, endowment is regarded as important financial resources due to the fact that if the management organization lacks of financial resources, the endowment can be received from government or waste producer providing as a waste management fund.⁹⁰

3. **Waste Management Fund:** Generally, Waste management fund is mostly adopted by countries operating nuclear power plant. However, the fund is also utilized in some countries, where nuclear power plant is not operated, Austria is the example. The source of fund is collected from revenues and contribution from nuclear power plant operator and license holder responsible for the waste. In certain situations, waste management fund can be collected from the state budget. Initially, the fund model is purposed by the IAEA, supporting by the study that the revenue which is the source of fund shall be built up accordance with the repository's life cycle. Gaining the medium or long-term interest from the financial instrument is one of the ways to generate the fund's budget. Regarding the contribution, the rate can be considered in case by case, depending on the waste generating activities. The risk occurring from those waste is one of the most important factors to identify the stakeholder in the fund payment. Furthermore, the risks are mostly determined from the principle of Polluter Pays Principle. Since the principal objective of the radioactive waste management is to protect people and environment, the fund is endowed to serve as the safeguard for such risks resulting from the waste. Furthermore, the fund is examined as a type of financial securities providing in order to ensure the proper management of the waste. Additionally, aforementioned risks are return risk and liquid

⁸⁹ Ibid.

⁹⁰ Ibid.

risk. The advantages of this form of financial mechanism are stability and lack of inflation fluctuation. In addition, the fund's interest is untouchable. As a result, the waste management fund is one of the most effective strategies for waste management's financial security.⁹¹

4. **Waste Management Resources:** It is generally emerging from the fee collection from two sources: accumulated profits and accumulated reserves. Accumulated earnings allow profits to be generated imperishable and independent resources.⁹² However, accumulated reserve comes from the charges fee from waste producer. It is considered as one of the most sustainable resources due to its availability. Nevertheless, it also contains risk since the charges paid from the waste producer are an estimation of the cost, which may not be covered adequately in the future. For the future use, the accumulated reserves can be just reserved when there is no repository, meanwhile in the case where the repository exists, it also can be used for the closure cost to monitor and manage the waste in the future.⁹³

5. **Bank Loan:** This financial mechanism designated potentially to generate a profit in exchange for taking a risk may be available. This scenario occurs when the certainty is required. However, the bank loan requires a satisfied guarantee from a bank.⁹⁴

6. **Advanced Payment:** According to the agreement with the waste management organization, the necessary financing is divided among the waste producers in accordance with their projected future regarding the capacity of utilization. Payments are provided through recurring installments. The waste producers are typically given access to space in the repository that has been earmarked for their specific waste in exchange for an advance payment for construction. The key benefits of this financing are mainly due to the fact that the funds are accessible to waste

⁹¹ Ibid.

⁹² Ibid.

⁹³ Ibid.

⁹⁴ Ibid.

management organizations and the costs are distributed fairly among the waste producers.⁹⁵

(2) OECD Ensuring the Adequacy of Funding Arrangements for Decommissioning and Radioactive Waste Management

Regarding Organization for Economic Co-operation and Development, it has launched a study named “Ensuring the Adequacy of Funding Arrangements for Decommissioning and Radioactive Waste Management”.⁹⁶ The purpose of this study is to examine case studies from various member countries to determine who should be in charge of radioactive waste management. Additionally, it seeks to provide a detailed legal framework and to examine case studies from member states to assign ultimate responsibility for radioactive waste management. The main objective is the consideration of the availability of the guarantee of proper management and decommissioning facilities. There are several critical components to take into consideration, according to the OECD's approach. These elements include technological solution, time, expected return on existing assets, risk, and liability structure. In this context, the concept of funding reveals the following alternative suggestions:

1. **Internal non-segregated model:** This model supports that the fund is regarded as the internal reserve. It is less popular among the NEA members due to the transparency and adequacy risks.⁹⁷

2. **Internal segregated model:** This fund model is similar to the internal non-segregated model, which operates and monitors the fund's collection. However, the separated fund with other assets, including liability, is the characteristic of this model. Thus, it is more reliable.⁹⁸ The two concepts of the internal model share similar idea, in which the operating organization manages the fund.

⁹⁵ Ibid.

⁹⁶ Keppler JH and others, *Ensuring the Adequacy of Funding Arrangements for Decommissioning and Radioactive Waste Management*, 2021) p.64

⁹⁷ Ibid.

⁹⁸ Ibid.

3. **External segregated model:** The fund under this concept is managed and operated by the independent and external unit, which possibly can be private or public financial organization. In this sense, the pros of this concept are to promote greater openness, improve insolvency protection, and increase public trust.⁹⁹

4. **Government-fund model:** This model states that decommissioning process and waste management should belong to the government. This model appears in the case of the older generations of nuclear power plants, which leads to the difficulties in the liability. In this case, the government-fund model is considered helpful.¹⁰⁰

(3) European Union: The Directive 2011/70/Euratom

Furthermore, the European Union has introduced the Council Directive 2011/70/Euratom for framework on the radioactive waste management and spent fuel, as it is compulsory to guarantee that there is sufficient funding for waste management for European nations. The Directive 2011/70/Euratom has mentioned the contribution from the facilities possessing the radioactive material to ensure adequate finance for the radioactive waste management.¹⁰¹ The factor to consider the fund concerns whether the offering covers all the decommissioning and long-term management of the radioactive waste.¹⁰² Moreover, a contribution is suggested to review consistently for the commensurate with the decommissioning and costs.¹⁰³ Each country has its own set of rules governing the ownership and management of funds, which can be separated into two distinct categories of the management. Firstly, internal management, it refers that the fund is managed by the licensee, operator or relevant

⁹⁹ Ibid.

¹⁰⁰ Ibid.

¹⁰¹ Official Journal of the European Union, Directive 2011/70/Euratom of 19 July 2011, <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011L0070&from=DA#:~:text=This%20Directive%20establishes%20a%20Community,undue%20burdens%20on%20future%20generations>>, Accessed 13 June 2022

¹⁰² Ibid.

¹⁰³ Ibid.

waste management organizations. The fund is utilized for the decommission and radioactive waste management. For some circumstances, the financing for the management is segregated for some jurisdictions, and the NEA recommends this strategy. Furthermore, it is suggested that the account related to the fund for the radioactive waste management and other expenditures shall be separated. Apart from internal management, there is a concept of an external management, which is referred to as trusts, which are the fund managed by the outer body, while being collected by the operators from the licensee. The fund can be secured in a commercial bank or treasury account, both of which are subjected to strict laws to prevent the funds from being used outside the scope of their objective and financial risk; alternatively. In this case, the funds will be controlled by a legally formed body which is entirely separated from the operator.¹⁰⁴ In the light of this concept, it can be decentralized by having an operator for each fund. Meanwhile, centralized management has a single national fund for all nuclear operators and accounts separated in the case that an operator is no longer able to meet its financial obligations. In that case, the state is able to gain the control of the account and any related financial security to ensure that the necessary fund is accessible.¹⁰⁵ In some jurisdictions, in Finland, for example, the licensee can borrow back an accurate percentage from the capital in the fund with the indicated interest rate in order to prevent the entrepreneur from the bankruptcy.¹⁰⁶ For the avoidance of inconsistencies in incentives and moral hazards, external trust is more suggestive rather than any other financial securities. One of the reasons to support this opinion is when the internal funds lack stability together with the adequacy to regulate and control. According to the operator's perspective, internal funds could be used as an inexpensive funding source and investment for purposes besides long sufficiency. The financial guarantee might be necessary in some cases to pledge to the fund or to the government, depending on the circumstances.

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

¹⁰⁶ JH, *supra* note at 96.

Conclusively, the financial security is considered as one of the funding mechanisms to ensure that there will be an adequate funding for the radioactive waste management.

3.3 Foreign Laws on the Securities of Radioactive Waste Management

The securities of radioactive waste management are based on an idea that is widely accepted worldwide, but different perspectives depending on the appropriateness of each country. Austria is one of the most interesting countries due to the fact that Austria, as a civil law country, has never operated nuclear power plants similar to Thailand. For this reason, to compare with Thailand, where the utilization of nuclear technology is excluded from the nuclear power plant, will be an inspiring option to adopt and study the securities system in a country without a nuclear power plant. Apart from Austria, Canada is another remarkable country to study the securities of radioactive waste management due to the types of securities, assessment system, and related authority, which are considered effective for the securities of radioactive waste management.

3.3.1 Austria

Austria adopts a civil law system with the constitutions as the highest law. The civil law system in Austria is hierarchical, with the federal constitution serving as the highest law. The federal constitution and some extra federal constitutional legislation or elements of a constitutional nature within common federal laws constitute the Constitution.¹⁰⁷ Austria is one of the few countries in Europe with the stance of not developing a plan for nuclear power plants regarding Federal Constitutional Act for a Nonnuclear.¹⁰⁸ In Europe, there are 173 nuclear power plants

¹⁰⁷ Anna Gamper, Republic of Austria < https://www.law.ox.ac.uk/sites/files/oxlaw/oscola_4th_edn_hart_2012.pdf > accessed 14 April 2022.

¹⁰⁸ European Nuclear Society, Nuclear Power Plant in Europe, < <https://www.euronuclear.org/glossary/nuclear-power-plants-in-europe/> > accessed 16 April 2022.

as in March 2022, with a total installed electric net of 154,563 Mwe.¹⁰⁹ In 1971, a nuclear power plant was demonstrated in Austria in Zwentendorf, locating 60 kilometers away from the Northeast of Vienna.¹¹⁰ However, as the referendum resulted in 50.47 percent voting against the nuclear power project,¹¹¹ no nuclear power plants have been established in Austria since then.

Nuclear Engineering Seibersdorf GmbH (NES) is the organization that is officially in charge of dealing with radioactive material. Even though there is never an operation of a nuclear power plant in Austria, the use of radioactive material still exists, including low and intermediate waste produced from medical, industrial, and the decommissioning of facilities for nuclear research. Austria generates approximately 15-20 tons of radioactive waste annually.¹¹² In the field of medicine, there are widespread of widespread of applications in diagnostic procedures, laboratory testing, research, pharmaceuticals, and treatment.¹¹³ In the industrial field, radiation sources are generally safety-related measurement and control devices, such as measuring devices for filling systems, flow rate, and so on.¹¹⁴ As aforementioned, in Austria, with the lack of nuclear power plant, only low-level and Intermediate-level radioactivity level are treated, conditioned and stored for the radioactive waste management.¹¹⁵ Moreover, Austrian has the cooperation with Italy, in which Austria collects and treats the ion resins waste arising from power plant in Italy. Regarding this procedure, the waste will be managed in Italy. Similar to the general purpose of waste

¹⁰⁹ Ibid.

¹¹⁰ Promper, Otmar, and Helmuth Böck, Can Austria survive without nuclear power?, (Slovenia: Nuclear Society of Slovenia, 2007) p.831.

¹¹¹ Ibid.

¹¹² Nuclear Engineering Seibersdorf GmbH, Radioactive waste in Austria, <<https://www.nes.at/en/organisation/radioactive-waste-management-in-austria/radioactive-waste-in-austria>> accessed 10 May 2022

¹¹³ Ibid.

¹¹⁴ Ibid.

¹¹⁵ Neubauer Josef, Radioactive waste management in Austria. Nuclear Technology and Radiation Protection, (VINČA Institute of Nuclear Sciences, 2004), p.59-64.

management, it is equally crucial to decrease residual waste by using proper treatment methods to conserve space in storage facilities to lower expenses. As previously said, waste must be effectively managed according to the respective types. In Austria, the waste is separated into following categories in Austria: solid burnable, solid non-burnable, liquid burnable, liquid non-burnable, sealed sources and fissile material.¹¹⁶

Furthermore, Austria has never acquired a nuclear power plant. Currently, there is research reactor, locating in the Institute of Atomic and Subatomic Physics by Vienna University of Technology. In Austria, radioactive waste is generated by research, medicine, and industry. Only low and intermediate levels of waste can be operated and managed in Austria, which is estimated to be around 6900 m³ for solid radioactive waste and 50000 m³ for liquid waste as of the end of 2002. In contrast, high levels of waste will be exported to other countries as part of international cooperation. Due to this fact, Austria does not have the encumbrance to manage radioactive waste with a high radioactivity level. Furthermore, with the division of types of radioactive waste, it has been discovery that combustible waste from hospitals accounts for the vast majority of solid radioactive waste. Regarding liquid waste, it originally comes from reactor operations and incinerators.

In addition, Radiation Protection Act 2020, enacting as a governance of waste management in Austria, has addressed various technical questions pertaining to managing radioactive waste, with its treatment, conditioning, and storage.¹¹⁷ Especially, the act also includes the financial provision regarding the goal of this approach is to indemnify the costs from polluters, so there will be no burdens for future generations.¹¹⁸ According to Section 143 of the Radiation Protection Act of 2020, the waste producers are required to pay the NES for waste treatment and interim storage, as well as a prepaid charge that the Federal Government may use exclusively

¹¹⁶ Ibid.

¹¹⁷ Federal Ministry of Agriculture, Forestry, Environment and Water Management, Seventh National Report of Austria (Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2020), p.25-26.

¹¹⁸ Ibid.

for finance as a subsequent disposal facility.¹¹⁹ In this regard, it is notable that the pre-payment also implies to financial security in order to ensure that there will be enough money to manage waste in Austria in the future. Since Austria is one of the members of European Union, there is the duty to follow European Waste Management Directive. Austria has established a National Program for Radioactive Waste Management according to the European Waste Management Directive (Council Directive 2011/70/EURATOM on the Sustainable and Effective Management of Spent Fuel and Radioactive Waste) , ensuring the complete implementation of spent fuel and radioactive waste management from generation to disposal. The Austrian law does not require all types of waste to be managed by the NES. A small amount of gaseous and liquid radioactive material is allowed to discharge regarding Section 77 of the General Radiation Protection Ordinance.¹²⁰

In addition to the Radiation Protection Act of 2020, Austria's radioactive waste management is governed by the General Radiation Protection Ordinance of 2020, the Ordinance on Interventions in Case of Radiological Emergencies of 2020, and the Ordinance on the Shipment of Radioactive Waste. Furthermore, the Nuclear Liability Act is the essential legal instrument in Austria when it comes to liability,¹²¹ as the Environmental Impact Assessment Act is the most critical factor to consider.

As mentioned prior, the polluter-pay-principle is the important tool to consider on the radioactive waste management's finance. Especially on the issue of the financial security, indicating in the relevant provision on Section 143 of the Radiation Protection Act 2020. Also, Section 143 stipulates that there are two parts of cost compulsory to pay for the waste management. Firstly, the polluter must pay the predisposal management to the NES. Secondly, the disposal management for the future must also be defrayed. The indicated fee for disposal shall be converted into a separate fund that is not considered as a part of the state budget. The Federal Ministry

¹¹⁹ Ibid, p.11.

¹²⁰ Ibid, p.12.

¹²¹ Ibid, p.30.

for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) is the entity responsible for organizing the fund, which is the government authorities in Austria. This fund functions as the future cost for the disposal waste managing. In the event that the cost of waste management is insufficient, the Austrian government shall be responsible for the difference in order to cover the remaining costs. Moreover, according to Section 36C Paragraph 2 of the Radiation Protection Act, the disposal fee also concerns of the risk assessment called 'risk premium' ("Risikozuschlag").¹²²

To facilitate the handling of radioactive waste and its associated securities, the fund has been formed in Austria, collecting from the fee that shall be charged in the future for radioactive waste, the amount of which is determined by the category of the waste. The future disposal fee is separated from the treatment fee. In this respect, the law related in this case is the Radiation Protection Act 2020, especially in the Article 143. The fund is managed by the government authority, namely the Austrian Board for Radioactive Waste Management¹²³ whose role involves safe disposal of radioactive waste. The involving stakeholders in Austria is the involvement as follows:

1. The targeted group or relevant persons responsible for the fund are the holder of radioactive waste arising from natural radiation, the holder under the Radiation Protection Act, and the responsible regulator, who has confiscated radioactive sources or been granted orphan sources.¹²⁴
2. The relevant organizations are;

¹²² Federal Ministry of Agriculture, Forestry, Environment and Water Management, Second National Report of Austria (Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2022), p.22.

¹²³ Entsorgungsbeirat, Funding, <<https://www.entsorgungsbeirat.gv.at/en/themen/about-us/funding>>, Accessed 19 June 2022.

¹²⁴ Federal Ministry Republic of Austria, National Program for the Management of Radioactive Waste ACC. ART. 36B Radiation Protection Act, <https://www.entsorgungsbeirat.gv.at/fileadmin/daten/pdf/NaEntPro_EN.pdf>, Accessed 19 June 2022.

(1) Federal Ministry Republic of Austria Sustainability and Tourism; It is the representative of the Austrian government, regulating the safety of nuclear and radiation in Austria.¹²⁵

(2) Nuclear Engineering Seibersdorf GmbH (NES); Its main tasks, are to execute certain process on behalf of the Republic of Austria, including collecting, processing, conditioning, and storage, as well as the decontamination and decommissioning (dismantling) of nuclear facilities. The Seibersdorf facility has been the site of continuous research and development for the past 45 years.

(3) The Austrian Board for Radioactive Waste Management; Its task is to establish, develop a decision and recommend the radioactive waste management in Austria. Members of the board are appointed from a variety of industries in relation to radioactive waste management. It holds an annual meeting in order to discuss the related issues twice a year.¹²⁶

The fund literally comes from the precautionary fee, which paid by the polluter to the Federal Government and utilized solely for the subsequent final disposal of the conditioned radioactive waste. The calculation of the precautionary fee shall be based on the most recent estimations of the total disposal expenses and associated preparatory and transportation costs.¹²⁷

¹²⁵ International Atomic Energy Agency, IAEA Mission Says Austria Committed to Strengthening Nuclear and Radiation SafetySees Areas for Enhancement, <<https://www.iaea.org/newscenter/pressreleases/iaea-mission-says-austria-committed-to-strengthening-nuclear-and-radiation-safety-sees-areas-for-enhancement>>acssed 19 June 2022

¹²⁶ Entsorgungsbeirat, Austrian Board for Radioactive Waste Management <<https://www.entsorgungsbeirat.gv.at/en/themen/about-us>> accessed 20 May 2022.

¹²⁷ Federal ministry republic of Austria sustainability and tourism, National Program for the Management of Radioactive Waste ACC. ART. 36B Radiation Protection Act (Federal ministry republic of Austria sustainability and tourism,2018).

As a result of Austria's implementation of the IAEA's Cost Considerations and Financing Mechanism for the Disposal of Low and Intermediate Level Radioactive Waste, it can be recapitulated that the fund system is designed to assure the efficacy of radioactive waste management. Moreover, the state budget is necessary in order to fund the remaining expenses. In conclusion, the legislation of Austria established a state budget and waste management fund to ensure the financial stability of radioactive waste management.

3.3.2 Canada

As the country's federal parliament, responsible for enacting laws applying to the entire nation, Ottawa is recognized as the legislative center of the country. The Constitution Act of 1867 confers legislative authority to the provincial and federal governments.¹²⁸ The combination of civil and common law in Canada's law is one of its distinct features. In Canada, the common law is primarily used, with the exception of Quebec, where civil law is adopted.¹²⁹

Nuclear technology is essential in Canada, particularly nuclear power plants, which generate approximately 16 percent of total electricity in the country. Furthermore, the world's top producer of uranium is Canada, which started the use of nuclear power approximately in 1945.¹³⁰ The intent behind use is obviously shown in the Order-in-Council providing liability protection for people and environment. Subsequent constitutional changes and legislative measures strengthened this strategy, which is currently enshrined in Canada's Constitution Act's division of powers (1982). The Nuclear Safety and Control Act governs the industry. Additionally, Atomic Energy of Canada Limited (AECL) is the primary regulator whose mission is to promote nuclear energy and innovation in Canada, using the uranium sector as an example, and to

¹²⁸ Introduction to the country's system, <<http://www.oas.org/dil/flpc/docs/canada/substantive/introduction%20to%20the%20legal%20system%20of%20canada.pdf>>, accessed 20 May 2022.

¹²⁹ Ibid.

¹³⁰ Canadian Nuclear Safety Commission, Seventh Canadian National Report for the Joint Convention (Canadian Nuclear Safety Commission, 2021)

support the use of nuclear energy in other fields, such as in healthcare industry, business, and research.¹³¹

Radioactive waste management in Canada also conducts the concept of duty to ensure the safe of those waste for people and environment since Canada operates nuclear power plants. Therefore, the radioactive waste management in Canada covers used fuel, low and intermediate level of waste and uranium mines.¹³² As previously mentioned, the safety of public and the surroundings is essential, so environmental and safety assessments are included in the safety assessment. It combines pre-closure and post-closure assessments, as described in the Systems Variability Analysis Code (SBAC).¹³³

The low and intermediate levels of radioactive waste in Canada are the result of nuclear power plants, research, and any other utilities that generate more than 10,000 m³ of radioactive waste each year.¹³⁴ Every year, the examination and review of the safety is implemented. Canada has established a legal framework that outlines the government's role to regulate and monitor the safety of waste management as well as the waste owners' responsibilities, regarding waste management and funding. Atomic of Canada Limited, the Canadian Nuclear Safety Commission, and Natural Resources Canada are the responsible government entities in Canada.

Regarding financial security system in Canada, the relevant law are the Nuclear Safety and Control Act (NSCA) and General Nuclear Safety and Control Regulations (GNSCR).¹³⁵ Section 24(5) of NSCA specifies that the license must offer the financial guarantee approved by the commission under this act.¹³⁶ Additionally, the

¹³¹ Ibid.

¹³² McEwen Tim, Siting, Design and Construction of Underground Repositories for Radioactive Wastes: Proceedings of an IAEA Symposium, (Austrian schillings, 1987), p. 401-403.

¹³³ Ibid.

¹³⁴ Ibid.

¹³⁵ Canadian Nuclear Safety Commission, para note 130 at 62.

¹³⁶ Licenses

Marginal note: Licenses

Section 24 (1) The Commission may establish classes of licenses authorizing the licensee to carry on any activity described in any of paragraphs 26(a) to (f) that is specified in the license for the period that is specified in the license.

Marginal note: Application

(2) The Commission may issue, renew, suspend in whole or in part, amend, revoke or replace a license, or authorize its transfer, on receipt of an application

(a) in the prescribed form;

(b) containing the prescribed information and undertakings and accompanied by the prescribed documents; and

(c) accompanied by the prescribed fee.

Marginal note: Refund of fees

(3) The Commission may, under the prescribed circumstances, refund all or part of any fee referred to in paragraph (2)(c).

Marginal note: Conditions for issuance, etc.

(4) No license shall be issued, renewed, amended or replaced — and no authorization to transfer one given — unless, in the opinion of the Commission, the applicant or, in the case of an application for an authorization to transfer the license, the transferee

(a) is qualified to carry on the activity that the license will authorize the licensee to carry on; and

(b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Marginal note: Terms and conditions of licenses

(5) A license may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.

Marginal note: Application of proceeds of financial guarantee

(6) The Commission may authorize the application of the proceeds of any financial guarantee referred to in subsection (5) in such manner as it considers appropriate for the purposes of this Act.

Marginal note: Refund

(7) The Commission shall grant to any person who provided a financial guarantee under subsection (5) a refund of any of the proceeds of the guarantee that have not been spent and may give the person, in addition to the refund, interest at the prescribed rate in respect of each

NSCA provides in the section 3 that the financial guarantee is required.¹³⁷ There are the followings securities existing in the Canadian law; Cash funds, Investment funds,

month or fraction of a month between the time the financial guarantee is provided and the time the refund is granted, calculated on the amount of the refund.

(8) [Repealed, 2012, c. 19, s. 124]

¹³⁷ Section 3 (1) An application for a license shall contain the following information:

- (a) the applicant's name and business address;
 - (b) the activity to be licensed and its purpose;
 - (c) the name, maximum quantity and form of any nuclear substance to be encompassed by the license;
 - (d) a description of any nuclear facility, prescribed equipment or prescribed information to be encompassed by the license;
 - (e) the proposed measures to ensure compliance with the Radiation Protection Regulations, the Nuclear Security Regulations and the Packaging and Transport of Nuclear Substances Regulations, 2015;
 - (f) any proposed action level for the purpose of section 6 of the Radiation Protection Regulations;
 - (g) the proposed measures to control access to the site of the activity to be licensed and the nuclear substance, prescribed equipment or prescribed information;
 - (h) the proposed measures to prevent loss or illegal use, possession or removal of the nuclear substance, prescribed equipment or prescribed information;
 - (i) a description and the results of any test, analysis or calculation performed to substantiate the information included in the application;
 - (j) the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste;
 - (k) the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;
 - (l) a description of any proposed financial guarantee relating to the activity to be licensed; and
 - (m) any other information required by the Act or the regulations made under the Act for the activity to be licensed and the nuclear substance, nuclear facility, prescribed equipment or prescribed information to be encompassed by the license.
- (n) [Repealed, SOR/2008-119, s. 2]

Letter of credit, surety bonds, expressed commitments, insurance from Canadian government entities and other type of securities.¹³⁸

(1) Cash fund

The cash fund is regarded as one of the most efficient securities tools. The advantages of this type of instrument are reliability due to its consistency and value assurance, as well as liquidity.¹³⁹ Certified cheques, bearer bonds, and guaranteed investments are to be substituted based on their dependable properties.

(2) Investment funds

Funds set aside for financial guarantees can be invested to generate interest income, which can be used to help cover decommissioning costs.¹⁴⁰ However, there are a few economic concerns, such as the risk of inflation and the low rate of return. As a result, it is required that reports are to be presented on a consistent basis

(1.1) The Commission or a designated officer authorized under paragraph 37(2)(c) of the Act, may require any other information that is necessary to enable the Commission or the designated officer to determine whether the applicant

(a) is qualified to carry on the activity to be licensed; or

(b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

(2) Subsection (1) does not apply in respect of an application for a license to import or export for which the information requirements are prescribed by the Nuclear Non-Proliferation Import and Export Control Regulations, or in respect of an application for a license to transport while in transit for which the information requirements are prescribed by the Packaging and Transport of Nuclear Substances Regulations, 2015.

¹³⁸ Canadian Nuclear Safety Commission, 'Canada's National Reports to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management', (Canadian Nuclear Safety Commission, 2014) p. 63.

¹³⁹ Canadian Nuclear Safety Commission, 'Document history for REGDOC-3.3. 1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities' (Canadian Nuclear Safety Commission ,2019) p.6.

¹⁴⁰ Ibid, p.7.

for the NSCA to examine and verify that sufficient funds are available for decommissioning.¹⁴¹

(5) Letter of credit

It can be referred to “credit letter”. It is issued by the financial institution as listed by the NSCA, which requires the trustworthy to guarantee that the licensee would complete the decommission and waste management.¹⁴² The advantage of a Letter of Credit is its ability to offer the amount of money in the event that the licensee fails to fulfill his or her own stated obligation for the decommission and managing radioactive waste. Another reason the Letter of Credit is acceptable is due to its liquidity.¹⁴³

(6) Surety bonds

A basic form of securities can be provided through surety bonds or as a supplement to other instruments. A surety company, for instance, is able to pledge to the obligation for all liability and costs related to decommissioning up to a specified maximum under the terms of a performance bond arrangement. On the other hand, if the estimated costs of decommissioning are going to be higher than the amount of the surety bond, a different type of financial guarantee will be necessary.¹⁴⁴ In addition, it is suggested that a Canadian company should control a beneficiary, insurance, and bonding agents.

(7) Insurance

The CNSC accepts insurance as a form of financial security. It includes a requirement that the beneficiary will be the CNSC. Furthermore, the assurance business must be a CNSC-approved insurance company.¹⁴⁵

(8) Expressed commitment from government entities

¹⁴¹ Ibid.

¹⁴² Ibid.

¹⁴³ Ibid.

¹⁴⁴ Ibid.

¹⁴⁵ Canadian Nuclear Safety Commission, *supra* note 139 at 63.

The Expressed Commitment from government entities is the form of guarantee issued by the head of government entities such as Canadian federal, provincial or territorial government in order to guarantee that the organization under their control are able to manage the radioactive waste in future, which requires the ability to set off through transfer payment.¹⁴⁶ This is the unique type of financial guarantee stipulated in Canadian nuclear law. It is usually found in government sectors where the licensee is a university or hospital.¹⁴⁷ It suggests that the government sector will not require such tangible assets, due to the fact that the asset, the state budget, is owned by state. The only requirement is that the certification must be signed by the head of entity to ensure the responsibility required by law, for example, the university with license to possess for the radioactive waste whose objective is designated for the research. In this case, the university only need the expressed commitment from government entities signed by the chancellor who is the principal of the university.¹⁴⁸

(9) Other type securities

Apart from the aforementioned securities, the Canada Nuclear Statute also allows other types of securities that are not specifically mentioned in the law. This is a distinctive feature of Canadian law: it allows additional types of securities, and the legislation can be updated depending on the scenario. Other types of securities, by the way, must be determined by the CNSC to ensure that they can be used effectively.¹⁴⁹

Its objective is to discover and evaluate the environmental risks associated with nuclear power in Canada,¹⁵⁰ making it one of the country's most essential regulatory bodies.¹⁵¹ The CNSC securities assessment, in particular, is one of its most essential responsibilities. Each security must be evaluated by the CNSC for

¹⁴⁶ Canadian Nuclear Safety Commission, *supra* note 139 at 8.

¹⁴⁷ Ibid.

¹⁴⁸ Ibid.

¹⁴⁹ Ibid.

¹⁵⁰ Canadian Nuclear Safety Commission, *supra* note 138 at 151.

¹⁵¹ Ibid.

decommissioning and waste management. Moreover, it requires to be responsible for the annual assessment due to the economy and situation changes to guarantee that the securities are adequate for the related activities. In order to determine financial securities whether there is sufficient fund for the decommission and radioactive waste management or not, the CNSC has to consider these following criteria;

(1) Liquidity: This component suggests that decommissioning and waste management shall be conducted whenever the commission requires, with the necessary funds deriving from the securities. It is considered as a financial measure to employ a fund supply for waste management.¹⁵²

(2) Certainty of value: The CNSC has to ensure that the proposed securities is in full value guarantee.¹⁵³

(3) Adequacy of value: The CNSC shall consider that there is the sufficient fund in accordance with the plan.¹⁵⁴

(4) Continuity: The continuity is one of the criteria's characteristics that shall be considered. The reason is to maintain the coverage of continuity and stabilize financing.¹⁵⁵

Apart from the defined securities enacted in law, the criteria described above unveils that Canada has established general criteria, in this way, CNSC is able consider securities effectively, and this notion is rarely seen in other jurisdictions, which is utterly interesting.

Furthermore, the licensee is required to update and review the securities to the CNCS at least every five years, or sooner, if necessary, in order to determine whether the securities are still appropriate.¹⁵⁶ Under, Canadian Nuclear law, the updated financial guarantee is requested respectively.

¹⁵² Canadian Nuclear Safety Commission, *supra* note 139 at 63.

¹⁵³ Ibid.

¹⁵⁴ Ibid.

¹⁵⁵ Ibid.

¹⁵⁶ Ibid.

Regarding the nuclear operators, a financial mechanism is mandatory to fulfill their decommissioning and radioactive waste management liabilities as “Internal Segregated Funds”. Three purposes of this funds are as follows,

(1) To use for the cost for conduct the decommission and long-term management of Low-Level Waste (LLW) and Intermediate Level Waste (ILW).

(2) To be used as a fuel fund

(3) To Fund the cost for the interim dry storage and definitive storage of the spent nuclear fuel.¹⁵⁷

Regarding the Nuclear Fuel and Waste Act 2002 (NFWA), the law authorized fund management to be independently operated by the third party as its characteristic of an “Internal Segregated fund.” As required by an operation entity called “Nuclear Waste Management Organization (NWMO)”, managing spent nuclear fuel over the long term is another objective of this fund. Their primary duties as the NWMO include: determining the entire cost every year, notifying the members of the NFWA that request the sum of contributions yearly, updating the discount rates every five years, and publishing important funding-related information in the NWMO yearly report.¹⁵⁸

In conclusion, the regulation of securities has been established by Canadian law regarding the “polluter pay principle”. In Canada, the Nuclear Safety and Control Act (NSCA) and the Canadian Nuclear Safety Commission (CNSC) serve as significant legislative instruments regarding utilization of nuclear technology, and for the securities of the radioactive waste management. The six types of indicated securities specified by law and an external trust fund are the financial mechanisms that Canada has established for the radioactive waste management. However, Canadian law permits a licensee to submit a petition to the commission to take other forms of securities into account as well. Furthermore, under Canadian nuclear legislation, the licensee must submit a review of previous securities submitted every five years.

¹⁵⁷ Keppler, *supra* note 96 at 95.

¹⁵⁸ Ibid.

3.4 Conclusion

To recapitulate, various relevant international agencies are involved with nuclear technology to develop and protect people and the environment in each regional community, for instance, OECD, Euratom, ASEANTOM, and especially the IAEA. The IAEA is regarded as the distinctive international organization promoting "Atom for peace". Therefore, there are eleven related international conventions relating to nuclear law. The Joint Convention on Spent Fuel and Radioactive Waste Management is an international law related to the securities of radioactive waste management. Mainly, Chapter 3 indicates the responsibility for radioactive waste management as it has to ensure the safety of people and the environment, which is the key to radioactive waste management, therefore, providing the securities is required. The IAEA has also issued guidance on the securities of radioactive waste management: "Cost Considerations and Financing Mechanism for the Disposal of Low and Intermediate level radioactive waste". This manual introduces the recommended financial mechanism for radioactive waste management from the beginning until the end of the process. Thus, the securities can be considered as one of the funding mechanisms to ensure that there will be adequate funding for radioactive waste management. Though, the securities of radioactive waste management is a globally accepted principle; however, attitudes may vary by country. In Austria, a civil law country, has never operated nuclear power plants similar to Thailand with the law of the Radiation Protection Act 2020 and the General Radiation Protection Ordinance of 2020 are two fundamental laws governing radioactive waste management. The securities strategy applied in Austria is in the form of a fund operated by the Austrian Board for Radioactive Waste Management entity. The fund for the radioactive waste management in Austria derives from the 'Principle Pay Principle', which emerges from the polluter's precautionary fee based on current estimates of disposal, preparation, and transportation costs; meanwhile, the state budget also plays a vital role as the remaining cost. Canada is another fascinating country to research radioactive waste management securities due to the diversity of securities, evaluation method, and

related authority. Radioactive waste management in Canada is governed by two primary legislations, Nuclear Safety and Control Act (NSCA) and General Nuclear Safety and Control Regulations (GNSCR). Canada's financial mechanisms for radioactive waste management are six types of specified securities and an external trust fund. Apart from that, Canadian legislation lets a licensee propose, and the commission considers alternative securities. Under Canadian nuclear law, the licensee must assess its securities every five years.



CHAPTER 4

THAI LAW ON THE SECURITIES ON THE RADIOACTIVE WASTE MANAGEMENT

4.1 Introduction

This chapter will explain the overview of Thailand's nuclear law, focusing on the history and background of Thai nuclear law in Thailand together with the relevant organizations that play an important role regarding nuclear law in Thailand. Furthermore, this chapter mainly analyzes and discusses current Thailand's policies and laws, including the specific law on nuclear and radiation in Thailand, which is Nuclear Energy for Peace Act B.E.2559 and B.E. 2562. Also, the related ministerial regulations such as supplementary law, especially the draft ministerial regulation on the securities of radioactive waste management, are currently in drafting process. Consequently, the deficiency of Thai nuclear legislation will be explored by the comparison with foreign laws and international organizations' guidelines described previously in Chapter3.

4.2 Thai Law on the Securities of Radioactive Waste Management in Thailand

4.2.1 Nuclear Energy for Peace Act B.E. 2559

According to Policies and Strategic Plans to promote and advance Nuclear Energy of the Country 2017 – 2026, this law encourages and supports international cooperation, including regional and global cooperation on nuclear technology. In this stage, international cooperation is strengthened and operationalized. The international obligation is required to follow and review the international operation. Another objective is to support and impel Thai personnel involving in the international organization; the IAEA, as well as to revise and review the legislation regarding Thai regulations in order to standardize and globalize Thai law

associated the safety, safeguard, and security for peaceful use.¹⁵⁹ Thus, Thailand concerns safety use of nuclear and radiation for people and environment can be reflected the national strategy and policy.

As stated previously, for the IAEA's establishment, the initial statute's goal is to use nuclear technology for peace, addressed by Dwight D. Eisenhower, the U.S. president. This is how the U.S.'s project providing scientific staff to all various countries started with the purpose to support nuclear technology as a means of advancing global growth and welfare.¹⁶⁰ By the Cabinet Resolution of 17 November 1954¹⁶¹, Atomic Energy for Peace Commission (later changed into Nuclear Energy for Peace Commission) was appointed by the government in order to consult with a representative from the U.S. The qualification of the committee was fulfilled with the knowledge, skill, and experience related to the fields of science. Thailand's first act regarding nuclear law, Nuclear Energy for Peace Act B.E. 2554 (2011) was initiated to comply with the commission.

However, due to the passage of time and advancements in nuclear technology, the Nuclear Energy for Peace Act of B.E. 2504 (1961) cannot be successfully regulated due to the following explanation:

Firstly, each licensee was granted a license by the Atomic Nuclear Energy for Peace Commission ("the commission"). The license that the commission issued undoubtedly created an impediment due to the long duration of license approval from the commission.¹⁶² Secondly, there are primarily three regimes:

¹⁵⁹ Office of Atom for Peace, Understanding of policies and strategic plans Nuclear Power Development of the Country 2017 – 2026, (Office of Atom for Peace, 2017).

¹⁶⁰ International Atomic Energy Agency, 60 years of Atom for Peace, <<https://www.iaea.org/newscenter/news/60-years-atoms-peace>>, Accessed 23 June 2022.

¹⁶¹ Office of Atoms for Peace, Annual Report 2021, <https://www.oap.go.th/images/documents/resources/media-library/publications/p01-68_%E0%B8%A3%E0%B8%B2%E0%B8%A2%E0%B8%87%E0%B8%B2%E0%B8%99%E0%B8%9B%E0%B8%A3%E0%B8%B0%E0%B8%88%E0%B8%B3%E0%B8%9B%E0%B8%B5_2564_%E0%B8%9B%E0%B8%AA.pdf>, Accessed 24 June 2022.

¹⁶² Chaigyod Suntarapa, Why do we have Nuclear Energy for Peace Act B.E. 2559, (Competent Officer Training Course, Office of Atoms for Peace, 15 February 2022)

exemption, notification, and licensing, which are based on radioactivity and hazard to humans and the environment. However, the previous act stipulated that all radioactive materials, regardless of their radioactivity, must be licensed, therefore, this concept is not effectively applicable during the current situation.¹⁶³ Furthermore, the legislation regulated only for the operation process, as no permit is necessary for the installation or construction. As a result, this does not cover overall process, in which the law should govern the entire process from construction to decommission. Thus, the law has amended in this session. Moreover, the law itself does not comply with the international obligation. For example, the law is deficient in term of the nuclear accident and radiological emergency concepts. Foremost, radioactive waste management had never existed until 2016.¹⁶⁴ Therefore, the Atomic Energy for Peace Act B.E. 2504 (1961) has been substituted by The Nuclear Energy for Peace Act B.E. 2559 (2016). This revised legislation provides the highest possible standards of safety, security, and safeguard for radiation and nuclear in Thailand.

Presently, there are approximately four ministerial regulations¹⁶⁵ which are already effective concerning radioactive waste management, including

(1) Ministerial Regulation on the Radioactive Waste Management B.E. 2561; This ministerial regulation determines the rules, procedures and conditions pertaining to the radioactive waste management.

(2) Ministerial Regulation on the Import and Export of Radioactive Waste Management into the Kingdom B.E. 2561: According to Ministerial Regulation on the Import and Export of Radioactive Waste Management into the Kingdom B.E. 2561, the import and export of radioactive waste is generally prohibited unless a license is obtained from the Secretary General of the Office of Atom for Peace. In this ministerial regulation, the regulations, methods, and requirements for obtaining a license are thoroughly specified.

¹⁶³ Ibid.

¹⁶⁴ Ibid.

¹⁶⁵ Office of Atoms for Peace, Act, Ministerial Regulations and Office Notification, <<https://www.oap.go.th/about-us/regulations>>, Accessed 21 June 2022.

(3) Ministerial Regulation on the Discharge Radioactive Waste B.E. 2561: generally, the discharge of radioactive waste is prohibited otherwise it is accordance with the ministerial regulation which is the activities and half-lives. The procedure of the discharge of such waste is prescribed in this ministerial regulation.

(4) Ministerial Regulation on the technical capability of a service on the radioactive waste management B.E. 2564: the commission shall allow the service of radioactive waste management and shall specify the technical competence in this ministerial order.

As mentioned earlier, the amended act proposed the concept of radioactive waste management, and the obligation to manage radioactive waste. For example, the law proposes that any person who intends to produce, possess, or use radioactive material must have the capability to manage radioactive material, as stated in section 29.¹⁶⁶ It is acknowledged in order to delegate responsibility to the licensee on the issue of the environment. Regarding nuclear facilities, the licensee also has to ensure that they will be responsible for managing spent fuel in the future. In particular, the Nuclear Energy for Peace Act B.E. 2559 (2016) specifies licensee's duties in order to ensure that they would fulfill the obligations for radioactive waste management, necessitating financial security.

Section 31¹⁶⁷ requires a licensee to provide a guarantee following the rules, procedures, conditions, and periods of time prescribed by the Ministerial

¹⁶⁶ Nuclear Energy for Peace Act Section 29: An applicant for a license under section 19 and section 26 who is a natural person shall have the qualifications and shall not be under any prohibitions as follows: (1) qualifications (a) being not less than twenty years of age; (b) having adequate technical capability for safety and security management of a radioactive material to be licensed, disuse management and radioactive waste management or having adequate technical capability for safety management of a radiation generator to be licensed, as the case may be. Such technical capability shall be as prescribed by the Ministerial Regulation with at least the following: 1) a storage facility or a business establishment; 2) equipment, tools, and instruments; 3) a radiation safety officer; 4) a radiation protection plan.

¹⁶⁷ Section 31: A license holder under section 19 and section 26 have the duty to provide a guarantee upon obtaining the license as the guarantee for the radioactive waste management and

Regulation. According to Thai law, in the second paragraph of Section 31, such guarantee mentioned as the financial security shall be in cash, Thai government bond, bank guarantee, and other types of financial guarantee prescribed by the ministerial regulation.

4.2.2 The Draft Ministerial Regulation on Financial Guarantee of Radioactive Waste Management B.E...

Initially, Thailand has two significant issues regarding the management of radioactive waste. First, the licensee with radioactive material neglects to manage the radioactive waste appropriately. These wastes have the potential to be stolen or lost and later discovered as orphan waste, which shall harm both the environment and people. Second, the state is primarily responsible for the management of radioactive waste that is considered orphan waste. The state budget is the sole possible source of funding for handling radioactive waste. Eliminating the

the operation of a competent official under section 104 in accordance with the rules, procedures, conditions, and periods of time prescribed by the Ministerial Regulation.

The guarantee under paragraph one shall be cash, Thai government bond, bank guarantee, or any other guarantee prescribed by the Ministerial Regulation.

If the license holder does not provide the guarantee or provide the guarantee with a lesser amount and not within the period prescribed in paragraph one, the license holder shall pay a surcharge at the rate of two percent per month of the required guarantee amount or the amount of shortfall, as the case may be, beginning from the due date. The Secretary General shall issue a notice to the license holder to provide the guarantee or the surcharge within thirty days upon receiving the notice. If the guarantee or the surcharge is still not provided, the Secretary General may issue an order to revoke the license.

In the case where the Secretary General assigns other party to manage radioactive waste for the license holder, the expense for that party shall be payable from the guarantee under paragraph one. If the guarantee is insufficient, the license holder shall be liable for the remaining expense. The remaining balance from the guarantee, if any, shall be returned to the license holder. The guarantee under paragraph one shall not be subjected to the execution of judgment but shall still be part of liability under this Act. Maintenance and disbursement of the guarantee shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

state's financial burden is one of the primary explanations for Thai law's requirement that any remaining amount from the securities must be returned to the license holder.¹⁶⁸

Under the draft of the ministerial regulation occurring from section 31, the amount of the financial securities is calculated from the total activity. The securities under the draft can be cash or cash cheque issued by a bank, government bonds, bank's guarantee contract, assurance contract or insurance policy, revocable letter of credit, and promissory note.¹⁶⁹ The only purpose for the securities is for guarantee for the spent nuclear fuel management, radioactive waste management, and the decommission plan.¹⁷⁰

The draft of the ministerial regulation has detailed the securities for radioactive waste management, that is also necessary for spent nuclear fuel management and the activities under the decommissioning plan.¹⁷¹ The draft law has set the required securities, which are cash, cash cheque issued by the bank, Thai government bonds, bank guarantee, revocable letter of credit and promissory note.¹⁷² However, the draft law, on the other hand, does not mention any criteria for determining whether the proposed securities are acceptable or not. Furthermore, following discussions with the director of legal affairs from the Office of Atom for Peace, it can be concluded that it has no further intention to establish such a framework for the securities' assessment, and the licensing officer retains sole authority. It is reasonable to presume that the securities are solely determined by an officer, which could lead to uncertainty and ineffective securities for radioactive management under Thai legislation.¹⁷³ Also, it is possible that the securities only determined by an officer

¹⁶⁸ Article 9 paragraph 2 of the draft.

¹⁶⁹ Principle and Reason recorded of the draft ministerial regulation of the financial guarantee B.E....

¹⁷⁰ *Supra* note 151

¹⁷¹ Article 1 of the draft.

¹⁷² Article 2 of the draft.

¹⁷³ Interview with Mr. Aniruth Songjakkaew, Head of Legal Affair, Office of Atom for Peace. (Office of Atom for Peace, 13 June 2022)

might result in the uncertainty and lack of effectiveness of the securities for the radioactive management under Thai law. The amount of guarantee is calculated from total activity appeared in the licensee.¹⁷⁴ Besides, Thai law establishes a re-evaluation of the securities listed in Article 6¹⁷⁵ in the event that the securities are insufficient or exceed the amount required by the officer's assessment. Therefore, it sets the right to appeal against the Secretary General's order.¹⁷⁶ By the way, it still lacks the recognition of the practical guideline or legal basis for evaluating the time and considerations. In addition, under the draft regulation, different types of securities per license and also the change of securities is acceptable via submitting a request to the Secretary General.¹⁷⁷ All the securities are kept by the Office of Atom for Peace.¹⁷⁸ According to the draft of ministerial regulation arising from section 31, it is required to be subjected to the concept of "public hearing" as defined in section 77 of the Constitution of the kingdom of Thailand B.E. 2560. According to Section 77, the state must consult with the public, also known as stakeholders, in order to conduct consultation and analysis, considering them at every stage of the legislative process.¹⁷⁹ Mostly, the opinions derive from

¹⁷⁴ Article 3 of the draft

¹⁷⁵ Article 6 of the draft.

¹⁷⁶ Ibid.

¹⁷⁷ Article 7 of the draft.

¹⁷⁸ Article 8 of the draft.

¹⁷⁹Section 77 The State should introduce laws only to the extent of necessity, and repeal or revise laws that are no longer necessary or unsuitable to the circumstances, or are obstacles to livelihoods or engagement in occupations, without delay, so as to abstain from the imposition of burdens upon the public. The State should also undertake to ensure that the public has convenient access to the laws and are able to understand them easily in order to correctly comply with the laws.

Prior to the enactment of every law, the State should conduct consultation with stakeholders, analyses any impacts that may occur from the law thoroughly and systematically, and should also disclose the results of the consultation and analysis to the public, and take them into consideration at every stage of the legislative process. When the law has come into force, the State should undertake an evaluation of the outcomes of the law at every specified period of time, for which consultation with stakeholders shall be conducted, with a view to developing all laws to be suitable to and appropriate for the changing contexts.

private sector which aims to use radioactive materials and radiation reactors for industry purpose. As a result, the proposed ministerial regulation has advanced to the next level. The following is how the public hearing can be concluded, dividing into 3 issues: type of securities, estimation of the amount calculation, and the impact of this regulation.

According to the public hearing report concluded by the legal affair of Atom for Peace, the relevant issues on the type of securities were raised as follows;

(1) The issue on the amount calculation on the securities is clarified that it is calculated from the total activity based on waste management service from Thailand Institute of Technology (Public Organization), which is the only waste management service in Thailand.¹⁸⁰

(2) The private sector proposed the Insurance Contract as one of supplementary securities. The Office of Atom for Peace agrees but still requires the further discussion with Office of Insurance Commission.¹⁸¹

(3) The private sector proposed the discount for the total amount as 5 Bath per Giga-becquerels but not exceed 5,000,000 baht.¹⁸²

4.2.3 The Default of the Draft of the Ministerial Regulation on the Securities of Radioactive Waste Management

(1) The Type of securities restricted by Thai law;

Only six types of securities are specified in section 31 of the Nuclear Energy for Peace Act and the draft ministerial regulation on securities: cash or cash cheque issued by a bank, government bonds, bank's guarantee contract, assurance contract or insurance policy, revocable Letter of credit, and promissory note. Because

¹⁸⁰ Legal Affair Office of Atoms for Peace, Summary of public hearing on the Draft Ministerial Regulation on Financial Guarantee of Radioactive Material B.E..., (Office of Atoms for Peace, 25 September 2019)

¹⁸¹ Ibid.

¹⁸² Ibid.

of these restricted securities, as previously stated, the private sector's capacity to provide additional financial guarantees is limited.

Furthermore, due to the law change and situation, the appropriate assets as the securities may change in the future. The limit of securities and the other prohibited types is not recommended. Besides, each licensee may have the different proper types of the securities as a guarantee. Thus, the law should be open to the different types of securities that the authority may consider in each individual case.

(2) The problem on the discretion

As aforementioned, The Office of Atom for Peace, Thailand's regulator, is the body in charge of assessing securities requests, Nuclear Energy for Peace Act, as the primary law, and the associated regulations do not explicitly establish the power of evaluation. As indicated, there is a discovery that the license system only allows for officer determination of the license. The technical officer is the only person with the authority to decide on both a license and a financial guarantee. As a result, it lacks professional and qualified officers who are knowledgeable, skilled, and experienced in economic or securities law.

(3) The issue with the interest that may arises from the securities

Except for cash, which will be deposited at the bank, all of the securities that were acquired from the licensee will be kept in the Office of Atom for Peace. Keeping the securities only for a storage purpose would be of little use. For instance, the proposal states that a licensee must give securities totaling for approximately one million baht. It is apparent that the sum of money represented by the securities is extremely significant and might be crucial for the commercial sector. One million baht in securities, together with a few state-owned interests, are stored at the bank. Cash can be used to conduct businesses rather than being kept solely for storage, rather than being used for securities.

(4) The issue with the assessment procedure

Currently, there are two significant issues with the assessment procedure. Firstly, the Nuclear Energy for Peace Act and the draft ministerial regulation do not recognize the concept of re-assessing the securities that are provided on a regular basis; even the ministerial regulation only mentions the request to reconsider

the number of securities in the case where the licensee disagrees with the secretary general's order. Secondly, the officer who evaluates a license's technical potential is also responsible for assessing the securities, regardless of the fact that he or she might lack eligible expertise or knowledge required to be a specialist in economics or law concerning any financial securities.

(5) The limited scope of the securities

Cash, cash cheques issued by the bank, Thai government bonds, bank guarantee, revocable letter of credit and promissory note guarantee are only the securities prescribed by the draft ministerial regulation. Even though today's securities can be more extensive, it appears that other types of securities may not be recognized by Thai law, even in the form of a fund, one of the most trustworthy financial mechanisms that were widely used, considered to be efficient, and recommended by international organizations.

4.3 The Relevant Regulators and Organizations in Thailand

Regarding radioactive waste management in Thailand, there are three leading agencies, involving the securities for radioactive waste management as listed below:

4.3.1 Office of Atoms for Peace (OAP)

The "Office of Atomic Energy for Peace (OAEP)" was established after the Royal Thai Government announced the Atomic Energy for Peace Act, B.E. 2504 article 19, was enacted on April 25th, 1961.¹⁸³ As per its statutory mandate, the OAEP had been in charge of conducting nuclear technology research and development to benefit the nation's growth and overseeing nuclear and radiation safety regulations. Later, the name of the organization was changed eventually to the Office of Atoms for Peace (OAP). It is in charge of regulating Thailand's use of radiation and nuclear technology.¹⁸⁴

¹⁸³ Office of Atoms for Peace, Getting to know Office of Atoms for Peace (Office of Atoms for Peace)

¹⁸⁴ Ibid.

Especially the OAP is the key regulatory organization accountable for radioactive waste management. The OAP is initially accountable for establishing and regulating associated governmental regulations on managing radioactive waste. For all licenses and assessments regarding radioactive waste management, foremost, securities will be required to provide for the future.

The OAP is the primary regulator who has a significant role in drafting the ministerial regulation on the securities of radioactive waste management. Furthermore, the OAP is the regulatory agency in charge of issuing licenses and determining which securities are provided.

4.3.2 Thailand Institute of Nuclear Technology (TINT)

The TINT is in charge of conducting research and development on various applications of nuclear technology, in addition to providing services and spreading information in the sectors of industry, medicine, and the environment. Foremost, TINT is currently the sole radioactive waste management center in Thailand. Services provided include the disposal of radiation sources and solid and liquid waste.¹⁸⁵

Radioactive waste management involves the TINT inevitably because currently, the TINT is the only entity that is regarded as the Waste Management Organization in Thailand. Accordingly, TINT's service cost of radioactive waste management will be used as the ground for the OAP's calculation of the cost of the financial guarantee.

4.3.3 The Nuclear Energy for Peace Commission

This principal authority on analyzing and promoting the nation's strategy on the peaceful use of nuclear energy and radiation. It was established to implement these responsibilities. In addition, it is also responsible for counseling the Thai government on matters of legislation relating to nuclear and radiation technology.

¹⁸⁵ Thailand Institute of Nuclear Technology, About TINT, < <https://www.tint.or.th/en>>, Accessed 24 June 2022.

The Nuclear Energy for Peace Commission is in charge for guiding both legislative and regulation advancement pertaining to the safety and radioactive waste management.

4.4 Proposed Solutions on the Securities of Radioactive Waste Management in Thailand

According to the author's perspective, the issue of securities' types and the assessment procedure under the draft law remains unclear and ineffective. Compared to the international law and foreign laws, Thai law including the Nuclear Energy for Peace Act and the Draft Ministerial Regulation on Financial Guarantee of Radioactive Material B.E.... should be amended by these following recommendations.

1. The concept of fund shall be introduced to Thai law regarding radioactive waste management. As mentioned previously in Chapter 3, the idea of fund is widely used worldwide, which is recommended at the international level and is commonly used in many countries, both operated nuclear power plant and the country that never does. The pros of the fund include various factors, firstly, it is regarded as one of the most reliable tools for the securities on radioactive waste management since inflation fluctuation rarely exists. In addition, the fund can cause interests in the case where money is provided in the fund. Various ideas for the fund are another advantage of the fund system. From the author's perspective, Thailand's version of a fund should be implemented by the government, for example in Austria, since it is convenient to manage. Furthermore, the purpose of the fund in other jurisdictions are for radioactive waste management and liability.

According to author's opinion, the liability and the waste management shall be separated. Regarding business's perspective as a licensee, two separated funds may become the burden, since two amounts of money shall be defrayed separately. On the other hand, regarding the environment and the public's perspective, the two separated funds are one of the most efficient guarantees for the safety and recovery in the case of nuclear and radiation accident.

2. The evaluation mechanism must be enhanced and revised. Due to the fact that, the relevant assessment officer only acquires the expertise on technical

knowledge regarding nuclear and radiation without eligible knowledge of law and economics to reasonably evaluate the securities. In this way, it is necessary to assess the personnel assessment method. For the utmost efficacy, the assessment officer shall take the form of a committee comprised of specialists from various linked fields, such as nuclear law, technical experts, economics, and other related fields.

Another suggestion is that the OAP, which is the primary regulator, should acknowledge the guideline as the manual in order to establish the standard for the securities relating to the radioactive waste management for the assessment officer as well as the licensee, who is responsible for providing the securities. This would fulfill the duty that the licensee has to provide the securities.

3. Apart from the proposed guideline for the assessment, the assessment authority shall be implemented in a team of qualified members with skill, knowledge, and experience in law, economics, and technique since the assessment relies on factors in those relevant fields.

4. Under Thai law, other types of securities should be allowed to provide as a financial guarantee. The scope of securities shall be extended more than what specified in the Nuclear Energy for Peace Act and draft ministerial regulation unless there is a prohibition from the commission whose authority of securities' assessment.

5. According to the public hearing on the proposed the insurance contract as one of the securities, the insurance contract can be taken into account, nevertheless some condition is recommended. Thailand shall adopt the idea from Canadian nuclear law that the beneficiary shall be OAP as the regulator who is a regulator represented the responsibility for the radioactive waste management in this regard.

6. Regarding the licensee, a government sector, the special types of securities shall be considered. As under Canadian law, if any licensee is the government sector, an expressed commitment from government entities is the most recommended as it is a government agency. For this reason, the level of control is therefore less intensive because there is a guarantee from the head of the organization. In addition, such guarantee regardless comes from state budget.

7. Regarding the OECD's perspective, the securities that are once provided can be borrowed back by that licensee with the indicated interest. In the author's

perspective, this concept shall be an option to implement in Thai law, since in the case of crisis, it is necessary for the licensee especially the private sector to be able to continue the business.

8. The proposed ministerial regulation shall adopt the annual assessment. As mentioned previously, the draft simply permits the Secretary General to take the assessment into consideration without mentioning about frequency of the assessment. Because of this, the assessment must be conducted every year due to changes in the economy and situation. Another significant issue that must be addressed is how to encourage the growth of various corporate sectors while also protecting both people and the natural environment.

9. There is another solution for funding radioactive waste management in addition to partly subsidizing taxes in the NEA. Since radioactive waste is considered hazardous, the licensee shall be responsible for those waste. Furthermore, the licensee should be responsible and capable of paying a tax. With this concept, the tax is collected from the licensee directly for those who might cause the radioactive waste in the future. This idea can be divided into two scenarios. Firstly, the tax can be the main financial guarantee of radioactive waste management. Secondly, the tax can be considered as the supplemented cost that covers the remaining cost after the fund.

The revenue from the tax received will be set aside for an extrabudgetary fund with a defined purpose. It is exempted from the remittance to the Ministry of Finance as a state income. Additionally, it cannot be used for other purposes except for spending as specified in the objectives of the fund.

10. The total amount of securities for licensees who decide to export radioactive waste abroad shall be determined priorly, or the amount of securities shall be lower than others because they have to deal with the high cost of the export, according to the public hearing for the draft ministerial regulation.

4.5 Conclusions

The substitution of The Nuclear Energy for Peace Act B.E. 2559 (2016) from the Atomic Energy for Peace Act B.E. 2504 (1961) is regarded as the most significant

legislative framework on nuclear and radiation in Thailand, which establishes the fundamental rules for generating and using nuclear energy and radiation. This law aims to control radiation and nuclear operations with regard to safety, security, safeguards and to adhere to appropriate international legal frameworks. Thailand is in compliance with the Safety of Radioactive Waste Management (Joint Convention), the international law regarding waste management arising from radiation and nuclear utilization. The securities of radioactive waste management in Thailand have been stated in Sections 31 and 69 of the Nuclear Energy for Peace Act B.E. 2559. In addition, there are currently four ministerial regulations that are the subsidiary laws, detailing radioactive waste management. Also, The Draft Ministerial Regulation on the Securities of Radioactive Waste Management B.E... is the draft of the ministerial regulation emerging from Section 31, specifying the securities of the radioactive waste management particularly. The securities provided are limited only to those that are prescribed in the draft law and collected by the Office of Atoms for Peace represented by a technical officer who is also responsible for the financial security's assessment. Under Thai legislation, the objective of the securities is to assure that licensees are responsible for radioactive waste management. When there is radiation, or the occurrence of nuclear liability, the corresponding securities will be disqualified. Furthermore, the license holder in Thailand is responsible for the remaining cost if the securities are insufficient, unlike the Austrian nuclear law, which states that the government is responsible for the remaining expense.

CHAPTER 5

CONCLUSION

This independent study's primary focus is to observe the type of securities which use as an instrument for the securities of radioactive waste management and to explore the appropriate assessment system. The purpose of nuclear safety and security is, first and foremost, to save people and their property, as well as the natural environment. One of the most important benefits of superior safety and security systems and measures is broadening and maintaining access to nuclear science and technology for peaceful purposes. It is one of the most fundamental advantages emerging from the existence of these systems and measures. The utilization of nuclear power and radiation for various purposes in industry, research, and medicine inevitably produces radioactive waste. Especially in Thailand, the waste has been used in ionizing radiation for more than 120 years involving multiple sectors. The majority of license types in Thailand is the industry license, which is popular in the industry operating in foods, packaging, parts of automobile, petrochemical, and electronics shatters. For medicine, the first x-ray machine was imported to diagnose pulmonary tuberculosis in inmates. Until today, using radioactive material and generators plays a significant role in the medical sector. The healthcare system is concerning the prevalence of cancer, the leading cause of death. For this reason, the cancer care from the radiology and radiation oncology facilities is an example of how nuclear technology affects the medical industry.

Therefore, it is required to appropriately manage radioactive waste through qualified technical knowledge in accordance with the types of radioactive waste. This suggests that distinct categories of radioactive waste should be handled in a variety of different ways, depending on the type of waste as to keep environment and people safe is the key of radioactive waste management. Moreover, removing the burden for the next generation is the overarching principle of radioactive waste management. Therefore, financial securities are the legal mechanism that will be utilized to guarantee that there will be decent management of radioactive waste. Due to the

development of an international agreement on radioactive waste management, it is now considered a global issue. Joint convention on the Spent Fuel Management and on the Safety of Radioactive Waste Management 1997 was established by the International Atomic Energy Agency (IAEA). This convention is the only international legally binding agreement that addresses the worldwide management of radioactive waste and spent fuel. Thailand is one of the members of the IAEA, and also, the Joint convention on spent fuel management and the safety of radioactive waste, starting the member state in 2018. Ensuring they are taking the proper steps to manage radioactive waste, the member states of this Joint convention, including Thailand, are obligated to prepare the National Report. In addition, Nuclear Energy Agency or the NEA, which is under the Organization for Economic Cooperation and Development (OECD), the European region organization, introduces financial mechanisms for spent fuel and radioactive waste management. One of the most preferred securities is a fund, because of its ability of separation into various models, each of which has advantages and disadvantages, depending on the appropriateness for the context of each country.

For example, in Austria, where the fund is adopted as securities despite of the lack of nuclear power plant, the fund and the state budget are officially separated. According to the "Pollution Pay Principle", the license holder is responsible for funding and the Austrian Board for Radioactive Waste Management, a government-representative agency, manages the fund. The Radiation Protection Act is a crucial piece of nuclear security legislation in Austria. The state budget is responsible for recovering any leftover costs differing from Canadian nuclear law where nuclear power plant and other utilities are operated from radiation, which generate spent fuel and radioactive waste. According to the securities, Canada established "fund" in the model of an internal segregated fund for the decommission, including spent fuel particularly as well. Apart from that, Canada establishes the various types of securities that are even more interesting than Austrian law. Apart from the indicated securities, Canada permits the regulator, the Canadian Nuclear Safety Commission (CNSC), to consider any securities as a financial guarantee; this is a significant characteristic of Canadian nuclear law. However, Canadian law does not mention the remaining cost in the case

where there is insufficient funding for the radioactive waste management and spent fuel.

Regarding Section 31 of the Nuclear Energy for Peace Act, Thailand requires licensees who operate in the process of radioactive waste and spent fuel on the decommission to provide the securities to ensure the management of those wastes. The detail on the securities on the radioactive waste management in Thailand is determined in the draft regulation named “The Draft Ministerial Regulation on Financial Guarantee of Radioactive Material B.E....”. However, the securities under the draft law are unfortunately limited to only six types, lack of review sessions as well as an appropriate assessment clearly by the law.



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APPENDICES

APPENDIX A

PUBLIC HEARING ON THE DRAFT MINISTERIAL REGULATION REGARDING THE SECURITIES OF RADIOACTIVE WASTE MANAGEMENT

**สรุปการประชุมเพื่อรับฟังความคิดเห็นต่อ
ร่างกฎกระทรวงกำหนดหลักเกณฑ์ วิธีการ เงื่อนไข และระยะเวลาในการวางหลักประกันเกี่ยวกับ
วัสดุกัมมันตรังสี เครื่องกำเนิดรังสี วัสดุนิวเคลียร์ และสถานประกอบการทางนิวเคลียร์
และการเข้าดำเนินการของพนักงานเจ้าหน้าที่ พ.ศ.**

**สำนักงานปรมาณูเพื่อสันติ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัยและนวัตกรรม
เมื่อวันที่ ๒๕ กันยายน ๒๕๖๒ เวลา ๑๓.๓๐ - ๑๖.๓๐ น.**

การประชุมเพื่อรับฟังความคิดเห็นต่อร่างกฎกระทรวงกำหนดหลักเกณฑ์ วิธีการ เงื่อนไข และระยะเวลาในการวางหลักประกันเกี่ยวกับวัสดุกัมมันตรังสี เครื่องกำเนิดรังสี วัสดุนิวเคลียร์ และสถานประกอบการทางนิวเคลียร์ และการเข้าดำเนินการของพนักงานเจ้าหน้าที่ พ.ศ. มีสาระสำคัญโดยสรุปดังนี้

๑. ผู้ประกอบการถามว่า หลักเกณฑ์การคิดจำนวนหลักประกันที่ต้องวาง มีที่มาอย่างไร
ปส. ชี้แจงว่า จำนวนหลักประกันที่ต้องวางจะคิดจากค่ากัมมันตภาพรวม (total activity) ในใบอนุญาต ทั้งนี้ จำนวนหลักประกันที่ต้องวางมีฐานมาจากอัตราค่าบริการจัดการกากกัมมันตรังสีของสถาบันเทคโนโลยีนิวเคลียร์แห่งชาติ (สทน.)

๒. ผู้ประกอบการเสนอให้เพิ่มกรรมธรรม์ประกันภัยเป็นอีกหนึ่งประเภทของหลักประกัน
ปส. ชี้แจงว่า ปส. จะรับมาพิจารณาและหารือกับสำนักงานคณะกรรมการกำกับและส่งเสริมการประกอบธุรกิจประกันภัย (คปภ.) ว่าสามารถกระทำได้หรือไม่ อย่างไร

๓. ผู้ประกอบการถามว่า สัญญาค้ำประกันของธนาคารต้องออกโดยธนาคารในประเทศไทยเท่านั้นหรือไม่

ปส. ชี้แจงว่า ร่างกฎกระทรวงไม่ได้กำหนดว่าต้องเป็นธนาคารในประเทศไทยเท่านั้น ผู้ประกอบการจึงสามารถใช้สัญญาค้ำประกันของธนาคารที่ออกโดยธนาคารในต่างประเทศได้ ทั้งนี้ ปส. จะพิจารณาความน่าเชื่อถือของธนาคารประกอบด้วย

๔. ผู้ประกอบการเสนอให้ขยายระยะเวลาในการวางหลักประกันจาก ๓๐ วัน เป็น ๖๐ วัน เพื่อให้สอดคล้องกับขั้นตอนการจัดทำหนังสือค้ำประกันธนาคารของผู้ประกอบการ และเพื่อให้ผู้ประกอบการได้เตรียมการตั้งงบประมาณในการวางหลักประกันไว้ล่วงหน้า

ปส. ชี้แจงว่า ปส. จะรับมาพิจารณา

๕. ผู้ประกอบการเสนอให้ปรับลดจำนวนหลักประกันที่ต้องวางในข้อ ๓.๑ ที่กำหนดว่า “ผู้รับใบอนุญาตเกี่ยวกับวัสดุกัมมันตรังสีให้คิดประมาณค่าใช้จ่าย ในอัตรา ๑๕ บาทต่อจิกะเบ็กเคอเรล ทั้งนี้ ต้องไม่น้อยกว่า ๕,๐๐๐ บาท และไม่เกิน ๑๐,๐๐๐,๐๐๐ บาท” เป็น “อัตรา ๕ บาทต่อจิกะเบ็กเคอเรล และไม่เกิน ๕,๐๐๐,๐๐๐ บาท”

ปส. ชี้แจงว่า ปส. จะรับมาพิจารณา

๖. ผู้ประกอบการเสนอให้กำหนดสิทธิพิเศษในการวางหลักประกันให้กับผู้ประกอบการที่ทำสัญญาส่งคืนกากกัมมันตรังสีไปจัดการยังบริษัทผู้ผลิตต่างประเทศ เช่น การลดจำนวนหลักประกันที่ต้องวางลงครึ่งหนึ่ง เนื่องจากผู้ประกอบการต้องมีค่าใช้จ่ายที่ค่อนข้างสูงกรณีที่ทำสัญญาดังกล่าว

ปส. ชี้แจงว่า ปส. จะรับมาพิจารณา โดยอาจพิจารณาประกอบกับความเห็นข้อ ๕ ข้างต้น

APPENDIX B

THE DRAFT MINISTERIAL REGULATION ON THE SECURITIES OF RADIOACTIVE WASTE MANAGEMENT

ร่างปรับแก้ไขเสนอที่ประชุมพิจารณา ...

บันทึกหลักการและเหตุผล

ร่างกฎกระทรวงการวางหลักประกันและการดำเนินการเกี่ยวกับหลักประกัน

พ.ศ.

หลักการ

กำหนดหลักเกณฑ์ วิธีการ เงื่อนไข และระยะเวลาในการวางหลักประกันและการดำเนินการเกี่ยวกับหลักประกัน

เหตุผล

โดยที่มาตรา ๓๑ มาตรา ๓๒ มาตรา ๔๔ และมาตรา ๖๙ แห่งพระราชบัญญัติพลังงานนิวเคลียร์เพื่อสันติ พ.ศ. ๒๕๕๙ บัญญัติให้ผู้รับใบอนุญาตเกี่ยวกับวัสดุกัมมันตรังสี เครื่องกำเนิดรังสี วัสดุนิวเคลียร์ และสถานประกอบการทางนิวเคลียร์มีหน้าที่วางหลักประกันตั้งแต่ได้รับใบอนุญาตเพื่อเป็นหลักประกันในการจัดการกากกัมมันตรังสี และในการเข้าดำเนินการของพนักงานเจ้าหน้าที่ การจัดการเชื้อเพลิงนิวเคลียร์ใช้แล้ว และการดำเนินการตามแผนการเลิกดำเนินการสถานประกอบการทางนิวเคลียร์ เพื่อให้เป็นหลักประกันในความปลอดภัยของประชาชนและสิ่งแวดล้อม และเป็นไปตามหลักมาตรฐานสากล ตลอดจนการเก็บรักษาและการเบิกจ่ายหลักประกัน ทั้งนี้ ตามหลักเกณฑ์ วิธีการ เงื่อนไข และระยะเวลาที่กำหนดในกฎกระทรวง จึงจำเป็นต้องออกกฎกระทรวงนี้

ร่าง
กฎกระทรวง
การวางหลักประกันและการดำเนินการเกี่ยวกับหลักประกัน
พ.ศ.

อาศัยอำนาจตามความในมาตรา ๕ วรรคสอง แห่งพระราชบัญญัติพลังงานนิวเคลียร์เพื่อสันติ พ.ศ. ๒๕๕๙ ซึ่งแก้ไขเพิ่มเติมโดยพระราชบัญญัติพลังงานนิวเคลียร์เพื่อสันติ (ฉบับที่ ๒) พ.ศ. ๒๕๖๒ และมาตรา ๓๑ วรรคหนึ่ง วรรคสอง และวรรคหก มาตรา ๓๒ มาตรา ๔๔ มาตรา ๖๔ และมาตรา ๘๐ วรรคสอง แห่งพระราชบัญญัติพลังงานนิวเคลียร์เพื่อสันติ พ.ศ. ๒๕๕๙ รัฐมนตรีว่าการกระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัยและนวัตกรรม ออกกฎกระทรวงไว้ดังต่อไปนี้

ข้อ ๑ ในกฎกระทรวงนี้

“หลักประกัน” หมายความว่า หลักประกันในการจัดการกากกัมมันตรังสี การจัดการเชื้อเพลิงนิวเคลียร์ใช้แล้ว การดำเนินการตามแผนการเลิกดำเนินการสถานประกอบการทางนิวเคลียร์หรือสถานที่ให้บริการจัดการกากกัมมันตรังสี และในการเข้าดำเนินการของพนักงานเจ้าหน้าที่

“ผู้รับใบอนุญาต” หมายความว่า ผู้รับใบอนุญาตดังต่อไปนี้

- (๑) ผลิต มีไว้ในครอบครอง หรือใช้วัสดุกัมมันตรังสี
- (๒) ทำเครื่องกำเนิดรังสี
- (๓) มีไว้ในครอบครองหรือใช้เครื่องกำเนิดรังสี
- (๔) มีไว้ในครอบครองหรือใช้วัสดุนิวเคลียร์
- (๕) ดำเนินการสถานประกอบการทางนิวเคลียร์
- (๖) ดำเนินการสถานที่ให้บริการจัดการกากกัมมันตรังสี

ข้อ ๒ หลักประกันมีดังต่อไปนี้

- (๑) เงินสดหรือเช็คเงินสดที่ธนาคารสั่งจ่าย
- (๒) พันธบัตรของรัฐบาลไทย
- (๓) สัญญาค้ำประกันของธนาคาร

(๓/๑) สัญญาประกันภัยหรือกรมธรรม์ประกันภัยของบริษัทประกันภัยตามกฎหมายว่าด้วยคณะกรรมการกำกับและส่งเสริมการประกอบธุรกิจประกันภัย

- (๔) สแตนด์บายเลตเตอร์ออฟเครดิตประเภทเพิกถอนไม่ได้

๒

(๕) ตัวสัญญาใช้เงิน

การตรวจสอบความครบถ้วน ความน่าเชื่อถือ และถูกต้องของหลักประกันตามวรรค
หนึ่ง ให้เป็นไปตามหลักเกณฑ์และวิธีการที่เลขาธิการกำหนด

(ขอให้ผู้แทน ปส พิจารณาในประเด็นเรื่องการวางหลักประกันเป็นส่วน ประเภท
หลักประกันที่จะวาง ผู้ประกอบกิจการที่สามารถวางเป็นส่วนได้)

หมวด ๓

การวางหลักประกัน

ข้อ ๓ ให้ยกเว้นหน้าที่การวางหลักประกันตามกฎหมายกระทรวงนี้แก่สภาวิชาชีพและ
หน่วยงานของรัฐ แต่ไม่รวมถึงรัฐวิสาหกิจ

(พิจารณาเทียบเคียง กท ใบอนุญาตวัสดุกัมมัน)

ข้อ ๔ ผู้รับใบอนุญาตมีหน้าที่วางหลักประกันที่มีมูลค่า ~~ตามที่กำหนด~~ ตามอัตรา
ดังต่อไปนี้

(๑) ผู้รับใบอนุญาตเกี่ยวกับวัสดุกัมมันตรังสี ~~และผู้รับใบอนุญาตเกี่ยวกับเครื่อง~~
~~กำเนิดรังสีที่สามารถทำให้เกิดผลผลิตจากการก่อกัมมันตรังสี (activation product) ในอัตรา ๑๕~~
บาท ต่อ ๑ จิกะเบ็กเกอร์ ทั้งนี้ ต้องไม่น้อยกว่า ๕,๐๐๐ บาทและไม่เกิน ๑๐,๐๐๐,๐๐๐ บาท

~~(๒) ผู้รับใบอนุญาตเกี่ยวกับเครื่องกำเนิดรังสีที่สามารถทำให้เกิดผลผลิตจาก~~
~~การก่อกัมมันตรังสี (activation product) ในอัตรา ๑๕ บาทต่อ ๑ จิกะเบ็กเกอร์ ทั้งนี้ ต้องไม่~~
~~น้อยกว่า ๕,๐๐๐ บาทและไม่เกิน ๑๐,๐๐๐,๐๐๐ บาท~~

(๓) ผู้รับใบอนุญาตเกี่ยวกับวัสดุนิวเคลียร์ ในอัตราดังนี้

(ก) วัสดุต้นกำลัง ในอัตรา ๕๐ บาท ต่อ ๑ กิโลกรัม

(ข) วัสดุนิวเคลียร์พิเศษ ในอัตรา ๕๐ บาท ต่อ ๑ กรัม

(๔) ผู้รับใบอนุญาตดำเนินการสถานประกอบการทางนิวเคลียร์ ในอัตราดังนี้

(ก) สถานที่ใช้เครื่องปฏิกรณ์นิวเคลียร์เพื่อการผลิตพลังงาน ในอัตรา
๑,๙๕๐,๐๐๐ บาท ต่อ ๑ เมกะวัตต์ (ความร้อน)

(ข) สถานที่ใช้เครื่องปฏิกรณ์นิวเคลียร์วิจัย ในอัตรา ๕๐๐,๐๐๐ บาท ต่อ
๑ กิโลวัตต์ (ความร้อน)

(ค) สถานที่ตั้งแร่เพื่อให้ได้มาซึ่งวัสดุนิวเคลียร์ สถานที่เปลี่ยนรูปหรือ
เสริมสมรรถนะวัสดุนิวเคลียร์ สถานที่ประกอบหรือจัดเก็บเชื้อเพลิงนิวเคลียร์ หรือสถานที่จัดเก็บหรือแปร
สภาพเชื้อเพลิงนิวเคลียร์ใช้แล้วให้ วางหลักประกันตามหลักประกันมูลค่าใช้จ่ายจาก กัมมันตภาพของ

๓

วัสดุแก๊สมันตรังสีและปริมาณของวัสดุนิวเคลียร์ที่ได้รับอนุญาตให้เกิดขึ้นตลอดการดำเนินการของสถานประกอบการ ดังนี้

๑) วัสดุกัมมันตรังสี ในอัตรา ๑๕ บาท ต่อ ๑ จิกะเบ็กเคอเรล ทั้งนี้ ต้องไม่น้อยกว่า ๕,๐๐๐ บาท

๒) วัสดุนิวเคลียร์ที่เป็นวัสดุต้นกำลัง ในอัตรา ๕๐ บาท ต่อ ๑ กิโลกรัม

๓) วัสดุนิวเคลียร์ที่เป็นวัสดุนิวเคลียร์พิเศษ ในอัตรา ๕๐ บาท ต่อ ๑ กรัม

หากผู้รับใบอนุญาตดำเนินการสถานประกอบการทางนิวเคลียร์เป็นผู้รับใบอนุญาตเกี่ยวกับวัสดุกัมมันตรังสีหรือวัสดุนิวเคลียร์ด้วย ให้วางหลักประกันเฉพาะในส่วนของสถานประกอบการทางนิวเคลียร์เพียงอย่างเดียว

(๕) สถานที่ให้บริการจัดการกากกัมมันตรังสี ในอัตรา ๑๕ บาท ต่อ ๑ จิกะเบ็กเคอเรล ทั้งนี้ ต้องไม่น้อยกว่า ๑๐,๐๐๐ บาท และไม่เกิน ๑๐,๐๐๐,๐๐๐ บาท

ในกรณีที่ผู้รับใบอนุญาตดำเนินการสถานที่ให้บริการจัดการกากกัมมันตรังสี มีสัญญาส่งกากกัมมันตรังสีทั้งหมดไปยังประเทศผู้ผลิต ให้ผู้รับใบอนุญาตดำเนินการสถานที่ให้บริการจัดการกากกัมมันตรังสีวางหลักประกันลดลงกึ่งหนึ่งของมูลค่าเดิมจำนวนที่ต้องวาง (สอบถามผู้แทนว่าสามารถใช้กลไกการขอลดหลักประกันตามร่างข้อ ๖ วรรคสอง ได้หรือไม่)

ข้อ ๕ ให้ผู้รับใบอนุญาตยื่นคำขอวางหลักประกัน และแสดงรายละเอียดหลักประกัน พร้อมทั้งมอบหลักประกันเดิมจำนวนตามอัตราในข้อ ๔ ให้เจ้าหน้าที่ตรวจสอบภายในระยะเวลาหกสิบวันนับแต่วันที่ได้รับใบอนุญาตจากเลขาธิการ **ยื่นแต่การวางหลักประกันตามข้อ ๒ (๑) ผู้รับใบอนุญาตดำเนินการสถานประกอบการทางนิวเคลียร์ และผู้รับใบอนุญาตดำเนินการสถานที่ให้บริการจัดการกากกัมมันตรังสีอาจวางหลักประกันโดยการผ่อนชำระเป็นงวดได้ ตามหลักเกณฑ์และเงื่อนไขที่เลขาธิการประกาศกำหนด**

เมื่อเจ้าหน้าที่ได้ตรวจสอบหลักประกันที่ผู้รับใบอนุญาตนำมาวางตามวรรคหนึ่งครบถ้วนถูกต้องแล้ว ให้เลขาธิการออกใบรับการวางประกันให้แก่ผู้รับใบอนุญาตเก็บไว้เป็นหลักฐาน **ค่าของหลักประกัน ใบรับการวางหลักประกัน ให้เป็นไปตามแบบที่เลขาธิการกำหนด (ย้ายไป ๗/๒)**

ข้อ ๖ ในกรณีที่มีการวางหลักประกันแล้วเลขาธิการมีอำนาจพิจารณาเพิ่มหรือลดมูลค่าของหลักประกันได้ หากปรากฏว่าประมาณการค่าใช้จ่ายในการจัดการกากกัมมันตรังสี การจัดการเชื้อเพลิงนิวเคลียร์ใช้แล้ว การดำเนินการตามแผนการเลิกดำเนินการสถานประกอบการทางนิวเคลียร์หรือสถานที่ให้บริการจัดการกากกัมมันตรังสี และในการเข้าดำเนินการของพนักงานเจ้าหน้าที่ตามกฎหมายว่าด้วยพลังงานนิวเคลียร์เพื่อสันติเพิ่มหรือลด โดยต้องแจ้งเป็นหนังสือให้

๔

ผู้รับใบอนุญาตทราบ พร้อมกับชี้แจงเหตุผลของการเพิ่มหรือลดมูลค่าของหลักประกัน และสิทธิในการอุทธรณ์ให้ผู้รับใบอนุญาตทราบ

ผู้รับใบอนุญาตอาจขอเพิ่มหรือลดมูลค่าของหลักประกันได้ โดย**ยื่นเป็นหนังสือ**ระบุเหตุผลและมูลค่าของหลักประกันที่เพิ่มหรือลดต่อเลขาธิการเพื่อขอความเห็นชอบ

ให้ผู้รับใบอนุญาตวางหลักประกันในส่วนที่เพิ่มภายในหกสิบวันนับแต่วันที่ได้รับหนังสือแจ้งจากเลขาธิการ และให้เลขาธิการคืนหลักประกันในส่วนที่ลดภายในกำหนดเวลาตามข้อ ๑๐ (๕)

ข้อ ๗ ผู้รับใบอนุญาตสามารถวางหลักประกันประเภทเดียวทั้งหมดหรือหลายประเภทรวมกันได้ และหากในกรณีผู้รับใบอนุญาตประสงค์จะเปลี่ยนแปลงประเภทหลักประกันให้ผู้รับใบอนุญาตยื่นคำขอเปลี่ยนแปลงประเภทหลักประกันเพื่อขอความเห็นชอบจากเลขาธิการตามแบบ โดยเลขาธิการต้องพิจารณาให้แล้วเสร็จภายในสามสิบวันนับแต่วันที่รับคำขอเปลี่ยนแปลงประเภทหลักประกัน

เลขาธิการมีอำนาจเปลี่ยนแปลงประเภทหลักประกันได้ โดยแจ้งเป็นหนังสือให้ผู้รับใบอนุญาตทราบพร้อมกับระบุประเภทหลักประกันที่ให้เปลี่ยนแปลง และสิทธิในการอุทธรณ์ให้ผู้รับใบอนุญาตทราบ

ให้ผู้รับใบอนุญาตดำเนินการเปลี่ยนแปลงประเภทหลักประกันให้แล้วเสร็จภายในหกสิบวันนับแต่วันที่ได้รับหนังสือแจ้งจากเลขาธิการ

ในกรณีที่มีการเปลี่ยนแปลงหลักประกัน ให้นำความในข้อ ๕ วรรคสองมาใช้บังคับโดยอนุโลม

ข้อ ๗/๑ การยื่นคำขอวางหลักประกัน รายละเอียดหลักประกันและส่งมอบหลักประกัน คำขอเพิ่มหรือลดมูลค่าของหลักประกัน คำขอเปลี่ยนแปลงประเภทหลักประกันตามกฎหมายกระทรวงนี้ ให้ยื่น ณ สำนักงาน หรือยื่นผ่านระบบอิเล็กทรอนิกส์ตามวิธีการที่เลขาธิการประกาศกำหนด

ข้อ ๗/๒ คำขอวางหลักประกัน ใบรับการวางหลักประกันให้เป็นไปตามแบบที่เลขาธิการกำหนดโดยประกาศในราชกิจจานุเบกษา

หมวด ๒

การเก็บรักษา การเบิกจ่าย และการคืนหลักประกัน

๕

ข้อ ๘ การเก็บรักษาหลักประกันที่เป็นเงินสดให้นำส่งเข้าบัญชีของสำนักงานที่เปิดไว้กับกระทรวงการคลังสำหรับเก็บรักษาหลักประกันเท่านั้น

การเก็บรักษาหลักประกันประเภทอื่นนอกจากเงินสดให้เก็บรักษาไว้ในตู้นิรภัยของสำนักงาน หรือสถานที่อื่นที่มีความปลอดภัยตามที่เลขาธิการเห็นชอบ

การเก็บรักษาหลักประกันรวมทั้งการจัดทำบัญชีหรือรายงานการเก็บรักษาให้เป็นไปตามหลักเกณฑ์และวิธีการที่เลขาธิการประกาศกำหนดในราชกิจจานุเบกษา

ข้อ ๙ ในกรณีที่เลขาธิการมอบหมายให้บุคคลอื่นดำเนินการแทนผู้รับใบอนุญาตในการจัดการกากกัมมันตรังสี จัดการเชื้อเพลิงนิวเคลียร์ใช้แล้ว ดำเนินการตามแผนการเลิกดำเนินการสถานประกอบการทางนิวเคลียร์และสถานที่ให้บริการจัดการกากกัมมันตรังสี และในการเข้าดำเนินการของพนักงานเจ้าหน้าที่เลขาธิการมีอำนาจดำเนินการหรือเบิกจ่ายหลักประกันของผู้รับใบอนุญาตเพื่อเป็นค่าใช้จ่ายให้กับบุคคลนั้น

ในกรณีที่หลักประกันไม่เพียงพอ ผู้รับใบอนุญาตต้องรับผิดชอบค่าใช้จ่ายส่วนที่ขาด และหากมีหลักประกันเหลือให้คืนแก่ผู้รับใบอนุญาต

การนำหลักประกันมาชำระค่าใช้จ่ายตามวรรคหนึ่ง ให้บุคคลดังกล่าวยื่นคำขอเบิกจ่ายพร้อมหลักฐานค่าใช้จ่าย เพื่อโอนเข้าบัญชีบุคคลนั้นหรือด้วยวิธีการอื่นตามที่เลขาธิการกำหนด

ข้อ ๑๐ ให้เลขาธิการคืนหลักประกันที่ผู้รับใบอนุญาตได้วางไว้ ภายในระยะเวลาหกสิบวันดังต่อไปนี้

- (๑) นับแต่วันที่ผู้รับใบอนุญาตแสดงเอกสารถึงการจัดการกากกัมมันตรังสีแล้วเสร็จ
- (๒) นับแต่วันที่ผู้รับใบอนุญาตแสดงเอกสารหรือหลักฐานในการส่งวัสดุกัมมันตรังสี เครื่องกำเนิดรังสี หรือวัสดุนิวเคลียร์คืนแก่ประเทศผู้ขายหรือผู้รับ ณ ประเทศปลายทาง
- (๓) นับแต่วันที่ผู้โอนใบอนุญาตแสดงเอกสารหรือหลักฐานในการวางหลักประกันของผู้รับโอนใบอนุญาตครบถ้วนแล้ว
- (๔) นับแต่วันที่เลขาธิการโดยความเห็นชอบของคณะกรรมการสั่งให้สถานประกอบการทางนิวเคลียร์หรือสถานที่ให้บริการจัดการกากกัมมันตรังสีตามที่ได้รับใบอนุญาตนั้นพ้นจากการควบคุม
- (๕) นับแต่วันที่เลขาธิการเห็นชอบให้ลดมูลค่าของหลักประกันตามข้อ ๖ หรือเปลี่ยนแปลงประเภทหลักประกันตามข้อ ๗

ทั้งนี้ ดอกเบี้ยที่เกิดขึ้นจากหลักประกันประเภทเงินสดหรือเช็คเงินสดที่ธนาคารสั่งจ่ายที่เกิดขึ้นให้ตกเป็นของแผ่นดินตามกฎหมายว่าด้วยวินัยการเงินการคลังของรัฐ

๖

บทเฉพาะกาล

ข้อ ๓๓ ผู้รับใบอนุญาตที่ได้รับใบอนุญาตอยู่ในวันก่อนวันที่กฎกระทรวงนี้ใช้บังคับ
ให้วางหลักประกันเต็มจำนวนภายในหกสิบวัน นับแต่วันที่กฎกระทรวงนี้มีผลใช้บังคับ

ให้ไว้ ณ วันที่ พ.ศ.....

รัฐมนตรีว่าการกระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัยและนวัตกรรม

BIOGRAPHY

Name	Pantha Chanachu
Educational Attainment	2017: Bachelor of Law, Thammasat University
Date of Birth	09 May 1996
Work Experiences	Legal Advisor, DFDL Limited Company Legal Officer, Office of Atoms for Peace

